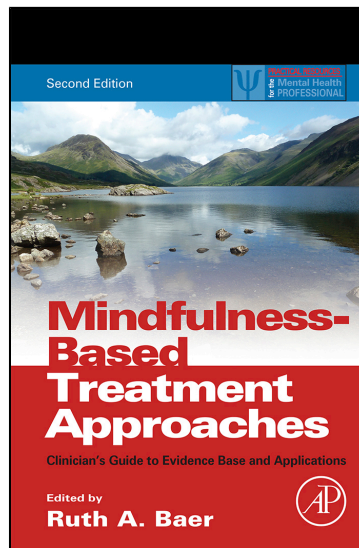


**Provided for non-commercial research and educational use only.  
Not for reproduction, distribution or commercial use.**

This chapter was originally published in the book *Mindfulness-Based Treatment Approaches*. The copy attached is provided by Elsevier for the author's benefit and for the benefit of the author's institution, for non-commercial research, and educational use. This includes without limitation use in instruction at your institution, distribution to specific colleagues, and providing a copy to your institution's administrator.



All other uses, reproduction and distribution, including without limitation commercial reprints, selling or licensing copies or access, or posting on open internet sites, your personal or institution's website or repository, are prohibited. For exceptions, permission may be sought for such use through Elsevier's permissions site at:

<http://www.elsevier.com/locate/permissionusematerial>

From Greeson, J., & Eisenlohr-Moul, T. (2014). Mindfulness-Based Stress Reduction for Chronic Pain. In R. A. Baer (Ed.), *Mindfulness-Based Treatment Approaches: Clinician's Guide to Evidence Base and Applications*. Academic Press, 267–292.

ISBN: 9780124160316

Copyright © 2014, 2006 Elsevier Inc. All rights reserved  
Academic Press

---

Part IV

**Applications with  
Medical Populations**

**Author's personal copy**

# Mindfulness-Based Stress Reduction for Chronic Pain

Jeffrey Greeson and Tory Eisenlohr-Moul

*Department of Psychiatry & Behavioral Sciences, Duke University Medical Center, Duke Integrative Medicine, Durham, NC, USA*

*“Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage...Pain is always subjective.”*

International Association for the Study of Pain (IASP)

*“Psyche and body react sympathetically to each other, it seems to me. A change in the state of the psyche produces a change in the structure of the body, and, conversely, a change in the structure of the body produces a change in the state of the psyche.”*

Aristotle (Physiognomonica)

## INTRODUCTION

According to modern professional associations and ancient philosophers alike, pain is a mind–body experience. Whereas acute pain is adaptive and critical for survival, chronic pain is typically not useful and can produce enormous suffering. Chronic pain that persists for 6 months or longer is highly prevalent, affecting about one in three adults in the United States (Johannes, Le, Zhou, Johnston, & Dworkin, 2010) and about one in five adults globally (Goldberg & McGee, 2011). Therefore, chronic pain is a major public health problem. Based on the alarming prevalence, enormous cost to society, and current limitations with conventional treatment approaches, the Institute of Medicine (Committee on Advancing Pain Research, Care, & Institute of Medicine, 2011) has called for a cultural transformation in the way pain is viewed and treated. Mindfulness meditation offers a fundamental shift in view and a path of transformation in its own right.

This chapter articulates how clinicians can meet the urgent public health need for more effective pain relief by tailoring mindfulness-based approaches to treatment and prevention that leverage patients' inner resources for self-management, self-regulation, and self-healing, including attention, awareness, compassion, and connection.

Pain processing, as well as a person's subjective experience of pain, is multifaceted; it involves physical, cognitive, emotional, behavioral, and even spiritual factors (Garland, 2012; Young, 2004). Mindfulness-based stress reduction (MBSR) is a popular mind-body medicine intervention that can help patients with chronic pain, stress, and illness cope more skillfully, relieve their suffering, and reclaim a sense of themselves as a whole person (Kabat-Zinn, 1982, 2003, 2011). As reviewed in this chapter, mindfulness training can target multiple facets implicated in the phenomenology of pain, including attention, sensory perception, cognition, emotional processing, physiological reactivity, and unhealthy coping behaviors. Based on the emerging science and practice of mindfulness, integrative approaches to treating and preventing chronic pain now aim to address the whole person, not just the body (Greeson, Krucoff, Moon, Moon, & Shaffer, 2010). A take-home message of this chapter is that reducing stress through mindfulness meditation practice can help patients learn to self-regulate their mind, brain, body, and behavior and live with greater ease, functioning, and well-being (Greeson, 2009; Rosenzweig *et al.*, 2010). Because each person already has the capacity for mindfulness, each patient with chronic pain can learn to cultivate attention, awareness, and compassion that, together, instill a sense of equanimity, which allows one to respond wisely, versus react automatically, to pain.

Although pain medication, medical devices, and physical therapy can help manage symptoms and preserve functioning for some patients, traditional medical therapies do not produce sufficient pain relief for many people (Committee on Advancing Pain Research *et al.*, 2011). In addition, medical treatments for pain can cause significant side effects, including dependence on narcotics, pain sensitization, and even an unintended focus on what is wrong to the exclusion of what is right, or functioning well, in a person. From the perspective of mindfulness, there is far more right with us than wrong, as long as we are alive and breathing in this moment (Kabat-Zinn, 2005). In this sense, the healing potential of a mindfulness-based approach to chronic pain lies in a fundamental shift in perspective that occurs once one begins to practice being mindful during formal meditation and in everyday life. The goal of mindfulness practice is not to eliminate pain, or be stress free, or even make one's mind go blank to avoid upsetting thoughts about pain, loss, or the future. Rather, practicing mindfulness is about attending to one's body, mind, and heart in an open, curious, and accepting way, so one can live fully even with physical pain and its attendant emotions and functional limitations, should they be present. After years of trying to diagnose the underlying pathology and to determine most effective treatment(s), patients with chronic pain are frequently told by their doctors, "There is nothing more we can do. You just have to learn to live with it." But *how*? Mindfulness offers a new way of seeing, a way of being, in which attention, awareness, and compassion are not merely tools in the proverbial toolbox, but a fundamentally new way of relating to the body, the mind, and life itself as it unfolds moment by moment.

Since 1979 when the Stress Reduction and Relaxation Program was founded by Jon Kabat-Zinn and colleagues at the University of Massachusetts Medical School,

what later came to be known as Mindfulness-Based Stress Reduction (MBSR) has garnered increasing evidence as an effective behavioral approach to relieving suffering, restoring functioning, and maximizing quality of life for people with chronic pain. Today, MBSR programs are commonly available in medical center, educational, and private practice settings (for a listing, see <http://w3.umassmed.edu/MBSR/public/searchmember.aspx>). Persons living with chronic pain also have access to an increasing number of self-help books and guided audio programs, which provide economical options for cultivating core mindfulness skills and perspectives that can stimulate learning, self-discovery, healing, and transformation. Because individuals in chronic pain may be reluctant to “pay attention to” or “become aware of” the various sensations, thoughts, feelings, and behaviors that constitute their personal experience of pain, there is a vital need for clinicians trained in the principles, practices, and evidence for mindfulness-based approaches to managing chronic pain. Ultimately, to best deliver a therapeutic experience that is engaging, effective, and lasting, clinicians must understand how a complex array of biological, psychological, social, and even spiritual factors plays out in an individual person’s mind, brain, body, and behavior.

This chapter describes how mindfulness meditation practice can specifically target the underlying phenomenology of pain as a mind–body experience. *The central thesis is that mindfulness training can help patients relieve their suffering and reclaim their life by developing a “wise relationship” with the inner experience of pain.* By learning to relate to body sensations, thoughts, emotions, and behavioral impulses without having to change them, avoid them, or suppress them, a greater degree of openness, flexibility, and skillfulness emerges that can translate into “wise action”—choosing what to do in the present moment to care for one’s body, mind, and spirit. Thus, developing a “wise relationship” through mindfulness practice refers to a fundamental shift in perspective that reduces stress, and facilitates healthy self-regulation of mind, body, and behavior (Greeson & Brantley, 2009). In the case of chronic pain—like depression and other stress-related conditions—patients are able to learn how to relate to their pain differently. Specifically, they are able to mindfully observe pain, describe sensations associated with it, notice how pain-related sensations, thoughts, emotions, and impulses change moment by moment, and uncouple cognitive, affective, and behavioral reactions from the sensory experience of pain. Ultimately, patients who learn mindfulness meditation are more willing and able to move into pain and through it, rather than habitually try to avoid it or move away.

