

PARADIGMS

Systematic Review of the Efficacy of Meditation Techniques as Treatments for Medical Illness

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ABSTRACT

Background: Meditative techniques are sought frequently by patients coping with medical and psychological problems. Because of their increasingly widespread appeal and use, and the potential for use as medical therapies, a concise and thorough review of the current state of scientific knowledge of these practices as medical interventions was conducted.

Purpose: To systematically review the evidence supporting efficacy and safety of meditative practices in treating illnesses, and examine areas warranting further study. Studies on normal healthy populations are not included.

Methods: Searches were performed using PubMed, PsycInfo, and the Cochrane Database. Keywords were Meditation, Meditative Prayer, Yoga, Relaxation Response. Qualifying studies were reviewed and independently rated based on quality by two reviewers. Mid-to-high-quality studies (those scoring above 0.65 or 65% on a validated research quality scale) were included.

Results: From a total of 82 identified studies, 20 randomized controlled trials met our criteria. The studies included 958 subjects total (397 experimentally treated, 561 controls). No serious adverse events were reported in any of the included or excluded clinical trials. Serious adverse events are reported in the medical literature, though rare. The strongest evidence for efficacy was found for epilepsy, symptoms of the premenstrual syndrome and menopausal symptoms. Benefit was also demonstrated for mood and anxiety disorders, autoimmune illness, and emotional disturbance in neoplastic disease.

Conclusions: The results support the safety and potential efficacy of meditative practices for treating certain illnesses, particularly in nonpsychotic mood and anxiety disorders. Clear and reproducible evidence supporting efficacy from large, methodologically sound studies is lacking.

INTRODUCTION

Meditation, yoga, and similar techniques have been the topic of much research, particularly in the last 30 years.^{1–4} They have also become increasingly popular in Western cultures, and have gained acceptance among the larger group of “mind–body” interventions in Western medicine (1), with a number of universities offering training in techniques. For example, Harvard Medical School and the University of Massachusetts (UMASS) offer training in such

techniques. In 1999, the U.S. government appropriated ten million dollars for the National Institutes of Health NIH to create centers for the study of “Mind/Body Interactions and Health.”⁵ This interest has arisen because of greater awareness of the contribution of psychological distress on a number of medical conditions and health outcomes, as well as its more well-known role in psychiatric disorders. The further acceptance of the biopsychosocial and psychoneuroimmune/endocrine paradigms have probably contributed to this as well.^{6–13}

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Numerous studies have been conducted examining the physiologic impact of different meditative techniques, particularly Transcendental Meditation™ (TM) (a commercial technique) and mindfulness meditation techniques. However, there have been few attempts to critically evaluate and synthesize the findings from these many studies, nor to integrate the varied perspectives regarding the theoretical and operational definition and understanding of the practices being tested. Quantitative analyses on the subject have noted beneficial effects of these practices, but have not focused on their efficacy as treatments for specific disease states.^{14,15} This paper presents a critical review of the literature for clinical efficacy of meditative practices and rates the strength of evidence for these treatments. Beyond that we provide a new multidimensional classification that we believe will enhance and clarify further research efforts into meditative and related practices. Another aim is to provide an objective educational resource on the topic for physicians and other treatment providers who will encounter patients using these practices, and may want to offer such treatments to patients, as well as for researchers who wish to conduct methodologically sound investigations in this field. Knowledge of these treatments is already important for physicians because of

their increasing use by patients to treat anxiety and depression, as well as other conditions.^{5,16}

There is evidence to suggest that integrating these treatments into the formal health care system may be cost effective.^{1,6,17,18} An estimated seventeen billion dollars in lost productivity in the workplace is thought to be caused by stress-related disorders.¹⁹ The noncommercial teaching and practice of meditation can be brought to patients by health professionals at minimal costs.

WHAT IS MEDITATION?

Meditative practices derive from traditions in both Eastern and Western cultures, many dating back centuries.^{2,20} Very similar types of meditation exercises are found in most of the world's different religions and cultures.² Christian meditation is found in written works throughout its history, some dating back to the most early Christian sects.² Meditation practices are also found in Islam and Judaism.² Probably the most popular techniques of meditation in the Western world over the last half-century are the Buddhist and Indian forms, including various Yoga forms.

TABLE 1. MULTIDIMENSIONAL DESCRIPTION OF MEDITATION TECHNIQUES

	<i>Physical activity and goal</i>	<i>Mental activity and goal</i>	<i>Additional training content</i>	<i>Authentic?</i>	<i>Relaxation response?</i>	<i>Duration</i>
Mindfulness meditation	Can be sitting, lying down, or walking	Thoughtless awareness	Varies	Yes	Yes	Varies
Transcendental Meditation		Focus on mantra, return to mantra as thoughts stray	Varies	Yes	Yes	Usually suggested 15–20 min twice a day or more
Sahaja Yoga	Sitting	Two parts: 1. Thoughtless awareness 2. Self-affirmations	Related to Kundalini tradition and Vipassana	Yes	Yes	Suggested 15 minutes twice daily
Kundalini Yoga	Various combinations of breathing patterns, mantras, eye postures, and hand and arm postures, usually sitting	Thoughtless awareness, expansion towards transcendent states, amelioration of psychiatric symptoms and disorders	Purpose is to access higher levels of spiritual energy—rich tradition	Yes	Varies	Varies
Meditative prayer	Varies	Varies, can include imagery	Varies	Sometimes	Sometimes	Varies
Relaxation response	Sitting	Thoughtless awareness, but varies	None	Yes	Yes	10–20 minutes one or two times daily
Hatha Yoga	Obtaining and maintaining different positions to build strength, flexibility and balance. Also includes breathing exercises.	Varies. Usually a relaxation component. Sometimes combined with more typical meditative techniques	Varies	Sometimes	Varies	Varies

