CLINICAL REVIEW

Mind-Body Medicine: State of the Science, Implications for Practice

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Background: **Although emerging evidence during the past several decades suggests that psychosocial factors can directly influence both physiologic function and health outcomes, medicine had failed to move beyond the biomedical model, in part because of lack of exposure to the evidence base supporting the biopsychosocial model. The literature was reviewed to examine the efficacy of representative psychosocial–mind-body interventions, including relaxation, (cognitive) behavioral therapies, meditation, imagery, biofeedback, and hypnosis for several common clinical conditions.**

Methods: **An electronic search was undertaken of the MEDLINE, PsycLIT, and the Cochrane Library databases and a manual search of the reference sections of relevant articles for related clinical trials and reviews of the literature. Studies examining mind-body interventions for psychological disorders were excluded. Owing to space limitations, studies examining more body-based therapies, such as yoga and tai chi chuan, were also not included. Data were extracted from relevant systematic reviews, meta-analyses, and randomized controlled trials.**

Results: **Drawing principally from systematic reviews and meta-analyses, there is considerable evidence of efficacy for several mind-body therapies in the treatment of coronary artery disease (eg, cardiac rehabilitation), headaches, insomnia, incontinence, chronic low back pain, disease and treatment-related symptoms of cancer, and improving postsurgical outcomes. We found moderate evidence of efficacy for mind-body therapies in the areas of hypertension and arthritis. Additional research is required to clarify the relative efficacy of different mind-body therapies, factors (such as specific patient characteristics) that might predict more or less successful outcomes, and mechanisms of action. Research is also necessary to examine the cost offsets associated with mind-body therapies.**

Conclusions: **There is now considerable evidence that an array of mind-body therapies can be used as effective adjuncts to conventional medical treatment for a number of common clinical conditions. (J Am Board Fam Pract 2003;16:131–47.)**

Evidence emerging within the past several decades suggests that psychosocial factors from emotional states, such as depression, behavioral dispositions, such as hostility, and psychosocial stress can directly influence both physiologic function and health outcomes.[1–4] Evidence from several converging lines of research, however, also suggests that despite seemingly widespread acknowledgment of and support for the importance of the biopsychosocial model,[5–7] psychosocial factors continue to be overlooked or missed in many clinical encounters[8–12] and are frequently underemphasized in medical education.[13–15] Whereas the reasons underlying the failure of medicine to move beyond the biomedical model are no doubt complex (eg, overloaded curriculum, inadequate economic incentives), lack of exposure to the evidence base supporting the biopsychosocial model might be one such factor. Furthermore, while studies have shown that evidence of the effectiveness of a given therapy is frequently insufficient to change clinical practice,[16] the generation, synthesis, and communication of research findings continue to be central tasks for evidence-based medicine.

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Table 1. Description of Mind-Body Therapies (MBTs).

Modality	Description	Use by the Public[17] (%)
Relaxation techniques	Relaxation techniques, broadly defined, include those practices whose primary stated goal is elicitation of a psychophysiological state of relaxation or hypoarousal. In certain practices, the goal might be to reduce muscular tension (as in progressive muscle relaxation in which muscles are alternatively tensed and relaxed). In other cases, the primary goal is to achieve a hypometabolic state of reduced sympathetic arousal. The most prominent example of the latter is Benson's relaxation response[18,19]	16.3
Meditation	Meditation has been defined as the "intentional self-regulation of attention," a systematic mental focus on particular aspects of inner or outer experience.[20–23] Unlike many approaches in behavioral medicine (eg, biofeedback, relaxation strategies), most meditation practices were developed within a religious or spiritual context and held as their ultimate goal some type of spiritual growth, personal transformation, or transcendental experience. It has been argued that as a health care intervention, meditation can be taught and used effectively regardless of a patient's cultural or religious background.[24] The two most extensively researched forms are transcendental meditation,[25] in which practitioners repeat a silent word or phrase (a mantra) with the goal of quieting (and ultimately transcending) the ordinary stream of internal mental dialogue, and mindfulness meditation,[26] in which practitioners simply observe or attend to (without judgment) thoughts, emotions, sensations, perceptions, etc, as they arise moment by moment in the field of awareness	10.0
Guided imagery	Guided imagery involves the generation (either by oneself or guided by a practitioner) of different mental images. Using the capacities of visualization and imagination, individuals evoke images, usually either sensory or affective. These images are typically visualized with the goal of evoking a psychophysiological state of relaxation or with some specific outcome in mind (eg, visualizing one's immune system attacking cancer cells, imagining oneself feeling healthy and well, exploring subconscious themes, etc)	4.5
Hypnosis	Hypnosis has been defined as "a natural state of aroused, attentive focal concentration coupled with a relative suspension of peripheral awareness."[27] Primary components of the hypnotic trance experience include (1) absorption, or the intense involvement of a central object of concentration; (2) dissociation, in which experiences that would ordinarily be experienced consciously occur outside of normal conscious awareness, in part owing to the intense absorption; and, (3) suggestibility, in which persons are more likely to accept outside input (ie, instructions, guidance) without cognitive censor or criticism[27]	1.2
Biofeedback	Developed in the 1960s, biofeedback involves the use of devices that amplify physiological processes (eg, blood pressure, muscle activity) that are ordinarily difficult to perceive without some type of amplification. Participants are typically guided through relaxation and imagery exercises and instructed to alter their physiological processes using as a guide the provided biofeedback (typically visual or auditory). Examples of prominent forms of this therapy are electromyographic biofeedback, in which patients with a condition, such as tension headaches, are provided with feedback regarding the degree of tension in the frontalis muscle, or temperature biofeedback, in which patients with migraine headache disorder are instructed to warm their hands using as their feedback cue sounds or tones indicating temperature changes in this region of the body	1.0
Cognitive behavioral therapy	Among more traditional psychological interventions, one of the more prominent MBTs is cognitive-behavioral therapy. It emphasizes the role of cognitive processes in shaping affective experience and argues that problematic emotions, such as anger, depression, and anxiety, result from irrational or faulty thinking.[28,29] Behavior therapy (as distinguished from cognitive behavior approaches) tends to emphasize the use of environmental reinforcements (eg, not rewarding certain behaviors) to change or elicit certain behavioral changes.	N/A
Psychoeducational approaches	These approaches typically combine certain psychological strategies (eg, cognitive behavioral coping skills training, relaxation, meditation, and imagery for stress reduction) with patient education (ie, teaching patients about their disease, appropriate treatments, self-care behaviors, and communicating with health care providers). A prototype is the Arthritis Self-Management Program developed by Lorig and colleagues[30]	N/A

