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## The Emerging Role of Meditation in Addressing Psychiatric Illness, with a Focus on Substance Use Disorders

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### Abstract

Over the past 30 years the practice of meditation has become increasingly popular in clinical settings. In addition to evidence-based medical uses, meditation may have psychiatric benefits. In this review, the literature on the role of meditation in addressing psychiatric issues, and specifically substance use disorders, is discussed. Each of the three meditation modalities that have been most widely studied—transcendental meditation, Buddhist meditation, and mindfulness-based meditation—is critically examined in terms of its background, techniques, mechanisms of action, and evidence-based clinical applications, with special attention given to its emerging role in the treatment of substance use disorders. The unique methodological difficulties that beset the study of meditation are also considered. A brief discussion then integrates the research that has been completed thus far, elucidates the specific ways that meditation may be helpful for substance use disorders, and suggests new avenues for research.

### Keywords

Buddhist meditation; meditation; mindfulness; psychiatry; substance use disorders; transcendental meditation

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With greater numbers of patients and physicians choosing alternatives to traditional, medication-oriented treatment, the clinical use and popularity of meditation have grown tremendously. Scientific interest in the subject has increased as well; nearly 70 peer-reviewed articles devoted to mindfulness (a Buddhist-derived meditation practice incorporated into clinical use) were published in 2007 alone.<sup>1</sup> Of the so-called alternative treatments available to patients, meditation and its related practices have been the most widely evaluated, and it is the first mind-body intervention to be adopted by mainstream health care providers and incorporated into evidence-based therapeutic programs.<sup>2</sup> The medical benefits of meditation include improving hypertension,<sup>3,4</sup> managing the stress of chronic illness,<sup>5,6</sup> and promoting cardiovascular health.<sup>4,7</sup> Long-term meditation may have a role, too, in slowing and perhaps stopping cortical atrophy and cognitive decline.<sup>8</sup>

Meditation has also been studied in psychiatric settings. While the evidence for its efficacy is preliminary and inconclusive at present, meditation's possible benefits may include ameliorating depression,<sup>9</sup> improving anxiety,<sup>10</sup> promoting abstinence from drugs of abuse,<sup>11,12</sup> and reducing the self-injurious behaviors of personality disordered patients.<sup>13</sup> In

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this review, the available literature on the role of meditation in addressing psychiatric illness, and specifically substance use disorders, will be addressed.

The review will begin by exploring some of the challenges that beset the study of meditation. Three distinct, widely studied meditation practices will then be discussed: transcendental meditation, Buddhist meditation, and mindfulness-based meditation, a secular variant of Buddhist mindfulness meditation. Each type of meditation will be independently explored in terms of its background, techniques, purported mechanisms of action, and evidence-based psychiatric applications, with special emphasis on substance use disorders. This will be followed by a discussion synthesizing the research that has been conducted thus far, elucidating the specific ways that meditation may be helpful for substance use disorders, and suggesting new avenues for research.

## METHODS

Articles were accessed by searching Ovid, Medline, and PubMed using the terms meditation, mindfulness, psychiatry, transcendental meditation, Buddhist meditation, and substance use disorders. Further articles were accessed along the way, and textbooks were consulted for additional information on the techniques of mindfulness, transcendental meditation, and Buddhism.

## DEFINITIONS AND LIMITATIONS

Meditation comes from the Latin root *meditor*: to reflect, ponder over, consider. It originated as a spiritual and healing practice in various parts of the world more than 5,000 years ago, but it has been scientifically defined, in large part, without reference to this religious tradition: as a practice that self-regulates the mind and body by engaging a certain attentional set;<sup>14,15</sup> as a self-directed wakeful mind-frame coupled with deep bodily relaxation;<sup>16</sup> and as a voluntary and alert hypometabolic state of parasympathetic dominance,<sup>17</sup> among others.<sup>18</sup> This lack of focus on spirituality may come at a cost; it has been argued that the spiritual components of meditation may be vital to its effects and mechanisms of action.<sup>26</sup> Definitions that incorporate ideas of a spiritual nature, however, have not lent themselves to scientific investigation; meditation has been defined, even in academic settings, with such elusive, imprecise, and mystifying terms as wisdom, enlightenment, and open-heartedness.<sup>1,19,20,26</sup>

Another difficulty that complicates the conceptualization of meditation is that meditative states are subjective and private. Consequently, they are not easily given to scrutiny, reliability testing, analysis, or even definition. Definitions that attempt to conceptualize the mental processes that constitute meditative practice will be very different from definitions that assume a more biological or physiological stance, but consciousness-oriented definitions may themselves be very different from one another.<sup>18</sup> There remains, in any case, no consensus regarding meditation's definition, though broad operational definitions have been devised.<sup>18,21</sup>

Meditation also encompasses many techniques, some of them quite diverse. These techniques are primarily distinguished by their focus of attention and can therefore be organized by attentional style along a continuum, with *concentrative* techniques on one end and mindfulness or *diffuse* techniques on the other. Concentrative techniques involve focusing on a specific sensory or mental stimulus to the exclusion of anything else: breath, for example, or an object in space. Diffuse practices, by contrast, involve allowing thoughts, feelings, and sensations to arise while maintaining a nonjudgmental, detached, and accepting attitude to them, as well as a heightened perceptual stance attentive to the entire field of perception.<sup>22,23</sup> As will become apparent, most meditation practices are both concentrative

and diffuse, and the distinction is applicable insofar as it designates the dominant attentional style of a particular technique.