TABLE 2. EXCLUDED STUDIES

<i>Study</i>	<i>Reason for exclusion</i>
Astin ¹⁹	No disease state, healthy
Astin ⁸⁵	Confounded treatment arm, mixed technique
Benhard ⁸⁶	Nonrandomized
Benson ⁷⁰	No control group
Boswell ⁸⁷	No disease state, healthy
Broota ⁸⁸	Essentially a laboratory study, 3 days not enough to demonstrate clinically significant data
Carlson ⁸⁹	No control group
Carlson ⁹⁰	No control group
Carlson ⁹¹	No control group
Carson ⁹²	Nonrandomized
Caudill ⁹³	No control group
Cunningham ⁹⁴	No control group, nonrandomized
Davidson ²⁶	No disease state
Deberry ⁹⁵	Confounded treatment arm
Dimsdale ⁹⁶	Observational study
Domar ⁹⁷	No control group
Fentress ⁹⁸	Confounded treatment arm—two therapies
Garfinkel ⁴¹	Excluded based on quality rating
Garfinkel ⁴²	Excluded based on quality rating
Greendale ⁹⁹	No control group; nonrandomized
Haber 1983 ¹⁰⁰	Excluded based on quality rating
Jacobs ¹⁰¹	Confounded treatment arm, mixed technique
Kabat-Zinn 1982 ¹⁰²	No control group
Kabat-Zinn ²²	No control group
Kabat-Zinn ¹⁰³	No control group
Keefer ⁴³	Excluded based on quality rating
King ¹⁰⁴	Narrative Review
Klein ¹⁰⁵	Meditation treatment arm too technique
Kolasinski ¹⁰⁶	No control group
Kronenberg and Fugh-Berman ¹⁰⁷	Narrative review
Lehrer ¹⁰⁸	No disease state, healthy
Mahajan ¹⁰⁹	Treatment arm confounded—did not control for diet (two therapies)
Murugesan ⁴⁴	Excluded based on quality rating
Nagarathna ⁴⁵	Excluded based on quality rating
Norton ¹¹⁰	No clear diagnosis, not clearly specific phobia
Patel ¹¹¹	Confounded treatment arm—two therapies
Patel ¹¹²	Confounded treatment arm
Ramel ¹¹³	Nonrandomized
Raub ¹¹⁴	Narrative review
Reibel ¹¹⁵	Observational study (not RCT)
Robert McComb ¹¹⁶	Confounded treatment arm (multiple techniques)
Rohini ¹¹⁷	No adequate control group (essentially a dismantling study)
Seer ⁴⁶	Excluded based on quality rating
Shapiro ¹¹⁸	No disease state, healthy
Tacon ¹¹⁹	Includes multiple diseases
Taylor ¹²⁰	Confounded treatment arm
Thomas ¹²¹	No disease state, not studied long enough to determine any clinical benefit
Vahia ¹²²	Diagnosis unclear; no clear modern diagnostic equivalent, measures of unclear clinical significance
van Montfrans ¹²³	Confounded treatment arm (multiple therapies)
Vyas ¹²⁴	No disease state, nonrandomized
Weiss ¹²⁵	Includes multiple disease states
Witoonchart ¹²⁶	No control group
Woolery ¹²⁷	No clear disease state
Zamarra ¹²⁸	Nonrandomized

RCT, randomized controlled trial.

Despite the apparent similarities in meditative techniques across cultures, there are considerable differences between meditative techniques that have been developed, often even within one culture. Further defining and operationalizing

meditation for the purpose of empirical study has been the topic of much work, yet there remain differing views on how this should be done.^{2,20,21}

Manocha has suggested that the term “meditation” should

be narrowed and refined to include only techniques that have certain “authentic” traditional qualities. By reviewing the traditions behind a number of techniques, he has isolated the following qualities as being key to an authentic technique; achieving a well-defined state called “thoughtless awareness,” focusing attention to the present moment and directing attention away from dwelling on “the unchangeable past or undetermined future,” reducing unnecessary and unproductive “background mental noise.” Thoughtless awareness is described by Manocha as “a state in which the excessive and stress producing activity of the mind is neutralized without reducing alertness and effectiveness.”²⁰ According to Manocha, background mental noise “impinges on our otherwise natural tendency toward psychological and spiritual health.” He refers to forms that do not meet these criteria as “quasimeditation.”²⁰ Other writers have attempted to clarify constructs such as meditation and “mindfulness” and distill core elements. For example, Bishop et al.⁴ suggest that mindfulness, which is often a goal of meditation, involves two components: the first being the “self regulation of attention, which involves sustained attention, attention switching, and the inhibition of elaborative processing” and the second being “a quality of relating to one’s experience within an orientation of curiosity, experiential openness, and acceptance.” More research is needed to explore and validate the “authentic” construct and whether the distinction is significant. Manocha’s definition is concise, useful, and accurate in its description of the mental activities or mental procedure involved in authentic meditation techniques, but lacks reference to the physical nature of many meditation forms. It also does not include reference to the transpersonal nature of the meditation experience and spiritual development that is inherent in many of the traditions from which it comes.

We present a multidimensional classification system that expands upon the definition described by Manocha. The proposed expansion allows for a more comprehensive understanding of the processes, which constitute meditative practices, and allows for direct comparison and differentiation among different forms or categories of meditation. This new system also allows for comparison to related techniques such as guided imagery, hypnosis, and even psychotherapies. Our system includes several dimensions: physical activity and goal during meditation, mental activity and goal during meditation, additional training content, length of time during active meditation, and recommended frequency of practice (Table 1). For the mental activities section, if a technique meets Manocha’s standard for authenticity, it has been noted. A category has been added to note whether or not the exercise meets the criteria for Benson’s relaxation response. As knowledge about the impact of meditation practices progresses, it may be found that some techniques produce a physiologic relaxation response, or tropotrophic response, and others do not, or involve other significant physiologic states. Similarly, some techniques may be beneficial for emotional states without discernable physiologic impact. The ad-

dition of information about training content allows for descriptions of training courses and conceptual and theoretical material necessary to learn a particular meditation form.

