

SPECIAL ISSUE

The Mindfulness Imperative: How the Pedagogical Principles of Mindfulness Provide the Foundation for Biofeedback

Brad Lichtenstein, ND, BCB^{1,2}

¹Bastyr University, Seattle, WA; ²The Breath Space, Seattle, WA

Keywords: biofeedback, mindfulness, meditation, self-regulation, nonjudgment.

Mindfulness is everywhere, from the cover of TIME magazine to segments on every major news network. With such popularity in mainstream culture for mindfulness, it was only a matter of time before psychology embraced the approach by offering a burst of mindfulness-based therapies, such as mindfulness-based stress reduction, mindfulness-based cognitive therapy, and mindfulness-based eating awareness therapy. These approaches claim mindfulness as a central theme, yet debate has grown over the role of mindfulness in psychotherapy and biofeedback, and there is growing concern about secularizing a philosophy originating in Asia over 2,000 years ago. This paper will define mindfulness from both traditional and modern perspectives, review the skills and practice of mindfulness, examine the connection of mindfulness and health, and show how, as a process, mindfulness is incorporated in virtually most forms of psychotherapy as well as biofeedback training.

Historical Origins and Terminology

Mindfulness

The term *mindful* can be found in the English language as early as the 14th century, and denoted *attention, being cautious, careful, and paying heed*. In the 16th century, the word *mindfulness* became synonymous for *attention, awareness, and memory*. The connection of mindfulness with Buddhist philosophy and practices can be attributed to the British civil servant turned Buddhist and Pali scholar, Thomas William Rhys Davids (1843–1922), who used the word *mindfulness* for the translation of the Pali word, *sati*. Rhys Davids struggled to capture the essence of this concept, initially using terms such as *remember, recollection, and memory*. This “remembering” did not mean past events, but pertained to the continual, ongoing remembering of the present activity with which one was engaged, or

present moment recollection. The term *mindfulness*, however, was eventually adopted as the accepted translation, and became the basis upon which this modern movement has been built (Shonin et. al., 2015).

Modern conceptualization of mindfulness has evolved well beyond the original meaning. Kabat-Zinn (2003), developer of mindfulness-based stress reduction (MBSR), describes it as “awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment” (p. 145). Bishop and colleagues (2004) define mindfulness as “nonelaborative, nonjudgmental, present-centered awareness in which each thought, feeling, or sensation that arises in the attentional field is acknowledged and accepted as it is” (p. 232). Grossman, Niemann, Schmidt, and Walach (2004) state that mindfulness is “dispassionate, nonevaluative and sustained moment-to-moment awareness of perceptible mental states and processes” (p. 36).

When conceptualized as a process, several core aspects of mindfulness can be identified, many of which are present in varying degrees in many forms of psychotherapy. These include:

1. Self-regulation of attention
2. Present-moment focus
3. Nonelaboration
4. Nonjudgment
5. Tolerance

Self-Regulation of Attention

Mindfulness is not a trait or set of exercises; rather, it is a state (Davis & Hayes, 2011). Practices such as meditation, tai chi, and yoga can, however, induce this state. These practices must be repeated in order to achieve any degree of mastery. Mindfulness trains cognitive capacity, and

strengthens concentration and sustained focus. An object of attention, or anchor, is specifically chosen. By continually returning the mental processes to the anchor, one strengthens cognitive flexibility and the capacity for self-regulation. With ongoing practice, this state can be cultivated with a variety of intentions from relaxation to coping.

Present-Moment Focus

The anchor for self-regulation is the immediate experience arising within the here-and-now. When attention drifts away from the anchor, one reminds oneself to shift focus back to present moment phenomenon, and this reminder can be either internal or external in origin. Internal objects of attention originate from within and pertain to bodily sensations (pressure, temperature, vibration, numbness) or thoughts (*I am bored, this is silly, when can I move*), whereas external phenomena arise from outside the individual (sounds, sights, and smells). In either case, attention is directed back to one's experience of the phenomena—sensations and cognitions arising in this moment. Breath awareness, a staple of Vipassana meditation, instructs the meditator to remember the experience of breathing happening in current time—temperature changes at the nostrils, sensation of air in the trachea, movement of the ribcage or abdomen. Thus, mindfulness aids in the development of interoceptive attention to visceral bodily sensations.

Nonelaboration

Elaboration is the process of thinking and rumination. These ongoing cognitions occur after phenomena are experienced, and involve “thoughts about the sensations” or “thoughts about thoughts,” and move attention away from present moment focus. Mindfulness training facilitates insight into the true nature of an experience by uncoupling these layered cognitions. Mindfulness training is not thought suppression. Whatever arises in the perceptual field is acknowledged. Once observed, the anchor is remembered, and present moment attention is restored.