This chapter is organized into four parts. Part 1 provides a theoretical foundation and a conceptual rationale for MBSR as a useful intervention for patients with chronic pain. Part 2 presents a clinically rich case study that illustrates how the core principles and practices of mindfulness are able to target the physical, cognitive, emotional, behavioral, and spiritual elements implicated in one woman’s experience of chronic pain. Part 3 reviews current empirical support for the efficacy of MBSR in treating chronic pain, including clinical outcome studies and psychological and neural mechanisms of change. Part 4 concludes with

a discussion of practical issues relevant to clinicians interested in implementing MBSR, or other mindfulness-based interventions (MBIs), in their practice. Throughout the chapter, we aim to translate research findings from psychology, medicine, and neuroscience that point to the value of using a mindfulness-based approach to treating and preventing chronic pain.

## THEORETICAL FOUNDATION AND CONCEPTUAL RATIONALE

The practice of offering a mindfulness meditation program for chronic pain patients stemmed from the fact that many patients with chronic pain were “falling through the cracks” of the medical system (Kabat-Zinn, 1982). To meet the need for an alternative approach for patients who had already been treated with conventional medical therapy with limited success, a stress reduction and relaxation program was developed based on the theory of meditation as a self-regulation practice (Goleman & Schwartz, 1976; Kabat-Zinn, 1982; Schwartz, Davidson, & Goleman, 1978). Specifically, mindfulness meditation was framed as a systematic, secular method anyone can learn to more skillfully self-regulate the mind, brain, body, and behavior. The program was intended to help motivated patients develop internal resources, such as attention, awareness, and compassion, to cope with the complex experience of chronic pain, largely by developing a different way of relating to pain itself.

MBSR, centered on the systematic cultivation of mindfulness, was developed based on Kabat-Zinn’s personal experience with pain during extended periods of meditation training, and on the theoretical basis of how sensory perception, attention, cognition, emotion, and behavior all interact to influence one’s subjective experience of pain and suffering. By learning and practicing the core meditative concepts of bare attention, detached awareness, and self-compassion, patients are able to deconstruct their experience of pain into its component parts (sensory, cognitive, emotional, behavioral, and spiritual), thereby creating a greater sense of control, mastery, resilience, and coping (Kabat-Zinn, 1982, 1990; Young, 2004). In addition, through regular self-observation during daily meditation practice, MBSR participants learn about the connection between their thoughts about pain, their emotional reactions to thoughts, beliefs, judgments, and memories, and their tendency to act automatically on behavioral impulses to suppress negative thoughts, upsetting emotions, and unpleasant physical sensations. Because the interplay between pain-related sensations, thoughts, emotions, and impulses is complicated, automatic, and fast-moving, patients may not be aware of each of the components of their pain experience. Mindfulness meditation practice helps teach patients how each component of their pain experience can be attended to, observed, and treated with compassion.

This perspective often represents a radically new way of relating to pain. With practice, as patients learn to observe the fullness of their inner experience more mindfully and less reactively, they can begin to uncouple decisions, beliefs, and actions from automatic thoughts, negative appraisals, and unpleasant physical

sensations. This experience, through regular meditation practice, typically results in a greater sense of flexibility, possibility, control, and hope, which not only helps restore emotional balance, but can also affect patterns of brain activity, physiology, and even molecular biology (e.g., inflammation) that are directly associated with pain perception and processing (Garland, 2012). Because stress-related cognitive appraisals like catastrophizing, and emotional reactions like anger or fear, are associated with activation of brain regions like the amygdala that mediate sympathetic nervous system (SNS) function, cells and tissues that receive stress signals from the brain via neurotransmitters and cytokines can respond to the molecules of emotion (Garland, 2012; Pert, 1997). Therefore, the perception of stress and emotional distress can be biologically transduced into information that literally amplifies pain signals in the nervous systems and in the brain. In theory, learning to mitigate maladaptive negative thoughts and associated emotional reactions through practicing mindfulness can facilitate the self-regulation of brain activity, stress physiology, and even biochemistry and cell signaling, thus helping to relieve stress, pain, and anxiety (Garland, Gaylord, & Park, 2009; Greeson & Brantley, 2009; Greeson, 2009; Kabat-Zinn, 1990).

As described in Part 3 (Review of Empirical Support), clinical trials, modern neuroscience, and psychophysiological lab studies on MBSR and other MBIs are providing data to substantiate the theory that shifts in perception, such as simply observing sensations associated with pain while not feeding into negative thoughts or emotional reactions, can significantly reduce suffering and improve functioning. At its heart, the group-based behavioral medicine program, which eventually became known as MBSR, offers patients an opportunity to actively participate in their own health and healing by teaching themselves how to reduce stress, be more present in the moment, and live fully with chronic pain, rather than being restricted or defined by it (Kabat-Zinn, 1982; Santorelli, 2010).

## CASE STUDY

In this section, we expand upon the theoretical rationale for MBSR by providing a concrete, illustrative case example. This case study is intended to provide a richer description of how mindfulness meditation principles and practices may be applied in real clinical settings.

## Background

“Susan” is a 57-year-old Caucasian female with a 4-year history of chronic neuropathic pain related to spinal stenosis and failed back surgery. She has had eight back surgeries in the past 4 years and is currently on disability. She states that her “life is over as I know it.” Susan was referred for individual psychotherapy after enrolling in an 8-week MBSR course, but dropping out after only two sessions. Her primary goals in therapy were to better cope with stress, more effectively manage chronic pain, and decrease medication use.



At the time of initial consultation, Susan was taking over 30 prescription medications. For pain management, she was prescribed: duloxetine 20 mg (Cymbalta), gabapentin 800 mg, lidocaine patch 700 mg, metaxalone 800 mg (Skelaxin), tramadol 50 mg, and hydrocodone/acetaminophen 7.5–325 mg. In addition, Susan was taking medications for numerous other medical and mental health conditions, including: estradiol/norethindrone 1–0.5 mg (hormone replacement therapy), misoprostol 200 mcg (gastrointestinal/constipation), pantoprazole (gastroesophageal reflux), sertraline 100 mg (depression), trazadone 150 mg (sleep), zolpidem 10 mg (sleep), clonazepam 0.5 mg (anxiety), ondansetron 8 mg (nausea), and fludrocortisone 0.1 mg (adrenal fatigue). In addition, Susan had a spinal cord stimulator implanted 1.5 years ago to treat her intractable neuropathic pain, which radiated from the back into the legs, disrupting normal daily activities, precluding her ability to work as a nurse, and severely disrupting sleep. Susan reported that her pain was “completely out of control.”

Further, multiple other problems in her life were accumulating to the point that she could no longer cope. One son was preparing for his third military deployment to Afghanistan, while a second son was preparing for an upcoming wedding. Medical bills were reportedly in collection with five different agencies, yet Susan’s husband was withdrawing money from their 401(k) retirement account to help fund their son’s wedding. In response to these cumulative health and life stressors, Susan reverted to binge eating, and she had regained 30 lbs of the 100 lbs she lost in 2008 before the chronic pain began.

At her first consultation, Susan said she was not functioning well, she was having regular panic attacks, and she noted that she “would be ok if she died,” though she denied active suicidal ideation or intent. She reported that some non-pharmacologic treatments helped manage her pain and reduced her stress somewhat. These included physical therapy (including ice packs, stretching, walking, and pool exercises), psychotherapy (cognitive-behavioral therapy, CBT), bio-feedback, and prayer. Susan shared that her biggest strengths are that she is usually positive, motivated, able to persevere, has a strong faith, and is open-minded. She also reported being committed to regular physical exercise, with a current regimen of walking each morning for 30 minutes and doing pool exercises three to five times a week. However, she also reported being noncompliant with her prescribed physical therapy regimen and with several medications due to disconcerting side effects. In the past month, Susan said she has realized she needed help to manage stress, cope with severe pain that was usually 8–9/10 (0 = no pain, 10 = worst imaginable pain), and minimize the medications she had to take, which were causing persistent “brain fog.”