These variations in style, furthermore, may have significant clinical consequences; different practices may lead to distinct short- and long-term effects on the brain, as well as to specific benefits.<sup>51</sup> In a study comparing individuals with extensive training in Kundalini (mantra-based and concentrative) or Vipassana (insight-oriented and diffuse) meditation, Lazar and colleagues<sup>24</sup> found that each style was associated with a different pattern of brain activity by functional MRI (fMRI) during active meditation and several control tasks (e.g., simple rest, generation of a random list of numbers, and paced breathing). This finding underscores the importance of not generalizing the results of one study—presumably investigating a specific meditation practice—to other types of meditation. Each practice should be tested separately, for each may yield a different outcome.<sup>25</sup> Each practice will therefore be discussed separately here, even though there may be overlap and commonalities among them (Table 1).

## TRANSCENDENTAL MEDITATION

### Background

Transcendental Meditation (TM) was developed by the Indian yogi Maharishi Mahesh Yogi (born Mahesh Prasad Varma) in 1955. He claimed that the practice derives from the Vedic (Hindu) tradition.<sup>27</sup> In 1957, he began to teach and disseminate this technique. TM's rise to popularity was rapid and far-reaching, with many celebrities in the West, most famously the Beatles, Donovan, and Mia Farrow, coming to champion the movement.

The general reception of TM in the West has been mixed. Responses have ranged from enthusiastic, citing TM's inclusive religious perspective and reputed physical and intellectual benefits, to hostile, claiming that TM represents a cult that subverts Western values, dupes the wealthy and privileged, and recruits biased pseudoscientists to support its dubious claims. Despite the criticisms its organizational structure and religious viewpoints have aroused, TM's medical claims have been taken seriously. The National Institutes of Health has donated more than \$20 million to fund research investigating the effect of TM on cardiovascular disease, and studies continue to be performed to validate its alleged health benefits.<sup>28,29</sup>

### Technique

The process of learning TM is standardized and consists of seven steps.<sup>30</sup> It begins with two introductory lessons and a brief interview, and is followed by four training sessions on four consecutive days, each lasting approximately two hours. The training begins with a small ritual performed by the instructor. Subsequent lessons provide more information about TM and ensure that the practice is performed correctly. The cost of learning TM from a trained instructor is around \$2000. Each student is provided a unique mantra, or a spiritually significant set of words, which he or she is told to keep secret and not share with anyone.

The practice of TM involves two twenty-minute meditation sessions a day, one performed in the morning and the other in the evening. The Maharishi has frequently claimed that the practice of TM involves neither concentration nor contemplation;<sup>27</sup> practitioners sit in a relaxed posture, close their eyes, and mentally repeat the mantra that has been assigned them. The TM movement claims that mantras are selected according to a precise system and that for TM to be effective, only certain mantras can be used.<sup>27,30</sup>

Being a mantra-based practice, TM ostensibly meets the working definition of a concentrative practice. The TM movement has emphasized, however, that focused attention

is contrary to the practice and that the ultimate aim is an unified and open attentional stance<sup>27,30</sup>—which, of course, is more consistent with a diffuse approach. This suggests the limitations of the classification scheme.

### Mechanisms of Action

A problem inherent in investigating practices with a religious or spiritual focus is that such practices often attribute their efficacy to claims that are not amenable to experimental verification or refutation. The TM movement, for example, has stated that the practice of TM, among others things, allows a practitioner to access “the original source of thought,”<sup>27</sup> a claim that is difficult, if not impossible, to test experimentally. For this reason, investigators have focused on providing physiological explanations for efficacy that accord with current scientific understanding. We will take this approach toward TM and the other meditation practices discussed later, focusing on claims that lend themselves to scientific research only (an approach that does not actually exclude an investigation into the significance of spiritual development, mystical experience, or metaphysical consolation in the efficacy of TM and other meditation practices: see the discussion section below).

Most of the research investigating the physiological changes that accompany TM was performed in the 1970s. Several studies have examined the physiological state accompanying active meditation and have characterized it as a wakeful hypometabolic state of parasympathetic dominance and sympathetic attenuation.<sup>31</sup> Among the changes noted were reductions in respiratory rate, decreases in tidal volume, serologic drops in lactate levels, and increases in basal skin resistance.<sup>31–33</sup> Young and colleagues<sup>17</sup> have hypothesized that this hypometabolic state, consciously induced during TM-style meditation, serves an estivation- or hibernation-like role that allows for successful adaptation and plasticity in the midst of environmental change and stress. This state may have health-promoting and restorative benefits, as well as positive effects on neural plasticity.<sup>17</sup>

State-dependent EEG changes that accompany TM-style meditation include increased theta waves and the predominance of alpha waves in both the occipital and frontal lobes.<sup>34</sup> With long-term, consistent meditation, these changes are no longer circumscribed to the active meditative state and generalize to normal activity.<sup>35,36</sup> The changes have been hypothesized to enhance integration of regional brain activity and executive functioning, as well as to potentially dampen emotional reactivity.<sup>36–38</sup> TM has also been found to be associated with increased cerebral perfusion to the frontal and occipital regions during active meditation.<sup>41</sup>

Long-term (duration of four months or greater) TM has been shown to result in decreased cortisol levels, as well as a heightened cortisol response to acute stress—which has been interpreted to suggest that TM can protect against the impact of chronic stress.<sup>42</sup>

Yoga, which the TM movement considers a similar practice and which derives from the Hindu tradition as well, has also been extensively studied, and while the two may not be entirely related, they share many commonalities, including the emphasis on controlled breathing, the maintenance of a particular posture, and the cultivation of a state of deep bodily rest coupled with mental alertness. It has been found that GABA levels in the brain increase significantly after a 60-minute yoga session as compared to a reading session of comparable length.<sup>39</sup> It has been hypothesized that TM can lead to increased GABA indirectly through its effect on ketones and the neuroendocrine system,<sup>40</sup> but it has not been demonstrated that GABA actually increases following a session of TM. This potential increase in GABA has been proposed as a possible mechanism explaining the benefit that TM and yoga may have on certain disorders associated with low GABA, such as depression, anxiety, and epilepsy.<sup>39</sup>

## Psychiatric Uses

The TM movement has reported that TM can help addiction, as well as improve depression, reduce anxiety, enhance cognitive function, and promote insight and healthy choices.<sup>30</sup> The overwhelming majority of supportive clinical trials, however, were neither placebo controlled nor randomized. Furthermore, many of the investigators had some affiliation with the TM movement—if not as members of the movement, then as beneficiaries of research funding from it—which may have presented a source of bias.

