

Three-Year Follow-up and Clinical Implications of a Mindfulness Meditation-Based Stress Reduction Intervention in the Treatment of Anxiety Disorders

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Abstract: *A previous study of 22 medical patients with DSM-III-R-defined anxiety disorders showed clinically and statistically significant improvements in subjective and objective symptoms of anxiety and panic following an 8-week outpatient physician-referred group stress reduction intervention based on mindfulness meditation. Twenty subjects demonstrated significant reductions in Hamilton and Beck Anxiety and Depression scores postintervention and at 3-month follow-up. In this study, 3-year follow-up data were obtained and analyzed on 18 of the original 22 subjects to probe long-term effects. Repeated measures analysis showed maintenance of the gains obtained in the original study on the Hamilton [$F(2,32) = 13.22$; $p < 0.001$] and Beck [$F(2,32) = 9.83$; $p < 0.001$] anxiety scales as well as on their respective depression scales, on the Hamilton panic score, the number and severity of panic attacks, and on the Mobility Index-Accompanied and the Fear Survey. A 3-year follow-up comparison of this cohort with a larger group of subjects from the intervention who had met criteria for screening for the original study suggests generalizability of the results obtained with the smaller, more intensively studied cohort. Ongoing compliance with the meditation practice was also demonstrated in the majority of subjects at 3 years. We conclude that an intensive but time-limited group stress reduction intervention based on mindfulness meditation can have long-term beneficial effects in the treatment of people diagnosed with anxiety disorders.*

Introduction

The lifetime prevalence of anxiety disorders in the United States is estimated to be between 15% and 25%. Symptoms of anxiety are often associated with and/or exacerbate many common medical conditions. Current treatment strategies for the various anxiety disorders include psychopharmacology, cognitive therapy, cognitive/behavioral therapy, relaxation training, self-hypnosis, biofeedback, meditation, supportive psychotherapy, psychodynamic psychotherapy, and other forms of psychotherapy. In the current climate of cost containment, effective time-limited group interventions may serve an important clinical and cost-reducing complementary role to more traditional, time-consuming, and expensive forms of therapy.

Several studies have suggested the effectiveness of various meditation techniques in reducing symptoms of anxiety in individuals with non-DSM-III-R-defined anxiety [1-4]. A previously reported study from our clinic of 22 medical outpatients who met DSM-III-R criteria for generalized anxiety disorder or panic disorder with or without agoraphobia demonstrated clinically and statistically significant improvements in subjective and objective symptoms of anxiety following an 8-week intensive outpatient group stress reduction and relaxation intervention based on mindfulness meditation [5]. The improvements were shown to persist at 3-month follow-up. The current study was designed to follow up on the 22 subjects in the original study at 3 years to investigate the long-term effectiveness of this brief, intensive group intervention in the treatment of individuals with anxiety disorders.

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The Stress Reduction and Relaxation Program (SR&RP) at the University of Massachusetts Medical Center is an outpatient clinic in the form of a one-session-per-week, 8-week-long course which serves a diverse, physician-referred, medical patient population with a wide range of diagnoses. The structure of the program has been previously described [6–11]. The SR&RP can be thought of as an educational intervention for medical patients based on relatively intensive training in mindfulness meditation and its applications in daily living. During the program, participants learn a range of both formal and informal mindfulness-based stress reduction techniques which they are required to practice daily during the intervention period. The formal meditation techniques (body scan, sitting meditation, and mindful hatha yoga) require devoting a special time of at least 45 minutes duration per day, 6 days per week during the 8 weeks of the program, during which the participants practiced these methods using audiotapes for guidance. The informal mindfulness techniques (such as mindfulness of eating, routine activities, stress reactivity, difficult communications) were assigned in different weeks to be practiced during the conduct of everyday living. The details of certain informal mindfulness exercises were recorded daily by each participant in a workbook each received along with the audiotapes. For further description of the formal and informal mindfulness methods, see [6,12].