Nonjudgment

Modern definitions of mindfulness incorporate the concepts of acceptance and nonjudgment, hallmarks of Buddhist ethical and moral principles, yet not explicit in the original term, *sati*. An aspect of nonelaboration, nonjudgment is an orientation strategy of openness, wonder, and curiosity, as experiences are accepted and embraced. Nonjudgment leads to freedom from suffering, which is different from pain. Pain is comprised of base physiological and psychological

sensations. We suffer when thoughts judge phenomena as “good” or “bad.” This, in turn, leads to craving more of the good experiences, and resisting the bad ones. We become *attached*, or *habituated*, to these cravings and aversions through repeated rumination and comparison when one desires a different experience than the one currently happening. This creates an internal conflict and struggle between the present moment and some idealized state, which may or may not come to be.

Trends in psychotherapy have begun to address the importance of acceptance as a necessary condition before working on change.

Tolerance

The more the capacity for mindfulness develops, the greater the ability to tolerate unpleasant phenomena. Distress arises when the mind and the body, and their subsequent cognitions and sensations, are labeled as unsafe. Behaviors are then employed to avoid or distract from perceived threat. Mindfulness can be likened to exposure therapy, in which unpleasant and painful thoughts and sensations are continually and nonjudgmentally observed. Over time, desensitization and tolerance builds, reducing emotional reactivity (Linehan, 1993a, 1993b) and forging a new relationship with our thoughts. Thoughts can be understood as distinct from reality, and thinking a thought no longer means it is true. The cognition “I am unlovable” is merely a thought, and may be separate from any actual phenomenon. Furthermore, judging a situation, sensation, or thought as bad, dysfunctional, or unsafe, facilitates an emotional experience (fear), which may or may not be grounded in actual threat.

In the experience of pain, for example, mindfulness practice attends to the sensations arising in the body (e.g., pain in right foot) as the anchor. Attention may drift from sensation to rumination, from pain to judgments about the pain (*I've had this pain for an hour, it won't stop, nothing is working, this pain will last forever, I feel afraid of this pain, I need it to stop now*), or judgments about the judgments (*I shouldn't be stressed as it will make it worse, I need to let it go*). With practice, returning one's gaze to pure sensations becomes easier, and insight into the true nature of the phenomenon develops once elaborative judgments (e.g., dull, throbbing, burning pain that increases and decreases in intensity is present) fall away or are no longer given audience.

Additionally, accepting pain, without physically or mentally bracing against it, disempowers the habituated link between narrative and physiology, and increases tolerance. This differs from cognitive-behavioral therapy

(CBT) in several ways. For one, thoughts are no longer judged as rational or irrational, as in CBT. When the emphasis of therapy centers primarily on change, individuals with less ego strength and resiliency may internalize this goal as criticism and weakness. Therefore, rather than focus on changing so-called dysfunctional patterns of thinking and behavior, these are acknowledged and accepted as reality of the present moment experience.

Mindfulness-Based Interventions

Michael Baime, the Director of the Penn Program for Mindfulness at the University of Pennsylvania, stated that “trying to understand mindfulness by its definition is like trying to understand what it is like to fall in love by reading a textbook. You might get a general idea, but you’d be missing out on the best part: what it actually feels like” (M. Baime, personal communication, June 16, 2016). At its very foundation, mindfulness is a subjective experience, yet with its increasing popularity in use from a coping strategy to approach in psychotherapy, the desire to mechanize it has increased exponentially.

One main criticism of the secularization of mindfulness is its use as a means of achieving a particular outcome, such as improved immune function, stress release, reduced blood pressure, or increased cardiovascular function. By definition, mindfulness involves acceptance of the present moment condition rather than attachment to any particular future outcome. In other words, the goal of mindfulness is mindfulness. Rather than researching the use of mindfulness to induce change, a more aligned approach might be to observe the effects that arise from practicing nonelaborative, nonjudgmental, present moment focus of attention. That said, mindfulness-based or mindfulness-informed psychotherapeutic approaches designed for specific conditions, such as depression or eating disorders, have been increasingly and successfully incorporated into psychotherapy, including acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999), mindfulness-based cognitive therapy (MBCT; Segal, Williams, & Teasdale, 2002), mindfulness-based relapse prevention (MBRP; Witkiewitz, Marlatt, & Walker 2005), mindfulness-based eating awareness therapy (MBEA; Kisteller & Wolever, 2011), mindfulness-based art therapy (MBAT; Monti et al., 2006), and dialectic behavior therapy (DBT; Linehan, 1993a, 1993b).

Self-Regulation Through Mindfulness

The historic intention of *sati* was not relaxation or stress reduction, but rather insight and enlightenment, which stands to reason, given its Buddhist origins. A mindful state

may induce relaxation, yet at other times might be activating. Regardless, the practice emphasizes acceptance, not change.

Engaging in self-regulation of attention is a choice, and intention for practice correlates with outcome. Shapiro, van Gordon, and Singh (1992) discovered that the intention of meditators moved along a continuum from self-regulation to self-exploration to self-liberation. When the intention was self-regulation, this was achieved. The same was seen for the other intentions. Mindfulness “skills” can be used in many situations, and research has demonstrated the benefits of mindfulness-based interventions (Davidson et al., 2003, Siegel, 2007).

