

SPECIAL ISSUE

Biofeedback, Meditation, and Mindfulness

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Biofeedback has its beginnings in research conducted on yogis and Zen masters decades ago. Research shows the pervasive positive impact that meditative and mindfulness practices have on individuals. Mindfulness-based practices have been taken out of their broader contexts—extracted from deeper systems of yogic and Buddhist disciplines. Clinicians need to be aware of the unintended consequences of divorcing these practices from their original systems. Biofeedback, meditation, and mindfulness training share important techniques for effecting positive changes.

Introduction

I came to the field of biofeedback in the late 1990s after decades of study and teaching various forms of meditation and mindfulness. In addition to years of training in ashrams and meditation centers in the West, I had also spent nearly 3 years in India training to become a monk, a *sannyasin*. I have also practiced for more than 20 years in the Buddhist tradition. My training in clinical psychology and Jungian depth psychology has given me a good foundation for translating back and forth between Eastern and Western paradigms.

While teaching meditative skills to individuals from around the world, I noticed that a significant percentage of people struggled with acquiring these skills and often gave up. Others practiced diligently for years but complained that they weren't getting the benefits of meditation they had read about—the profound states of relaxation, a quieter mind, or markedly less tension in their body. It seemed like they were missing an inner feedback loop that would allow them to readily change states, both physiological states and states of consciousness. In my search to find an effective means for teaching my students meditation I discovered biofeedback excelled for imparting many related skills.

The Roots of Biofeedback

I was delighted to discover that biofeedback had its roots in research done with yogis and Zen masters back in the 1950s and 1960s who demonstrated control of autonomic functions that Western medicine at the time thought was impossible. Now we are training people with a wide variety

of biofeedback and neurofeedback modalities that offer extraordinarily positive results affecting numerous disorders. I recommend that people read Elmer and Alyce Green's book *Beyond Biofeedback* (Green & Green, 1989) to learn about where it all began and their pioneering efforts, which included lugging large bulky physiological recording equipment into the field in India to measure what was happening with yogis as they did their practices. Their research on Swami Rama, who they had brought back from India to their labs at the Menninger Foundation, allowed our field to make quantum leaps forward in understanding the remarkable levels of self-regulation the human mind-body instrument can accomplish. Some of the leaps they made left the materialist medical and research fields shaking their heads in denial. This happened when Swami Rama demonstrated that he could move a physical object at a distance by using only the force of his mind! That demonstration is something that many people still find difficult to confront.

Meditation, Mind, and Body

In 2001 I began teaching seminars entitled the *Science and Art of Meditation*, drawing on the burgeoning research evidence of the effects of meditation on the body, brain, hormones, thoughts, emotions, anxiety, depression, happiness, stress resistance, health, use of medical care, and more. Meditation was becoming mainstream, and now it is. Articles on its health benefits appear in the *Wall Street Journal*, *Newsweek*, *Time*, and *U.S. News & World Report*.

David Brooks, a conservative columnist for the *New York Times*, wrote about "neural Buddhism" and the impact of all the research coming out on the effects of meditation on the brain (Brooks, 2008). His Holiness the Dalai Lama has vigorously supported scientific research on advanced and novice meditators, especially through the research by Richard Davidson and his team at the University of Wisconsin. They have made numerous valuable contributions to our understanding of neuroplasticity, in addition to helping delineate the correlates of activity in the brain that go with various meditative practices and qualities of awareness such as boundless compassion.

In brief, the research demonstrates that meditation practices substantially impact the brain by

- Altering the EEG output of the brain during meditation, and, over time, in other states as well
- Changing patterns of dominance, excitation and inhibition over whole areas of the brain, including subcortical areas
- Changing the actual physical structure of the brain—prolonged practice has been correlated with increases in cortical thickness in areas of the brain utilized for the practices (Lazar et al., 2005)
- Changing levels of neurotransmitters and hormones, and
- Changing blood flow to areas of the brain during meditation.

These changes have positive effects on mood, focus, empathy, relaxation, sleep, blood pressure, cholesterol, cortisol, serotonin, seizure activity, health, stress reactivity, addiction recovery, and the list goes on and on. What is the meditator doing to produce such depth and breadth of impact?