The systematic cultivation of mindfulness, or nonjudgmental moment-to-moment awareness [6], is most frequently associated with Buddhist meditative practices, where it is known as the "heart of Buddhist meditation" and is extensively described in the traditional Buddhist literature and psychological texts [see 15]. However, the roots of mindfulness can be found in yogic practices described in the Upanishads, dating back thousands of years before the advent of Buddhism. Though its earliest origins stem from Asian meditative traditions, mindfulness can be conceptualized as a universal human attribute in that it has to do with a particular way of paying attention.

The term *mindfulness* is synonymous with awareness. Mindfulness meditation can be defined as the effort to intentionally pay attention, nonjudgmentally, to present-moment experience and sustain this attention over time. The aim is to cultivate a stable and nonreactive present moment awareness. This is usually accomplished through a regular daily discipline involving both formal and informal mindfulness practices.

Epstein [13] notes that there is a remarkable similarity between mindfulness as described by the Buddhist literature and Freud's characterization of the ideal mind state of the psychoanalyst during therapy. Freud described the latter as one of "evenly suspended attention" [14] which he defined operationally as to "suspend . . . judgment and give . . . impartial attention to everything there is to observe." Epstein notes: "Thus, Freud proposed an optimal attentional stance or state of mind [for the analyst] characterized by two fundamental properties: the absence of critical judgment or deliberate attempts to select, concentrate, or understand; and [an] even, equal, and impartial attention to all that occurs within the field of awareness" [13]. This attentional stance is remarkably similar in many respects to the quality of mind which is the aim and method of mindfulness meditation practice [13,15,16].

Training in mindfulness meditation in the context of the SR&RP has been shown to be effective in the self-regulation of chronic pain [8–10], in reducing physical and emotional symptoms in non-pain-related stress disorders and medical problems (J. Kabat-Zinn et al., unpublished manuscript), and as an adjunct to psychotherapy [17,18].

Methods

The study design for the original intervention period has been described in detail elsewhere [5]. Briefly, 44 medical patients who had been referred to the SR&RP by their physicians and who met preliminary identifying criteria were invited to participate in the original study and undergo further screening for generalized anxiety disorder and panic disorder. Screening was performed by psychologists and psychiatrists trained in administering the Structured Clinical Interview for DSM-III-R (SCID). Thirty-two of these individuals completed the evaluation process and twenty-four met the DSM-III-R criteria for generalized anxiety disorder or panic disorder with or without agoraphobia. These subjects were assessed at four times (recruitment; preintervention; postintervention; 3-month follow-up) with an extensive battery of interviewer-administered measures (see below), and weekly from time of recruitment through the intervention period and monthly up to 3 months postintervention by telephone using the Beck Anxiety Inventory, the Beck Depression Inventory, and ratings of the frequency and severity of panic attacks. Results were analyzed using a repeated

measures analysis of variance. Twenty-two of the twenty-four subjects completed the intervention (92%). The original study reported clinically and statistically significant reductions on all measures during the intervention period which were maintained at 3-month follow-up. Improvements were independent of whether subjects were taking anxiolytic medications or not. The therapeutic effect was reflected in reductions in frequency and severity of panic attacks in the panic attack cohort.

Eighteen of the original 22 subjects participated in this 3-year follow-up study. Of the remaining four subjects, one declined to participate, one was unreachable, and two were noncompliant with several attempts to schedule interviews. Ten subjects were interviewed in person, and eight subjects were interviewed over the telephone. The assessment battery included Hamilton Rating Scale for Anxiety [19], Hamilton Rating Scale for Panic Attacks [20], Hamilton Rating Scale for Depression [21], Beck Anxiety Inventory (used by special permission of Jeffrey Seugerman, Ph.D., Psychological Corp., personal communication), Beck Depression Inventory [22], Mobility Inventory for Agoraphobia—Accompanied and Alone [23], Fear Survey Schedule [24], number of panic attacks in the preceding week, and the severity of these panic attacks. As in the original study, a repeated measures analysis of variance (ANOVA) was employed to compare relevant time points. Matched *t*-tests were used in all cases to confirm that the significant change occurred between pretreatment and posttreatment with maintenance of posttreatment levels at 3-year follow-up.

