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## Mindfulness and Physical Disease: A Concise Review

Jeffrey M. Greeson<sup>\*</sup>, Gabrielle R. Chin

Rowan University, College of Science and Mathematics, Department of Psychology,  
ching4@students.rowan.edu

### Abstract

Many of today's most common, chronic, and costly diseases – from high blood pressure, to chronic pain – are related to stress. Mindfulness, considered a *state*, a *trait*, and a *training*, might help treat or prevent stress-related physical symptoms. A concise review of current scientific evidence shows that both higher levels of trait mindfulness as well as mindfulness training are associated with better psychological well-being, coping, and quality of life. Effects on objective measures of disease, however, are often non-significant or await replication. Larger trials with active control groups, clear diagnostic criteria, objective outcome measures, and longer-term follow-up are needed to generate better quality evidence. Yet, many studies do support integrating mindfulness into health care as part of self-care and disease management.

### Introduction

Many of the most common physical diseases in modern society co-occur with mental health conditions, and both can be caused or exacerbated by stress [1]. Although some stress helps individuals respond adaptively to threats in their environment (“fight or flight”), chronic stress can cause “wear and tear” such that 60–80% of visits to primary care physicians are attributed to stress-related symptoms [2]. Effects of stress on health are further reflected by magnified health care utilization and costs for stress-related chronic diseases [3], as well as by poorer disease outcomes and decreased quality of life (QoL). For many people, experiencing a stress-related disease breeds additional stressors, including physical and psychiatric symptoms, time, travel and monetary obligations related to health care, uncertainty of the future, shifting self-perceptions, the need to make difficult and emotion-laden decisions, and heightened awareness of one's mortality. If stress cannot be avoided, then it must be managed to reduce the risk of developing stress-related medical symptoms or exacerbating existing illness.

<sup>\*</sup>Corresponding Author; Jeffrey M. Greeson, Ph.D., Rowan University, College of Science and Mathematics, Department of Psychology, 201 Mullica Hill Road, Glassboro, NJ 08028, USA, Phone: 856-256-5271, greeson@rowan.edu.

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#### Conflict of Interest

Both authors declare that they have no conflicts of interest.

Papers of particular interest, published within the period of review, have been highlighted as:

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\*\* of outstanding interest

Mindfulness is a promising approach to coping with chronic stress, with significant implications for promoting mind-body health and wellness, irrespective of disease state. The popularity of mindfulness-based interventions (MBIs) has recently surged, given considerable evidence that mindfulness training can decrease subjective measures of stress and that stress reduction effects endure over time [4–7], and the rising reports of stress and stress-related disease across the globe [8]. A common definition of mindfulness is an awareness of one's present experience, with acceptance [9]. In theory, the ability to mindfully observe one's present-moment experience with clarity and equanimity enables more effective appraisals of stressors, which, in turn, facilitates conscious, healthy decisions, and prevents automatic, unhealthy, habitual reactions. Taken together, the core principles and practices of mindfulness can promote self-regulation that may ultimately “buffer” against biological processes and behaviors that contribute to stress-related disease [10].

### Effects of Mindfulness-Based Interventions in People with Physical Disease

While few studies find direct impact on physical disease symptoms as a result of MBIs, research confirms that MBIs decrease stress and distress while improving QoL for people with a variety of chronic, stress-related diseases.

**Cardiovascular Disease**—Higher levels of dispositional (trait) mindfulness have been correlated with some objective markers of cardiovascular health, like lower blood sugar and obesity, but not with blood pressure (BP) [11]. Clinical trials have found that MBIs significantly decrease BP across multiple levels of cardiovascular risk, from subthreshold-prehypertensive levels [12], to prehypertensive [13\*], to frank heart disease [14,15], but not in participants with unmedicated hypertension [16]. Although few studies relating mindfulness with hypertension examine QoL related variables, preliminary research has shown that BP decreases following mindfulness training are mediated by increased mindful attention and decreased rumination [17]. Moreover, a pilot study of MBSR for women with heart disease found significantly decreased anxiety and reactive coping behaviors post intervention [18]. Additional trials of other MBIs observed reduced sympathetic nervous system (SNS) activation and subjective disease symptoms in older adults with chronic heart failure [19,20].