N/A = not available.

Note: In describing MBTs, researchers have used a number of broad, interrelated terms, including "behavioral," "psychosocial," "psychoeducational," and so on. Such variations in terminology can reflect differing approaches and emphases. Often, however, the terms simply reflect the particular theoretical orientations of the investigators (eg, those working in the complementary and alternative medicine field might refer to meditation as a mind-body therapy, whereas researchers within behavioral medicine might refer to it as a behavioral intervention). For simplicity of presentation, we have tried to use the broader term *mind-body therapies* throughout the article to refer collectively to these different approaches.

The purpose, therefore, of the present review is to provide a general overview of the state of the science regarding the relative efficacy of an array of psychosocial–mind-body interventions. This article reviews the efficacy of mind-body therapies (MBTs) in the treatment of health-related problems other than mental illness or psychological difficulties. The National Institutes of Health (NIH) define MBTs as "interventions that use a variety of techniques designed to facilitate the mind's capacity to affect bodily function and symptoms." As summarized in Table 1, the prominent MBTs we examine include relaxation, meditation, imagery, hypnosis, and biofeedback.

Owing to space constraints, we have focused the review on several specific clinical areas. These areas were selected primarily because of their more extensive investigation in terms of MBTs. We do not address additional body-based approaches, such as yoga and tai chi chuan, nor do we address the research examining spiritual healing practices, such as prayer and distant healing.[31] Finally, we do not review the literature of what might be termed body-mind medicine, eg, the use of exercise and massage to influence psychological function.

Methods

An electronic search of the MEDLINE, PsycLIT, and the Cochrane Library databases and a manual search of the reference sections of relevant articles was conducted. Search terms included specific MBTs (eg, relaxation therapy, biofeedback), more general terms such as "stress management," "cognitive-behavioral therapy," and the combination of these with specific health-related conditions (eg, "biofeedback and pain"). To further delimit the scope of our search, we selected systematic reviews of MBTs. When these reviews did not exist, we examined the available literature, focusing on randomized trials.

Although in theory systematic reviews reduce bias by objectively and systematically sorting out and then synthesizing results from available studies, such reviews are still prone to bias.[32] We therefore examined the methodological quality of the meta-analyses as an aid to assessing the validity of their conclusions. We used the instrument developed by Oxman and Guyatt[33] to assess quality. This scale contains nine items and rates reviews on a scale from 1 to 7 (higher scores reflecting better quality).

Results

Description of Mind-Body Therapies

While we have characterized the various MBTs as somewhat discrete categories, there is, in fact, considerable crossover between them, eg, imagery is often included as part of meditation and relaxation; biofeedback often uses imagery and relaxation techniques. In addition, studies examining the health benefits of MBTs often combine modalities. For example, one frequently finds in the literature references to psychosocial interventions or stress management techniques that can include relaxation and biofeedback, as well as a cognitive-behavioral counseling component.

In Table 1, we have briefly described the more prominent MBTs.

Quality of Reviews

Data from 28 systematic reviews are summarized in Table 2. There was a mean quality rating of 4.5 (of 7.0).[33] Eight reviews (29%) were judged to have major methodological flaws (scoring 3 or less). Fifty percent mentioned publication bias as a potential issue, and 18% assessed whether it was present (eg, funnel plot). Fifty-seven percent tested for heterogeneity, whereas 54% conducted sensitivity-subgroup analyses. There was a trend toward more recent reviews scoring higher on quality ($P = .06$) and higher quality reviews being less likely to conclude that the treatment was effective.