## Intervention

Over four individual sessions, we integrated the core principles and practices of mindfulness and CBT to help Susan cultivate the self-regulation skills she needed to better manage stress, regulate emotions, cope with persistent, severe

pain, and reclaim a sense of balance, fullness, and direction. Because Susan had already tried and dropped out of the traditional 8-week group MBSR class, we focused on teaching core meditation practices included in MBSR, but tailored in length and application for Susan as an individual.

In the first session, we discussed Susan's medical and mental health history in detail, with an emphasis on her most pressing current concerns. She stated that her primary goals were to (1) decrease or eliminate her use of Zoloft and Klonopin, (2) reduce stress, (3) develop better coping skills to manage emotions like anxiety and anger, and (4) better manage strained family relationships with her husband, sister, and one son. Because Susan said she typically copes with stress and worry by overeating and ruminating about things that have gone wrong in her life, we framed the therapy sessions through the lens of mindfulness, which asserts that as long as you are alive and breathing, there is far more right with you than wrong. When presented with this radically different view, Susan's eyes got wide, and she looked surprised, though she was smiling. She said, "nobody has ever put it that way before."

With a renewed sense of possibility that things can be different simply by shifting our perception of them, we next proceeded to discuss how attention acts like a spotlight—it brightens whatever it shines on. In the case of chronic pain, and things that have gone wrong, shining the light of attention narrowly on them amplifies pain, emotional distress, and suffering. On the other hand, learning to skillfully steady attention by deliberately focusing it on another (neutral) object, such as the breath, can help disengage from mental proliferation and emotional reactions, thereby restoring calmness, control, and presence on a moment-by-moment basis. After a conversational explanation, Susan gained direct, first-hand experience with the foundational skill of attention regulation during a 5-minute guided mindful breathing meditation. After the exercise, Susan said, "I couldn't believe it, but I was able to *just breathe*." In other words, she experienced at least a temporary cessation of suffering, not by trying to escape or avoid her pain, but by paying attention to the sensations of the breath, rising and falling, relaxing and letting go, moment by moment, without trying to make anything happen. This first session allowed Susan the novel experience of relating to her pain differently by knowing it was there, but choosing to focus the spotlight of her attention elsewhere in her body, on a place that felt neutral or even pleasant in some sense. The results? A surprising direct experience of feeling in control by simply noticing sensations and letting go of the story. Susan's homework was to practice mindful breathing each day, for at least 5 minutes, or longer if so inspired.

In session 2, 1 week later, Susan reported that she was having more "belly attacks" as the holidays drew near, and her son's wedding was fast approaching. The stress of the holidays, coupled with financial stresses associated with unpaid medical bills and the upcoming wedding, were taking a toll on Susan's body. In response, she said she was having the urge to binge eat sweets lately. To target this symptom, which was directly related to Susan's weight, her emotional distress, her self-esteem, and her confidence in her ability to make and

maintain healthy lifestyle changes, we did a guided “urge surfing” meditation in session to teach the skills of distress tolerance and nonreactivity in the face of stress or craving. During the urge surfing meditation, which is not commonly taught in MBSR, but is taught as part of mindfulness-based relapse prevention (MBRP), the participant is encouraged to anchor attention on the breath while being open to noticing cravings, impulses, desires, or urges. As an urge begins to form, mindfulness skills are used to observe the physical sensations that arise, mentally note or describe the thoughts and emotions associated with the urge, not judge one’s experience but rather let it be as it is, and not react to the flowing stream of sensations, thoughts, emotions, and impulses to do something. In urge surfing meditation, one is taught to ride the wave of an urge much like a surfer rides a wave. First, it begins to form, then it rises and gathers strength, then it crests and falls, and then it washes over. When perceived as “just an urge,” “just a craving,” or “just a sensation,” urges (like physical discomfort) can be reappraised or reperceived as “just energy”—nothing inherently harmful (Kabat-Zinn, 1990; Young, 2004). With this fundamental shift in perspective, there is typically a renewed sense of control, equanimity, and belief that one has the ability to cope with intense experiences and impulses. Susan’s homework was to practice urge surfing meditation each day, using the recorded practice.

In session 3, 3 weeks later, Susan’s son had been deployed to Afghanistan, her other son had gotten married, and she had made it through the holidays. She had a fall that exacerbated her pain and triggered heightened worry about her health. She said she “had to get [her] head back in the game,” and that she no longer wanted to rely on Klonopin to manage her health anxiety. Because of how “sticky” Susan’s worries about her health were, we did a guided meditation in session called “choiceless awareness.” Choiceless awareness is a meditation practice that systematically expands awareness from sensations of the breath to the body, to sounds, to thoughts, to emotions, to impulses, to releasing any particular object of meditation such that the meditation is on awareness itself, with no chosen object. One simply endeavors to be aware of whatever rises in the field of consciousness—a physical sensation in the body, a train of thought, a judgment, a memory, a sound, an emotional reaction such as liking or disliking, or an impulse to move or shift position, for example. Although choiceless awareness meditation is typically considered a more advanced meditation practice, we taught it to Susan to help her realize there were many, many other things besides her own thoughts, pain, and worries that she could pay attention to, and practice letting go of. And because choiceless awareness allows for stressful, troublesome thoughts to arise and be present, the skill comes in realizing that those thoughts and perceptions come in waves, just like the breath, just like sounds, just like other (benign) sensations, constantly changing and shifting, increasing and decreasing in intensity on their own accord. As Susan stated after we finished the guided practice, “I didn’t have to DO anything...I could sit and listen.” She was feeling some relief from letting go of the burden to try to make things better, finding freedom in allowing things to be as they were in the moment without

judging or reacting. Susan's homework was to continue practicing choiceless awareness meditation each day to build the skills of "seeing and letting go."

In session 4, Susan forgot to bring her ice packs to sit on, so she was more physically uncomfortable and agitated than usual. She said she had bought and had been reading Jon Kabat-Zinn's book, *Full Catastrophe Living*, to deepen her understanding of the core principles, practices, and rationale for MBSR. Because of the prominent physical tension and discomfort Susan was experiencing in session, we agreed to do a longer meditation in an effort to help her relax and experience her body in a different way—a way that felt more comfortable and more whole. We did a 30-minute body scan meditation, in which Susan was instructed to notice whatever sensations were present in each part of her body, as she systematically guided attention into and through each part, from her toes up to her head. In addition to observing body sensations as they are without trying to change them (e.g., tightness, warmth, dryness, pressure, softness, movement, or sometimes no sensation at all), the body scan invites one to imagine breathing into an area of the body, and then breathing out from it, leaving the area more relaxed. At the end, one is also invited to imagine breathing out through a blow-hole in the top of the head, like a dolphin or whale. The body scan typically ends with a sense of the whole body breathing. At the end of the extended guided practice in session, Susan delightfully commented that, "I felt really relaxed. I also wasn't thinking as much. You taught me to inhabit my body and breathe through my toes!"

During a series of four sessions, Susan learned through several basic meditation practices how to harness and deliberately focus her attention on a chosen object, how to "surf" urges to binge eat or emotional reactions to intense stress or pain, how to expand awareness to include many other things in the field of consciousness other than stress, worry, or pain, and how to reinhabit the body with a sense of ease, peace, and wholeness. By practicing the meditations at home, Susan reinforced the core mindfulness qualities of bare attention (focusing on direct sensory experience, letting go of evaluative stories), detached observation (both having a direct experience in the moment and yet maintaining awareness of awareness itself), compassion (treating oneself with kindness in the face of difficulty), and connection (knowing how the mind, brain, body, and behavior are related and, in part, controllable). Six months later, Susan returned to the clinic to see one of her physicians, and reported that she was taking steps to pursue her dream of pediatric hospice nursing. She was also able to function better with fewer pain medications, and she felt more resilient to her family, financial, and health-related stress after practicing with her meditation CDs for the past several months. She was now interested in trying the MBSR course again. Overall, though her medical conditions had not changed appreciably, she had made significant progress in coping, in part, by no longer identifying as strongly with the pain, and being able to uncouple her everyday decisions and actions from the automatic thoughts, emotional reactions, and impulses associated with her pain and life context.