Other data obtained included current medications, amount of current practice of the various formal mindfulness techniques, amount of current practice of the informal mindfulness technique termed "awareness of breathing in daily life," the rating of the subjective importance in their life of the SR&RP, rating scale of the degree of lasting value of what was learned in the SR&RP, treatment in addition to the SR&RP, whether any additional treatment began before or after the SR&RP, whether additional treatment was still ongoing, and the type(s) of treatment. Each subject interviewed was also evaluated for current psychosocial stressors, current psychiatric and medical disorders, and their reflections on whether and how the techniques learned in the SR&RP influenced their life.

To support the potential generalizability of the results of this follow-up study, the 58 "nonstudy"

subjects reported on in the original study who had met the screening criteria for study and who received identical treatment in the SR&RP along with "study" subjects, and who collectively showed reductions in anxiety comparable to the study subjects [5] on the Symptom Check List-90-Revised (SCL-90-R) [25], were contacted and retested on this measure and on compliance measures. Data were available for 39 of these 58 non-study subjects at all three time points (pretreatment, posttreatment, and 3-year follow-up). The General Severity Index (GSI) scores of the SCL-90-R as well as the Anxiety Sub-Scale scores of the SCL-90-R were compared at these three times. Here too, repeated measures ANOVA was used to compare the pretreatment, posttreatment, and 3-year follow-up scores of the subjects for whom all the data points were available.

Results

Table 1 shows the mean scores of the various rating scales for study subjects for whom data were available at all three time points (pretreatment, posttreatment, and 3-year follow-up). Repeated measures ANOVA clearly showed that the clinically and statistically significant improvements in subjective and objective symptoms of anxiety and depression demonstrated at posttreatment in the original study persisted at 3-year follow-up on the Hamilton Rating Scales For Anxiety and Depression and the Beck Anxiety and Depression Inventories. Moreover, posttreatment improvements in the Hamilton Panic Score and in the number and severity of panic attacks were also shown to be maintained at 3-year follow-up, as were improvements in the Fear Survey Schedule and in the Mobility Inventory For Agoraphobia—Accompanied. Statistically nonsignificant improvement also persisted in the Mobility Inventory for Agoraphobia—Unaccompanied.

Table 2 shows maintenance at 3-year follow-up of the statistically significant improvements observed in the posttreatment SCL-90-R General Severity Index scores and Anxiety Sub-Scale scores, respectively, among subjects in the larger non-study comparison cohort (see Methods) using repeated measures ANOVA.

At 3-year follow-up, 8 of the 18 subjects had participated in no other treatment intervention following completion of the SR&RP. Follow-up data were not available on one subject. Of the remaining nine subjects who used some form of treatment (medi-

Table 1. Scores on outcome measures over time of patients with anxiety disorders in a study of a meditation-based stress reduction program

Measure	N	Pre-treatment		Post-treatment		3-Year follow-up		Repeated measures ANOVA ^a		
		Mean	SD	Mean	SD	Mean	SD	F	df	p
Hamilton Rating Scale for Anxiety	17	25.65	11.19	17.29	9.14	17.24	9.73	13.22	2,32	<0.001
Hamilton Rating Scale for Depression	16	30.06	8.37	24.25	5.60	22.50	6.80	13.63	2,30	<0.001
Beck Anxiety Inventory	17	21.41	12.61	8.29	8.80	11.35	10.30	9.83	2,32	<0.001
Beck Depression Inventory	17	15.18	9.32	9.00	9.47	7.29	7.47	13.28	2,32	<0.001
Fear survey schedule	14	97.14	35.01	75.57	39.58	61.64	28.16	15.79	2,26	<0.001
Mobility inventory for agoraphobia										
Accompanied	13	38.00	15.81	33.15	11.35	32.46	9.70	4.00	2,24	0.032
Unaccompanied	13	47.85	22.26	43.54	17.55	41.23	15.47	1.47	2,24	0.249
Hamilton panic score	17	15.12	13.51	6.47	11.15	5.06	11.81	3.33	2,32	0.048
Hamilton number of panic attacks	16	0.94	0.77	0.31	0.48	0.31	0.60	5.00	2,30	0.013
Hamilton severity of panic attacks	16	1.31	1.20	0.50	0.82	0.50	0.73	4.02	2,30	0.028

