Mind–Body Therapies for the Management of Pain

John A. Astin, PhD

Abstract: This paper reviews the evidence for mind-body therapies (eg, relaxation, meditation, imagery, cognitive-behavioral therapy) in the treatment of pain-related medical conditions and suggests directions for future research in these areas. Based on evidence from randomized controlled trials and in many cases, systematic reviews of the literature, the following recommendations can be made: 1) multicomponent mind-body approaches that include some combination of stress management, coping skills training, cognitive restructuring and relaxation therapy may be an appropriate adjunctive treatment for chronic low back pain; 2) multimodal mind-body approaches such as cognitive-behavioral therapy, particularly when combined with an educational/informational component, can be an effective adjunct in the management of rheumatoid and osteoarthritis; 3) relaxation and thermal biofeedback may be considered as a treatment for recurrent migraine while relaxation and muscle biofeedback can be an effective adjunct or stand alone therapy for recurrent tension headache; 4) an array of mind-body therapies (eg, imagery, hypnosis, relaxation) when employed pre-surgically, can improve recovery time and reduce pain following surgical procedures; 5) mind-body approaches may be considered as adjunctive therapies to help ameliorate pain during invasive medical procedures.

Key Words: mind-body therapies, relaxation, meditation, cognitive-behavioral therapy, pain

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The NIH's National Center for Complementary and Alternative Medicine (NCCAM) defines mind–body medicine as "behavioral, psychologic, social and spiritual approaches to medicine not commonly used." Mind–body therapies (MBTs) include meditation, relaxation, imagery, hypnosis, and biofeedback. However, there has been considerable controversy in the field regarding which of the mind–body modalities should be considered "alternative." Some researchers within the mainstream academic and clinical disciplines of behavioral medicine and health psychology argue that the interventions they have spent, in many cases, decades researching in rigorous, carefully controlled studies should not be lumped together with less proven alternative therapies.[1] While I agree in part with this critique and would say that most of the mind–body interventions have been used as complements to rather than substitutes for (ie, alternative to) conventional medical interventions, the bulk of these modalities have largely remained at the margins of medical practice. For example, research suggests that the biomedical model of health and illness, and not the biopsychosocial one remains the dominant paradigm taught in medical schools today.[2] Following Eisenberg's original definition of "unconventional" medicine as those practices not commonly taught in U.S. medical schools nor practiced in U.S. hospitals,[3] it can be argued that the majority of MBTs, while possibly gaining in credibility and acceptance, are not practiced or incorporated as part of standard medical care and training today.[4]

Despite this lack of acceptance, these approaches are of considerable interest to patients. MBTs in fact, constitute a major portion of the overall use of complementary and alternative medicine (CAM) by the public. In 1997,[5] relaxation techniques, imagery, biofeedback, and hypnosis, taken together, were used by 23% of the adult U.S. population. Of these, 16.3% reported using relaxation strategies, the second most frequently used of all CAM therapies.

In this paper, evidence is reviewed for an array of MBTs (including more conventional behavioral medicine and psychosocial approaches) for the following pain-related medical conditions: headache disorders, low back pain, rheumatologic conditions (osteoarthritis, rheumatoid arthritis, fibromyalgia), and chronic pain in general. In addition, the paper summarizes the evidence examining MBTs for post-surgical pain, treatment and disease-related pain symptoms in cancer, and pain during labor and delivery.

RHEUMATOLOGIC CONDITIONS

Rheumatoid Arthritis

Astin et al[6] carried out a recent meta-analysis of 25 randomized trials examining an array of mind–body/psychologic interventions as adjunctive therapy in the management of rheumatoid arthritis. Interventions included multimodal "cognitive-behavioral" approaches (typically involving some combination of relaxation, imagery, stress-management, and/or the teaching of cognitive coping skills), biofeedback, or more traditional psychotherapeutic approaches. Significant

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From the California Pacific Medical Center Research Institute, San Francisco, California.
Reprints: John A. Astin, PhD, P.O. Box 426, Santa Cruz, CA 95061 (e-mail: john@integrativearts.com).

pooled effect sizes were found post-intervention for pain (0.22), functional disability (0.27), psychologic status (0.15), coping (0.46), and self-efficacy (0.35). At follow-up (averaging 8.5 months), significant pooled effect sizes were observed for tender joints (0.33), psychologic status (0.30), and coping (0.52). No clear or consistent patterns emerged when effects sizes for different types of treatment and control conditions were compared, or when higher quality trials were compared with lower quality ones. Findings suggested that these mind–body interventions may be more effective for patients who have had RA for shorter duration.