Another issue that complicates research into TM's efficacy and into the study of meditation in general is the lack of a reliable way to ensure that subjects perform the meditation technique correctly, particularly if they are inexperienced. This problem may partly explain the inconsistencies in study findings. In reviewing TM's efficacy, as well as the efficacies of the other meditative practices, randomized controlled trials (RCTs) will be primarily considered here, even though they are few in number.

An RCT in 73 elderly adults comparing TM to other mental relaxation or concentration tasks and to the waitlist to receive TM found no significant difference in depression between groups after 12 weeks.<sup>43</sup> However, another RCT in 61 adults who were assigned to one of two meditation groups or a control found that those assigned to the group using a Vedic mantra (a practice similar to that of TM) had a significantly greater reduction in depression symptoms after 28 days of meditation.<sup>44</sup> For non-clinically depressed individuals, therefore, the evidence for TM is inconsistent, with the two RCTs yielding different results. Furthermore the studies are small, with no blinding. There is no evidence for the efficacy of TM in treating depressive disorders.

An RCT in 55 subjects comparing TM with relaxation training and biofeedback in the treatment of “anxiety neurosis,” or what is now considered generalized anxiety disorder, found no significant differences between the three groups.<sup>45</sup> Furthermore, the authors noted that the secrecy and “cult-like” community of TM may distance certain patients.<sup>45</sup>

Ten RCTs have investigated TM's efficacy in enhancing memory, attention, and executive functioning; six of them were unresponsive.<sup>46</sup> The four that were supportive, however, were flawed due to a probable “expectation effect” and subject bias; in all four studies, the subjects were favorably inclined to TM.<sup>46</sup>

No evidence is available on TM's effectiveness in treating addictive disorders. The only study was a favorable, non-controlled cohort study following TM practitioners over time—from which it is difficult to draw any helpful inferences.<sup>11</sup>

## Conclusions

The evidence for TM's efficacy in treating addictive disorders is speculative and inconsistent, at best. No RCTs test TM's effect on this disorder. Furthermore, the quasi-religious aspects of TM, along with the financial cost of learning the technique, may deter many people from approaching it. The simplicity of the technique, the regenerative health-promoting physiological changes it induces, and its apparent efficacy in nonpsychiatric settings, however, merit further exploration and study.

## BUDDHIST MEDITATION

### Background

It is beyond the scope of this article, of course, to review the full history and development of Buddhism; the following is primarily intended to provide a brief historical and intellectual

background to the meditation practices of that religion. Readers who wish to learn more are encouraged to consult any of the many texts available on the subject.<sup>47,48,67</sup>

The religion and philosophy of Buddhism originated in India around 600 BC; its founder was Lord Siddhartha Guatama, a prince who renounced his life of luxury and privilege in favor of a search for wisdom. Though his intellectual and cultural background was rooted in Hinduism, the Buddha's teachings were a radical departure from the theism of that religion. Instead of encouraging devotion to the gods, the Buddha approached spiritual awakening from a more empirical perspective; this approach is encapsulated in his Four Noble Truths and Eightfold Path.<sup>47</sup> The Buddha, in brief, regarded suffering as an essential part of existence, attributed suffering to improper behavior, thought, and understanding, and introduced a system of ethics, conduct, meditation practice, and philosophy as a means by which to transcend suffering and attain enlightenment.<sup>47</sup>

Buddhism later spread to China and then Japan, attaining culturally bound idiosyncrasies in each of its new homes. The predominant forms of Buddhism practiced in each of these countries can be very different from one another in many respects. These different traditions, however, have one fundamental commonality: the central place accorded the regular practice of meditation. Depending upon the tradition, however, meditation can have many manifestations and techniques or traditions, with the three most commonly studied being Tibetan, Zen, and Vipassana meditation. Each, unsurprisingly, has both concentrative and diffuse currents. The exercises will be discussed in greater detail below.

### Techniques

Many of the meditative techniques of Buddhism can be classified according to the scheme introduced earlier: concentrative techniques, for example, primarily involve focusing on a sensation, a single point in space, a color, an object, a sound, or an affective state, like compassion; diffuse techniques primarily involve developing awareness, increasing attentiveness, and promoting a detached, neutral attitude toward phenomena in general; and some techniques oscillate equally between the two. The practices of Buddhist meditation, moreover, are not merely diffuse or concentrative; they are also profoundly *philosophical*. That is, meditative states move beyond a particular attentional stance and facilitate the attainment of certain philosophical and metaphysical insights considered essential to attaining enlightenment. These include insight into the transience of phenomena, for example, or concerning the illusion of a separate self.<sup>47</sup> While some Buddhist writers regard such insights as natural inferences or conclusions to be drawn from meditative experiences, the insights can also be regarded as metaphysical speculations that move beyond what is apparent in direct experience and that are likely shaped by the *philosophical* context in which the meditation practices take place.<sup>47</sup>

It is not uncommon for participants to attend long retreats that involve both meditation and instruction in Buddhist philosophy. Vipassana meditation, for example, may involve retreats that last for several days, during which participants follow a certain fixed schedule, eat a vegetarian diet, practice meditation for several hours a day, receive instruction from an experienced meditation practitioner, and attend lectures on spiritual and philosophical subjects pertaining to Buddhism.