Overall, the quality of reviews compared favorably with other areas of medicine. For example, among reviews in asthma[63] and analgesia,[64] 80% and 41%, respectively, were judged to have major methodological flaws based on the Oxman-Guyatt scale.

Of particular concern in meta-analyses is the issue of publication bias. Sutton et al[65] in their analysis of 48 systematic reviews, found that 54% showed some evidence of publication bias. Additionally, while only in four cases did adjustment for publication bias change the statistical significance of the effect sizes, the failure to assess and control for publication bias could potentially invalidate the results of some meta-analyses. In our review of the five meta-analyses that assessed whether publication bias was present, none found any evidence for it. Whereas it is unclear the extent to which publication bias might have influenced the results and conclusions of the other reviews we examined, Sut-

Table 2. Summary of Systematic Reviews of Mind-Body Therapies (MBTs).

First Author, Year	Condition	Number and Type of Studies Reviewed	Total Number of Subjects	Interventions	Results	Quality Rating[13]
Anderson & Lyttkens[35]	Tinnitus	8 randomized controlled trials	700	Cognitive-behavioral, relaxation, hypnosis, biofeedback, education, problem solving	Effect sizes:* Annoyance = 0.86 Loudness = 0.68 Negative affect = 0.48 Sleep = 0.26 Effects diminished at follow-up	4
Astin et al[36]	Rheumatoid arthritis	24 randomized controlled trials	1,189	Psychological-psychosocial approaches	Effect sizes: Pain = 0.22 (0.06 at follow-up) Disability = 0.36 (0.20 at follow-up)	5
Berghmans et al[37]	Urinary incontinence	11 randomized controlled trials	240	Pelvic floor muscle exercises with or without biofeedback	No evidence that addition of biofeedback is helpful	4
Brown[38]	Diabetes	82 trials (26 single group design)	Not provided	Patient education including relaxation, stress reduction, and cognitive-behavioral counseling	Metabolic control (0.16–0.41)	5
Carroll & Seers[39]	Chronic pain	9 randomized trials	414	Relaxation	Insufficient evidence to support use of relaxation	4
Devine & Pearcy[40]	Chronic obstructive pulmonary disease	65 studies (54% controlled; 34% randomized)	3,642	Psychoeducational care (see Table 1)	Endurance = 0.77 Functional status = 0.63	7
Devine[41]	Asthma	31 studies (58% randomized)	1,860	Psychoeducational care	Asthma attacks = 0.56 Respiratory volume = 0.34 Expiratory flow rate = 0.29 Functional status = 0.46 Medication use = 0.62	5
Devine[42]	Presurgery	191 studies (69% randomized)	Not available	Presurgical psychoeducational interventions	Recovery = 0.43 Pain = 0.38	7
Dusseldorp[43]	Coronary heart disease	37 studies (75% randomized)	9,699	Health education and stress management	34% reduction in cardiac mortality 29% reduction in recurrent events	5
Eisenberg et al[44]	Hypertension	26 randomized trials	1,264	Cognitive behavioral techniques (including meditation, relaxation, biofeedback, stress management)	Significant blood pressure declines compared with usual care or wait-list control, but not significant compared with placebo or sham condition	5
Glanz et al[45]	Post stroke rehabilitation	8 randomized trials	180	Biofeedback	Lower extremity range of motion = 0.5 Upper extremity = 2.3	7
Haddock et al[46]	Chronic benign headache	20 randomized trials	Not available	Home and clinic-based behavioral treatments	46% (home based) and 53% (clinic based) showed significant improvement (ie, 50% reduction in headache activity)	5
Hadhazy et al[47]	Fibromyalgia	13 randomized trials	802	Mind-body therapies including autogenic training, relaxation, meditation, biofeedback, cognitive therapy, hypnosis	Limited evidence that MBTs are effective in fibromyalgia	5
Hermann et al[48]	Pediatric migraine	17 studies (9 control group design)	92	Behavioral treatments (typically biofeedback or relaxation, or multi-component MBT)	All behavioral treatments more effective than placebo or wait-list although thermal biofeedback alone or in combination with relaxation appeared most effective	4