The Central Role of Attention in Meditative Effects

What it all comes down to is *attention*. No matter what type of meditative practice you are doing, what you're working with is your *attention*. All meditative practices across traditions work with attention, conscious, directed attention. Twenty-five hundred years ago, saying, "As you think, so you become," Buddha showed himself to be one of the first cognitive behaviorists! As you think, so you become, so your brain becomes, so your body becomes, so your mind becomes, so your actions become, so your relationships become, and so your life becomes. Meditation and other self-regulation practices, including biofeedback, empower us to make choices that change our life-long patterns of thinking, reacting, acting, and creating. They all involve *attention*. If we're not attending, then very little change occurs, and we live with layers of conditioning unconsciously determining our lives.

If our client isn't attending to the feedback, then no change occurs. If the meditator is simply sitting and following their mind as usual, then no changes occur. But when we use our conscious attention to focus in specific ways, we can literally resculpt the brain and take hold of powers of consciousness that the great masters of meditative and yogic disciplines demonstrate we are all capable of. Swami Rama was demonstrating only a very minor power when he twice moved the needle on a

compass-like device that was several feet away from him and shielded from his breath or movements by Plexiglas. Action at a distance and consciousness—a nonmaterial phenomenon—impacting matter goes entirely against the fundamental materialist perspective of Western science and medicine. Elmer Green told me it was too unbelievable for the observers, other researchers and doctors, at the Menninger Foundation to believe. They preferred instead the comfort of telling themselves he must have blown on it somehow, as they shook their heads and walked away—though, of course, there was no way he could have physically affected the instrument.

We now see that meditation—acts of conscious attention—affect the material substance of the brain and the entire body. The materialist view says consciousness is a result of matter—the firing of neurons—and reduces consciousness to a side effect of material events. Thus, without the matter, there is no consciousness. Many Eastern meditative traditions approach consciousness and all of material reality very differently. They see consciousness as directly creating matter from consciousness. In fact, in the monistic perspectives there is only consciousness as energy, *chitshakti* in Sanskrit, taking the shape of all forms that are themselves insubstantial. What is surprising is the extent of agreement between such ancient meditative traditions and the perspective of top quantum physicists! Einstein made it clear that there is no such thing as solid matter—it's all energy, $e = mc^2$. He said, "Reality is an illusion, albeit a persistent one."

Einstein's brilliant protégé Sir David Bohm was a leading quantum physicist. He took the next step saying that not only is all matter energy, but all energy has the quality of consciousness. This is exactly what the ancient Shaivite yogis proclaimed was the nature of *chitshakti* ages ago. What varies is the nature and complexity of forms and with these the extent to which the form can manifest inherent properties of consciousness. A snowflake reflects consciousness/energy's ability to manifest form and structure. A simple amoeba is quantum steps beyond the most complex crystals or chemicals or even stars, and with that increased complexity comes more manifestations of consciousness through the life of the amoeba. When we get to the extraordinary complexity of the human brain we have an instrument that uses consciousness to reshape itself.

Jeffrey Schwartz, a research psychiatrist at the UCLA School of Medicine, and Sharon Begley in their book *The Mind and Brain: Neuroplasticity and the Power of Mental Force* (2003) help translate those seemingly impossible notions of the meditative traditions and quantum physics into how practices derived from mindfulness meditation

empower people suffering from obsessive compulsive disorder (OCD) to change their brains in ways that show up very concretely in functional magnetic resonance imaging studies. Schwartz and Begley examine the quantum physics governing the state of neurons and the synaptic space between them where transmission from neuron to neuron occurs. Schwartz demonstrates how through the principles of quantum physics we can understand consciousness effecting material change and empowering the individual to inhibit the potent neural circuits triggered in OCD. The same applies to all of us and our ability to change our brains. We can use meditation and mindfulness, exercising our power of consciousness, to transform our mind, our brain, our life.

Biofeedback engages our same abilities to use our conscious awareness to change the habitual responses of our autonomic nervous system, cortical and subcortical structures of the brain, and heart and endocrine system activity, thus enabling us to be free of patterns and traumas that have unduly diminished our capabilities.

Heart-rate variability (HRV) and respiration training are enormously powerful for teaching mindfulness and down-regulation of the autonomic nervous system. The pioneering work of Paul Lehrer and his colleagues and students at Rutgers University, Maria Karavidas, Evgeny Vaschillo, and others, is beginning to demonstrate the effects of breath and HRV training on major depression (Karavidas et al., 2007). This research shows how to enhance the down-regulating effect of HRV training on the autonomic nervous system by precisely targeting the individual's resonant frequency (Vaschillo, Vaschillo, & Lehrer, 2006). This has close parallels with the ancient yogic pranayama practices of breath control that support meditation. These types of yogic breathing aren't simply the routine ones that you might receive rudimentary training in at a yoga class, but the refined methods that a yoga master would employ in working with an individual student to achieve maximum benefit. Few such yoga masters exist and even fewer in the West.