### Mechanism of Action

As with TM, long-term Buddhist meditation has been found to result in a distinctive resting EEG pattern, with increased coherence of certain wave patterns and alpha and theta predominance.<sup>49-51,55</sup> There are various differences by EEG between concentrative and diffuse meditation exercises.<sup>51</sup> Furthermore, studies have found enhanced regional

activation in areas that correspond to the particular mental tasks associated with the meditation techniques.<sup>52–54,61</sup>

Some research has aimed at elucidating, by neuroimaging, the extent of meditation's impact on cortical plasticity. In one such study, long-term practitioners of insight meditation, which involves focused attention to internal experiences, were found to have significantly greater cortical thickness than controls in areas associated with interoception, attention, and sensory processing, including the prefrontal cortex and right anterior insula.<sup>56</sup> In effect, structural evidence is emerging for experience-dependent cortical plasticity in long-term meditation practitioners.

Whether this training in a certain mental domain leads to a significant improvement in its function, however, has been recently called into question. In a study comparing the capacity for interoceptive awareness between long-term practitioners of Buddhist meditation and nonmeditating controls,<sup>57</sup> it was found that there was no significant difference between groups, with both controls and long-term practitioners demonstrating equal skill in assessing their heart rates. The primary difference was that the group of practitioners consistently believed themselves to be more adept at doing so than they actually were.

Some attention is also being given to the claim that meditation can help one control the mind. A study looking specifically at Zen practitioners<sup>58</sup> found that they displayed a reduced duration of the neural response linked to conceptual processing in regions of the default network, the area of the brain thought to be involved in self-referential thought and introspection. This finding suggests that meditative training may foster the ability to control the automatic cascade of associations triggered by a stimulus and, by extension, to voluntarily regulate the flow of spontaneous thoughts.

Regular practitioners of Zen meditation have also been found to have no age-correlated cortical atrophy and decline in attentional capacity. In a study comparing regular practitioners with controls,<sup>59</sup> the former group did not demonstrate the expected negative correlations of both attentional performance and gray matter volume with age. The effect of meditation on gray matter volume was most prominent in the putamen, which is highly involved in attentional processing.

Buddhist meditation, specifically compassion meditation, has been determined to dampen stress-induced behavioral and neuroendocrinological responses by reducing cortisol secretion and potentially enhancing brain-derived neurotrophic factor (BDNF) function.<sup>60</sup>

## Psychiatric Uses

As with TM, the evidence for Buddhist meditation's efficacy in the psychiatric setting is inconclusive, in part because there are so few RCTs. This paucity of RCTs merits some discussion, as it may be due, to some extent, to the particular obstacles that psychiatric illness presents. As one consumer on a Web site put it: "The problem with meditation, as with exercise, is that depression and anxiety can prevent you from trying them ... if you can't sit still long enough to close your eyes and relax, you can't meditate. If you can, however, [it] works well when done on a regular basis—that's the key, though, to [its] effectiveness."<sup>62</sup> It may be impossible, in other words, for severely psychiatrically ill subjects to meditate effectively. This incapacity may explain, to an extent, the low number of RCTs evaluating meditation in psychiatric populations, and it also explains why self-selection can be such a confounding factor when it comes to investigating meditation's efficacy: those who opt to attempt meditation, and who persist in practicing it, may be contending with less psychopathology than are those who do not. One has to consider, in addition, a bias and expectation effect.

There are only a few RCTs, in any case, that evaluate Buddhist meditation in a psychiatric setting. An RCT of 150 subjects<sup>63</sup> found that Buddhist meditation may have efficacy in improving mood in patients who are not clinically depressed. It concluded that enrollment in a Buddhist retreat significantly reduced depressive symptoms as compared to the delayed-treatment group. No studies have determined meditation's efficacy in treating depressive disorders.

Only one controlled trial has investigated Buddhist meditation's efficacy in treating substance use disorders.<sup>64</sup> In-mates in a correctional facility were offered a choice between treatment as usual and a ten-day course of Vipassana meditation. Those choosing the latter showed decreases in alcohol-related problems and psychiatric symptoms upon discharge, as well as increases in positive psychosocial outcomes. Given the lack of randomization, and because of the problems with self-selection, it is difficult to draw definite conclusions from these findings.

## Conclusions

As with TM, there is no conclusive evidence for Buddhist meditation's efficacy in treating substance use disorders. The investigations into its mechanism of action, however, indicate that the different forms of Buddhist meditation may strengthen the ability of long-term practitioners to dampen their stress responses and to control the automatic cascade of semantic associations and thoughts, as well as to increase attentional capacity and preserve cortical integrity and plasticity. These mechanisms suggest a role for long-term Buddhist meditation in treating substance use disorders, with their associated problems of impulsivity, poor self-regulation, and craving/compulsive states. The same patients who are dissuaded from attempting TM due to its religious background, however, may also be disinclined to attempt Buddhist meditation. Moreover, those with severe addiction, as with severe psychiatric illness, may not possess the requisite equanimity, motivation, and discipline for consistent meditation. Buddhist meditation therefore may be most effective in a certain population of willing and able patients.

## MINDFULNESS-BASED MEDITATION

### Background

Mindfulness-based meditation originated in the Buddhist tradition, but it is not currently identified with that religion in therapeutic settings, even though it continues to rely, implicitly or explicitly, on Buddhist ideas.<sup>26</sup> The distance of mindfulness-based meditation from its religious predecessor may make it more appealing to Western patients; Jon Kabat-Zinn,<sup>26</sup> one of the seminal figures in the development of mindfulness-based training, has suggested that mindfulness practice can be used to develop this ostensibly health-promoting capacity in people who might be otherwise unwilling to adopt Buddhist traditions or vocabulary.

