Mindfulness in Medicine

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Mindfulness refers to a meditation practice that cultivates present moment awareness. In the past 30 years, interest in the therapeutic uses of mindfulness has increased, with more than 70 scientific articles on the topic published in 2007. Meditation practices, including mindfulness, have come to the attention of neuroscientists investigating consciousness and affect regulation through mental training and to psychotherapists interested in personal development and interpersonal relationships. In this Commentary, we define mindfulness, consider possible mechanisms, explore clinical applications, and identify challenges to the field.

Mindfulness and Its Relationship to Medicine

Mindfulness involves attending to relevant aspects of experience in a nonjudgmental manner. Historically a Buddhist practice, mindfulness can be considered a universal human capacity proposed to foster clear thinking and open-heartedness. As such, this form of meditation requires no particular religious or cultural belief system. The goal of mindfulness is to maintain awareness moment by moment, disengaging oneself from strong attachment to beliefs, thoughts, or emotions, thereby developing a greater sense of emotional balance and well-being.

The original purpose of mindfulness in Buddhism—to alleviate suffering and cultivate compassion—suggests a potential role for this practice with medical patients and practitioners. Much cardiovascular disease, diabetes, cancer, and other chronic illness is caused or exacerbated by modifiable lifestyle factors, and lifestyle modification constitutes primary or ancillary treatment for most medical condi-

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REFERENCES

tions. An aim of mindfulness practice is to take greater re-
ponsibility for one's life choices. Thus, mindfulness may
promote a more participatory medicine by engaging and
strengthening an individual's internal resources for opti-
mizing health in both prevention of and recovery from ill-
ness. For intractable disease, meditative techniques that al-
ter and refine awareness may modulate the subjective
experience of pain or improve the ability to cope with pain
and disability.

Implicitly, at least, mindfulness has always been part of
good medical practice, facilitating the physician's compas-
sionate engagement with the patient. Epstein\(^2\) suggests that
"mindfulness is integral to the professional competence of
physicians" in promoting effective clinical decision mak-
ing and reducing medical errors. Indeed, the connection be-
tween medicine and meditation is underscored by their
shared etymological origins in the Latin word *mederi*, which
means "to heal."

**Mechanisms**

There are many ways that mindfulness might influence sus-
ceptibility to, or ability to recover from, disability and dis-
ease. These may include (1) decreased perception of pain
severity; (2) increased ability to tolerate pain or disability;
(3) reduced stress, anxiety, or depression; (4) diminished
usage of, and thereby reduced adverse effects from analge-
sic, anxiolytic, or antidepressant medication; (5) enhanced
ability to reflect on choices regarding medical treatments
(eg, decision to seek a second opinion); (6) improved ad-
herence to medical treatments; (7) increased motivation for
lifestyle changes involving diet, physical activity, smoking
cessation, or other behaviors; (8) enriched interpersonal re-
lationships and social connectedness; and (9) alterations in
biological pathways affecting health, such as the auto-
nomic nervous system, neuroendocrine function, and the
immune system. Most of these possibilities have not been
rigorously examined. Nevertheless, psychological stress has
been linked to numerous medical conditions.

Moreover, preliminary data suggest that mindfulness prac-
tice has a profound and perhaps unique effect on brain func-
tion. In a study using functional magnetic resonance imaging
in 27 undergraduate students in Los Angeles, California,
Creswell et al\(^3\) found that individual disposition toward mind-
fulness was associated with widespread prefrontal cortical
activation and reduced bilateral amygdala activity during an
affect-labeling task, after controlling for various psycho-
metric covariates. Using electroencephalogram (EEG), Lutz
et al\(^4\) found that highly experienced Buddhist monks pro-
duced, during meditation, long-distance phase synchrony
(suggestive of large-scale neural coordination) and gamma
activity with a higher amplitude than any reported in a state
of health. Davidson et al\(^5\) randomly assigned participants in
a corporate setting to a mindfulness-based stress reduc-
tion group or a wait list control group and reported in-
creased left-sided anterior activation by EEG (patterns as-
sociated with positive emotional experience) in the stress
reduction group. This group also demonstrated a greater in-
crease in antibody titers to influenza vaccine, and the mag-
nitude of the EEG change predicted the magnitude of an-
tibody response. Tang et al\(^6\) reported that undergraduates
in a Chinese university randomly assigned to a mind/body
intervention that included mindfulness showed lower sali-
vary cortisol and higher salivary IgA concentrations in re-
sponse to psychological stress (mental arithmetic task) com-
pared with control students who were given an intervention
of equal intensity that focused on relaxation. Thus, mind-
fulness training may be an effective way to positively regu-
late brain, endocrine, and immune function, influencing
physiological and psychological variables important to well-
being.