## REVIEW OF EMPIRICAL SUPPORT

Many factors may contribute to a clinician's decision to use MBSR in their clinical practice. Clinicians may choose to use this treatment because they find the MBSR approach to chronic pain to be consistent with some theoretical orientation or personal values (see Part 1), or may act on the basis of positive clinical experiences (see Part 2). However, clinicians in scientifically oriented therapeutic disciplines often strive for an empirically informed treatment decision-making process, and look for empirical evidence regarding the use of a particular treatment for a particular population. Therefore, in the present section, we describe the results of many trials of MBSR for chronic pain, as well as laboratory studies investigating the mechanisms by which mindfulness training creates positive change among these individuals.

### Randomized Controlled Trials

When evaluating the empirical support for the efficacy of any treatment, results of randomized controlled trials (RCTs) provide the highest level of evidence. To date, 14 randomized controlled trials of MBSR (12) and MBCT (2) have been conducted—six comparing the MBI to a wait-list control group only, and eight comparing the MBI to active control groups. In the following sections, the evidence from these RCTs will be reviewed.

#### *Fibromyalgia*

Five RCTs have examined the efficacy of MBSR (4) or MBCT (1) for treating physical and mental symptoms in fibromyalgia (FM), a condition characterized by chronic pain and stiffness throughout the body. Astin *et al.* compared an intervention combining MBSR with qigong to an educational support group, and found that both pain and depressive symptoms declined similarly in both groups (Astin, Shapiro, Eisenberg, & Forys, 2003). In another study comparing MBSR to a wait-list control group, Sephton *et al.* demonstrated that MBSR reduced depressive symptoms among women with FM; pain outcomes were not reported (Sephton *et al.*, 2007). Further, Brown and Jones found that an intervention based on MBSR improved general mental health, perceived control, and engagement in self-management of pain more than treatment as usual, but did not significantly change self-reported pain levels or experimental sensitivity to pain (Brown & Jones, 2013). In the most comprehensive RCT to date, Schmidt *et al.* compared three treatments, including MBSR, a psychoeducational group, and a wait-list control group (Schmidt *et al.*, 2011). No significant groupwise differences in change over time emerged for pain, depressive, or anxiety symptoms, or health-related quality of life. However, the MBSR group showed the greatest number of significant within-group improvements, including improved health-related quality of life, depression, anxiety, sleep, and various measures of pain and related somatic symptoms. Additionally, one RCT compared MBCT to

treatment as usual for FM (Parra-Delgado & Latorre-Postigo, 2013). Although both groups showed equal reductions in pain, the MBCT group showed greater reductions in the functional impact of FM symptoms at 8 weeks, and greater reductions in both functional impact and depressive symptoms at 3 months. Therefore, although additional work is needed to verify the specificity of the salutary effects of mindfulness training in this population, there is some evidence that participation in MBSR or MBCT is associated with improvements in both mental and physical well-being in FM.

### *Chronic Headache*

Two RCTs have compared MBIs to medical treatment as usual groups for individuals with chronic headache pain. In one trial of accelerated MBSR (six sessions in 3 weeks), Cathcart and colleagues found significant decreases in the frequency of tension-type headaches among MBSR participants only (Cathcart, Galatis, Immink, Proeve, & Petkov, 2013). In a trial of MBCT for chronic headache, Day *et al.* found significantly greater improvements in self-efficacy, pain acceptance, pain catastrophizing, and pain interference in the treatment group; daily diaries of headache pain revealed that headache frequency declined equally in both groups (Day *et al.*, 2014). These studies suggest that MBIs are effective for enhancing both physical and mental well-being among individuals with chronic headache pain.

### *Rheumatoid Arthritis*

Two RCTs have investigated the efficacy of MBSR for rheumatoid arthritis (RA), a chronic autoimmune disease that degrades the function of a variety of organ systems and tissues, but primarily leads to painful inflammation and degeneration of joint tissue. In general, the results suggest that MBSR may be especially effective for improving mental health among individuals diagnosed with RA. Pradhan *et al.* compared MBSR to a wait-list control group for RA (Pradhan *et al.*, 2007). Although there were no significant groupwise differences in response to treatment at 8 weeks, MBSR was associated with significantly greater improvements in psychological distress and general psychological well-being at 6 months. Despite these positive effects on psychological functioning, no significant effects of MBSR on physical RA symptoms were observed at any time point.

A second, three-armed RCT compared an MBI to both a cognitive-behavioral skills training (CBT) intervention and a general health education group (Zautra *et al.*, 2008). The MBI sessions were composed of a variety of lessons and exercises designed to promote mindful emotional awareness, awareness of and engagement with social resources, and 10-minute mindfulness meditations similar to those found in MBSR. The CBT sessions entailed psychoeducation regarding pain and related psychological processes, relaxation training, and training in a variety of skills for coping with and problem-solving pain experiences. Analyses



revealed no groupwise differences in pain or negative affect. However, both the mindfulness and CBT interventions were associated with significantly greater improvements in pain catastrophizing, coping efficacy, and positive affect than wait-list control. Further, there were several significant interactions with history of recurrent depression; among those with a positive history of recurrent depression, the MBI was most effective for improving pain catastrophizing, negative affect, coping efficacy, and positive affect. Notably, individuals in the CBT or educational arms of the study reported significantly greater improvements in daily self-reported pain control compared to the MBI. On the other hand, MBI was associated with greater reductions in pain and joint swelling during physician inspection among individuals with a history of recurrent depression. In general, these studies suggest that MBSR may be more effective for managing the psychological responses to RA than changing specific physical symptoms associated with RA, and that individuals with a history of depression may benefit more from MBIs both mentally and physically.

### *Other Pain Conditions*

Five RCTs have evaluated the efficacy of MBSR for mixed diagnostic groups composed of various types of chronic pain. Morone and colleagues compared MBSR to a wait-list control group for chronic low back pain (Morone, Greco, & Weiner, 2008). Although individuals randomized into MBSR did not demonstrate significantly greater pain reduction, they did show greater improvements in physical functioning and pain acceptance—especially with regard to the ability to engage in daily activities despite pain. Plews-Ogan *et al.* compared MBSR to both massage and a wait-list control (standard medical care) group for individuals with musculoskeletal pain (Plews-Ogan, Owens, Goodman, Wolfe, & Schorling, 2005). The massage group showed significantly greater reductions in pain than the wait-list control group at 8 weeks, but no greater pain reduction than the MBSR group; these differences disappeared at a 12-week follow-up (when treatments were no longer ongoing). The massage group also showed significantly greater improvements in mental health than the other two groups at 8 weeks; however, at 12 weeks, participants in MBSR showed a significantly greater improvement in mental health than the other two groups, and previous massage-related gains in mental health functioning were not maintained. Esmer and colleagues compared standard medical care to MBSR plus standard medical care for individuals who had adverse (i.e., increased pain) responses to back surgery (Esmer, Blum, Rulf, & Pier, 2010). Unlike standard medical care, MBSR was associated with significant improvements in pain level, sleep, medication use, disability due to pain, and chronic pain acceptance (willingness to experience pain and to engage in daily life activities despite pain).

Two RCTs of MBSR for mixed pain populations have incorporated more traditional CBT approaches to the treatment of chronic pain. Wong and colleagues compared MBSR to a multidimensional CBT group intervention for chronic pain (Wong *et al.*, 2011). Although significant reductions in pain intensity and

pain-related distress were found in both groups, there were no significant group differences. Another trial compared combined MBSR and CBT to treatment as usual for bodily distress syndrome, which the authors characterized as a cluster of symptoms including three of the following types of pain: cardiopulmonary, gastrointestinal, musculoskeletal, or general pain (Fjorback *et al.*, 2013). Results indicated that both MBSR plus CBT and treatment as usual were associated with reductions in self-reported physical health problems; there were no significant differences between groups. However, there was some indication that the improvements observed in the experimental group came about more quickly than those observed in the treatment-as-usual group. These studies provide evidence that MBIs are useful for both pain reduction and psychological functioning in mixed pain samples.