Mindfulness has been described as the nonjudgmental observation of the ongoing stream of internal and external stimuli as they arise;<sup>23</sup> as bringing one's complete attention to present experience on a moment-to-moment basis;<sup>65</sup> and as paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally.<sup>66</sup> Numerous meditation exercises have been developed to cultivate mindfulness skills, and mindfulness training has been incorporated into various therapeutic modalities, including mindfulness-based stress reduction (MBSR) and dialectical-behavioral therapy (DBT).



## Techniques

There are several strategies currently in clinical use that incorporate mindfulness training. These include MBSR,<sup>66,70</sup> DBT,<sup>71</sup> acceptance and commitment therapy (ACT),<sup>69</sup> relapse-prevention therapy (RPT),<sup>101</sup> and mindfulness-based cognitive therapy (MBCT)<sup>82</sup> (Table 2). These treatments are manualized, generally short-term, and to a greater or lesser extent, intended to promote mindfulness for therapeutic reasons. MBSR, DBT, and MBCT will be discussed in greater detail under “Psychiatric Uses” below.

Not every mindfulness-based strategy involves meditation in the strict sense of the term; some are equally concerned with the more philosophical task of imparting mindfulness-derived insights and perspectives through non-meditation mental exercises, guided imagery, or metaphor. For example, participants may be encouraged to regard their mind as a conveyor belt, and to observe, label, or categorize their thoughts, sensations, and feelings as would a sorting machine. The primary goal of mindfulness-based treatment is to promote mindfulness, and if that cannot be done through meditation, for whatever reason, then less challenging strategies are available to the clinician/instructor and participant for that purpose.<sup>67</sup>

Nonetheless, a core component of treatment in MBCT, MBSR, and DBT is instruction in mindfulness meditation skills. These skills include various exercises that resemble the meditation practices of the Buddhist tradition, with participants encouraged to sit in a calm and wakeful position while focusing their attention on breathing, parts of their bodies, emotions, and thoughts. They are asked to be aware of the target of attention in the moment, and when emotions, sensations, or cognitions arise, to observe them nonjudgmentally. As in Buddhist meditation, there is also a philosophical component, with the therapist encouraging the participant to develop a detached view of phenomena (“I am not my thoughts”) and to realize that most sensations, thoughts, and emotions are transient, fluctuating, and ultimately neutral. These insights facilitate a stance whereby even very difficult thoughts and feelings come to be calmly noticed, contemplated, and then allowed to pass on, with the participant maintaining his or her attention on the present moment. Alongside being encouraged to practice meditation on their own at home, patients are asked to practice mindfulness while doing ordinary things, such as walking and eating.

In addition to adopting Buddhist meditation practices, MBSR incorporates elements of hatha yoga; participants learn a few yoga postures, which they are encouraged to practice at home.

While ACT does not conceptualize its strategy in terms of mindfulness or meditation,<sup>68</sup> it teaches skills that are consistent with mindfulness training. Participants are encouraged to develop detachment from internal and external phenomena; to experience and accept emerging thoughts and emotions without judgment, evaluation, or a desire to change them; and to develop a neutral observational capacity. Furthermore, patients are encouraged, as in DBT, to simultaneously accept their thoughts and feelings as they are, and to change their behaviors in constructive ways to improve their lives; this dialectic between change and acceptance permeates many of the treatments that incorporate mindfulness training.<sup>69</sup>

Like ACT, RPT is not a mindfulness-based treatment, but it uses mindfulness training as a strategy to cope with cravings. In the exercise of “urge surfing,” participants learn to experience urges as waves that grow gradually until they crest and subside; the participant comes to realize that urges will always pass and that new urges may always come. These new urges, when they arrive, are accepted nonjudgmentally and are dealt with in adaptive ways. A program of mindfulness-based RPT is currently being evaluated in a government-funded RCT.<sup>100</sup>

## Mechanisms of Action

Several psychological mechanisms have been suggested regarding how mindfulness skills can lead to psychiatric symptom reduction and behavioral change. The following mechanisms have been suggested for mindfulness-based training alone, but they may be involved in other practices as well, particularly the Buddhist mindfulness tradition from which such training developed.

1. It has been hypothesized that the development of a nonjudgmental attitude toward distressing phenomena can reduce the associated distress.<sup>70</sup> This effect may stem from a semantic shift whereby a distressing stimulus is recast in a more neutral light that deprives it of its negative signification. Relief may also be due to a kind of exposure therapy or desensitization. Borderline patients who learn to observe their distressing thoughts or emotions—without trying to escape or avoid them—come to experience attenuated fear responses and an extinction of the avoidance behaviors previously elicited by those stimuli.<sup>71</sup>
2. The practice of mindfulness may lead to changes in thought patterns or in attitudes about one's thoughts. A state of mindfulness involves detachment from, and neutral appraisal of, one's thoughts and emotions, as well as a capacity to attend to them without responding automatically. It may be easier, as Teasdale and colleagues<sup>72</sup> have suggested, for those who have learned mindfulness to redirect their attention from a pattern of thought or emotion that is distressing or associated with problematic behaviors to one that is more adaptive.
3. Mindfulness-based training may assist participants in implementing better coping skills. Improved self-observation may allow participants to catch early behavioral, emotional, or cognitive precursors of problematic behavior,<sup>72</sup> to better tolerate distress,<sup>73</sup> to better recognize the consequences of behavior,<sup>71</sup> and to more easily mobilize the motivation to carry out healthier choices.<sup>71</sup>
4. Mindfulness-based acceptance may have a role in reducing problematic behaviors, particularly when these behaviors are destructive adaptations to feelings or thoughts from which the participant attempts to flee. An increased capacity for acceptance may allow participants to effectively extricate themselves from these maladaptive patterns by coming to accept the thought or emotion at its source.<sup>69</sup> For example, borderline patients, once they come to accept their chronic feelings of emptiness, may engage less in the self-injurious behaviors, such as cutting or drug use, previously used to dampen those feelings.<sup>71</sup>