^a All significant changes occurred between pretreatment and posttreatment as determined by paired *t*-tests. There were no significant differences between postintervention and 3-year follow-up values for any measure.

cation and/or psychotherapy) post-SR&RP, seven had been in treatment prior to taking the SR&RP. At 3-year follow-up, four had discontinued these treatments. Two subjects had begun some additional form of treatment after completing the SR&RP. At 3-year follow-up, one remained in treatment. *t*-tests on subjects who were taking benzodiazepines ($N = 3$) at time of entry into the original study as compared to subjects who were not taking benzodiazepines ($N = 15$) at time of entry showed no significant differences in outcomes at 3-year follow-up on any outcome measure. Nor were significant differences found on any outcome measure at 3-year follow-up between subjects who were taking antidepressants at time of entry into the study ($N = 5$) compared to those not on antidepressants at time of entry ($N = 15$).

Of the 18 subjects in the main follow-up cohort, 10 continued to practice a formal mindfulness technique at 3 years posttreatment. Four were practicing at a combined frequency and duration which we described as "high"; an additional three subjects were practicing in a "moderate" range (see [9] for details of these ratings). Sixteen of the subjects continued to practice the informal technique of Awareness of Breathing in Daily Life. Of these 16 subjects, 4 reported using this technique "often," 11 "sometimes," and one subject used it "rarely."

The subjects in the main follow-up cohort were asked to rate the degree of importance they attributed to the SR&RP in terms of their life on a scale of 1–10, where 1 signified "of no importance" and 10 signified "very important." Twelve of the 18 responders rated the SR&RP a 7 or greater, and 5

Table 2. Pretreatment, posttreatment, and 3-year follow-up SCL-90-R GSI and anxiety subscale scores of a comparison cohort of non-study participants ($N = 39$) in the program who met initial screening criteria for the study

Measure	Pretreatment		Posttreatment		3-year-follow-up		Repeated measures ANOVA		
	Mean	SD	Mean	SD	Mean	SD	F	df	P
General severity index	0.82	0.55	0.45	0.36	0.49	0.29	13.04	2,76	<0.0001
Anxiety subscale	1.05	0.84	0.45	0.37	0.48	0.35	17.55	2,76	<0.0001

of these rated it a 10. One subject rated it "of no importance."

When subjects were asked at the time of follow-up whether they felt the SR&RP had had a "lasting value" for them, 16 of the 18 responders reported in the affirmative. One subject was "not sure" and one did not respond to this question.

Discussion

The results recorded in Table 1 demonstrate maintenance of the originally observed clinical improvements at 3-year follow-up in this cohort of patients on every outcome measure of the original study. This finding provides strong evidence that an intensive mindfulness-based stress reduction intervention such as the SR&RP can provide a clinically effective treatment for medical patients who also have anxiety disorders as defined by the DSM-III-R. The average duration of the subjects' anxiety disorders at the time of induction into the study was 6.5 years, and half of them ($N = 11$) were receiving pharmacotherapy for anxiety at that time [5]. As noted in the Results section, at 3-year follow-up, 8 of the 18 subjects had received no further treatment of any kind for anxiety. Of those undergoing some other form of treatment (medication and/or psychotherapy) post-SR&RP, seven had been in treatment prior to taking the SR&RP. By 3-year follow-up, four of these seven subjects had discontinued treatment, two other subjects had begun treatment, and of these, one had subsequently discontinued treatment. These facts, together with the finding that there were no significant differences at 3-year follow-up between subjects taking either benzodiazepines or antidepressants at the time of entry into the study and those who were not, and the finding that the majority of subjects continued to use both the formal and informal mindfulness practices learned 3 years earlier in their daily lives to one extent or another (see Results) strongly suggest that individuals with long-term chronic anxiety, whether undergoing other forms of treatment for anxiety or not, can make substantial and long-lasting positive changes in their lives to reduce anxiety and panic by participating in a once a week, outpatient mindfulness-based group stress reduction program in the form of an 8-week course.