### Nonrandomized Trials

In nonrandomized controlled trials, a control group is utilized but individuals are not randomly assigned to a group; rather, participants are generally allowed to self-select into the MBSR group in controlled trials. The conclusions drawn from nonrandomized trials should be interpreted carefully, acknowledging that individuals who self-select into MBSR may be different from the general population in some way. Five controlled—but not randomized—trials of MBSR have been conducted in chronic pain patients.

Two nonrandomized trials of MBSR for FM suggest that MBSR is efficacious for improving symptoms. Goldenberg and colleagues reported that, compared to a wait-list control group, MBSR participants showed greater reductions in FM pain intensity, functional interference, and general psychological distress (Goldenberg *et al.*, 1994). In another trial, Grossman and colleagues compared MBSR to a combination of progressive muscle relaxation and gentle stretching for FM (Grossman, Tiefenthaler-Gilmer, Raysz, & Kesper, 2007). Individuals in the MBSR group showed greater improvements in pain intensity, coping with pain, depression, anxiety, and quality of life. In contrast to the RCTs of MBSR for FM reviewed above, these nonrandomized controlled trials suggest strong beneficial effects of MBSR on both pain intensity and psychological functioning in FM.

Three nonrandomized trials have examined the efficacy of MBSR for mixed groups of individuals with various types of chronic pain. In the original study of MBSR conducted by Kabat-Zinn and colleagues, significant improvements over time were observed in pain intensity, functional impairment, negative body image, self-esteem, pain-related drug utilization, and psychological symptoms following MBSR (Kabat-Zinn, Lipworth, & Burney, 1985). These effects were significantly greater than those in a comparison control group undergoing medical treatment as usual. Additionally, the authors reported that gains were maintained over 15 months, and that participants reported continued meditation practice after completion of the program. Sagula and Rice found that, compared to a wait-list control group, the MBSR group was associated with greater



reductions in depression and anxiety, and moving more quickly through the stages of the grief process (Sagula & Rice, 2004). Pain intensity results were not reported. Another controlled trial compared in-person MBSR to both a teleconferencing version of the MBSR group and a wait-list control group (Gardner-Nix, Backman, Barbati, & Grummitt, 2008). Teleconferencing and in-person MBSR groups showed equal improvements in pain catastrophizing and general psychological health that were significantly greater than changes in the control group. The in-person MBSR group was also associated with significantly greater improvements in pain intensity and physical quality of life than the teleconferencing MBSR group.

Finally, one prospective observational study with no control group found that the effectiveness of MBSR differed as a function of chronic pain condition (Rosenzweig *et al.*, 2010). Physical symptoms improved most among chronic pain patients with low back or neck pain and among patients who suffered from two or more pain conditions. Lesser but significant improvements were observed in participants with diagnoses of FM, arthritis, and chronic headache. The authors also reported that although the amount of meditation practice at home was not associated with greater reduction of pain intensity, more frequent home practice was associated with greater improvements in psychological distress, physical symptoms, and self-rated overall health.

### Conclusion

In sum, there is ample evidence that MBSR and other MBIs can have a positive impact on individuals suffering from chronic pain of various kinds. In their review of both randomized and nonrandomized controlled trials of MBSR for chronic pain, Chiesa and Serretti note that MBIs were generally associated with greater psychological and physical symptom reduction than *wait-list* control groups (i.e., comparing MBSR to no treatment at all), but did not consistently demonstrate greater efficacy when compared to *active* control groups (i.e., comparing MBSR to alternative treatments) (Chiesa & Serretti, 2011). Notably, the most marked improvements associated with MBSR have been reported in emotional (e.g., depression) and behavioral (e.g., activity engagement) domains rather than physical (e.g., pain intensity) domains. Additional RCTs using active controls and adequate sample sizes are needed to replicate the effects found in existing studies before firm conclusions can be drawn about the *specific* effects of MBSR. However, a preponderance of evidence suggests that MBSR and closely related MBIs are effective for reducing both physical and psychological symptoms among individuals with chronic pain (Carlson, 2012; Chiesa & Serretti, 2011; Lakhan & Schofield, 2013).

### Laboratory Studies of the Mechanisms of MBSR for Chronic Pain

The mechanisms by which MBIs exert salutary effects in chronic pain have been the subject of many laboratory-based empirical investigations over the past

decade. Most of these studies focus on four mechanistic themes: (1) changes in pain perception, (2) enhanced emotion regulation, (3) changes in psychophysiological responses, and (4) uncoupling of sensory experiences from thoughts and feelings. The literature from each of these areas is reviewed in the following sections.

### *Pain Perception*

As noted at the beginning of this chapter, pain perception is an inherently subjective process. Meditation may decrease anticipation or perception of pain stimuli in the laboratory, and studies have begun to identify the specific neural underpinnings of such effects. Long-time meditators have reported lower ratings of pain intensity (Grant & Rainville, 2009), pain unpleasantness (Brown *et al.*, 2010; Gard *et al.*, 2012; Lutz, McFarlin, Perlman, Salomons, & Davidson, 2012), or a higher threshold of pain perception (Grant, Courtemanche, Duerden, Duncan, & Rainville, 2010; Grant, Courtemanche, & Rainville, 2011) than controls. These differences in pain perception have been linked to neural activity consistent with downregulation of anticipatory pain representations (Brown *et al.*, 2010; Lutz *et al.*, 2012), neural activity associated with increased attentional recruitment during pain (Lutz *et al.*, 2012), and greater cortical thickness in areas associated with somatosensory and pain processing (Gard *et al.*, 2012; Grant *et al.*, 2010).

Individuals who receive brief training in mindfulness also show attenuated pain perception during laboratory stimuli. Kingston *et al.* found that, in students, six bi-weekly mindfulness training sessions increased pain tolerance (perseverance) and decreased self-reported pain intensity compared with a guided-imagery control group (Kingston, Chadwick, Meron, & Skinner, 2007). In another set of studies with nonpatient college students, a 3-day mindfulness meditation intervention led to greater reductions in ratings of laboratory-induced pain than a relaxation intervention (Zeidan, Gordon, Merchant, & Goolkasian, 2010). A similar study using a 4-day mindfulness meditation intervention again led to reduced ratings of the intensity, accompanied by increased pain-related activation of the anterior cingulate cortex and the anterior insula, which have been linked to the evaluation of pain intensity (Zeidan *et al.*, 2011). In conclusion, there is evidence that changes in pain perception are at least partially responsible for the positive effects of mindfulness for chronic pain.

### *Emotion Regulation*

Pain-related emotion is a key component of the pain experience. Several studies suggest that improvements in both attentional control and cognitive reappraisal—two important stages in the emotion generative process—play key roles in the benefits of mindfulness meditation for chronic pain. In one study, experienced meditators showed patterns of brain activity consistent with less anticipation of pain (i.e., greater attention to the present moment) and less negative

appraisal of pain; these differences were associated with lower pain intensity ratings (Brown *et al.*, 2010). In another study, meditators rated a laboratory pain induction as equal in pain intensity, but lower in unpleasantness, suggesting that improved emotion regulation as evidenced by appraisals of pain as less unpleasant may underlie the benefits of mindfulness for pain (Lutz *et al.*, 2012). This study also reported meditation-related downregulation of brain areas associated with pain anticipation prior to the onset of the stimulus and upregulation of attentional regions during pain, suggesting a potential role for improved attention to the present moment, both before and during the onset of pain.

Another set of studies examined the impact of very short-term training in mindfulness meditation on the role of emotion regulation in the experience of pain in the laboratory. One study found that a single 10-minute standardized body scan exercise reduced pain-related distress more than a control script among chronic pain patients, which may again point to changes in appraisals of pain as one emotion-regulatory mechanism of mindfulness meditation (Ussher *et al.*, 2012). In a study previously mentioned, decreases in laboratory pain intensity ratings following a 3-day mindfulness intervention compared with a relaxation intervention were partially mediated by self-reported improvements in anxiety and mindful awareness (Zeidan *et al.*, 2010). Reductions in anxiety accompanied by increased present-moment awareness may reflect improved emotion regulation via better attentional control.