Cardoso et al.²¹ have also suggested an operational definition of meditation based on several criteria. Their conceptualization requires a meditation technique to be a specific technique, which involves muscle relaxation, “logic relaxation,” and produces a self-induced state involving an “anchoring” or self-focusing technique, in order to be considered meditation. This operational definition, though more precise than the conceptualization we offer, is more constricted, yet fails to separate clearly meditation from hypnosis. The preferential usefulness or accuracy of any of the abovementioned conceptualizations of meditation remains to be clearly demonstrated.

COMMONLY USED MEDITATION TECHNIQUES

Commonly used forms of meditation are; Mindfulness, Vipassana, TM, Sahaja Yoga, Relaxation Response, Kundalini Yoga, and meditative prayer. Many of the traditions and religions from which meditative forms were generated use meditation as a way to achieve an enlightened state, or state of higher consciousness. Often this is described as entering a state of transcendental love, or becoming one with God or a divine consciousness.² Many of the traditions also describe this as becoming one with all beings or with the universe. A detailed look at these techniques is beyond the scope of this paper, but can be found in selected references.^{1,2,20,22–26} In addition, in Kundalini Yoga, different meditation techniques have been claimed to be specifically

TABLE 3. STRENGTH OF EVIDENCE RATINGS

<i>Rating</i>	<i>Criterion</i>
–	Only negative data from included trials
±	Both positive and negative findings from included trials
+	Positive findings, with equivalency to case series or studies, based on minimum requirement of an active, or wait-list control, with randomization, blinding not required
++	Positive findings, with equivalency to some randomized controlled data, with placebo or sham control; blinding not required
+++	Positive findings, with equivalency to randomized placebo or sham controlled data, using objective measurements rated by blind observers
++++	Consistently reproduced data from randomized, placebo, or sham controlled trials, using objective measures made by blinded observers, or quantitative meta-analyses.

TABLE 4. SUMMARY OF INCLUDED STUDIES

<i>Study (first author and reference number)</i>	<i>Year</i>	<i>Type of treatment</i>	<i>Type of control group</i>	<i>Disease state</i>	<i>Mean quality rating</i>	<i>Standard deviation</i>
Chang ⁶³	2005	RR	TAU	CHF	0.81	0.07
Cohen ⁴⁷	2004	Tibetan Yoga	WLC	Sleep Disturbance and psychologic distress/cancer	0.83	0.11
Cooper ⁴⁸	2003	Pink City Lung exerciser	PCLE sham and active	Asthma	0.78	0.27
Goodale ⁶⁴	1990	RR	Sham and No treatment	PMS sx	0.68	0.08
Irvin ⁶⁵	1996	RR	Sham and No treatment	Menopausal sx	0.67	0.04
Janakiramaiah ⁴⁹	2000	SKY (minus meditation)	Active	Major depression melancholic	0.68	0.01
Kabat-Zinn ⁶¹	1998	MM	TAU	Psoriasis	0.72	0.00
Kroner-Herwig ⁵⁰	1995	Hatha Yoga	Active	Idiopathic Tinnitus	0.66	0.06
Khumar ⁵¹	1993	Shavasana Yoga	No treatment (approx. WLC)	Severe depression (equivalent to MDD)	0.66	0.16
Manocha ⁵²	2002	Sahaja Yoga	Relaxation training/CBT	Asthma	0.85	0.13
Oken ⁵³	2004	Yoga	Exercise and WLC	Multiple Sclerosis	0.96	0.02
Panjwani 1 ⁵⁴	1995	Sahaja Yoga	Sham and No additional treatment	Epilepsy	0.8	0.13
Panjwani 2 ⁵⁵	1996	Sahaja Yoga	Sham and No additional treatment	Epilepsy	0.8	0.18
Raskin ⁶⁶	1980	TM	Active	Chronic anxiety (equivalent to GAD)	0.73	0.19
Sabina ⁵⁶	2005	Yoga	Sham	Asthma	0.88	0.04
Shaffer ⁶⁰	1997	Hatha yoga	TAU	Opiate dependence	0.88	0.04
Shannahoff-Khalsa ⁵⁷	1999	KY	Active (RR/MM)	OCD	0.8	0.08
Singh ⁵⁸	1990	Pink City Lung exerciser (PCLE) (Pranayama Yoga)	PCLE sham device	Asthma	0.68	0.21
Specia ⁶²	2000	MBSR	WLC	Stress/cancer	0.72	0.06
Vedanthan ⁵⁹	1998	Yoga	TAU	Asthma	0.69	0.10

^aMean Quality Rating Scores determined using scale developed by Reisch et al. (1989).

Key: MM, Mindfulness meditation; Y, yoga—various; SKY, Sudarshan Kriya Yoga; RR, (Benson's) relaxation response; TAU, treatment as usual; WLC, wait-list control; CBT, cognitive-behavioral therapy; CHF, congestive heart failure; OCD, obsessive-compulsive disorder; MBSR, mindfulness-based stress reduction; PMS, premenstrual syndrome; MDD, major depressive disorder; GAD, generalized anxiety disorder; sx, symptoms; KY, Kundalini Yoga.

useful for a variety of psychiatric disorders and health conditions.^{27–29}

METHODS

Searches were performed using MEDLINE® (PUBMED), PsycInfo, the catalogs of Western Michigan University, University of Connecticut, and Michigan State Uni-

versity, and the Cochrane Database. Keywords were Meditation, Meditative Prayer, Yoga, Relaxation Response, and Benson and Relaxation Response. Hits were reviewed for relevance, as were their references. Searches were performed at several timepoints between March 2001, and November 2005. Initial searches were not performed independently, and were performed by the lead author (A.J.A.). Google and Yahoo Internet searches were also done to find any relevant material.