Investigations elucidating mindfulness meditation's neural correlates have found that after an eight-week course in mindfulness meditation, subjects engaged in moment-to-moment awareness demonstrated a shift by fMRI from activation in the ventromedial prefrontal cortex and the amygdala toward more lateral regions; this finding suggests a more self-detached and objective analysis of interoceptive and exteroceptive stimuli, free of judgment or self-referential cognitive and emotional associations.<sup>74</sup> Furthermore, long-term mindfulness training has been shown to lead to more consistent and sustained activation in the dorsolateral prefrontal cortex and the anterior cingulate than that observed in novice participants or controls.<sup>75</sup>

## Psychiatric Uses

MBSR, DBT, and MBCT, the three mindfulness-based treatments currently in clinical use, incorporate meditation as one of many therapeutic tools. Their therapeutic benefits may be due to a combination of factors: the relationship established between patient and clinician/instructor, the mindfulness-training exercises, other nonmeditative exercises, the cognitive

reframing, and so on. It is difficult to determine to what extent treatment efficacy is due specifically to the mindfulness training. Nonetheless, these treatments consider the cultivation of meditative and meditative-like states as important to their therapeutic strategies; a review of the RCTs that have been performed to establish their respective efficacies may therefore shed light on how meditation-oriented treatments can be helpful in addressing psychiatric, and more specifically substance use, disorders.

### **Mindfulness-Based Stress Reduction**

MBSR is an eight-week, class-based program in which participants meet once a week for 2.5 hours on most days, and for 8 hours at the halfway mark; they are encouraged to practice for 45 minutes a day and are assigned homework. Training in various meditation techniques is fundamental to MBSR. It is not designed to treat any particular disease and was originally intended as a nonspecific way to improve quality of life by teaching mindfulness. Since its inception, it has been studied for its efficacy in treating chronic pain and chronic medical conditions, as well as in managing subclinical anxiety and mood symptoms.

A small RCT of 38 subjects previously diagnosed with a mood disorder were randomized into a group that received MBSR and another that did not; it was found that in the 22 subjects who were matched in regard to mood symptoms at baseline, the MBSR group of 11 subjects had significantly fewer mood symptoms, as well as fewer ruminations.<sup>76</sup> This study used patients on a waiting list to receive MBSR as a control group, which may present some bias, given that these patients would have preferred to receive MBSR and instead received no treatment, potentially leading to an exaggerated lack of positive response to the control condition.

This same issue complicated a smaller RCT of 18 women with cardiovascular disease.<sup>77</sup> Subjects on MBSR were compared to a control group on an MBSR waiting list in regard to anxiety levels. It was found that women with a reactive coping style did better after the MBSR course than did those who were on the waiting list but that women who with a suppressive or reflective coping style did not demonstrate any added improvement after MBSR. Another RCT of 55 college students examined the effects on stress levels and capacity for forgiveness of MBSR, another meditation practice (concentrative), and no treatment; the two meditation groups had significantly decreased stress after the course, as well as an increased tendency to forgive.<sup>78</sup> In an RCT of 91 patients with fibromyalgia, MBSR and no treatment (waiting list) were compared in regard to alleviating depressive symptoms; depressive symptoms in the treatment group were significantly reduced up to two months post-treatment.<sup>79</sup>

The efficacy of MBSR in treating addictive disorders has not been determined. Currently, MBSR is believed to be most effective at improving quality of life and as an adjunct in the treatment of chronic illnesses, with or without mood disturbances and anxiety.<sup>5,6</sup>

### **Dialectical-Behavioral Therapy**

DBT was originally developed to treat patients who contend with borderline personality disorder (BPD), particularly when they are highly suicidal, but it has since been modified to address other comorbidities and conditions, including depression, eating disorders, and BPD with substance abuse. DBT draws its principles and practice from behavioral science, dialectical philosophy, and Zen. The central dialectic of DBT is between acceptance and change; accepting oneself as one is and yet working toward change at the same time. Mindfulness training plays a prominent, though not central, role in DBT; no studies have determined, moreover, the extent to which each of DBT's individual components provides therapeutic benefit. DBT has been evaluated and found to be efficacious for the treatment of

BPD in seven RCTs carried out by four independent research teams, and it has demonstrated efficacy in RCTs for chronically depressed older adults, older depressed adults with comorbid personality disorder, and eating-disordered individuals.<sup>80</sup> DBT may also be effective for the treatment of substance use disorders in patients who have affective dysregulation but who do not meet full criteria for BPD.<sup>81</sup>

### **Mindfulness-Based Cognitive Therapy**

MBCT was developed to prevent the relapse of depressive disorders. It is an eight-week, class-based program that combines elements of mindfulness training with elements of cognitive-behavioral therapy for depression. As such, mindfulness training plays an important role in MBCT's therapeutic strategy. Several RCTs have been performed, all by the same group, to assess MBCT's efficacy in preventing the relapse of depressive disorders. Two small RCTs comparing MBCT and treatment as usual (TAU) to TAU alone found that the MBCT group was associated with less depressive relapses.<sup>82,83</sup> In another RCT<sup>84</sup> investigating the effect of MBCT plus TAU versus TAU alone on mood, memory, and cognition, subjects in the former group experienced a greater shift, as compared to controls, toward specific memories ("my seventh birthday party at the beach") and away from categorical memories ("birthday long ago"), suggesting the development of a less depressogenic cognitive style; there was no difference between groups, however, in regard to assessed mood. MBCT has not been evaluated for the treatment of substance abuse disorders, but a modified version for addictive disorders may be in development.<sup>85,100</sup>

