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Running head: EASTERN-INFLUENCED THERAPIES AND STRESS

A Meeting of East and West: Can Eastern-Influenced Therapies be Effective  
in the Treatment of Stress and Mood Disorders?

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## Introduction

In 1979 a conference entitled “Comparative Approaches to Cognition: Western and Buddhist” was set to be held at The Naropa Institute in Boulder, CO. The meeting was supposed to be a ground-breaking meeting of Buddhists, psychologists, neurologists, and other interested that would launch a mutually beneficial relationship between Buddhism and the west. The conference did not play out as expected. The different factions were unable to communicate their ideas effectively with each other and thus began the Buddhism-science dialogue (Boyce, 2005). Eight years later a more successful meeting was held in Dharamsala. This was the first meeting of The Mind and Life Institute (MLI), an organization formed by the Dalai Lama and a handful of western scientists and other academics who were interested in opening a productive dialogue between these different schools. The MLI aims to create a contemplative, compassionate, and rigorous experimental and experiential science of the mind which can contribute to research pertaining to medicine, neuroscience, psychology, education and human development. The 1987 conference focused on cognitive science, the most natural starting point for a dialogue between the Buddhism and modern science. Ideas from cognitive science, including scientific method, neurobiology, cognitive psychology, artificial intelligence, brain development, and evolution were discussed (Mind and Life Institute, 2007).

The institute has taken large strides since that first meeting and now holds yearly conferences in Dharamsala. Additionally, in 2003 a meeting was held at MIT where Richard Davidson, a neuroscientist who is heavily involved with the MLI and the Dalai Lama shared the stage. Davidson quoted the Tibetan spiritual leader’s belief that “the

wiring in our brain is not static, not irrevocably fixed. Our brains are adaptable.’

Applause, even cheers, burst from the audience – not the way a thousand neuroscientists might usually respond to intriguing lab results. It was more like they’d just heard a new declaration of human independence – and maybe they had” (Barasch, 2005).

The research that is conducted by the MLI and the scientists who are members incorporates eastern practices, such as meditation and mindfulness with principals of western science. The practice of meditation is an ancient one that challenges an individual to become acutely aware of their inner state and in doing so the body and mind come to be one entity. Practicing monks who live in monasteries or zendos practice regularly so that meditation, in some cases, can take up the majority of their waking hours. The practice of meditation and mindfulness however, is not something that needs to be extended to such extreme commitment. The general mindset of the east and west differs in one particularly prominent way: the eastern mindset is seen as a more mindful and present focus while the western mindset is generally more linear so that people focus on the past and on goals for the future which removes them from the present (Schwartz, Gulliford, Stier, & Thienemann, 2005).

MLI research has turned up interesting results however when monks who had completed 10,000 or more hours participated in studies; imaging studies showed that monks are capable of altering the structure and function of their brains, presumably, through regular focused meditative practice (Barasch, 2005; Boyce, 2005; Flora, 2005). These findings confirm the Dalai Lama’s declaration that the human mind is not a static entity but can in fact be altered. This property of the brain is known as neuroplasticity and these changes can occur both with and without intention. Neuroplasticity although

most often beneficial can also be harmful and may be induced by any number of factors including injury, expertise, or stress.

Given that the human brain is plastic and that structural alterations have been seen in monks who meditate on a regular basis, the question arises of whether these two facts are actually related. Furthermore, if this is in fact the case, would it be possible to apply these findings to the public? In this paper I will present the different conditions that induce neuroplasticity as well as give an overview of meditation and the ways that it is practiced nowadays. To this end I will argue that if monks are able to alter the structure of their brains and the brain is naturally inclined to heal itself then incorporating eastern-practices, such as mindfulness and imagery, into western therapies could benefit patients suffering from mood disorders and, in particular, stress.