**Diabetes**—MBI effects on long-term blood sugar control (HbA1c) and kidney function (albumin levels) in patients with diabetes are mixed, with some studies finding significant benefit [21–23] and others showing no change [24,25]. The most recent published review in this area found modest improvements in body weight, glycemic control and BP, and noted that studies are limited by short duration and small sample sizes [26]. Finally, another recent trial involving patients on disability with diabetic peripheral neuropathy reported decreases in pain symptom severity and pain catastrophizing as well as improved function and health-related QoL [27\*].

**Musculoskeletal Conditions & Chronic Pain**—It remains uncertain if patients with musculoskeletal conditions like fibromyalgia [28,52\*], arthritis [29,30\*], and chronic and lower back pain [30\*,31] are afforded pain relief from MBIs, due to low methodological rigor [30\*], chronicity of pain, and co-morbidity with other mental and physical health

conditions. However, published work does show that MBIs generally improve depression, pain acceptance, coping, and the ability to better control pain in people with chronic pain conditions [28–33].

**Neurodegenerative Diseases**—Similar mixed results have emerged from studies on neurodegenerative disorders. Namely, MBIs may not be effective in directly improving motor function in people with Parkinson’s disease [34,35], but evidence of MBI-related improvement in QoL, including daily experience of pain [34], stress management, coping ability [35,36], and activities of daily living [35,37], has been shown. For people with Multiple Sclerosis (MS), MBIs again do not directly improve disease symptoms but do improve QoL alongside sleep problems, fatigue, and illness perception [38,39]. Furthermore, in MS, higher dispositional mindfulness predicts lower pain interference at clinically significant levels [40].

**HIV/AIDS**—Initial pilot studies of patients with HIV/AIDS indicated MBIs may buffer the decline of CD4+ helper T-lymphocytes and increase natural killer cell counts [41]. In these studies, immune effects were mediated by class attendance [42] and were concomitant with MBI-related increases in life satisfaction, problem-solving coping ability, and cognitive accuracy to negative stimuli [43]. In contrast, a much larger (n=177), more definitive trial that compared MBSR to a self-management skills group without mindfulness training found no significant differences on immunologic outcomes in HIV-infected adults (97% male) who were not on antiretroviral therapy [44\*]. Currently, the total evidence to date supports mindfulness training for reducing stress, enhancing coping, and promoting health-related QoL in patients with HIV/AIDS, however, no significant changes are observed, on average, for immune system outcomes or disease severity [45].

**Cancer**—There is no evidence to date that mindfulness training can alter cancer risk or progression of disease. Nevertheless, MBIs have been found to consistently reduce stress, improve emotional well-being, and enhance coping and health behaviors among patients with different types of cancer [46,47\*\*]. For example, in breast cancer patients, MBIs engender greater behavioral and cognitive coping ability and acceptance of emotional states related to disease experience. Across multiple forms of cancer, patients report increased QoL after mindfulness training, in addition to better sleep quality (in some studies) and decreased anxiety, depression, hostility, and fatigue [48–51].

**Psychosomatic/Functional/Somatization Disorders**—Initial evidence suggests that mindfulness training may be effective in treating some somatization disorders, including chronic fatigue syndrome (CFS) and irritable bowel syndrome (IBS) [52\*]. Specifically, MBIs have been shown to reduce pain and symptom severity, improve QoL, enhance coping ability, as well as decrease anxiety, rumination, depression, and impact of fatigue on functioning [52\*–54]. Results, however, often show inconsistent or null effects on physical symptoms [53,55,56], but consistent gains in health-related QoL at follow up [55,56].

## The Future of Health Care as Self-Care: Mindfulness for Health Promotion, Prevention & Disease Management

The consistent well-being and QoL benefits that result from participating in MBIs support mindfulness training as an evidence-based approach for alleviating the burden of stress-related diseases. Moreover, mindfulness is particularly well-suited as a complementary (adjunct) treatment to traditional allopathic medicine, given its ability to promote self-awareness, self-care, self-regulation, and self-management of disease. Although the American health care model has begun shifting from “sick care” to a “predictive, preventive, personalized, and participatory” model of health care [57\*], symptom management remains the predominant focus of disease management in most health care settings. For example, the current prescription opioid crisis has prompted an urgent need to test and disseminate safe and effective *non-pharmacologic* therapies to relieve pain and enhancing coping skills by targeting the underlying mechanisms of pain perception and by promoting psychological, social, and physical functioning irrespective of disease severity [58].