Studies that clearly did not meet the below criteria based on the abstract were not included in further analyses. When any thing was unclear, a copy was obtained and examined further. Paper selection was performed by one author (A.A.) only, and the limitations of this will be addressed in the Discussion section of this paper. Only studies excluded after being examined for further review are listed in the exclusions (see Table 2) because of the immense number of studies that hit under the abovementioned broad search terms.

Inclusion criterion: Clinical trials were randomized, and had one of the following types of control groups: wait-list (or equivalent), active, placebo, or sham. Outcomes of studies had to be quantitative, with standard statistical evaluation. All trials had to be conducted in patients with particular disease or symptom/syndrome entities and intended as a treatment. In addition, measured outcomes had to reflect relevant disease parameters. Studies with exclusively “normal” or healthy individuals were not included.

Exclusion criterion: Studies failing to use a control group, or where subjects served as their own controls were excluded. Additionally, studies testing “multimodal” or combined therapies were excluded unless the other therapy or treatment was administered to the control group, thus factoring out its contribution. Studies that used additional educational content or activities or a group structure were allowed, as long as such factors were adequately controlled. Techniques that contained very small amounts of other treatments or education were allowed (i.e., the Mindfulness-Based Stress Reduction program), as long as we could ascertain that the exposure to the other materials was minimal. Blinding was not used as a criterion because of the difficulties in blinding subjects in these types of studies (see Discussion section for more). Papers that were not in English were excluded. Lastly, because of possible experimenter bias, research by Maharishi TM-associated researchers has not been included, unless it was performed at a more neutral institution, and the majority of the researchers were not affiliated with the Maharishi organization.

Studies that achieved the above criteria were rated individually by two out of three independent raters on quality, using the scale developed by Reisch et al.,³⁰ for randomized controlled trials. Only studies with mean quality ratings greater than 0.65 were used to estimate the strength of evidence.

Calculation of strength of evidence: This was done in a relative manner, owing to the disparate diagnostic groups of subjects and different outcome measures being used. The scale used for strength of evidence is shown in (Table 3).

RESULTS

Systematic reviews and Meta-analyses

We identified 7 relevant systematic reviews,^{31–37} and three relevant quantitative meta-analyses.^{38–40} The scope of

these reviews overlapped only partially with the present study. Canter and Ernst (33) examined trials of TM for treating hypertension, and only found studies performed by Maharishi-associated researchers. Their findings indicated insufficient evidence to support TM as a treatment for hypertension. Canter and Ernst³³ examined all complementary and alternative treatments for anxiety, and identified three studies in which yoga or meditation was used for anxiety. Upon examination, these studies were excluded by our criterion. Jorm et al.³⁵ examined complementary and alternative treatments for depression. They identified 1 study on meditation and 2 for yoga, one of which did not meet our criteria; the others are included below. They concluded that there was a limited amount of evidence to support yoga for depression. Kirkwood et al. reviewed yoga for anxiety, and identified 8 studies, only 1 of which met our inclusion criteria.³¹ Kirkwood et al. found inadequate evidence for efficacy of yoga treatment for anxiety. Pilkington et al., reviewed yoga for depression, and identified 5 studies, 1 of which met our criteria and is included below.³¹ Pilkington et al. found evidence of potential efficacy for yoga to treat depressive symptoms. Grossman et al.⁴⁰ attempted a quantitative meta-analysis of mindfulness meditation using a theoretical effect-size measure of overall health benefit. They included studies not performed in patients with illness (otherwise healthy), as well as observational and quasiexperimental, which was not consonant with our study. Despite evidence of statistical homogeneity for health measures, the lack of a robust core of methodologically sound studies and profound clinical heterogeneity between studies severely limit any conclusions about clinical benefit that can be drawn from the study.

Because these abovementioned systematic reviews and meta-analyses used inclusion and exclusion criterion that were not compatible with ours, and mostly offered essentially inconclusive results, we searched these papers' bibliographies for studies matching our criteria, and extracted applicable studies. After reviewing all the included studies, it became clear that the diffuse disease states and measurements obtained in these studies prevented any clinically meaningful meta-analysis. Although meta-regression of clinical variables within a Random Effects Model (REM), along with the inclusion of uncontrolled observational studies, was considered for the purpose of hypothesis generation, we did not explore this further because the results would be largely speculative, especially given the lack of a methodologically sound and clinically homogeneous core of data.

Randomized controlled trials

We identified 27 studies that met the initial search criterion (Table 4). Also in Table 4 are the corresponding percentile quality scores using the rating scale developed by Reisch et al.³⁰ The mean quality rating was 0.76 (76%) (stan-

standard deviation 0.08) for all the studies that were rated. Seven (7) studies did not meet the quality rating criterion of more than 65% and were excluded.^{41–46} Table 5 lists the details of included studies and additional commentary. Table 6 displays the strength of evidence of meditative treatments for specific illnesses, listed by study. Table 7 summarizes the evidence to support the use of each treatment by illness. Table 2 lists the excluded studies and reason for exclusion. Fourteen (14) studies examined the use of yoga forms.^{47–60} Two studies examined the use of mindfulness or similar types of meditation.^{61,62} Three (3) studies examined the use of the relaxation response.^{63–65} One (1) study examined the use of TM.⁶⁶ The studies included a total of 958 subjects (397 experimentally treated, 561 controls).