Maintenance of reductions in anxiety and in

general psychological distress was demonstrated using the SCL-90-R at 3-year follow-up (Table 2) for the 39 responders to follow-up of the original 58 nonstudy subjects (see Methods) who met criteria for being invited to participate in the original study but were not included in it, and whose anxiety outcomes postintervention, as measured on the SCL-90-R, were comparable to those of the study subjects [5]. This demonstrates that the clinical improvements in anxiety observed in the intensively studied cohort generalized to the much larger majority of participants in the SR&RP presenting with high levels of anxiety and from whom much less data were gathered. It is thus unlikely that the more intensive data gathering procedures of the original study used with the study subjects (including weekly telephone reports during the intervention and face-to-face evaluation in the SCID protocol with a psychiatrist or clinical psychologist and in obtaining data pre- and postintervention on the Hamilton anxiety and depression rating scales) played a significant "quasi-therapeutic" role in the outcomes reported either postintervention [5] or at 3-year follow-up.

A noteworthy feature of the SR&RP intervention which may be an important factor in obtaining the positive results reported here is its orientation towards stress *per se*, rather than towards a particular diagnostic entity. This hospital-based, outpatient, behavioral medicine stress reduction clinic serves a highly heterogeneous population of medical patients who are referred to it by their physicians. Its focus is *not* on treating panic or anxiety or for that matter, any diagnostic entity, but rather on learning to deal more effectively with stress, pain and chronic illness through self-observation and the self-regulation of intrapsychic and external behaviors. The subjects in the present study were referred to the stress reduction clinic with a wide range of primary medical diagnoses including hypertension, chronic pain, cancer, heart disease, and many others, in addition to their anxiety disorder.

The nonspecific orientation of the mindfulness-based stress reduction approach differs paradigmatically from standard biomedical, psychiatric, and even behavioral medicine treatment models, which advocate as specific a treatment as possible for a specific diagnostic entity, based on as precise a diagnosis as possible. The paradigm of the SR&RP, on the other hand, reflects Hans Selye's seminal observation that there is a significant non-

specific component to "stress," which he defined as "the non-specific response of the organism to any demand" [26]. The SR&RP orients itself primarily toward those characteristics that are held in common by the highly heterogeneous population of medical patients referred to the clinic: 1) they are all suffering and feel *something* is out of control in their lives; 2) they are all referred by their doctors; 3) they have all contracted one on one with a clinic staff interviewer to enroll in the SR&RP, with the explicit understanding that it is being offered as a challenge to them to try to do something *for themselves* as a complement to what the more traditional medical and psychiatric approaches can do for them, and with the understanding that the program requires an immediate lifestyle change in the form of a daily, disciplined meditation practice; and 4) they are all, at least in principle, capable of developing and deepening what we believe to be the most important elements for achieving voluntary self-regulation of physiological and mental states, namely, attention regulation, concentration, relaxation, and insight. We have found that the nonjudgmental, moment-to-moment attentional stance directed towards various immediately observable objects of attention such as one's breathing and one's body sensations, thoughts and feelings which is characteristic of mindfulness meditation practices, is something that virtually all participants are capable of if sufficiently motivated. Moreover, cultivating this kind of attentional stance appears to be of direct relevance to the immediate inner experience of the majority of participants, independent of diagnosis or personal circumstances. Mindfulness thus serves to unify the diverse experiences and backgrounds of the program participants.