Holyrod & Penzien[49]	Migraine	35 studies (63% used between-group comparisons)	2,445	Biofeedback and/or relaxation	Relaxation and biofeedback appear equally effective compared with pharmacologic approaches (43% reduction in migraine activity)	3
Johnston & Vogele[50]	Surgery	34 randomized trials	1,774	Psychological preparation	Pain = 0.85 Pain medication = 0.60 Length of stay = 0.65 Recovery = 0.61	2
Linden & Chambers[51]	Hypertension	89 randomized trials	1,651	Psychologically based nonpharmacologic treatments	Individualized therapy appears most effective, ES = 0.65 for systolic blood pressure Multicomponent ES = 0.51 Single method ES = 0.47	2
Linden et al[52]	Coronary artery disease	23 randomized trials	2,024	Addition of psychosocial treatment to standard cardiac rehabilitation	Patients not receiving psychosocial adjunct had adjusted odds ratio for 2-y mortality of 1.7 and 1.84 for recurrence—effects weakened at follow-up	3
Meyer & Mark[53]	Cancer	45 randomized trials	2,840	Psychosocial interventions (eg, cognitive behavioral, social support, educational, and multimodal interventions)	Effect sizes: Functional adjustment = 0.19 Treatment and disease-related symptoms = 0.26	3
Moreland et al[54]	Stroke	8 randomized trials	Not available	Biofeedback	Significant changes in ankle muscle strength, ES = 1.2	7
Morin et al[55]	Insomnia	59 controlled trials	2,102	Psychological interventions (eg, stimulus control, relaxation)	Significant changes in sleep latency, ES = 0.88 Time awake after sleep, ES = 0.65	3
Morley et al[56]	Chronic pain	25 randomized trials	1,672	Cognitive behavioral and behavioral therapy (including biofeedback, relaxation)	Mean ES = 0.5 across all domains (eg, pain, function, mood)	7
Mullen et al[57]	Arthritis	15 controlled trials (13 randomized)	Not available	Psychoeducational interventions	Effect sizes: Pain = 0.20 Disability = 0.06	2
Murtagh & Greenwood[58]	Insomnia	66 controlled trials	1,907	Psychological treatments	Sleep latency = 0.87 Total sleep time = 0.49 Awakenings = 0.63 Sleep quality = 0.94	5
Scott et al[59]	Childbirth	11 randomized trials	4,230	Emotional support	Continuous support resulted in shorter labor (mean difference of −1.64 h), less analgesia (OR = 0.64), oxytocin (OR = 0.29), forceps (OR = 0.43) and cesarean section (OR = 0.49)	4
Seers & Carroll[60]	Acute pain	7 randomized trials	821	Relaxation	Some weak evidence (3/7 studies) suggesting positive effect of relaxation	5
Superio-Cabuslay[61]	Osteoarthritis	19 controlled trials	3,148	Patient education (eg, arthritis self-management program)	Effect sizes: Pain = 0.17 Disability = 0.03 Tender joints (RA) = 0.28	1
van Tulder et al[62]	Low back pain	20 randomized trials	1,349	Behavioral and cognitive-behavioral treatments	Effect sizes: Pain = 0.62 Functional status = 0.35	7

*Effect sizes are typically derived from Cohen's *d* statistic,[34] which represents the difference of the group means divided by their pooled standard deviation. Effect sizes therefore represent the difference between groups expressed in standard deviation units (ie, an effect size of 1.00 signifies a difference of one standard deviation in the outcome measure between the treatment and control groups). As suggested by Cohen, effect sizes between 0.20 and 0.50 are considered small, those between 0.50 and 0.80 moderate, and those greater than 0.80 large. Effect sizes in the behavioral sciences tend to be in the small to moderate range. In addition, even small effect sizes can represent important clinical phenomena, particularly when they represent changes in an outcome, such as mortality, or could potentially effect large numbers in the population.
ES = effect size, OR = odds ratio, RA = rheumatoid arthritis.

ton et al[65] suggest that this number is probably fairly low (approximately 8% based on their analysis).

To summarize, most (71%) of the mind-body meta-analyses we examined were deemed to have either minimal or relatively minor methodological flaws, and their quality was comparable to, if not slightly better than, reviews in other areas of medicine. We therefore feel relatively confident that our overall conclusions and recommendations (which are based to a large extent on these meta-analyses) are defensible based on the current literature. That being said, because a number of reviews did contain major flaws, we suggest that future systematic reviews in the mind-body area attempt to incorporate reporting guidelines such as those discussed in the QUOROM statement.[32]

In addition, it is important to note that the ultimate validity of any findings derived from a systematic review must obviously be evaluated in the context of the quality of the trials themselves. Among the sample of reviews we rated, 61% included only randomized controlled trials. In those reviews in which nonrandomized trials were included, in no instance were significant differences observed when the outcomes in randomized (ie, higher quality) trials were compared with those in nonrandomized trials. In six reviews,[38,48,49,55,58,61] it was not possible to determine whether trials referred to as controlled were randomized or not.

Finally, we note that a serious limitation in most mind-body studies reviewed is the absence of any placebo or sham control condition, because practitioners cannot typically be blinded to the treatment, and it is often not possible to blind patients to group assignment.

Pain-Related Disorders

Arthritis

Studies have examined the efficacy of multimodal MBTs in the treatment of osteoarthritis, rheumatoid arthritis, and fibromyalgia. These treatments typically include some combination of relaxation, biofeedback therapy, cognitive strategies (eg, for coping with pain), and education.