Osteoarthritis

The most researched MBT for arthritis has been the Arthritis Self-Management Program (ASMP).[7] This community-based intervention consists of education (about the disease and use of medication), cognitive restructuring and physical activity to reduce pain and distress, problem solving, relaxation, and the development of skills to communicate more effectively with family and health care professionals. Earlier studies found the program to reduce arthritis-related pain and disability on average 15–20% from baseline. (Most of the studies examining this program have combined OA and RA patients although the majority have been OA patients.)[8] Furthermore, a recent investigation using a revised version of the program that emphasizes patient self-efficacy (sense of control over the disease) found that reductions in pain were maintained 4 years post-intervention and physician visits were reduced by 43%.[9]

Participants in the ASMP have shown individual savings 4 to 5 times greater than the cost of the program.[9] It has been estimated that if 1% of persons with rheumatoid arthritis achieved the same benefits, net savings would be $2,900,000 over 4 years; for 1% of persons with osteoarthritis, the net savings would be $14,500,000.

A 1996 meta-analysis[10] compared effect sizes of psycho-educational interventions including the ASMP with those found in randomized trials of NSAIDs in both RA and OA patients. Overall, effect sizes appeared quite weak for the psycho-educational interventions (0.17 for pain; 0.03 for functional disability) though the effects appeared to be somewhat greater for RA patients (averaged effect size of 0.34 for tender joint count). However, the authors note that since most patients in these trials were already on NSAIDs, the relatively small effect sizes represent the additional benefit over and above medication and may therefore be clinically relevant. There have been no randomized trials that directly compare such interventions to pharmacologic therapy.

Fibromyalgia

Findings regarding the efficacy of MBTs in fibromyalgia are equivocal. A recent Cochrane review of 13 controlled trials (the majority of which were of poor methodologic quality), found limited evidence that MBTs are more effective than waiting list/usual care controls and inconclusive evidence that these therapies are more effective than physiotherapy, or education/attention controls.[11] There was moderate evidence that MBTs when combined with aerobic exercise are more effective than waiting list/treatment as usual (for self-efficacy and quality of life) but limited evidence that MBT plus exercise is more effective than education/attention control. The 1 outcome where the evidence for MBTs *was* strong was "self-efficacy," the subjective assessment that one has the internal–external resources to cope with a given or hypothetical situation.

BACK PAIN

Results from a 1992 meta-analytic review of 65 studies[12] suggested that multidisciplinary treatments that include some cognitive or behavioral component are more efficacious than no treatment, wait list control, or single-modality treatments such as physical therapy or usual medical care in patients with chronic low back or heterogeneous pain.

A more recent Cochrane review examined the efficacy of behavioral therapies in chronic low back pain.[13] Twenty RCTs were identified. Strategies employed in these trials included behavioral counseling, hypnosis, cognitive behavioral therapy, EMG biofeedback, relaxation, and structured group therapy. Interventions were categorized as operant (using reinforcement to modify behavior), cognitive (modification of cognitive responses to pain), or respondent (modification of the physiological response system—eg, progressive muscle relaxation). The authors concluded that there was "strong evidence" (defined as generally consistent findings in multiple high quality RCTs) that MBTs when compared with wait list controls or usual medical care have a moderate positive effect on pain (effect size, 0.62) and small effects on functional status (ES, 0.35) and behavioral outcomes (ES, 0.40).

In terms of weighing the relative efficacy of these different mind–body approaches, 1 study found no differences between hypnosis and relaxation;[14] another study found that progressive muscle relaxation added little to a cognitive behavioral treatment program in terms of efficacy; Stuckey et al[15] found relaxation therapy to be superior to EMG biofeedback in reducing pain; Turner and Clancy[16] reported that cognitive–behavioral therapy was more effective than operant conditioning in terms of maintaining treatment changes over time; and Turner et al found cognitive-behavioral treatment to be more effective than progressive relaxation in maintaining treatment effects 18–24 months post intervention.[17] Results of the van Tulder et al meta-analysis did not, however, shed light on the relative efficacy of different mind–body approaches for chronic low back pain.