### **Conclusions**

Mindfulness-based meditation represents a nonreligious alternative to the meditation practices of Buddhism and may be more acceptable to patients unwilling to engage with that tradition. Its mechanisms of action suggest a potential role in addressing substance use disorders. Many studies have been performed to evaluate the efficacies of mindfulness-based treatment, but it is difficult to draw conclusions from them regarding the efficacy of mindfulness-based meditation alone because they incorporate other elements that may also have a therapeutic effect, such as the therapist/patient relationship, psychotherapeutic exploration, and cognitive therapy. From this perspective, MBSR is the "purest" form of mindfulness-based meditation training, and it represents the most effective way to single out the specific impact that meditation has on treatment outcome. MBSR may have an effect on subclinical mood and anxiety symptoms and also on mood symptoms comorbid with a chronic medical condition, but it has not been evaluated as a treatment for substance use disorders.

## **DISCUSSION**

While the evidence is inconsistent and inconclusive, meditation is a promising technique for treating substance use disorders. The three different types of meditation discussed have not been equally evaluated in terms of efficacy or mechanisms of action, though, making it difficult to draw any definite conclusions about their respective strengths (or about their common strengths, which may well be revealed by further research). TM has not been rigorously evaluated as a treatment for substance use disorders; the evidence for Buddhist meditation's role is promising but inconclusive; and mindfulness-based training, as it has been incorporated into DBT, may have efficacy in treating a certain population of those with substance use disorders. As discussed earlier, however, the evidence for mindfulness training's specific efficacy in DBT is lacking because that form of therapy, like the majority of mindfulness-based treatments, incorporates other elements into its therapeutic strategy, such as cognitive therapy.

Alongside its alleged benefits, meditation may have certain adverse effects. It has been reported that meditation can cause depersonalization and derealization,<sup>86</sup> and several reports have found associations between meditation and psychotic states.<sup>87–89</sup> In general, however, meditation is a safe and well-tolerated practice.

Despite the paucity of evidence from RCTs, the theoretical basis for meditation's role in addressing substance use disorders is compelling. Substance use disorders are characterized by impaired self-regulation in regard to the substance of abuse. Moreover, they may involve firmly entrenched maladaptive or compulsive behaviors. In addition to the psychological mechanisms already described for mindfulness-based meditation, the following mechanisms of action indicate the ways in which meditation can address these disorders.

1. TM and Buddhist meditation have been determined to create a hypometabolic state of parasympathetic dominance. This state may serve an adaptive function, similar to hibernation or estivation, that effectively restores an organism's capacity for resilience and plasticity. Meditation may therefore have a role in attenuating compulsive and fixed drug-taking behaviors by revitalizing the capacity for resilient and healthy adaptation.
2. Both TM and Buddhist meditation lead to increased cerebral blood flow to regions implicated in the mental exercises of the respective meditation practices. While the evidence for this effect is inconsistent, it may lead to increased proficiency in the associated mental functions over time. An increased ability to attend to and monitor one's thoughts and internal states, for example, may allow one to more effectively navigate drug craving and cues. Buddhist meditation has also been found to increase cortical plasticity in, and to thicken, particular brain regions, potentially enhancing and preserving their function in neuroanatomically evident ways.
3. It has been hypothesized that meditation-induced reorganization of bihemispheric brain activity in the frontal lobe, as evidenced by EEG, may have an impact by reducing emotional reactivity and enhancing executive function.<sup>36–38</sup> These effects may have a role in treating substance use disorders by promoting healthy decision making and by dampening the emotional salience of drug cues.
4. Long-term Buddhist meditation has been correlated with a reduced stress response and lower cortisol levels. This finding suggests a role for meditation in addressing craving states: it may potentially reduce stress-induced craving, dampen the salience of drug craving, and increase craving tolerance.
5. Zen and mindfulness-based meditation have been associated with an increased neurally mediated capacity for attending to phenomena in a non-evaluative way, effectively dampening or precluding the automatic cascade of cognitive and emotional associations. This capacity may be helpful in facilitating cue extinction. Furthermore, it may lead to less reactivity in the face of craving states.
6. Meditation may also decrease drug use by behavioral mechanisms. Patients may learn to enter meditative states as a highly reinforced alternative to using drugs.<sup>100</sup>

The biological and behavioral focus of the above mechanisms reflects the biases that were mentioned earlier. Meditation's religious and spiritual elements, however, should not be overlooked, as they may also play an important role in promoting abstinence. Informal, nonspecific meditation, for example, is encouraged in the highly spiritual, 12-step programs; the eleventh step involves engaging in prayer or meditation regularly. The spiritual nature of meditation, furthermore, does not pertain only to TM, Buddhist meditation, the 12 steps, or other overtly spiritual forms of meditation; even mindfulness training, a relatively secular practice, involves a significant, albeit implicit, focus on spiritual development.<sup>26</sup> While the

studies performed thus far have been limited and sometimes inconsistent, higher measured scores of religiosity and spirituality have been associated with better health in many domains among drugs users.<sup>93-96</sup> Mystical experience, a transcendent sense of self, a metaphysical framework that provides meaning and coherence to one's life, and spiritually mediated self-efficacy have all been suggested as possible factors in the positive effect that religion and spirituality have on substance use disorders.<sup>97,98</sup>

Another caveat about the five biologically based mechanisms enumerated above: they were generally elucidated by studying long-term or consistent meditation practitioners who were healthy and without any apparent psychopathology. It is uncertain if substance users will respond in the same way as the study subjects. Also, as mentioned before, many substance users may be too ill to commit to a traditional meditation regimen. It is unclear, moreover, if persons dependent on different substances would respond equally to the same intervention; it is conceivable that heroin dependence, for example, being highly physiological, would respond better to a technique oriented toward somatic awareness than would marijuana dependence, which is less physiological.