Narrative reviews suggest that the Arthritis Self-Management Program (ASMP)[30] might be a particularly effective adjunct in the management of arthritis.[66] This community-based program consists of education, cognitive restructuring, relaxation, and physical activity to reduce pain and distress and facilitate problem solving. An analysis of 501 patients (68% osteoarthritis, 15% rheumatoid arthritis, and 17% other forms of arthritis) found that reductions in pain were maintained 4 years after the intervention, and physician visits were reduced by 40%.[67]

A 1996 meta-analysis[61] compared effect sizes of psychoeducational interventions, including the ASMP, with those found in randomized trials of nonsteroidal anti-inflammatory drugs (NSAIDs). Overall, effect sizes appeared quite small for these MBTs (0.17 for pain, 0.03 for functional disability, 0.34 for tender joint count in rheumatoid arthritis). The authors note, however, that because most patients in these trials were already on NSAIDs, the relatively small effect sizes probably represent the additional benefit in addition to medication and might therefore be clinically relevant. There have been no randomized trials that directly compare MBTs with pharmacologic therapy.

A recent meta-analysis[36] of 25 randomized trials of MBT found small but statistically significant effect sizes for pain (0.22), disability (0.36), and depression (0.17) in patients with rheumatoid arthritis. At follow-up (averaging 8.5 months), effects remained significant for all outcomes except pain, whereas effects for tender joints became significant (effect size = 0.35).

Findings regarding the efficacy of MBTs in fibromyalgia are equivocal. A Cochrane review of 13 controlled trials (most of which were of poor methodologic quality) found limited evidence that MBTs are more effective than waiting-list or usual-care controls and inconclusive evidence that these therapies are more effective than physiotherapy or education-attention controls.[47]

Pain Management

Findings regarding the efficacy of relaxation therapy alone (eg, progressive muscle relaxation) for chronic and acute pain are inconclusive. Although a 1996 NIH consensus panel stated that there was "strong" evidence that relaxation techniques were effective in the treatment of chronic pain,[68] a systematic review of nine randomized trials[39] found positive treatment effects in only three studies and concluded that there is insufficient evidence for the use of relaxation alone in the treatment of chronic pain. A systematic review of randomized controlled trials examining relaxation for acute pain management[60] similarly concluded that though there was "some weak evidence" to support the use of these therapies, the data were inconclusive, in part owing to methodological limitations.

Low Back Pain

A Cochrane review examined the efficacy of MBTs in chronic low back pain.[62] Twenty randomized trials were found. Interventions were categorized as operant (using reinforcement to modify behavior), cognitive (modification of cognitive responses to pain), or respondent (modification of the physiologic response system, eg, progressive muscle relaxation). Although overall, only 25% of the studies received high methodological quality ratings, the authors concluded that there was strong evidence (defined as generally consistent findings in multiple high-quality randomized controlled trials) that MBTs, when compared with wait-list controls or usual medical care, have a moderate positive effect on pain intensity (effect size = 0.62; 95% confidence interval [CI], 0.25–0.98) and small effects on functional status (effect size = 0.35; 95% CI, −0.04–0.74) and behavioral outcomes (effect size = 0.40; 95% CI, 0.10–0.70). Results did not shed light on the relative efficacy of the different MBTs.

Headache

A 1990 meta-analysis compared the efficacy of relaxation and biofeedback (34 trials) with drug therapy (25 trials) in recurrent migraine headache.[49] Both approaches yielded similar results—43% reduction in headache activity in the average patient compared with 14% reduction with placebo medication and no reduction in unmedicated subjects. A more recent narrative review concluded that a combination of relaxation training and thermal biofeedback is the preferred behavioral treatment for recurrent migraine disorder.[69]

A 1997 meta-analysis[46] suggests that both home and clinic-based MBTs are more effective than waiting-list or usual-care controls in the treatment of chronic benign headache (effect size = 0.51 and 0.52, respectively, across all headache types and outcomes). Recent evidence indicates that stress-management training is as effective as tricyclic antidepressants in the management of chronic tension-type headache, suggesting that combining these two therapeutic approaches might be more effective than using either one alone.[70]

Cancer

Evidence from multiple studies in heterogeneous groups of cancer patients[71] suggests that various MBTs can improve mood, quality of life, and coping,[72–76] as well as ameliorate disease and treatment-related symptoms, such as chemotherapy-induced nausea and vomiting,[77–80] physical pain,[81–83] and functioning.[84]

Consistent with Devine and Westlake's 1995 meta-analysis of 80 controlled trials,[71] Meyer and Mark's review of 45 randomized trials examining psychoeducational interventions for adult cancer patients[53] found small but statistically significant effect sizes for treatment and disease-related symptoms (eg, pain, nausea) of 0.26 (95% CI, 0.16–0.37), functional adjustment (effect size = 0.19; 95% CI, 0.06–0.32), and emotional adjustment (effect size = 0.24; 95% CI, 0.17–0.32). A more recent narrative review of 54 studies examined the efficacy of an array of behavioral interventions, including contingency management, relaxation, imagery, and hypnosis, in managing treatment-related side effects in cancer patients.[85] The authors concluded that such interventions were effective in reducing anticipatory nausea and vomiting and treating acute pain associated with diagnostic and treatment procedures. The evidence for chronic pain and nausea and vomiting after chemotherapy were deemed less strong.