Chronic and Acute Pain Management

In 1996, a NIH Technology Assessment Panel stated that there was strong evidence that relaxation techniques were ef-

fective in the treatment of chronic pain.[18] However, a systematic review of 9 randomized trials of relaxation therapy[19] found positive treatment effects in only 3 studies and concluded that there is *insufficient* evidence for the use of relaxation (alone) in the treatment of chronic pain. Based on a systematic review of RCTs examining the efficacy of relaxation for acute pain management, the authors similarly concluded that while there was "some weak evidence" to support the use of these therapies, the data were inconclusive, in part owing to methodological problems in the studies.[20]

Kabat-Zinn and colleagues have published a series of studies suggesting that mindfulness meditation may be an effective strategy for helping chronic pain (including low back pain) patients cope more effectively with their conditions.[21,22] While these studies have suffered from inadequate comparison/control groups, in a 4-year follow-up report,[21] the majority (60–72%) of 225 chronic pain patients who had completed this 8-week mindfulness meditation program reported "moderate to great improvement" in pain status.

HEADACHE

A 1990 meta-analysis comparing the effectiveness of relaxation/biofeedback with drug therapy (ie, propranolol) in migraine,[23] found both approaches to yield similar results—a 43% reduction in headache activity in the average patient compared with 14% reduction in placebo medication and no reduction in unmedicated subjects. In their more recent review, Holroyd and Penzien[24] concluded that combined relaxation training and thermal biofeedback is the preferred behavioral treatment of recurrent migraine disorder, the combination of these therapies yielding significantly larger treatment effects than either one alone.

In a review of non-pharmacological approaches to recurrent tension headaches, across studies, relaxation training, EMG biofeedback, and their combination yielded nearly a 50% reduction in headache activity.[24] While these 3 approaches do not appear to yield significantly different effects when compared with one another, they have all shown superior effects in comparison to untreated controls or patients treated with non-contingent (ie, placebo) biofeedback. A 1997 meta-analysis concluded 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 sizes of 0.51 and 0.52 respectively across all headache types and outcomes).[25]

Gauthier et al[26] concurred with the above findings stating that "the evidence supports the value of approaches based on relaxation, biofeedback, and coping skills training" in the management of recurrent headache disorders. They concluded that the effects of these mind–body therapies appear to be as comparable and long lasting as those obtained pharmacologically.

Studies also suggest that mind–body approaches may be effective in the treatment of pediatric headaches. Sartory et al[27] found that relaxation/stress-management training and biofeedback (cephalic vasomotor) were both more effective than metoprolol in treating pediatric migraine. A 1995 meta-analysis also found some preliminary evidence supporting the use of relaxation and biofeedback in treating children with migraines.[28] Finally, in a 1999 review, Holden stated that "sufficient evidence exists to conclude that relaxation/self-hypnosis is a well-established and efficacious treatment of recurrent headache" in children and that the evidence suggests that thermal biofeedback is a "probably efficacious" treatment.[29]

OTHER CLINICAL CONDITIONS

Substantial evidence exists to support the use of MBTs in a number of other clinical conditions that include pain as a central component. These include recovery time and pain following surgery, pain during childbirth, and helping both adults and children cope with painful medical procedures. Meta-analyses[30,31] have shown that an array of mind–body approaches when employed pre-surgically reduce pain following surgery. In the most recent of these, Johnston and Vogele[30] reported that an array of MBTs such as relaxation, guided imagery, hypnosis, and instructional interventions (eg, providing information about the procedure) when employed prior to surgery produced an averaged effect size of 0.85 for pain reduction and 0.61 for improved recovery time.