Principles of Mindfulness

With the accumulating research evidence and attention from the press on mindfulness training it is useful to be familiar with what the practice entails. The basic principles of mindfulness training go back thousands of years. They are the following:

1. *Relax*—breathe and let go, muscles soften and warm, you allow the breath to slow and deepen, effortlessly becoming diaphragmatic.
2. *NOW* awareness—present centered, letting go of past and future.
3. *Attention* training—may be focused on present sensations, flow of the breath, compassion, or other qualities. Open focus, simply aware of the unbounded field of awareness, can also be practiced.
4. *Detached* awareness—cultivating a nonjudgmental, nonreactive view, simply watching without engaging, the eternal Witness.
5. *Open* receptivity—neither pushing away nor clinging to whatever appears in the sky of awareness—simply, dispassionately, letting go and bringing one's attention back to one's focus, e.g., breath, mantra, witnessing, etc.
6. *Awake*—alert to the expansiveness of the field of awareness within which all thoughts, feelings, sensations, memories, fantasies, all things of the mind/body occur.

Mindfulness and Meditation in Their Original Context

These are practiced simultaneously and form the foundational meditative practice of mindfulness. This practice is traditionally embedded in a wider set of practices aimed at the total transformation of one's mind, body, and character. These include ethical training, contemplation, and study for deepening one's wisdom as well as practices for cultivating a loving, kind, and compassionate embrace of all beings. In the context from which it originated, mindfulness training is a foundational practice that may lead to other meditative practices as well. The aim is to become radically free from suffering and to know fully and directly the boundless expanse of what lies beyond the ordinary mind, beyond words and beyond even one's imagination. Buddha's Noble Eightfold Path and Patanjali's codification of the classic eight limbs of yoga are examples of meditation traditions that have this aim. It is important to remember that the effects of meditation that are being researched, as health promoting or life extending as they may be, are all side effects as far as meditation disciplines are concerned. One doesn't meditate to lower one's blood pressure or cholesterol. When we pluck a practice out of the whole context within which it is typically pursued, we are changing many components of these complex systems of practice. This limits the effectiveness of the practice and can even distort its use.

For example, mindfulness meditation is used for peak performance training. What happens when that practice is brought into the military and is then used to train snipers to kill more effectively? The practice comes out of a tradition of total nonviolence and respect for the life of

every creature and conscious being. In the Buddhist tradition this military application has raised debate on whether or not Buddhist teachers should be teaching such skills to the military. Stripped of the teachings and practices related to ethics and wisdom, mindfulness becomes perverted into a practice that causes more bondage and suffering rather than the freedom and relief from suffering that it is intended to produce. We need to be mindful of such unintended consequences of our actions.

Instead of mindfulness being practiced in the fullness of the traditions from which it comes, it is now being used for the very limited purposes of research or clinical practice, and the whole complement of practices from these ancient traditions is reduced to relaxation and cognitive-behavioral stress management skills, basic mindfulness training, and some stretches and body scan relaxation training. Yet even this limited set of mindfulness-based practices for stress reduction has proven very beneficial. It has such enormous power that a randomized controlled trial study of ordinary people doing them for several weeks as a stress management program at work showed changes in frontal lobe activation associated with more positive mood states and strengthening of their immune system (Davidson et al., 2003). They clearly demonstrated that you don't have to leave your job, or become a monk, or move to India to get the important health benefits from mindfulness training.

Mindfulness and Biofeedback

Looking at the basic principles of mindfulness training it is easy to see how these directly apply to many of the forms of biofeedback training we do. By using biofeedback in conjunction with the third principle—attention training—we add the power of biofeedback for helping people stay present-centered and learn to deepen their relaxation, breathing, focus, etc. Accurate feedback enhances all learning and our biofeedback modalities excel at giving steady, clear feedback. Biofeedback therapists wanting to add mindfulness training to their practice must receive training in it so they can teach it effectively and accurately represent their own skill level.

Our field needs to formally study the differences and similarities between training mindfulness and other meditation practices with and without biofeedback supplementation.

This is an extraordinary time of integration of the best training approaches from Eastern and Western self-regulation traditions. We will see increasing numbers of people empowered to live up to their highest potentials. I have found that many people who have no interest in learning meditation are very interested in biofeedback and gain the same initial benefits when taught in a way that unobtrusively integrates the wisdom that the meditation perspectives provide to expand and deepen biofeedback practices.

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