The intervention is oriented toward what is "right" with people rather than toward what is "wrong" with them and aims to nurture and strengthen innate capacities for relaxation, awareness, insight, and behavior change. The emphasis in the program is to encourage each individual to explore his or her own "inner resources" for growth and learning and healing, and to systematically cultivate mindfulness in all areas of daily life, including those times in which they find themselves confronting distressing symptoms and problems.

In the above ways, the mindfulness-based stress reduction paradigm suggests a therapeutic value in orienting nonpharmacological treatment ap-

proaches towards nonspecific attentional self-regulation. Attention and its regulation lie at the core of perception, appraisal, insight, behavior change, and coping [27], and thus are relevant for dealing with the specific and nonspecific aspects of stress reactivity in human beings, including generalized anxiety and panic.

Elsewhere [28] we have hypothesized, based on our own clinical experiences and the work of others in the field of stress reactivity, that the approach to present-moment experience characterized by mindfulness can abate or short-circuit the fight or flight reaction characteristic of the sympathetic nervous system, particularly in stressful or anxiety-producing social situations where it is non-adaptive. Mindfulness and the associated calmness, clarity, and stability of mind which are associated with it allow one to "respond" to potentially anxiety-producing situations with greater effectiveness rather than to "react" with escalating panic or fear, which invariably feeds feelings of loss of control. Many of our patients in the present study described their new-found control over feelings of panic and anxiety in such terms during their exit and follow-up interviews, and this was frequently connected with continued use of awareness of breathing in daily life situations and with the overall high ratings of importance and lasting value accorded the SR&RP (see Results).

It should be noted that the formal and informal meditation instructions themselves serve as a continuing source of reminders to practitioners of the possibility of not identifying with and getting caught up in the stress of thoughts and other mental activity that usually color present-moment experience. They encourage the practitioner to adopt a more dispassionate, witness-like observing and self-reporting of the moment by moment unfolding of one's experience. Anecdotal reports from thousands of patients in the SR&RP over the past 16 years suggest that the more one practices formally at home in times of low stress, the more likely the transfer to other in vivo situations of high stress. Mindfulness appears to give the individual a practical way to disentangle from reflexive behaviors and reactions that often have their roots in past experience.

In contrast to mindfulness training, cognitive therapy aims to restructure thought content to achieve a more accurate and adaptive relationship between thought, feeling state, and action once one becomes more aware of the inaccuracy or self-

negation of certain thoughts. Mindfulness shares with cognitive therapy the perspective that perception and thought drive emotion and behavior and that if one changes one's relationship to thought, one can change deeply ingrained self-destructive or maladaptive patterns of behavior.

However, the mindfulness approach does not try to substitute one thought pattern for another, but is based on the direct perception of the inaccuracy, limited nature, and intrinsic impermanence of thoughts in general and anxiety-related thoughts in particular. Moreover, it is grounded as much in somatic awareness as in cognitive sensitivity, through the use of practices such as the body scan and mindful hatha yoga. In addition, the meditative approach in the SR&RP is taken up by participants as a daily discipline. It is meant to be practiced independent of one's present-moment state of anxiety. The mindfulness approach emphasizes meditation as an alternative way of relating to moment-to-moment experience, and thus, more as a "way of being" rather than as a "technique" in the narrow and usual therapeutic sense for coping with a specific problem such as panic. Other differences include that it takes place in a nonpsychiatric setting, that there is no attempt at systematic desensitization, and that the observational skills required to develop awareness of the process of thinking are themselves systematically cultivated.

A further discussion of similarities as well as salient differences between the cognitive approach and mindfulness can be found in the report of the original study [5]. For a discussion of the theoretical relationship of mindfulness meditation to cognitive science in general, see Varela et al. [29]; for its clinical as well as theoretical relationship to psychotherapy and psychoanalysis, see Epstein [30], and for its relationship to cognitive therapy and depressive relapse prevention, see Teasdale et al. [31].