Recent theoretical developments and empirical research suggest that more mindful people may feel less pain [59], that mindfulness training can relieve pain via effects on cognitive, emotional, sensory, and self-processing neural networks [60], and that acute pain relief from mindfulness training can be explained not by opioid-based pathways, but rather by specific patterns of brain activity characterized by decreased default mode network activation and increased sensory/experiential awareness [61]. Taken together, there is sufficient scientific premise and evidence to recommend mindfulness as a part of an integrative, biopsychosocial, self-management approach to treating and preventing chronic pain [30], and for other stress-related physical diseases, including cardiovascular disease (CVD) [62\*\*].

While mindfulness training can alleviate symptom burden across different diseases, the mechanisms by which mindfulness helps manage stress-related diseases is less clear. In theory, when confronted with physical symptoms triggered or exacerbated by stress, mindfulness skills like non-judgmentally observing, without reacting, can help “uncouple” emotional reactions from physical sensations, thereby facilitating coping and increasing resilience [63]. In addition, different aspects of mindfulness training can help in different ways. For example, whereas sitting meditation may increase acceptance of symptoms in the moment and thereby reduce interference of pain or other physical symptoms on mood or behavior, mindful yoga may improve perceived physical functioning by recognizing and letting go of thoughts or beliefs about perceived limitations that may not in fact be true. Similarly, MBIs delivered in group format can provide a sense of social support, connection, and empathy that can mitigate feelings of isolation, depression, anxiety, or hopelessness that directly contribute to poor QoL and disability. Moreover, because mindfulness is also an interpersonal process that is learned, in part, through inquiry and direct observation of how others embody and enact the core qualities of mindfulness, group-based interventions with experienced instructors may be particularly useful, and cost-effective. Finally, developing mindfulness as a dispositional trait may also serve as a preventive factor against disease and disease progression. For example, mindful perspectives may *decrease* negative, reactive, habitual, and mindless behaviors like smoking, poor diet, and a sedentary lifestyle that are

associated with developing chronic diseases [64\*\*], and *increase* positive, valued, and purpose-driven health behaviors that are associated with self-care, health promotion, and disease prevention [65].

### Future Directions

Current evidence supports mindfulness has as a promising component of health care, particularly for symptom management, coping, and QoL. As research continues testing how MBIs might affect organic disease processes, consideration of future study methodology is paramount. Studies of MBIs have exploded in number over the past decade [66], yet study quality has only marginally risen [67\*\*]. Therefore, despite significant challenges with both funding and staffing in clinical trials, future work must prioritize rigorous experimental design, including large sample sizes to ensure sufficient statistical power, active comparison conditions to control for non-specific effects of positive expectancy (placebo effect), attention from group instructors, and social support from fellow group members, while minimizing attrition, monitoring intervention fidelity, using objective outcome measures and blinded data collection, and assessing longer-term outcomes. Furthermore, most participants in mindfulness research on physical diseases are white, middle to upper-class females [68]; an inaccurate reflection of national demographics given racial, gender, and socioeconomic disparities in chronic disease rates, access to care, and outcomes [69]. In addition to questions about efficacy and generalizability, the potential mechanisms by which mindfulness may help manage or prevent physical disease are unclear, but likely involve a combination of psychological, biological, and behavioral processes, ranging from improved attention and emotion regulation to changes in the brain, the immune system, and gene expression (for detailed reviews, see this Special Issue, subsections on Cognitive Processes, Emotion, Neural Correlates, and Genetic and Immune Systems).

Another major, practical gap in knowledge is whether higher trait mindfulness and/or mindfulness training improves adherence to medical regimens, increases wellness motivation, or decreases health care utilization? If so, mindfulness could become part of the current movement toward “integrated care” [70], where mental/behavioral health and physical health are treated together in a coordinated way, to improve health outcomes, lower costs, and improve both patient and provider satisfaction. However, more work is needed to understand how to best utilize mindfulness in primary care and community health settings, where most patients present with stress-related diseases. As noted by others, moving from tightly controlled clinical trials to implementation and delivery science will require pragmatic trials in real-world health care and community settings to determine treatment benefits, barriers, and how MBIs can be best delivered outside of the idealized academic setting [71]. Thus, an important challenge, and an enormous opportunity, is for academic researchers to collaborate with patients, community leaders, community-based organizations, and community health centers to adapt MBIs in a culturally sensitive manner. Such initiatives would also have to include (funded) opportunities for mindfulness instructors from diverse backgrounds to acquire professional MBI teacher training and supervision, a key barrier to translating, implementing, and disseminating MBIs to lower socioeconomic status (SES) and minority populations who bear a disproportionate burden of stress-related chronic diseases.