Notable exclusions

The list of excluded studies is shown in Table 2, along with the reason for exclusion. There were numerous observational and uncontrolled studies, which were excluded by our study but are not listed here.

Adverse effects of meditation

We also reviewed the included studies with regard to serious adverse events encountered in the studies, and none were reported. Only 1 included study explicitly stated that subjects were systematically and prospectively monitored for adverse events.⁶⁰ No serious adverse events were reported in the excluded studies, which were obtained in our search process. We also explored the medical literature for signs of adverse events not mentioned in those studies as well, the results of which are discussed further below.

There are a number of case reports of adverse reactions to meditation in the medical literature, and only a few small studies. Severe adverse effects appear to be rare. Adverse reactions have been reported with a variety of techniques, including TM and Vipassana mindfulness techniques.^{20,67,68} The reports of adverse effects from Vipassana techniques are from subjects who participated in rigorous meditation retreats, in which physical and psychologic demands are greater than those of clinical meditation.^{20,67} There appear to be no reports of adverse reactions as of yet for Sahaja Yoga in the medical literature.²⁰ The most frequently reported problems are the development of depersonalization, or derealization, which can reoccur spontaneously even when not meditating.^{67,69} This can be described further as a sense of confusion about the self, or the development of a second ego self that is different from the participating self, and is more emotionally detached.^{67,69} Some note an affective flattening, but with the development of an underlying contentment.⁶⁹ Some people also note that it is difficult to return to normal everyday life after meditation retreats.⁶⁷ Other subjects note that they are more critical of themselves, or that they become more aware of their own low self-esteem or unfortunate life situations.⁶⁷ Overall, it seems that

many meditators will experience adverse reactions at some points, but that most meditators report significantly more positive effects, and thus are not significantly bothered by these reactions. Feelings of depersonalization and derealization are common in the nonclinical, nonmeditating general public, occurring to some extent in as many as 70% of young adults.⁶⁹ In the clinical population, between 50% and 60% of patients with panic and anxiety disorders experience episodes of depersonalization.⁶⁹

Reports from Shapiro, Otis, Castillo, Walsh, and others suggest that there may be some potential serious adverse effects from meditation.^{68–72} Chan-Ob and Boonyanarunthee⁷¹ and Walsh and Roche⁷² have noted a handful of case reports demonstrating the precipitation of psychosis and mania in meditators, although these subjects were either known to have, or most likely had, underlying disorders that were unmasked by misuse or overuse of meditation. One (1) patient became increasingly obsessed with his problems from meditation and, because of this, he developed significant sleep deprivation. He later presented with mania and psychosis, and was subsequently diagnosed with bipolar mania type I.⁷¹ Another patient with a previous diagnosis of schizophreniform disorder suffered another psychotic break after 2 weeks of meditation.⁷¹ It was later noted that she had previously discontinued her medication, and also was under significant stress from family and financial problems. She was subsequently diagnosed with schizophrenia.⁷¹ Another patient suffered a brief psychotic episode after an intensive meditation retreat that resulted in significant sleep deprivation.⁷¹ Walsh and Roche noted three cases of previously diagnosed schizophrenics, who suffered psychotic episodes after sleep loss, reduced eating, and intensive meditation during retreats. These case reports suggest a cautious approach to using meditation in patients with known schizophrenia and bipolar disorders.⁷² It is difficult to interpret a clear relationship between meditation and psychosis from these cases because of the confounding sleep and food deprivation and, in 2 cases, the concomitant withdrawal of antipsychotic medications. Benson noted anecdotally that he had observed several cases of “mild to severe psychoses” when TM was practiced for several hours daily but said that these could have been related to preexisting psychiatric conditions (note these did not occur as adverse events in studies and so are not listed as such).⁷⁰

French et al.⁷³ noted a similar case report of a 38-year-old woman who underwent what they described as a severe state of “de-repression,” or some sort of spiritual crisis or transformation state within days of beginning TM.⁷³

Lazarus also described several case reports and anecdotal reports of adverse effects of the TM technique when used without clinical supervision.⁷⁴ Glueck and Stroebel reported some possible adverse reactions in a paper about using the TM technique in patients with psychiatric disorders.⁷⁵ These reports were not followed up or described in enough detail to analyze in a meaningful manner.