In summary, within the limitations of the original study (see below) this 3-year follow-up strongly suggests the long-term effectiveness of an outpatient, time-limited, group-delivered stress reduction program based on mindfulness meditation in the treatment of DSM-III-R anxiety disorders [generalized anxiety disorder (GAD) and panic disorder with and without agoraphobia]. Mindfulness training in the context of a generic stress reduction group format may thus be able to provide medical patients suffering from anxiety and panic with a set of tools for achieving effective long-term

nonpharmacological self-regulation and self-control, to be used as a complement to and/or eventual long-term substitute for more conventional medical interventions as appropriate in the treatment of anxiety disorders.

As noted in the original report [5], the study design lacked a randomized control group for comparison and a control for concomitant treatment. These limitations do not allow us to answer definitively the question of a differential response between those undergoing the intervention in question and appropriate controls. However, the cohort of patients receiving medication showed symptom reduction equivalent to the cohort not receiving any medication and this was true at follow-up as well. As noted in [5], this suggests that the mindfulness approach may be equally useful for patients receiving pharmacotherapy and those who do not. As with treatment studies comparing imipramine and alprazolam [32,33] and a study comparing three nonpharmacological therapies [34], both GAD and panic disorder patients responded equally well to the SR&RP intervention.

However, the number of patients in these two diagnostic categories was small, and a larger, randomized study would be required to determine if the SR&RP were equally effective in each case. It does appear that patients receiving pharmacotherapy received comparable benefit to those who did not. A larger randomized study would further substantiate this preliminary observation and might also compare the relative efficacies of the mindfulness-based intervention with other cognitive and cognitive-behavioral therapies. The small number of subjects in the present study also prohibits conclusions about the relationship of outcome with frequency of meditation practice among participants at follow-up. Almost all subjects had strong positive outcomes and the large majority used either formal or informal meditative practices at follow-up. A much larger sample would be required to analyze the role of frequency of meditation practice on anxiety outcomes.

We observed parallel reductions in both anxiety and depression scales over the course of the intervention period. These changes were similar to those noted by Borkovec et al. [35]. However, the presence of comorbidity for depression in eight subjects in our study was not associated with a statistically significant difference in outcome, as it was in an early report [36]. Our finding could mean that the intervention was helpful in alleviating depressive as well as anxiety symptoms. Alter-

natively, it could be an artifact of the small sample size.

A Note on Cost-Effectiveness

The finding that the initial improvements in anxiety and panic were maintained at 3-year follow-up in the majority of patients in this study suggests that the mindfulness-based stress reduction intervention has the potential to be significantly cost-effective. The total cost of the SR&RP was \$465 at the time the subjects went through it. As noted, the average duration of their anxiety symptoms prior to entry into the program was 6.5 years. Treatments over that time period were presumably associated with significant health care costs for those individuals receiving psychotherapy and/or medication treatments ($N = 8$). Five of these individuals discontinued treatment or sought it at reduced levels in the ensuing 3 years (see Results). These changes in health-care-seeking behavior for anxiety due to improved status (reduced anxiety, panic, and depression, and a greater sense of self-control) presumably resulted in cost savings in terms of psychotherapy, emergency visits, medication, and lost productivity. Further studies are required to explore this domain systematically.

An earlier unpublished pilot study of patients in the SR&RP suggested that it is a cost-reducing intervention for patients with chronic medical problems [37]. There is a growing body of evidence that many cognitive/behavioral, time-limited therapeutic interventions have a significant cost-effectiveness compared with more traditional medical and psychiatric interventions [38]. A larger, well-controlled study by Orme-Johnson [39] reported decreased hospital admissions, inpatient hospital days, and outpatient visits over a 5-year time period in a population of 2000 practitioners of Transcendental Meditation as compared to 600,000 members of the same insurance carrier who did not practice meditation.

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