### Neuroplasticity

In 1906 Ramon y Cajal and Camillo Golgi proposed the idea that the human brain was a fixed entity after development, incapable of reparations or alterations; Cajal soon after altered this theory and suggested that maybe learning could induce changes. In 1948 Jerzi Konorski modified this idea further by saying that changes could occur and that these changes were dependent on activity. Then in 1962 neurobiologists at Berkeley showed that behavior and environment could induce chemical and anatomical changes (Boller, 2004). This property of the brain that allows for structural alterations is known as neuroplasticity. This section reviews the technology that is used to chart these changes and the various events that may induce plasticity including increased stimulation, experience or expertise, training, injury, and stress.

### *Technology*

Research in this area has been more productive with the relatively recent availability of technology that allows us to observe the brain of a living person. Magnetic resonance imaging (MRI) uses the protons in the brain to construct fairly high resolution images that are helpful in detecting changes in the brain's structure. Positron emission tomography (PET) scans is used to look at the activity of the brain, as opposed to the structure, by using radioactive chemicals that can be charted as they move through the brain. The most successful advance has been the functional MRI (fMRI) which combines the best features of an MRI and a PET scan to provide an image with temporal and spatial resolution. Through the use of these techniques researchers have been able to observe structural alterations in animals as well as humans.

### *Stimulation Induced Plasticity*

One of the most common places to observe plasticity is in the somatosensory cortex which receives tactile input from the body. Each part of the body has an area of representation which is larger, such as the hands and face, or smaller, such as the legs and chest, depending on the detail of the input that is needed. Elbert, Pantev, Wienbruch, Rockstroh, and Taub (1995) used magnetic source imaging to observe the cortical representation of the left and right hands of nine musicians, including violinists, cellists, and guitarists. The input from the musicians two hands differs greatly because the right hand uses only the bow and the left hand is engaged in pressing firmly down on strings to form the correct notes. It was found that the four digits of the musicians' left hands had larger areas of representation than the left hands of the control subjects who didn't play string instruments; the representation of the musicians' left hands were also larger than

their own right hands. There was also a difference in representation depending on how long a person had been playing their string instrument for, a longer time of playing equated to a larger cortical representation of the left hand fingers.

Similar increases have been found in the representation of the reading fingers of braille readers. Pascual-Leone and Torres (1993) used somatosensory evoked potentials to observe and measure the differences between the regions of the brain that were being used in 15 proficient braille readers and 15 sighted controls who were unfamiliar with braille. The blind braille readers all exhibited larger sensorimotor representation of the reading fingers than the control group. Further research with braille readers has uncovered age differences in the areas that are recruited to aid with braille reading. People with late-onset blindness have the opportunity to use the visual cortex more than those with congenital blindness and therefore have visual memory and experience. With the use of PET scans it was found that greater areas of the visual cortex were activated during braille reading tasks in those with late-onset blindness than in people with congenital blindness (Büchel, Price, Franckowiak, and Friston, 1998)

#### *Experience Induced Plasticity*

Maguire, Frackowiak, and Frith (1997) used PET scans to look at the brains of London taxi drivers to see whether there were alterations due to the need to memorize detailed city layouts; training for the occupation takes upwards of 2 years and the drivers refer to learning the routes as acquiring “The Knowledge.” Research has shown that the volume of the hippocampus increases in small mammals and birds that use their spatial memory, such as in food storage or migrating (Lee, Miyasato, & Clayton, 1998). This experiment found similar results with the taxi drivers who had more highly developed

hippocampi, particularly the right hippocampus, than controls. It was found that the drivers who had been in the profession longest had the most developed hippocampi. They also showed that the right hippocampus specifically is activated during complex navigation tasks.

#### *Training Induced Plasticity*

Kolb, Tomie, and Ouellette (1995) trained mice to perform a reaching and a pulling task for food. Some mice were trained to reach into a tube to retrieve food using the same paw each time and other mice were trained to pull up a string using both paws in order to obtain food. There was also a control group of mice who merely received exposure to the training platform each day. When the brains of the mice were analyzed it was found that mice that had been trained in the pulling task had a 15% increase of dendritic material in the representational area of the forelimbs in both hemispheres. Similarly the mice that were trained in the reaching task showed a comparable increase of the forelimb area in the hemisphere opposite the reaching paw (Kolb, 1995).