Whereas studies suggest that MBTs can alter various immune parameters in cancer patients,[86–88] it is unclear what the potential clinical importance of these changes might be in terms of disease progression. Two randomized controlled trials that attempted to correlate changes in immunologic parameters with effects on disease progression and survival failed to do so.[89–90]

The debate regarding whether MBTs can influence survival among cancer patients remains unresolved. Three randomized trials have shown a significant survival effect.[90–92] In the most well publicized of these trials,[91] women with metastatic breast cancer randomized to a 1-year weekly support and hypnosis group evidenced significant differences in survival rates at 10-year follow-up. Despite these positive findings, results from four other randomized trials[93–96] have failed to show a survival effect of these interventions.

Incontinence Disorders

There is strong evidence that biofeedback-assisted muscle re-training is effective in the treatment of incontinence disorders, as reflected in the 1996 clinical practice guidelines from the Agency for Health Care Policy and Research that recommend behavioral treatments as a first-line treatment in urinary incontinence.[97] A 1998 systematic review[37] concluded that biofeedback did not add significantly to pelvic floor exercises in treating urinary incontinence in women. A meta-analytic review of five of these same trials,[98] however, concluded that biofeedback-assisted pelvic floor exercises were, in fact, more effective than pelvic floor exercises alone (OR = 2.1; 95% CI 0.99–4.4). Several recent studies[99–101] provide further evidence for the efficacy of biofeedback in treating urinary incontinence. Of particular note, the randomized trial by Burgio et al[100] showed that biofeedback-assisted behavioral treatment was more effective than drug therapy in reducing incontinence episodes in elderly women.

Research also suggests that biofeedback is a potentially effective treatment for patients with passive and urge fecal incontinence[102,103] and impaired fecal continence after obstetric trauma,[104] and constipation.[105,106]

Cardiovascular Disease and Hypertension

Human and animal studies show that psychological factors (eg, depression, hostility, and stress) can play a substantive role in the development and progression of cardiovascular disease.[1] In the most recent review examining the role of psychological factors in coronary artery disease, the authors concluded: "A confluence of pathophysiological and epidemiologic studies establish that both acute and chronic forms of psychosocial stress contribute to the pathogenesis of coronary atherosclerosis. These data establish an imperative for enhancing behavioral interventions among CAD-prone individuals."

There is evidence that MBTs can be effective in the treatment of coronary artery disease. A 1996 meta-analysis of 23 randomized trials[52] found that the addition of psychosocial treatments (eg, relaxation, group and individual psychotherapy, type A behavior modification, stress-management) to standard cardiac rehabilitation resulted in a 41% reduction in all-cause mortality and a 46% reduction in nonfatal cardiac recurrences at a 2-year follow-up. When patients were observed for more than 2 years, the mortality reductions became nonsignificant. (Only three randomized controlled trials provided longer term follow-up data, and when results from the large, nonrandomized Recurrent Coronary Prevention Project were added, the longer term follow-up results for mortality became significant.) The authors noted that while the interventions were quite diverse in terms of length, target behavior(s), and specific type of therapy, the results were almost uniformly positive across studies.

In a more recent meta-analysis[43] examining the effectiveness of psychoeducational interventions (health education and stress management) across 37 studies, there was a 34% reduction in cardiac mortality, a 29% reduction in recurrence of myocardial infarctions, and significant positive effects on dietary and exercise habits, weight, smoking, cholesterol, and blood pressure. Data from a recent prospective trial not included in the above review found that patients with coronary artery disease (n = 94) randomized to a stress management intervention evidenced fewer recurrent coronary events at 5-year follow-up compared with those patients receiving usual care.[107]

The evidence for the efficacy of MBTs in hypertension remains somewhat unclear. Although two earlier meta-analyses had questioned the efficacy of relaxation[108] and cognitive-behavioral interventions[44] in treating hypertension, a more recent meta-analysis[51] concluded that MBTs (particularly individualized cognitive-behavioral approaches) were comparable to drug treatments (in terms of raw effect sizes) in reducing both systolic and diastolic blood pressure.

Since this 1994 meta-analysis, several randomized trials have appeared that further suggest the potential efficacy of MBTs in hypertension. A study of older African Americans (n = 127)[109] found that hypertensive patients randomized to a 3-month trial of transcendental meditation showed significant reductions in systolic and diastolic pressure (10.7 and 6.4 mm Hg, respectively) compared with those practicing progressive muscle relaxation and an educational control. In a smaller trial (n = 39),[110] significant reductions in medication requirements were achieved by hypertensive patients randomized to a 6-week multicomponent cognitive-behavioral intervention that included temperature biofeedback, progressive muscle relaxation, and therapy for stress and anger management. Despite these positive findings, however, there are still no large-scale trials directly comparing MBTs with either self-monitoring of blood pressure or exercise, diet, and weight-loss interventions.