TABLE 5. DETAILS OF STUDIES, AND COMMENTS

<i>Study</i>	<i>Year</i>	<i>Type of treatment</i>	<i>Disease state</i>	<i>Comments</i>
Chang ⁶³	2005	RR	CHF	RR compared to patient education control group and TAU, QOL, and exercise tolerance were measured. Two deaths reported, none resulting from study; both in control group. Only one subscale of QOL measures was significantly improved in the RR group. Likely to have limited but possible clinical significance.
Cohen ⁴⁷	2004	Tibetan yoga	Sleep Disturbance and psychologic distress/cancer	A Tibetan yoga form that was compared to wait-list control, showed a significant benefit to sleep measures but not psychological measures.
Cooper ⁴⁸	2003	Pink City Lung exerciser (Yoga)	Asthma	Compared a breathing device (PCLE) that simulates pranayama yoga breathing to placebo/sham device and nonyogic breathing technique for treatment of asthma. PCLE was ineffective.
Goodale ⁶⁴	1990	RR	PMS symptoms	Compared the RR to reading/sham and no treatment control. RR was superior to both control groups in improving measures of physical symptoms and emotional distress associated with PMS. The benefit was likely to be clinically significant.
Irvin ⁶⁵	1996	RR	Menopausal symptoms	Compares the RR to reading/sham group and no treatment control group. The RR group was superior in reducing intensity of hot flashes but not frequency, and results on psychological measures were superior to sham on some but not all measures. Clinical significance unclear.
Janakiramaiah ⁴⁹	2000	SKY (minus meditation)	Major depression/melancholic	Compares SKY, which is mostly yoga breathwork, with the specific meditation component removed, to imipramine or ECT in the treatment of DSM-IV major melancholic major depression. All groups showed significant clinical improvement, with SKY comparable to imipramine, and ECT superior to both.
Kabat-Zinn ⁶¹	1998	MM	Psoriasis	Examined the addition of mindfulness meditation by guided audiotape to phototherapy to treatment as usual with phototherapy. Meditation group cleared skin lesions at a significantly (statistically and clinically) faster rate; psychologic benefit was not statistically significant, however. No placebo or sham limits conclusions. Use of some guided imagery makes for possibly confounded treatment arm.
Kroner-Herwig ⁵⁰	1995	Hatha Yoga	Idiopathic Tinnitus	A targeted cognitive therapy was compared to Hatha Yoga. 10 2-hour sessions was exposure. The cognitive therapy was superior to yoga, which showed no improvement.
Khumar ⁵¹	1993	Shavasana Yoga	Severe Depression (equivalent to MDD)	Compares Shavasana Yoga with a no-treatment control group in severely depressed female college students. Zung rating scales and interviews were used to make the diagnosis, and would likely have qualified them for major Depressive Disorder. Forty-four percent of treated subjects achieved the rating of "normal" by the Zung scale at 4 weeks, and 64% improved overall. Comparison to control was significant. Findings suggest clinically significant changes, but lack of HAMD or MADRAS scores limits conclusions.
Manocha ⁵²	2002	Sahaja Yoga	Asthma	Exact exposure at home unclear. Shaja Yoga group showed improved AHR (airway reactivity to methacholine) and improved measures of mood after the active treatment phase with mandatory weekly Yoga groups. No significant differences at 2 months' follow-up (patients must practice on their own).
Oken ⁵³	2004	Iyengar Yoga	Multiple sclerosis	Studied the effects of yoga compared to exercise and WLC on cognitive symptoms, fatigue, mood, and QOL in patients with multiple sclerosis. Significant improvements were noted for fatigue measures, and the treatment was comparable to the effects of the exercise group. No significant improvements on other measures.

TABLE 5. DETAILS OF STUDIES, AND COMMENTS (CONT'D)

<i>Study</i>	<i>Year</i>	<i>Type of treatment</i>	<i>Disease state</i>	<i>Comments</i>
Panjwani 1 ⁵⁴	1995	Sahaja Yoga	Epilepsy	Examined changes in physiologic markers of stress in Sahaja Yoga group versus sham and treatment as usual controls. Significant changes noted in Sahaja Yoga group, suggesting reduced stress. Direct psychologic measures not done.
Panjwani 2 ⁵⁵	1996	Sahaja Yoga	Epilepsy	Significant changes in Sahaja Yoga group over sham and treatment-as-usual controls, for both reduction in seizure frequency as well as beneficial EEG changes.
Raskin ⁶⁶	1980	TM	Anxiety Neurosis (approximately GAD)	Subjects met criteria for DSM-II anxiety neurosis. TM was compared to relaxation training and EMG feedback. All groups showed considerable clinical improvement; none were superior.
Sabina ⁵⁶	2005	Yoga	Asthma	Iyengar Yoga method used, and was not superior to sham control. Meditation component was likely to be considered authentic. Both Yoga and sham groups improved from baseline. No significant difference on PFTs or QOL.
Shaffer ⁶⁰	1997	Hatha Yoga	Opiate dependence	Use of Hatha Yoga Groups as adjunct to methadone was not superior to traditional methadone treatment; both were beneficial, but no other control/sham/placebo group to clearly show efficacy. Problems with acceptance and generalizability of yoga suggested.
Shannahoff-Khalsa ⁵⁷	1999	KY	OCD	Significant beneficial change for Kundalini Yoga only, not the MM/RR group. Significant benefit shown on Y-BOCS, comparable to medication treatment. Medications required to be dose-stabilized prior to study.
Singh ⁵⁸	1990	PCLE (Pranayama Yoga)	Asthma	Compared a breathing device that simulates <i>pranayama</i> yogic breathing to placebo/sham device for treatment of asthma. Significant beneficial change in treatment group for response to histamine challenge (PD20).
Specia ⁶²	2000	MBSR	Stress/cancer	Average meditation was 32 minutes/day, adherence was monitored. Reduced stress and mood disturbance in patients with cancer.
Vedanthan ⁵⁹	1998	Yoga	Asthma	Yoga was not superior to TAU based on PFTs. Airway reactivity to chemical challenge was not measured. Unclear exposure—how much yoga was used at home?

CHF, Congestive Heart Failure; PMS, Premenstrual Syndrome; MDD, Major Depressive Disorder; GAD, Generalized Anxiety Disorder; OCD, Obsessive-Compulsive Disorder; PCLE, Pink City Lung Exerciser (a breathing device [Pulmotech, Jaipur, India]); RR (Benson's) Relaxation Response; AHR, airway hyperresponsiveness; QOL, quality of life; EEG, electroencephalogram; ECT, electroconvulsive therapy; DSM, *Diagnostic and Statistical Manual*; TAU, treatment as usual; TM, Transcendental Meditation™; EMG, electromyography; WLC, wait-list control; PFTs, pulmonary function tests; MM, mindfulness meditation; Y-BOCS, Yale-Brown Obsessive Compulsive Scale; SKY, Sudarshan Kriya Yoga; HAMD, Hamilton Depression Scale; MADRS, Montgomery-Åsberg Depression Rating Scale.