Another important future direction is to investigate mobile and internet-based delivery of MBIs to increase accessibility and feasibility for people with physical health conditions, such as cancer, IBS, obesity, and chronic pain. One recent review of internet-based MBIs found success for alleviating subjective measures of symptom burden, but no evidence of impacting objective markers of disease [72]. One promising telephone- and app-based intervention designed for patients who survived a critical illness may serve as a model for delivering the basic principles and practices of mindfulness to medical patients who experience prolonged challenges with physical mobility, chronic pain, post-traumatic stress and anxiety, sleep problems, functional limitations, or limited time or financial resources [73]. Additional research in this area is needed to substantiate more widespread dissemination of evidence-based MBIs to populations who suffer from chronic stress, pain, and illness, yet who face substantial barriers to accessing care provided in traditional medical settings.

Finally, two last challenges and opportunities merit consideration in terms of doing the work necessary to advance the science and practice of mindfulness for physical disease. First, when, where, and how does mindfulness fit into conventional medicine, now and in the future? Second, given that mindfulness can be viewed as secular or spiritual, depending on the person, place, or context, how should the link between spirituality, mindfulness, and health be addressed going forward? From the view of both a patient and a health care provider, attending to one's health – from daily self-care behaviors to periodic encounters with medical providers – can improve awareness, communication, support, and compassion, all of which are directly tied to better health behaviors and health outcomes. Thus, attending to our own minds, bodies, and behaviors can make the field of medicine itself a mindful practice [74], above and beyond integrating MBIs into health care *per se*. From a clinical and translational science perspective, challenges and opportunities abound to further study the optimal 'dose' or duration of mindfulness practice for specific physical diseases, at a given stage of severity. Much more work is needed to determine whether trait mindfulness or mindfulness training play a role in treating, preventing, or promoting recovery from specific diseases, including potential integration with surgery preparation and recovery, for example. And, in terms of spirituality, future research studies on MBIs would benefit from assessing whether individuals perceive mindfulness training as secular or spiritual, whether that perception moderates health outcomes, and if a change in one's sense of spirituality during mindfulness training mediates improved physical health – possibly depending on secular or spiritual perception (moderated mediation).

## Conclusion

A preponderance of evidence shows that mindfulness – as both a dispositional *trait*, and as a skill-based *training* – can reduce patient-reported symptoms and improve coping and QoL across many physical health conditions. In addition, some studies have shown that both trait mindfulness and mindfulness training can “buffer” emotional and physiological reactions to stress, providing one plausible biological mechanism for protecting against stress-related diseases, like hypertension [75–76]. Given the increasing prevalence of chronic, often comorbid conditions – from cardiovascular disease, diabetes and depression, to chronic pain, cancer, and anxiety – mindfulness can play an important role in increasing self-awareness

and self-care, as part of an *integrated approach* to health promotion and prevention, irrespective of disease stage. Future studies are needed to clarify (1) whether MBIs to impact objective measures of disease severity or progression, (2) how to integrate MBIs into primary care, community health, and other health care settings, and (3) how to best tailor and disseminate effective MBIs for diverse populations that face significant barriers accessing and adhering to health care.

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### HIGHLIGHTS

- Many of today's most common, costly, and chronic diseases are stress-related
- Mindfulness, as both a dispositional *trait* and as a skill-based *training*, can reduce patient-reported symptoms of stress in the context of physical disease
- There is little good quality evidence that mindfulness-based interventions impact objective biomarkers of disease severity or progression
- There is adequate theoretical justification and empirical support to integrate mindfulness with conventional medical care for chronic pain, cardiovascular disease, and other stress-related chronic diseases
- Future studies are needed to clarify whether mindfulness impacts objective measures of physical disease, generalizes to diverse populations, and can be effectively implemented and disseminated in non-academic health settings