Insomnia

Numerous trials as well as several reviews[111–114] and meta-analyses[55,58] have examined the efficacy of MBTs for insomnia.[113] A 1994 meta-analysis of 59 studies[55] reported that psychological interventions averaging 5 hours produced reliable changes in sleep-onset latency and time awake after sleep. A 1996 NIH consensus panel concluded that MBTs, most notably relaxation and biofeedback, produce significant changes in some aspects of sleep but that it was unclear whether the magnitude of the improvements in sleep onset and total sleep time were clinically significant.[68] A 1999 systematic review concluded that stimulus control, progressive muscle relaxation, and paradoxical intention met American Psychological Association (APA) criteria for "empirically supported" treatments, whereas three additional approaches—sleep restriction, biofeedback, and multifaceted cognitive-behavioral therapy—met APA criteria for "probably efficacious" treatments.[113]

MBTs can also be helpful in treating late-life insomnia.[114] A recent randomized trial[115] found that cognitive-behavioral therapy (alone and in combination with pharmacologic therapy) was effective in reducing time awake after sleep onset in elderly patients. Whereas drug therapy alone was also more effective than placebo, only those patients using the behavioral approach maintained treatment gains at follow-up.[115]

Although pharmacological treatments produce somewhat faster sleep improvements in the short term, behavioral approaches in the intermediate term (4–8 weeks) show comparable effects, and in the long-term (6–24 months) behavioral approaches show more favorable outcomes than drug therapies.[116] The extent to which mind-body and pharmacological therapies can be effectively combined in the treatment of insomnia requires further study.[114]

Surgical Outcomes

Studies have examined the efficacy of MBTs, such as relaxation, guided imagery, hypnosis, and instructional interventions (eg, providing information about the procedure), before surgery on postsurgical outcomes.[117] The most recent meta-analysis[50] found moderate to large effect sizes across several outcomes including pain (effect size = 0.85; 95% CI, 0.17–1.52), medication use (effect size = 0.60; 95% CI, 0.36–0.84), length of stay (effect size = 0.65; 95% CI, 0.24–1.06), and recovery time (effect size = 0.61; 95% CI, −0.95–2.18). These findings are in general agreement with previous meta-analyses[42,118–120] that found consistent positive treatment effects for MBTs on a variety of postsurgical outcomes. For example, Devine[42] reports that across 76 studies, length of hospital stay was decreased on average 1.5 days among patients receiving presurgical MBT interventions.

At this point, however, there is no clear evidence regarding which MBTs are most effective, nor is there consensus as to the precise psychophysiological mechanisms (eg, reassurance, patient involvement, sense of control, relaxation-induced immune enhancement) that underlie these observed effects.[117]

Additional Clinical Areas

There are several other areas that merit further research based either on positive findings from randomized trials or strong theoretical links to psychosocial stress. These include asthma,[41,121–124] tinnitus,[35] diabetes,[38,125–130] chronic obstructive pulmonary disease,[40] recovery after stroke (muscle re-education using biofeedback),[45,54] dermatologic conditions,[131,132] allergies,[133] irritable bowel syndrome,[134–140] peptic ulcer,[141] pregnancy outcomes (where there is strong evidence that emotional support, ie, presence of a doula, has beneficial effects),[59,142] and human immunodeficiency virus infection.[143,144]

Table 3 summarizes the clinical conditions in which MBTs have shown the strongest evidence of efficacy.

Cost-Effectiveness

A number of clinical studies[18,145–147] and narrative reviews[42,120,148–150] suggest that MBTs can be cost-effective. Most recently, the previously discussed trial conducted by Blumenthal et al,[107] which showed significant reductions in coronary events for patients randomized to a stress management intervention, found significant cost savings associated with the program (when compared with an exercise program or usual medical care). To date, however, because relatively few MBT trials

Table 3. Mind-body Therapies: Best Clinical Evidence.

Clinical Condition	Level of Evidence	Source of Evidence (Total Number of Patients)	Implications for Practice
After myocardial infarction	Strong	Two positive meta-analyses[43,52] (12,879)	In addition to the current emphasis on exercise and nutrition, MBTs (that focus on the development of self-regulation skills, such as relaxation and the management of anger, hostility, and general stress reactivity) should be included as part of cardiac rehabilitation
Cancer symptoms (disease and treatment related)	Strong	Positive results from 2 meta-analysis[53,71] (~6,166)	MBTs (eg, relaxation, hypnosis, supportive group therapy) should be strongly considered as adjunctive therapy for cancer patients, given these therapies' showed efficacy in improving mood, quality of life, and coping with both the disease and treatment-related side effects
Incontinence disorders	Strong	Positive results from 1 meta-analysis[98]; AHCPR guidelines (240)	Biofeedback-assisted muscle retraining in the treatment of urinary incontinence. Can also be effective for fecal incontinence, although additional research is needed
Surgical outcomes	Strong	Positive findings from 2 meta-analyses[42,50] (~6,904)	MBTs (eg, relaxation, guided imagery, hypnosis, instructional interventions) can be recommended as part of presurgical preparation, although additional research is needed to determine the relative efficacy and cost-effectiveness of these different approaches
Insomnia	Strong	Positive results from meta-analyses (4,009); NIH Consensus Panel	MBTs (eg, muscle relaxation, cognitive-behavioral and behavioral therapies, such as stimulus control) should be considered in the treatment of insomnia. Additional research is required to determine how MBTs might be effectively combined with pharmacotherapy
Headache	Strong	Positive results from 2 meta-analyses[46,49] (~3,083)	The combination of relaxation and thermal biofeedback can be recommended as treatment for recurrent migraine, while the use of relaxation or muscle biofeedback can be recommended as adjunctive or stand-alone therapies for tension headaches
Chronic low back pain	Strong	Positive findings from 1 high-quality meta-analysis[62] (1,349)	Multi-component MBTs that include some combination of stress management, coping skills training, or cognitive restructuring should be strongly considered as adjunctive therapies in medical management of chronic low back pain
Osteoarthritis, rheumatoid arthritis	Moderate-strong	Positive findings from meta-analyses[36,61] (though effect sizes generally small and frequently diminished with time) (4,337)	Multimodal MBTs (that combine education with such approaches as relaxation, imagery, biofeedback, and cognitive behavioral counseling) should be considered as potentially effective adjunctive treatments for osteoarthritis and rheumatoid arthritis
Hypertension	Moderate	Positive results from 1 meta-analysis (1,651)[51] but contradictory findings in 2 others[44,108]	MBTs (particularly multi-component as opposed to single-component interventions, such as stand-alone relaxation therapies) can be potentially useful adjuncts in the medical management of hypertension