Two studies have examined emotion-regulatory mechanisms in 8-week MBSR interventions for chronic pain patients. In a study highlighting the importance of emotional appraisals of pain, Garland *et al.* found that the positive effects of MBSR (vs. a support group) on symptoms of irritable bowel syndrome (IBS) were partially mediated by reductions in the tendency to appraise painful abdominal sensations as catastrophic (Garland *et al.*, 2012). In another study, Vago and Nakamura found that women with FM who participated in a combined MBSR/MBCT group (vs. controls) showed reductions in avoidance of pain-related stimuli at early levels of processing and more efficient disengagement from the same stimuli at later stages of processing (Vago & Nakamura, 2011). These results are interpreted as supporting the roles of both attention allocation (i.e., toward direct experience of painful stimuli at early stages) and cognitive appraisal (i.e., less appraisal at later stages leading to less effortful disengagement) in the positive effects of MBSR for FM. In sum, there is strong self-report and physiological evidence that the positive effects of mindfulness for chronic pain can be attributed to helpful changes in the emotion regulatory processes of attention control and cognitive appraisal.

### *Psychophysiology*

Because pain is always both a physical and a psychological experience (Garland, 2012), psychophysiological research methods can be used to study the mechanisms that could explain how mindfulness meditation works to relieve pain. To date, however, only one study has examined the impact of mindfulness training

on psychophysiological variables in chronic pain patients. Following an RCT of MBSR for FM, Lush *et al.* found that skin conductance levels—a measure of SNS activity—were significantly reduced both at rest and during meditation among individuals with FM who had participated in MBSR (Lush *et al.*, 2009). This suggests that reductions in sympathetic activity may play a role in the positive effects of MBSR for FM (Sephton *et al.*, 2007).

### *Uncoupling Sensations from Thoughts, Emotions, and Behavior*

Kabat-Zinn explains that pain is often accompanied by thoughts (e.g., “I can’t stand this”) and emotions (e.g., hopelessness, fear), and that failure to identify such experiences as separate from the basic experience of pain may maintain or exacerbate both physical and psychological symptoms (Kabat-Zinn, 1982). Notably, cultivation of such detached awareness in which individuals acquire the ability to notice and label different types of experiences as transient mental events may actually be a transtherapeutic mechanism of action with transdiagnostic implications (Greeson, Garland, & Black, 2014). There is evidence that mindfulness allows one to uncouple sensations from secondary experiences in the context of pain.

Experienced meditators and those with brief meditation training show brain characteristics and activation patterns consistent with an ability to differentiate between the direct sensory experience of pain and associated elaborative experiences. Grant *et al.* found that experienced meditators had thicker cortex in brain regions associated with processing pain and associated emotional responses (anterior cingulate cortex), and that lower pain sensitivity was associated with thicker cortex in areas consistent with interoception or perception of sensory experiences underlying emotion (anterior insula) and emotional responses to pain (hippocampal formation) (Grant *et al.*, 2010). In a follow-up study, Grant and colleagues demonstrated that lower pain sensitivity among long-time practitioners was accompanied by greater activation of primary pain processing regions (anterior cingulate cortex, thalamus, insula) as well as reduced activity in areas associated with emotional responses to and appraisals of pain (prefrontal cortex, amygdala, hippocampus) (Grant *et al.*, 2011). Additionally, lower pain sensitivity in meditators was predicted by reduced functional connectivity between executive and pain processing regions. That is, long-term meditation experience may foster the ability to distinguish the fundamental sensory experiences of pain from secondary elaborative processes.

A similar study of long-term mindfulness meditation practitioners found that lower ratings of pain unpleasantness in meditators (vs. controls) were accompanied by a distinct pattern of brain activation consistent with increased somatosensory processing (right posterior insula) and decreased executive elaboration and control (prefrontal cortex) (Gard *et al.*, 2012). Finally, a study mentioned above (Garland *et al.*, 2012) found that the positive effect of an 8-week MBSR program (vs. support group) on symptoms of IBS was partially

mediated by self-reported reappraisal of abdominal pain as a direct sensory experience. In all, the results of these studies support the idea that meditation training positively affects pain experiences by uncoupling the sensory-discriminative and cognitive-evaluative aspects of pain.

## PRACTICAL ISSUES FOR CLINICIANS

The presence of significant empirical support for MBSR and insights regarding potential mechanisms of its effectiveness may lead many clinicians to choose this treatment modality for working with their patients. The following paragraphs are intended as a list of recommendations for clinicians as they embark on the process of integrating MBSR and other mindfulness-based approaches into their professional identities and practices.

### Teacher Qualifications

First and foremost, clinicians should know whether or not they are qualified to teach MBIs, or any of the specific meditations that could stand alone in helping to treat chronic pain. Patients and clinical practice directors often want to know if the mindfulness program provider is professionally qualified to deliver MBSR or another MBI. That is, do they have training in a health care discipline? Do they have an established personal meditation practice? Have they completed sufficient post-graduate professional training to deliver the MBI? Does the MBI instructor have access to a supporting community of peer-level mindfulness teachers, locally or remotely through a professional network?

It is also critical to know what professional credentials are required to offer a mindfulness-based program in private practice, a university clinic, a hospital or primary care setting, a behavioral health insurance plan, a commercial health and wellness center, or an integrative medicine center. The most important practical issue for clinicians is to “teach what you know.” Such personal insights about mindfulness derive from direct experience with meditation practice oneself. Whereas reading, self-study, peer discussion, and clinical supervision are all relevant and worthwhile, there is no substitute for becoming familiar with MBSR and other MBIs through directly participating in them oneself, and developing a daily meditation practice. There are currently professional guidelines (Crane *et al.*, 2012), certifications (MBSR, MBCT, MBRP, etc.), and teacher training manuals designed to prepare clinicians to effectively teach mindfulness to others, with a sense of fidelity and fluidity (McCown, Reibel, & Micozzi, 2010). We strongly encourage any clinician who is interested in offering MBIs to patients or therapy clients to first become familiar with daily meditation practice oneself, and to obtain a level of professional training commensurate with the type of intervention(s) or program(s) one wishes to offer.

## Establishing a Program in Your Setting

Questions to ask when setting up and maintaining a mindfulness-based program include: Is liability insurance required for clinical providers? Can MBSR (or other MBIs) be billed to insurance, using health and behavior (H&B) codes, for example? Does the setting include physical space for MBSR classes, or will mindfulness meditation be taught one on one, akin to the personalized case example described in this chapter? Who will serve as referral sources? Will intake interviews and/or group orientation sessions be offered prior to patients or clients enrolling in an MBSR course? Are there other MBSR programs locally, such that there could be competition? How much marketing will be required to effectively target those who can pay for \$400–\$500 MBSR classes, should insurance not be accepted? Will other forms of mindfulness training be offered, such as an ongoing 1-hour noon-time class, to support persons who cannot commit the time to an 8-week class, or who wish to experience a class or two before committing to the full course, or who perhaps have already taken MBSR and want a venue to maintain their meditation practice in a supportive setting? As people complete the initial program offering, will “graduate” level mindfulness programs be developed and offered for them? Will the clinician(s) who are hired to teach the mindfulness-based program be supported to further develop their teaching skills through professional continuing education workshops and/or advanced mindfulness teacher training programs? How will the initial program be evaluated for feasibility, acceptability, and effectiveness? Will program evaluation data be used to continuously improve program structure, scheduling, content, etc., based on the clientele’s needs and experiences with taking the program? Will there be budgetary pressure on the program? If so, is a formal business plan with a budget needed? Are there any possible benefactors, philanthropists, foundations, or other donors who might be interested in financially supporting a new mindfulness-based program for chronic pain? Will the program director need to interface with other professionals, and if so, will this be needed for the program to survive long term? What is the communications strategy, given the program’s stakeholders? Regarding accessibility, is the mindfulness-based program financially accessible in terms of price point, and is it logistically accessible in terms of driving distance, parking convenience, proximity to public transportation, and program availability via telephone and/or Internet? Is the program offered in group format and/or one on one? How often is the program offered during a given year?