**Clinical Applications**

Pain, stress, coping, and quality of life comprise the origi-
nal focus of medical research into mindfulness. In 1982,
Kabat-Zinn\(^7\) reported descriptive data from medical pa-
tients with chronic pain of 6 months to 48 years' duration
who received training in mindfulness-based stress reduc-
tion. Among the 51 participants who completed the pro-
gram (88% of the 58 total enrolled), perceived pain de-
creased significantly during the intervention, with half
reporting a reduction of at least 50%. In a study of 109 pa-
tients, aged 27 to 75 years, with various types of cancer, Speca
et al\(^8\) found that compared with a wait-list control group,
those randomly assigned to the mindfulness group experi-
cenced improvements of 65% in mood disturbance and 31%
in symptoms of stress. Others have found beneficial effects
of mindfulness training on acceptance of pain, severity of
general medical symptoms, physical functioning, and abil-
ity to cope with daily life.

Recently, a number of specific medical conditions have
become the subject of study. Based on research involving
individuals with a history of 3 or more episodes of major
depression,\(^9\) the National Health Service in the United King-
dom recommends mindfulness-based cognitive therapy.
Mindfulness training has shown preliminary evidence of ef-
ficacy in the treatment of psoriasis, type 2 diabetes, sleep
disturbance, attention-deficit hyperactivity disorder, and
other conditions. Mindfulness, or lack thereof, may have spe-
cific relevance for obesity and eating disorders. In one study,
lean and obese young adults were given a meal of soup in
special bowls that, unbeknownst to them, slowly refilled as
their contents were consumed. These individuals ate 73%
more than those who consumed soup from normal bowls.
Of particular note, they did not believe they had consumed
more, nor did they report being more satiated than the other
participants.\(^10\) Thus, mindfulness could inform not only the
choice of what to eat but also the awareness of having eaten
enough. In a pilot study, a small group of young women with
bulimia nervosa reported a reduction in emotional and be-
havioral extremes and greater self-acceptance after mind-
fulness training. The use of mindfulness training in pain, hypertension, myocardial ischemia, inflammatory bowel disease, human immunodeficiency virus, and substance abuse is presently under investigation in research supported by the National Institutes of Health (NIH).

Mindfulness training may also have applications in medical education and quality of care. Shapiro et al11 reported that premedical and medical students randomly assigned to mindfulness training, compared with a wait-list control group, showed reduced psychological distress and increased empathy. Grepmair et al,12 in a randomized controlled trial, examined the course of 124 psychiatric inpatients treated by 18 psychotherapy interns. Patients of interns who had received mindfulness training did significantly better on measures of symptom severity compared with patients of interns who had not received this training. Mindfulness may also play a role in medical error reduction. Groopman14 suggests that most misdiagnoses do not result from lack of knowledge but from faulty thinking, including anchoring errors (snap judgment), attribution errors (stereotyping), and other cognitive traps. He proposes that these cognitive errors can be avoided by paying attention to the process of thinking, a metacognitive practice of self-reflection akin to mindfulness.

Limitations of Current Research
The available research on mindfulness has major limitations, precluding any definitive assessment of effectiveness at this time.15 Published clinical studies frequently have small numbers of participants, lack an active control group, and include only subjective end points. Most of these studies do not adequately consider participant characteristics (making it difficult to generalize the effects to other groups), treatment methods (relating to reproducibility), study staff protocol adherence and participant skill acquisition (treatment fidelity), and relevant covariates (confounders and mediators). Moreover, the lack of consensus about working definitions of mindfulness and other meditative practices impedes comparative studies. These limitations, although not unusual in a nascent field, need to be addressed in future research.

Conclusion
The current age has been referred to as one of “continuous partial attention.” E-mail, cell phones, and other technologies invade nearly every moment of waking life. Economic pressures demand ever-increasing productivity, even as time to enjoy the fruits of labor declines. These factors adversely affect the health care system overall and diminish the patient-physician relationship. In this context, mindfulness may hold promise as a potential way to help prevent and treat disease, increase ability to cope with pain and chronic illness, reduce stress in patients and practitioners, foster compassion, improve quality of care and reduce medical errors. High-quality, mechanism-oriented studies and randomized controlled trials of mindfulness in medicine are needed.

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