have included a cost-effectiveness component, additional research is required before definitive conclusions can be drawn regarding the relative costs or cost savings associated with mind-body–psychosocial interventions.

Potential Adverse Effects of Mind-Body Therapies

Unlike pharmacologic trials, with standardized methods to assess side effects, there appear to be no well-developed or established tools for assessing adverse events associated with MBTs.

Some persons report experiencing increased anxiety while practicing relaxation techniques. The few small controlled trials that have examined the incidence of such relaxation-induced anxiety have found rates from 17%[151] to 31%[152] for relaxation to as high as 53.8% during meditation.[152] Factors that might be associated with such effects include fear of losing control, general restlessness and fear of inactivity, and fear of letting go.[151,153] Additional aversive states include unfamiliar feelings and sensations, intrusive thoughts, sense of losing control, floating, dizziness, feelings of vulnerability, sensations of heaviness, and myoclonic jerks.[153] In a survey of 116 psychologists using relaxation techniques in their practice, the most frequently reported problems encountered by patients were intrusive thoughts (15%), fear of losing control (9%), disturbing sensory experiences (4%), and muscle cramps and spasms (4%). Respondents reported that they terminated 3.8% of clients because side effects were seriously interfering with treatment.[154]

It has been suggested that some of these side effects are to be expected and can be used therapeutically.[155] For example, awareness of physical or psychological tension or stress during the practice of meditation and relaxation can facilitate one's learning to cope more effectively with stressful life situations when they arise.

Studies also suggest that some patients might experience transitory negative effects either during or after hypnosis.[156–159] These effects include headaches, drowsiness, confusion, dizziness, or nausea, and less frequently anxiety or panic.[156] Figures range between 5% to 31% of those who report experiencing such symptoms.[158] It has been suggested that the more serious complications are usually the result of the misapplication of hypnotic techniques or simply poor clinical practice (eg, not preparing patients sufficiently).[158]

Given the above findings suggesting that although relatively infrequent, MBTs can give rise to certain negative effects, we concur with Carlson and Nitz[160] that it is only prudent to apply such therapies after "careful evaluation of patients and within the context of an appropriate professional relationship."

Directions for Future Research

In this review we have suggested that a number of MBTs should be considered for inclusion as adjunctive or complementary therapies for several common medical conditions. We have summarized this best clinical evidence in Table 3. We believe, however, a host of clinical and research issues must be better addressed if MBTs are to be more effectively integrated into conventional medical care. These issues include examining the role of MBTs in primary and secondary prevention; comparing the clinical and cost-effectiveness of MBTs against one another to determine more clearly which strategies are most effective under what conditions and for which patients; better clarifying which patients are most likely to respond positively to MBTs and what the key psychosocial, contextual, and dispositional variables might be (ie, emotional distress, readiness to change, desire for control); examining the relative contribution of nonspecific (ie, placebo) factors associated with the effectiveness of MBTs; and continuing to elucidate the mechanisms of action underlying these therapeutic approaches.

Conclusion

We believe that the cumulative clinical evidence reviewed here lends strong support to the notion that medicine should indeed adopt a biopsychosocial[5,7] rather than exclusively biologic-genetic model of health.

As summarized in Table 3, based on the positive findings of meta-analyses and randomized controlled trials, there is strong evidence to support the incorporation of an array of mind-body approaches in the treatment of chronic low back pain, coronary artery disease, headache, and insomnia; in preparation for surgical procedures; and in management of the treatment and disease-related symptoms of cancer, arthritis, and urinary incontinence. Although we have noted several areas that future research should address (eg, mechanisms of action of MBTs, the relative contribution of nonspecific factors), given the relatively infrequent and minimal side effects associated with such treatments and the emerging evidence that these approaches can also result in significant cost savings,[107] we believe that the integration of psychosocial–mind-body approaches, particularly in the clinical areas highlighted above, should be considered a priority for medicine.

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