Modified meditation exercises have enjoyed some success in other settings, and mindfulness-based training has been adapted to many different populations. Some promising, though inconclusive, reports suggest that cognitively impaired, aggressive patients taught level-appropriate meditation techniques experience a reduction in aggressive behavior.<sup>90</sup> Similarly, meditation training for patients with addictive disorders may need to be modified to account for the particular challenges of that population. Further research would then need to be performed to demonstrate efficacy and to clarify the therapeutic mechanisms of such a training program.

Alongside the task of tailoring meditation practices for use in treating substance use disorders, researchers may also consider investigating pharmacological adjuncts to meditation practice. In a small, open-label study of several patients with refractory obsessive-compulsive disorder,<sup>91</sup> minimally supervised meditation sessions were coupled with psilocybin, a potent psychedelic; these patients enjoyed an unprecedented, nearly immediate and sustained remission of their symptoms up to 24 hours after ingestion. Ketamine, an anesthetic with dissociative and psychedelic properties, has been evaluated in similar settings; it has been found to result in a sustained reduction of drug use in patients with opiate dependence.<sup>92</sup> Griffiths and colleagues have recently demonstrated that psilocybin can promote long-standing increases in spirituality and mysticism, and that the psychedelic session was widely considered by subjects, long afterwards, as one of the most powerful experiences of their lives.<sup>99</sup> This finding suggests that the potential efficacy of such psychoactive substances is due to the production of a so-called transformative experience<sup>97</sup> that precipitates an immediate and persistent change in lifestyle predicated on newfound spirituality.

## CONCLUSION

Meditation practice is a promising new treatment for substance use disorders. Meditation's mechanisms of action indicate a potential role in facilitating cue extinction, attenuating cravings, reducing maladaptive and compulsive behaviors, and promoting healthier and more resilient choices. Furthermore, the spiritual and religious dimensions of meditation may have significant effects on promoting abstinence. The lack of RCTs, however, makes it difficult to draw any definite conclusions about its efficacy in these areas. While mindfulness training may represent the most likely type of meditation practice to gain clinical support, no evidence-based, mindfulness-based treatment specifically targets addictive disorders at present. It remains to be determined what particular meditation

exercises—concentrative, diffuse, or philosophical—would be most effective in those with substance use disorders. It is also unclear what particular role meditation may have: relapse prevention, motivational enhancement, or promotion of abstinence. Additionally, pharmacotherapy may have a role as an adjunct to meditation practice. No definitive statements can be made at this time, however, regarding meditation's place in the treatment of addictive disorders. Further research needs to be done in order to more properly and conclusively determine its benefits, mechanisms, and limitations.

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TABLE 1

## A Comparison of Practices by Techniques and Mechanisms of Action

Practice	Techniques	Mechanisms of Action <sup>a</sup>
Transcendental meditation	Primarily mantra based (concentrative) with diffuse elements	Spiritual development Restorative effects of the hypometabolic state of parasympathetic dominance Increased coherence of EEG wave patterns, with alpha and theta predominance Dampened emotional reactivity Promotion of neural plasticity Increased perfusion of certain brain regions Increase in GABA
Buddhist meditation	Concentrative, diffuse, and combinations of both, with a significant philosophical component	Spiritual development Restorative effects of the hypometabolic state of parasympathetic dominance Increased coherence of EEG wave patterns, with alpha and theta predominance Promotion of neural plasticity Increased perfusion of certain brain regions Reduced duration of the default network; attenuated cascade of semantic and affective associations Heightened, persistent function of implicated brain regions Dampened stress-induced responses
Mindfulness-based meditation	Primarily diffuse and philosophical	Spiritual development Reduced stress response to certain cues Facilitation of cognitive and behavioral changes Cultivation of better coping skills Promotion of acceptance and extinction of avoidance-based maladaptive behaviors Lateralization of brain activity towards regions (dLPFC) associated with calm, neutral appraisal

<sup>a</sup>The mechanisms enumerated for each type of meditation may not be exclusive to that type and are not necessarily exhaustive; they merely represent the mechanisms that have been studied. The mechanisms of mindfulness-based meditation, for example, reveal a psychological orientation because they have been primarily studied in that context, but there may be other, more biologically based mechanisms that further research may reveal.

**TABLE 2****A Comparison of Treatments Incorporating Mindfulness-Based Meditation**

<b>Treatment</b>	<b>Description</b>	<b>Mindfulness-based components</b>	<b>Applications</b>
Mindfulness-based stress reduction	Manualized Class based and didactic	Mindfulness training exercises, including meditation	Chronic pain Stress management
	Brief		Sadness and anxiety associated with chronic medical conditions
Mindfulness-based cognitive therapy	Manualized Class based and didactic	Mindfulness training exercises, including meditation	Prevention of depressive relapses
	Significant cognitive therapy component Brief or long term		
Dialectical-behavioral therapy	Manualized Group and individual	Mindfulness training exercises, including meditation	Borderline personality disorder Eating disorders
	Psychotherapy based Brief or long term Significant cognitive-behavioral therapy component		Substance use disorders associated with affective instability
Relapse-prevention training	Manualized Brief or long term	Mindfulness training exercise: “urge surfing”	Substance use disorders
	Psychotherapy based Individual		