Mindfulness plays a central role in most psychotherapeutic interventions seeking to regulate affect and improve emotional awareness (Martin, 1997). Strategies include teaching self-regulation of attention in order to reduce anxiety, and nonjudgmentally examining ruminations and perseverations. Rumination and perseverations may be the mechanism by which repeated, dysfunctional physiological activation occurs (Verkuil, Brosschot, Gebhardt & Thayer, 2010), resulting in poorer health, increased heart rate, lowered heart rate variability, increased cardiovascular disease, and poor sleep (Brosschot & Thayer, 2006, 2007). Paul, Stanton, Greeson, Smoski, and Wang (2013) hypothesized that mindfulness skills may reduce vulnerability to depression by reducing rumination and negative bias. A study by Goldin et al. (2013) comparing MBSR to aerobic activity in anxious individuals suggests that self-regulation of attention might be the psychological mechanism that leads to reduction of anxiety.

In addition to emotional regulation, mindfulness has shown promise in altering physiological and neurological function. Davidson et al. (2003) found an increase in both immune function (increased antibody production in response to flu vaccination) and brain function (increased left-sided anterior activation in areas associated with positive emotions) in 25 healthy participants after participating in an 8-week mindfulness course. Holzel et al. (2010) followed 26 participants through an 8-week MBSR course and showed that participants reported significantly less perceived stress, a finding that correlated with a decrease in right basolateral amygdala gray matter density. Zeidan et al. (2011) found a 57% reduction in pain unpleasantness, compared to 40% reduction among controls, together with reduction of pain-related activation of contra lateral primary somatosensory cortex (the receptive center for sensory awareness of tactile stimuli) after only four days of mindfulness meditation training. A nonrandomized controlled study evaluated the effect of MBSR on immune

function, quality of life, and psychological coping in women recently diagnosed with breast cancer. Results showed that women who participated in the MBSR intervention had reduced levels of stress hormones, better immune system biomarkers, improved coping skills, and better quality of life (Witek-Janusek et al., 2008).

Mindfulness, therefore, is a self-regulation and orientation strategy that improves health and wellbeing. Mindfulness is an approach of engaging with both the internal and external world. It provides a methodology to decrease rumination and let go of unwanted and disturbing experiences by focusing on the present experience. This, as we can see, impacts the neuroendocrine and immunological systems, directly affecting health and wellbeing.

Mindfulness and Biofeedback

Since awareness is the first phase of biofeedback, one can posit that mindfulness is vital in biofeedback training. Olson (1998) states that “The objectives are to help persons develop greater awareness and voluntary control over their physiological processes that are otherwise outside awareness and/or under less voluntary control, by first controlling the external signal, and then by the use of internal psychophysiological cues” (p. 29). Mindfulness training, without equipment, is a method for creating internal awareness (feedback) of habituated, patterned cognitive processes, sensations, and behaviors. Based upon awareness, one then practices nonjudgmentally remembering the present moment, freeing one from conditioned mental patterns that foster suffering.

Purists who believe that biofeedback requires the client to learn to alter physiological processes through stimuli from outside of themselves, such as a video screen or sound system, may not agree with including mindfulness as a basic component to biofeedback training. However, this approach raises several questions. First, would verbally expressed observations from a therapist or trainer regarding posture, muscular tension, or breathing rate of a client be considered biofeedback? If not, does this suggest that a trainer’s dialogue and coaching have little impact on the learning process? As a physician who practices physical medicine, I use touch stimulus as feedback for patients to alter physiological function. Are such manual methods biofeedback? The feedback signals from internal awareness and manual methods are obviously not amplified, but nonetheless they result in awareness, control, and generalization. Without machinery, learning and conditioning still occur.

Second, are the in-person sessions using equipment or the home practices frequently performed without equipment

primarily responsible for self-regulation and mastery? Equipment-aided training provides a level of psychophysiological awareness impossible for many to replicate through mindfulness skills or verbal and physical feedback from a trainer. Biofeedback equipment can ensure the adjustments the client makes are functional and in the proper direction of training. Unless the client has psychophysiological monitoring devices for home practice (which are on the rise with smart devices), the client is asked to practice a skill, and this requires mindful monitoring. In this author’s opinion, much of the biofeedback literature is silent on home practices and the psychological processes involved.

Finally, biofeedback training involves educating patients about the impact of effort. Patients are reminded, *and shown*, that the harder one tries, the less autonomic balance or relaxation is achieved. Thus, a mindful approach is required. Judgment while training and practice leads to tension and struggle, and acceptance fosters a reduction of effort.

Conclusion

Mindfulness is a state that requires training, and the process can be operationalized. Biofeedback offers direct and specific insight into psychophysiological responses that may be imperceptible to the untrained client. However, with practice, and as instrumentation is used less and less, the mind and body become skilled at awareness, a skill that itself can become more generalized. Therefore, mindfulness could be considered the foundational stage of any biofeedback training.

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Brad Lichtenstein

Correspondence: The Breath Space, 111 West McGraw Street, Seattle, WA 98119, email: doctorbrad@thebreathspace.com, Website: www.thebreathspace.com.