Research also suggests that mind–body/behavioral interventions can be effective in ameliorating pain stemming from invasive medical procedures in both adults (eg, cancer patients)[32] and children.[33] A review of 13 studies that examined mind–body approaches (including relaxation, distraction, imagery, cognitive coping skills, filmed modeling, behavioral rehearsal) concluded that such approaches met empirical criteria as "well established" treatments for reducing procedure-related pain in children and adolescents.[33]

Results from a number of clinical trials suggest that MBTs can be effective in helping cancer patients reduce the physical pain associated with treatment.[34–36] For example, Syrjala et al found that relaxation and imagery (each as separate interventions) and a combined cognitive coping skills package that included both therapies were all more effective than usual care or therapist support in ameliorating pain associated with bone marrow transplant. Meta-analyses[32,37,38] further support the value of such approaches for reducing acute pain associated with specific treatments and to a lesser degree chronic pain associated with the disease of cancer.[32]

A meta-analysis of 11 trials[39] found that the presence during childbirth of continual emotional support (in the form of a support person or "doula") resulted in a reduced need for analgesia as well as a number of other positive outcomes including lower C-section rates and shorter labors. Other evidence suggests that hypnosis may be an effective non-pharmacologic approach to managing pain during labor and childbirth.[40]

OVERALL CLINICAL RECOMMENDATIONS

Based on the evidence reviewed here, the adjunctive use of MBTs should be considered in the treatment of health-related problems that include pain as a major component. Specifically, the reviewed evidence suggests that:

1. Multicomponent approaches that include some combination of stress management, coping skills training, cognitive restructuring, and possibly relaxation therapy (although the evidence for relaxation is more equivocal) may be an appropriate complementary therapy in the treatment of chronic low back pain. (Mindfulness meditation appears to be a promising MBT for back and heterogeneous pain but has yet to be adequately tested with randomized controlled trials.)
2. Multi-modal cognitive-behavioral/mind–body therapies, along with the addition of an educational/informational component (eg, patient education/self-management programs) may be an appropriate adjunctive treatment in the management of rheumatoid and osteoarthritis.
3. MBTs, in particular the combination of relaxation and thermal biofeedback, may be considered as a treatment of recurrent migraines while the use of relaxation and/or EMG muscle biofeedback may be appropriate as adjunctive or stand alone therapy for recurrent tension headaches.
4. An array of MBTs when employed pre-surgically may significantly improve recovery time and reduce pain following surgical procedures.
5. Mind–body approaches (eg, hypnosis, group therapy, relaxation, imagery) may be considered as adjunctive therapies to help ameliorate pain during invasive medical procedures.

Directions for Future Research

The evidence reviewed here suggests that a number of MBTs may be considered for inclusion as adjunctive/complementary therapies for an array of pain-related conditions. However, a host of clinical and research questions must be better answered if MBTs are to be more effectively integrated into conventional medical care. These are outlined below:

1. The potential role of MBTs in primary and secondary prevention has not been adequately examined. Particularly given the increasing evidence that psychosocial stress may play a causal role in the progression and initiation of certain diseases,[41,42] it is plausible that interventions designed to minimize the impact of stress may be important tools to include as part of any comprehensive approach to disease prevention.
2. As noted, along with additional research comparing MBTs to credible shams or conventional medical therapies, future studies should compare the clinical *and* cost-effectiveness of MBTs against one another to more clearly identify which strategies are most effective under what conditions and for which patients. For example, some studies suggest that for chronic pain in general, multicomponent MBTs may be more effective than single component (particularly relaxation) approaches. However, in some conditions such as headache disorders, evidence suggests that more complex and costly multi-modal treatments may not be any more effective than simple self-administered/home-based relaxation practices that require minimal therapist contact.[25,43,44]
3. It is important for future research to clarify 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). To give but one example, providing surgery patients whose preferred coping style is one of denial more information about surgical procedures may exacerbate rather than diminish pain and anxiety.[45]
4. It is very difficult to control or tease out placebo/expectancy effects in mind–body trials for several reasons. First, it is quite difficult to create credible "placebo" conditions that are not obvious to research participants (ie, blinding to treatment is often impossible). Second, many of the elements that theoretically comprise non-specific effects may actually be critical aspects of MBTs themselves (eg, increasing patients' sense of control). Therefore to try and remove these may render such treatments less effective. These caveats notwithstanding, it is important for future research to examine the relative contribution of non-specific (ie, placebo) factors in MBTs.
5. Future research needs to continue examining mechanisms of action of MBTs. For example, Benson suggests that it is the elicitation of a hypometabolic state (the "relaxation response") that is the common mechanism underlying the effectiveness of all MBTs. However, emerging evidence suggests that meditation and relaxation may in fact be distinct from one another neurophysiologically.[46] Below I highlight 3 hypothesized mechanisms of action of MBTs, particularly as they relate to the management and treatment of pain-related conditions. These are: (a) the attenuation of stress reactivity, (b) the capacity to cope more effectively (with pain), and (c) the enhancement of patients' sense of control or self-efficacy.