## Communication with Other Professionals

Do local colleagues require in-service or other education about the core principles and practice of mindfulness? The program structure? The scientific evidence? The way in which a program has been tailored to meet the needs of local chronic pain patients? Is the mindfulness teacher fluent in the language of biomedicine, the biopsychosocial model, and pain pathophysiology, so as to have mutually beneficial discussions with referring physicians and other health care providers?



## Encouraging Participants to Practice

Getting participants with chronic pain to practice mindfulness meditation is often not an easy task. Attention can be constantly distracted by the pain. Mood fluctuations, including irritation, resentment, defiance, or pessimism are common, and can influence one's ability to maintain attention, be receptive and aware, be respectful toward others, and be accurate in reporting on one's own subjective experience with meditation practice. Motivation level typically waxes and wanes, like it does with most people without chronic pain. Traditionally, MBSR is taught with the philosophy of "you don't have to like it, you just have to do it!" In other words, keeping up a regular meditation practice does not depend on feeling better, making progress, or otherwise liking the meditation practice, although many individuals often do find the meditations pleasant, relaxing and enjoyable in one way or another. The traditional emphasis is on making a commitment to practicing meditation routinely, and holding off on judging the outcome for some period of time. Another, not mutually exclusive, strategy is to ask patients to reflect on what their intention is for practicing meditation, in the context of a formal class, or simply each day when one practices at home. For example, does one intend to have a clear mind so one can see sources of stress and automatic reactions clearly?

Intention can be integrated into meditation as a "preliminary practice." For instance, one can begin a meditation with a simple phrase like, "May this practice bring mental clarity," or "May this practice help me cope so I can live fully." Preliminary practices are short statements or internal reflections that set the stage for formal meditation, and serve as a foundation for meaning, purpose, and sustained motivation. Offering mindfulness-based programs in group format is also an effective way to highlight the commonalities—both struggles and successes—among people who are learning how to meditate to cope with chronic pain. The collective wisdom that emerges from a group allows individuals to benefit from other people's experience, and to share their own experience, as well. Finally, highlighting ways in which chronic pain patients can discover or experience joy, relief, or some form of pleasantness in meditating can help them keep up the practice, as Susan experienced in the case example. For example, enjoying the sensations of the breath, the awareness that many areas of the body are working well and may not be in pain, the fact that awareness itself is never in pain, and that one can learn to control attention and uncouple decisions and actions from thoughts, feelings, and sensations associated with pain, can provide a sense of joy, mastery, contentment, hope, and control, which together lend a sense of empowerment. Moreover, personalizing mindfulness practice to best match the needs of an individual patient or client can maximize motivation and commitment to practice, compared to going through a class where the applicability of some expected meditations may not be as apparent.

## CONCLUSION

In this chapter, we reviewed the rationale for MBSR in treating chronic pain, presented an illustrative case example, reviewed evidence for the outcomes and mechanisms of MBSR, and described a number of practical issues for clinicians to consider when offering mindfulness-based programs for people with chronic pain. By teaching the core self-regulation skills of bare attention, detached awareness, self-compassion, and uncoupling, mindfulness meditation offers a new way of seeing, and a new way of being, which holds potential to relieve pain, reduce suffering, and restore wholeness, hope, and functionality.

## ACKNOWLEDGMENT

The first author was supported by grant R00 AT004945 from the National Center for Complementary & Alternative Medicine (NCCAM) at the National Institutes of Health (NIH). The authors thank Johanna Greeson, PhD, MSS, MLSP, for critically reviewing the final draft of the manuscript and for technical assistance with manuscript preparation.

## REFERENCES

- Astin, J. A., Shapiro, S. L., Eisenberg, D. M., & Forsys, K. L. (2003). Mind-body medicine: State of the science, implications for practice. *Journal of the American Board of Family Medicine, 16*, 131–147.
- Brown, C., Conner, K. O., Copeland, V. C., Grote, N., Beach, S., Battista, D., et al. (2010). Depression stigma, race, and treatment seeking behavior and attitudes. *Journal of Community Psychology, 38*, 350–368.
- Brown, C. A., & Jones, A. K. (2013). Psychobiological correlates of improved mental health in patients with musculoskeletal pain after a mindfulness-based pain management program. *The Clinical Journal of Pain, 29*, 233–244.
- Carlson, L. E. (2012). Mindfulness-based interventions for physical conditions: A narrative review evaluating levels of evidence. *ISRN Psychiatry, 2012*, 651583.
- Cathcart, S., Galatis, N., Immink, M., Proeve, M., & Petkov, J. (2013). Brief mindfulness-based therapy for chronic tension-type headache: A randomized controlled pilot study. *Behavioural and Cognitive Psychotherapy, 42*, 1–15.
- Chiesa, A., & Serretti, A. (2011). Mindfulness-based interventions for chronic pain: A systematic review of the evidence. *The Journal of Alternative and Complementary Medicine, 17*, 83–93.
- Committee on Advancing Pain Research, Care, & Institute of Medicine. (2011). *Relieving pain in America: A blueprint for transforming prevention, care, education, and research*. National Academy.
- Crane, R. S., Kuyken, W., Williams, J. M. G., Hastings, R. P., Cooper, L., & Fennell, M. J. (2012). Competence in teaching mindfulness-based courses: Concepts, development and assessment. *Mindfulness, 3*, 76–84.
- Day, M. A., Thorn, B. E., Ward, L. C., Rubin, N., Hickman, S. D., Scogin, F., et al. (2014). Mindfulness-based cognitive therapy for the treatment of headache pain: A pilot study. *The Clinical Journal of Pain, 30*, 152–161.
- Esmer, G., Blum, J., Rulf, J., & Pier, J. (2010). Mindfulness-based stress reduction for failed back surgery syndrome: A randomized controlled trial. *Journal of the American Osteopathic Association, 110*, 646–652.