There are several reports of physical injuries resulting from extreme yoga postures or exercises. Yogic practices have been associated with fatal air embolism, orbital varices, persistent cheilitis, pneumothorax, neuropathy, and basilar artery occlusion.^{76–81} In most of these injuries, the strain of the posture, length of time spent in this position, or extreme nature of the breathing technique seem to have probably contributed to the injury. We also asked Kundalini Yoga expert Shannahoff-Khalsa about his experience with adverse events during his 31 years of teaching yoga, and he reported none except in cases in which yoga practitioners had modified the techniques even when instructed not to do so (D. Shannahoff-Khalsa, personal communication, 2006). Those adverse reactions were limited to brief dissociative-like experiences, which resolved spontaneously.

DISCUSSION

Our review revealed a number of studies that suggest that the strongest and most beneficial effects of meditative practices occur in the domain of psychological health/functioning, as well as in the physical parameters of disease conditions that are strongly influenced by emotional distress and where the physical symptoms can perpetuate emotional distress. These findings support the hypothesis that meditative treatments have a multifaceted effect on psychologic as well as biologic function, and that secondary physical benefits may occur via alterations in psychoneuroendocrine/immune and autonomic nervous system pathways.

The relaxation response appears to be a very promising behavioral intervention for women suffering from symptoms

TABLE 6. STRENGTH OF EVIDENCE AND RECOMMENDATIONS FOR USE IN TREATMENT (BY SOURCE)

<i>Study</i>	<i>Year</i>	<i>Type of treatment</i>	<i>Disease state</i>	<i>Evidence</i>	<i>Recommendations</i>
Chang ⁶³	2005	RR	CHF	–	No clear benefit
Cohen ⁴⁷	2004	Tibetan Yoga	Sleep Disturbance and psychologic distress/cancer	+	Benefit for improving sleep only
Cooper ⁴⁸	2003	Pink City Lung Exerciser	Asthma	–	No benefit
Goodale ⁶⁴	1990	RR	PMS symptoms	++	Reduces physical and emotional symptoms
Irvin ⁶⁵	1996	RR	Menopausal symptoms	++	Reduces intensity of hot flashes, improves symptoms of depression and anxiety
Janakiramaiah ⁴⁹	2000	SKY (minus meditation)	Major depression melancholic	+	Supports use as an adjunct treatment for depression
Kabat-Zinn ⁶¹	1998	MM	Psoriasis	+	Supports use as an adjunct treatment
Kroner-Herwig ⁵⁰	1995	Hatha Yoga	Idiopathic Tinnitus	–	No benefit for yoga
Khumar ⁵¹	1993	Shavasana Yoga	Severe Depression (approx. MDD)	+	Supports use as an adjunct treatment for depression
Manocha ⁵²	2002	Sahaja Yoga	Asthma	+	Supports use as an adjunct treatment, benefits some physical and psychologic symptoms
Panjwani ¹⁵⁴	1995	Sahaja Yoga	Epilepsy	++	Supports use as adjunct treatment, reduces seizure frequency
Oken ⁵³	2004	Yoga	Multiple Sclerosis	+	Benefit for patients with fatigue symptoms only
Panjwani ²⁵⁵	1996	Sahaja Yoga	Epilepsy	++	Supports use as adjunct treatment, reduces physical effects of stress
Raskin ⁶⁶	1980	TM	Chronic anxiety (approximately GAD)	+	Supports use as adjunct treatment, reduces anxiety
Sabina ⁵⁶	2005	Yoga	Asthma	–	No benefit
Shaffer ⁶⁰	1997	Hatha Yoga	Opiate dependence	+	Supports use as adjunct to methadone treatment
Shannahoff-Khalsa ⁵⁷	1999	KY	OCD	+	Supports use as an independent or adjunct treatment
Singh ⁵⁸	1990	Pink City Lung Exerciser (Pranayama Yoga)	Asthma	+	Supports use as adjunct treatment, benefit on some physical parameters
Speca ⁶²	2000	MBSR	Stress symptoms and mood/cancer	+	Supports use as adjunct treatment, benefits symptoms of stress and mood disturbance
Vedanthan ⁵⁹	1998	Yoga	Asthma	–	No benefit

CHF, congestive heart failure; RR (Benson's) Relaxation Response; MM, mindfulness meditation; TM, Transcendental Meditation™; KY, Kundalini Yoga; MBSR, mindfulness-based stress reduction; MDD, major depressive disorder; GAD, generalized anxiety disorder; OCD, obsessive-compulsive disorder.

of changing hormones as in premenstrual syndrome (PMS) and menopause. A safe, simple, and inexpensive intervention, the relaxation response could be easily implemented as a complementary or alternative treatment by primary care physicians and gynecologists, with benefit to many women. The relaxation response appears to reduce psychological distress and at least the subjective experience of the physical symptoms during hormonal changes in women with PMS and perimenopausal symptoms. This is an important alternative treatment option for those who prefer nonpharmacologic treatment for such symptoms, or for those with contraindications to, or side effects from, pharmacologic treatments.

Sahaja Yoga appears to exert a significant clinical benefit for patients with epilepsy by reducing seizure frequency and reducing the effects of stress on the patients. Given the morbidity and mortality of epilepsy, and the potential seriousness of adverse events associated with anticonvulsant medication therapies, Sahaja Yoga presents an excellent complementary option for patients with epilepsy and should be explored further.

The observed potential benefit from various yoga techniques in anxiety and mood disorders presents an important complementary and alternative treatment option for common and often disabling disorders. Given the impact of these disorders globally and the frequency of side effects from commonly used medications to treat these illnesses, these techniques should be further explored as treatments for anx-

ety and mood disturbance. This is especially relevant in the case of depression in youth, given the recent concerns over potential adverse effects of commonly used antidepressant medications. Specialized Kundalini Yoga techniques offer a much-needed alternative or complementary treatment for obsessive-compulsive disorder, an illness in which medication and behavioral therapies often fail to bring robust and lasting relief to those affected.