Stress Reactivity

Research suggests that a frequent concomitant or consequence of chronic pain conditions such as arthritis is psychologic and emotional distress. For example, Meenan et al[47] found that 63% of patients with RA experience major disruptions in psychologic status. Psychologic stress may also aggravate disease activity itself and exacerbate pain and other symptoms. MBTs may reduce stress and its associated effects on pain in several ways. First, by receiving training in stress coping (eg, through techniques such as cognitive-behavioral

therapy or mindfulness meditation), individuals may become more aware of their characteristic cognitive/emotional patterns and habitual ways of reacting to daily stressors and life challenges. The recognition of the automatic and largely unconscious nature of much stress reactivity (such as the "fight-or-flight" response) may, in turn, facilitate the development of greater control and mastery over such reactivity and expand the range and repertoire of possible responses to stressful life events. Second, according to Schwartz's system's model of "disregulation,"[48] stress may contribute to diminished health and well being when individuals dis-attend to critical cognitive/emotional or physiological feedback, resulting in a breakdown in communication between the organism's various subsystems. With their emphasis on developing greater awareness of bodily, emotional, and cognitive processes and states, MBTs may be particularly effective in reducing stress and its negative health consequences by increasing the amount of communication or information in the "system," thereby leading to greater psychophysiological regulation and balance. Finally, studies have shown that a physiological state of hypo-arousal frequently results from the practice of MBTs. This attenuation of sympathetic arousal (elicitation of what Benson refers to as the "relaxation response")[49] has been shown to be an effective approach for addressing the negative health consequences associated with chronic and acute stress reactivity.[50]

Coping With Pain

MBTs may help individuals cope more effectively with chronic pain in several ways. First, as noted above, the physiological state of hypo-arousal that frequently results from the practice of different MBTs may serve to diminish pain and its related emotional symptoms. Second, certain MBTs (most notably mindfulness meditation) that emphasize the development of a detached stance toward or observation of sensory experience, may in turn cause an "uncoupling of the sensory dimension of the pain experience from the affective evaluative alarm reaction."[51] Through the cultivation of greater objectivity, such cognitive/emotional alarm reactions to painful sensations (eg, "I'll never survive this," "This pain will probably go on forever…") become less all consuming or overwhelming. The process of observing these evaluative tendencies of the mind—that is, the propensity of consciousness to judge as either attractive or aversive sensory/perceptual experiences—may result in a deconditioning of the alarm reactivity to primary sensations such as physical pain. Indeed, research on MBTs suggests that while the physical (nociceptive) experience of pain may remain largely unchanged, the emotional and cognitive components of the pain experience appear to be significantly diminished, resulting in less suffering and distress.

Enhancing Sense of Control/Self-Efficacy

A large body of evidence suggests that the psychologic construct of control (eg, sense of control, self-efficacy) may have important implications for mental and physical health including the management of pain. Studies suggest that actual as well as perceived control of pain lessens its impact. For example, a study of chronic back pain patients found that both general and situation specific perceptions of uncontrollability and feelings of helplessness were more predictive of greater pain severity and disability than any disease-related factors.[52] Jensen & Karoly showed that patients' belief regarding the extent to which they could control their pain was predictive of medication use, levels of physical activity, and psychologic function.[53] Research also suggests that a patient's need to be in or maintain a sense of control may influence pain perceptions and post-surgical recovery.[54] Consistent with this research, studies also suggest that positive outcomes in mind–body interventions may be mediated by changes in sense of control and self-efficacy,[11,55] the subjective assessment that one has the internal-external resources to cope with a given or hypothetical situation. Both laboratory and clinical studies indicate that perceived self-efficacy is an important cognitive factor in pain tolerance and control,[56,57] and self-efficacy has also been found to predict pain tolerance in normal subjects and the degree of endogenous opioid activation in response to pain.[58]

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