- Fjorback, L. O., Arendt, M., Ørnbøl, E., Walach, H., Rehfeld, E., Schröder, A., et al. (2013). Mindfulness therapy for somatization disorder and functional somatic syndromes—Randomized trial with one-year follow-up. *Journal of Psychosomatic Research*, *74*, 31–40.
- Gard, T., Hölzel, B. K., Sack, A. T., Hempel, H., Lazar, S. W., Vaitl, D., et al. (2012). Pain attenuation through mindfulness is associated with decreased cognitive control and increased sensory processing in the brain. *Cerebral Cortex*, *22*, 2692–2702.
- Gardner-Nix, J., Backman, S., Barbati, J., & Grummitt, J. (2008). Evaluating distance education of a mindfulness-based meditation programme for chronic pain management. *Journal of Telemedicine and Telecare*, *14*, 88–92.
- Garland, E., Gaylord, S., & Park, J. (2009). The role of mindfulness in positive reappraisal. *Explore (New York, NY)*, *5*, 37–44.
- Garland, E. L. (2012). Pain processing in the human nervous system: A selective review of nociceptive and biobehavioral pathways. *Primary Care: Clinics in Office Practice*, *39*, 561–571.
- Garland, E. L., Gaylord, S. A., Palsson, O., Faurot, K., Mann, J. D., & Whitehead, W. E. (2012). Therapeutic mechanisms of a mindfulness-based treatment for IBS: Effects on visceral sensitivity, catastrophizing, and affective processing of pain sensations. *Journal of Behavioral Medicine*, *35*, 591–602.
- Goldberg, D., & McGee, S. (2011). Pain as a global public health priority. *BMC Public Health*, *11*, 770.
- Goldenberg, D. L., Kaplan, K. H., Nadeau, M. G., Brodeur, C., Smith, S., & Schmid, C. H. (1994). A controlled study of a stress-reduction, cognitive-behavioral treatment program in fibromyalgia. *Journal of Musculoskeletal Pain*, *2*, 53–66.
- Goleman, D. J., & Schwartz, G. E. (1976). Meditation as an intervention in stress reactivity. *Journal of Consulting and Clinical Psychology*, *44*, 456.
- Grant, J. A., Courtemanche, J., Duerden, E. G., Duncan, G. H., & Rainville, P. (2010). Cortical thickness and pain sensitivity in zen meditators. *Emotion*, *10*, 43–53.
- Grant, J. A., Courtemanche, J., & Rainville, P. (2011). A non-elaborative mental stance and decoupling of executive and pain-related cortices predicts low pain sensitivity in zen meditators. *Pain*, *152*, 150–156.
- Grant, J. A., & Rainville, P. (2009). Pain sensitivity and analgesic effects of mindful states in zen meditators: A cross-sectional study. *Psychosomatic Medicine*, *71*, 106–114.
- Greenson, J., & Brantley, J. (2009). Mindfulness and anxiety disorders: Developing a wise relationship with the inner experience of fear. In F. Didonna (Ed.), *Clinical Handbook of Mindfulness* (pp. 171–188). Springer.
- Greenson, J., Krucoff, C., Moon, S., Moon, T., & Shaffer, J. (2010). A “whole-person” approach. *Alternative and Complementary Therapies*, *16*, 359.
- Greenson, J. M. (2009). Mindfulness research update. *Complementary Health Practice Review*, *14*, 10–18.
- Greenson, J. M., Garland, E. L., & Black, D. S. (2014). Mindfulness as a transtherapeutic approach to transdiagnostic mental processes. In A. Ie, C. Ngoumen, & E. Langer (Eds.), *The Wiley-Blackwell Handbook of Mindfulness* (pp. 533–562). Wiley-Blackwell.
- Grossman, P., Tiefenthaler-Gilmer, U., Raysz, A., & Kesper, U. (2007). Mindfulness training as an intervention for fibromyalgia: Evidence of postintervention and 3-year follow-up benefits in well-being. *Psychother Psychosom*, *76*, 226–233.
- Johannes, C. B., Le, T. K., Zhou, X., Johnston, J. A., & Dworkin, R. H. (2010). The prevalence of chronic pain in United States adults: Results of an internet-based survey. *The Journal of Pain*, *11*, 1230–1239.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, *4*, 33–47.

- Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. New York, NY: Delacorte.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, *10*, 144–156.
- Kabat-Zinn, J. (2005). *Coming to our senses*. London: Piatkus.
- Kabat-Zinn, J. (2011). Some reflections on the origins of MBSR, skillful means, and the trouble with maps. *Contemporary Buddhism*, *12*, 281–306.
- Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, *8*, 163–190.
- Kingston, J., Chadwick, P., Meron, D., & Skinner, T. C. (2007). A pilot randomized control trial investigating the effect of mindfulness practice on pain tolerance, psychological well-being, and physiological activity. *Journal of Psychosomatic Research*, *62*, 297–300.
- Lakhan, S. E., & Schofield, K. L. (2013). Mindfulness-based therapies in the treatment of somatization disorders: A systematic review and meta-analysis. *PLoS One*, *8*, e71834.
- Lush, E., Salmon, P., Floyd, A., Studts, J. L., Weissbecker, I., & Sephton, S. E. (2009). Mindfulness meditation for symptom reduction in fibromyalgia: Psychophysiological correlates. *Journal of Clinical Psychology in Medical Settings*, *16*, 200–207.
- Lutz, A., McFarlin, D. R., Perlman, D. M., Salomons, T. V., & Davidson, R. J. (2012). Altered anterior insula activation during anticipation and experience of painful stimuli in expert meditators. *NeuroImage*, *64*, 538–546.
- McCown, D., Reibel, D. K., & Micozzi, M. S. (2010). *Teaching mindfulness: A practical guide for clinicians and educators*. New York: Springer.
- Morone, N. E., Greco, C. M., & Weiner, D. K. (2008). Mindfulness meditation for the treatment of chronic low back pain in older adults: A randomized controlled pilot study. *Pain*, *134*, 310–319.
- Parra-Delgado, M., & Latorre-Postigo, J. M. (2013). Effectiveness of mindfulness-based cognitive therapy in the treatment of fibromyalgia: A randomised trial. *Cognitive Therapy and Research*, 1–12.
- Pert, C. B. (1997). *Molecules of emotion: Why you feel the way you feel*. New York, NY: Simon and Schuster.
- Plews-Ogan, M., Owens, J. E., Goodman, M., Wolfe, P., & Schorling, J. (2005). A pilot study evaluating mindfulness-based stress reduction and massage for the management of chronic pain. *Journal of General Internal Medicine*, *20*, 1136–1138.
- Pradhan, E. K., Baumgarten, M., Langenberg, P., Handwerker, B., Gilpin, A. K., Magyari, T., et al. (2007). Effect of Mindfulness-Based stress reduction in rheumatoid arthritis patients. *Arthritis Care & Research*, *57*, 1134–1142.
- Rosenzweig, S., Greeson, J. M., Reibel, D. K., Green, J. S., Jasser, S. A., & Beasley, D. (2010). Mindfulness-based stress reduction for chronic pain conditions: Variation in treatment outcomes and role of home meditation practice. *Journal of Psychosomatic Research*, *68*, 29–36.
- Sagula, D., & Rice, K. G. (2004). The effectiveness of mindfulness training on the grieving process and emotional well-being of chronic pain patients. *Journal of Clinical Psychology in Medical Settings*, *11*, 333–342.
- Santorelli, S. (2010). *Heal thy self: Lessons on mindfulness in medicine*. New York, NY: Random House.
- Schmidt, S., Grossman, P., Schwarzer, B., Jena, S., Naumann, J., & Walach, H. (2011). Treating fibromyalgia with mindfulness-based stress reduction: Results from a 3-armed randomized controlled trial. *Pain*, *152*, 361–369.
- Schwartz, G. E., Davidson, R. J., & Goleman, D. J. (1978). Patterning of cognitive and somatic processes in the self-regulation of anxiety: Effects of meditation versus exercise. *Psychosomatic Medicine*, *40*, 321–328.

- Sephton, S. E., Salmon, P., Weissbecker, I., Ulmer, C., Floyd, A., Hoover, K., & Studts, J. L. (2007). Mindfulness meditation alleviates depressive symptoms in women with fibromyalgia: Results of a randomized clinical trial. *Arthritis Care & Research*, *57*, 77–85.
- Ussher, M., Spatz, A., Copland, C., Nicolaou, A., Cargill, A., Amini-Tabrizi, N., & McCracken, L. M. (2012). Immediate effects of a brief mindfulness-based body scan on patients with chronic pain. *Journal of Behavioral Medicine*, *37*, 127–134.
- Vago, D. R., & Nakamura, Y. (2011). Selective attentional bias towards pain-related threat in fibromyalgia: Preliminary evidence for effects of mindfulness meditation training. *Cognitive Therapy and Research*, *35*, 581–594.
- Wong, S. Y., Chan, F. W., Wong, R. L., Chu, M., Lam, Y. K., Mercer, S. W., & Ma, S. H. (2011). Comparing the effectiveness of mindfulness-based stress reduction and multidisciplinary intervention programs for chronic pain: A randomized comparative trial. *The Clinical Journal of Pain*, *27*, 724–734.
- Young, S. (2004). *Break through pain*. Boulder, CO: Sounds True.
- Zautra, A. J., Davis, M. C., Reich, J. W., Nicassario, P., Tennen, H., Finan, P., et al. (2008). Comparison of cognitive behavioral and mindfulness meditation interventions on adaptation to rheumatoid arthritis for patients with and without history of recurrent depression. *Journal of Consulting and Clinical Psychology*, *76*, 408–421.
- Zeidan, F., Gordon, N. S., Merchant, J., & Goolkasian, P. (2010). The effects of brief mindfulness meditation training on experimentally induced pain. *Journal of Pain*, *11*, 199.
- Zeidan, F., Martucci, K. T., Kraft, R. A., Gordon, N. S., McHaffie, J. G., & Coghill, R. C. (2011). Brain mechanisms supporting the modulation of pain by mindfulness meditation. *The Journal of Neuroscience*, *31*, 5540–5548.