Although serious adverse events with meditation were rarely reported, physicians should use a commonsense approach to meditation with patients. Patients should be advised to terminate practices that produce continued discomfort or strain, physically or emotionally. Physicians and patients should be wary of commercial for-profit organizations selling meditation techniques. Health care providers can teach their patients appropriate and beneficial techniques at low cost, in an open and compassionate environment without the ideologic pressures that they might experience elsewhere. Some groups, such as the TM organization, have been accused of unethical and cultlike practices.⁸² Physicians should not recommend intensive and rigorous meditation retreats. This should be of a patient's own volition. Physicians should make themselves available to discuss any adverse events from meditation, or meditation retreats, and should focus on reassuring the patient that they are not "going crazy," and on the patient developing a nonjudgmental and accepting awareness of themselves.

In evaluating patients with adverse reactions to medita-

TABLE 7. EVIDENCE BY TREATMENT AND ILLNESS

<i>Disease state</i>	<i>RR</i>	<i>MM/MBSR</i>	<i>Yoga</i>	<i>TM</i>
Asthma	ND	ND	±	ND
CHF	ND	ND	ND	ND
Chronic anxiety-anxiety neurosis (GAD)	ND	ND	ND	+
Epilepsy	ND	ND	++	ND
Idiopathic tinnitus	ND	ND	-	ND
Major depression/melancholic	ND	ND	+	ND
Menopausal symptoms	++	ND	ND	ND
Multiple Sclerosis (Fatigue symptoms)	ND	ND	+	ND
OCD	ND ^a	ND ^a	+	ND
Opiate dependence	ND	ND	+	ND
PMS symptoms	++	ND	ND	ND
Psoriasis	ND	+	ND	ND
Sleep disturbance in patients with cancer	ND	ND	+	ND
Stress symptoms and psychologic or mood disturbance in patients with cancer	ND	+	ND	ND

^aND, no data. RR (Benson's) Relaxation Response; MM/MBSR, mindfulness meditation/mindfulness-based stress reduction; TM, Transcendental Meditation™; CHF, congestive heart failure; GAD, generalized anxiety disorder; OCD, obsessive-compulsive disorder; PMS, premenstrual syndrome.

^aMM and RR were combined in an active/placebo control arm. That group did not benefit from the combination treatment.

tion, one should inquire about symptoms and behaviors and psychiatric review of systems suggesting a diagnosis of an anxiety, mood, psychotic, or other disorder. If the symptoms are primarily depersonalization, or more symbolic and existential in nature, *Diagnostic and Statistical Manual 4th edition Text Revision* religious and spiritual problem, dissociative disorder not otherwise specified, or the proposed dissociative trance disorder diagnoses may be made. Supportive or existential psychotherapies may be appropriate in such cases.

Suggestions for further research

Perhaps the most difficult conundrum for designing research trials with meditative techniques is choosing an adequate control group. A quiet rest group may be adequate for differentiating between rest meditation, but it may not be an adequate *placebo control* for meditation. Astin questioned whether or not there is an appropriate biobehavioral placebo for meditation.¹⁹ Perhaps sham meditation strategies could be used, such as instructing people to sit quietly and think about what makes them happy in life. It may be reasonable to use a placebo pill to compare to meditation, as has been done for electroconvulsive therapy trials.⁸³

Although blinding is difficult in studies of meditation, it is often possible to use blinded raters, which is likely to reduce bias, or the use of self-rating scales may be appropriate compared to clinician-only ratings. Adherence, acceptability, and tolerability, should be monitored as closely as possible, and can often be achieved with questionnaires. Adverse events should be monitored prospectively, closely, and reported in detail. Treatment studies should focus on making accurate and direct measurements using appropriate rating scales and measures for the most significant disease parameters, using the "gold standards" when possible (e.g., the Hamilton Depression Rating Scales or the Montgomery-Asberg Depression Rating Scales for depression trials).

The numerous complications of conducting research with meditation and Yoga are explored in more detail by Shanahoff-Khalsa in a recent paper.⁸⁴ Well-designed dismantling studies may help isolate the most effective components of particular techniques. This may help determine whether the techniques that include multiple and various components (various breathing patterns, eye posture, different mantras, and hand/arm postures) have useful and specific effects that differ or whether they are only symbolic without direct and "hard wired" clinical benefits.

Limitation

Because the search strategy was performed only by one reviewer, our study may suffer from selection bias. We have reduced this somewhat by attempting to include articles from relatively open-ended searches and using multiple databases. The use of independent raters and a validated rating scale for determining eligibility based on methodologic quality also helps reduce selection bias in this study. Although the

cutoff for quality rating was set arbitrarily, we attempted to set the bar high enough to ensure conservative conclusions.

CONCLUSIONS

The results of our review support the potential efficacy of meditative practices for treating medical illness, particularly in nonpsychotic mood and anxiety disorders, and illnesses in which mental distress plays a major role in the pathophysiology or morbidity and perhaps mortality of the illness. Clear and replicable evidence from large, methodologically sound studies is lacking. Although the evidence to date is promising, further methodologically sound research is needed to confirm or refute these hypotheses. Significant questions remain as to the significance of the differences in meditative techniques, and also in the contribution of mental activities versus physical activities that vary considerably between techniques. Dismantling studies to address these questions are, for the most part, lacking at present. Considerable questions remain regarding the tolerability, generalizability, effectiveness, and true cost effectiveness of meditative techniques when applied to the general population. Meditative techniques may work best when used as adjunct treatments for already existing therapies, and with more traditional medical and psychiatric treatments. Our review suggests that meditative techniques are likely safe for most people, and can probably be recommended by knowledgeable physicians as adjunctive treatments without serious adverse effects, provided the abovementioned cautions are taken into account. The potential benefit of integrating these treatments into medicine warrants further research.

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