#### *Injury Induced Plasticity*

Monkeys have proven to be useful models in plasticity experiments, allowing experimentation with injuries. Merzenich and Jenkins (1993) conducted a series of three experiments that looked at the effects of severed nerves, loss of a finger, and constant stimulation of two fingers. In the first experiment they severed the nerve of the thumb and first finger of a monkey. Shortly after severing the nerves the areas on the somatosensory cortex representing those fingers became unresponsive and roughly five months later that area had been taken over by the dorsal surface. In the second experiment middle finger of a monkey was surgically removed. This resulted in the expansion of the



two adjacent fingers so that the area previously held by that finger on the cortex was entirely taken up by the two other fingers. The final experiment used a stimulus disk that spun constantly while a monkey held his second and third digits against it with food rewards as an incentive. After several weeks they saw an expansion of the cortical areas of those two fingers so that they were larger and now occupied some of the space previously held by the adjacent digits. These three experiments provide a demonstration of the conservational nature of the brain's plasticity.

### *Stress Induced Plasticity*

While the above examples are beneficial instances of neuroplasticity there are less adaptive aspects as well. One example of this is stress-induced plasticity which results in structural changes in the hippocampus as well as other behavioral and physiological alterations. The primary reaction to stress is activation of the hypothalamo-pituitary-adrenal axis (HPA) which elevates the level of glucocorticoids which are modulators of cell physiology and behavior. It's been shown in animal models that while the HPA axis is necessary for beneficial stress reactions, the constant activation of it is detrimental; the constant presence of glucocorticoids is problematic, particularly in the hippocampus, and results in dendritic atrophy (Fuchs & Flügge, 1998). One stress-induced syndrome that is being looked into is burnout. Most people are familiar with the stress demands at school or work can bring and the accompanying fatigue and mild depression. Eriksson and Wallin (2004) formed a theory that altered brain plasticity in stress related syndromes, such as burnout, is in part due to the failure of hippocampal neurogenesis. Neurogenesis is the process by which neurons are made and they believe that neurogenesis is inhibited by constant stress. Another factor in the decrease of neurogenesis is age but it's been

suggested that by inhibiting the glucocorticoid action on neurogenesis the age induced decrease may be reversed (Kuhn, Dickinson-Anson, & Gage, as cited by Eriksson & Wallin (2004).

Stress can even take a toll during fetal development; if a mother experience episodes of stress during pregnancy the offspring may experience neural, behavioral, and hormonal alterations. Coe (2003) examined this effect in Rhesus Monkeys by stressing pregnant monkeys daily during the 24-week gestation and then evaluating the hippocampal volume, dentate gyrus, and cortisol levels of the offspring when they were 2 or 3 years old. It was found that prenatal stress increased cortisol levels which increased HPA activity thereby causing a decrease in hippocampal volume and inhibiting neurogenesis in the dentate gyrus. These effects are not just deficits that manifest themselves after birth and are then repaired, they have the potential to effect cognitive functions later in life just as other early life stressors can.

Another way that the brain is impacted later in life is via early-life stress (ELS) which typically consists of either sexual or emotional maltreatment or parental loss in the most salient cases but can also be caused by chronic illness, dysfunctional relationships, or poverty among other factors. ELS can deteriorate proper hippocampal functioning which can lead to learning and memory deficits. The majority of these deficits result from increased levels of glucocorticoids which results in excitotoxicity. Interestingly, the effects of increased glucocorticoids caused by events early in life are often not seen until adulthood and later. Hypotheses as to why this is include the possibility that the early stressors are not significant enough to cause drastic changes immediately but that they make the hippocampus more susceptible to changes later in life or, that perhaps the

changes caused by early-life stress set the neural systems related to stress on an abnormal developmental path (Brunson, 2005). Alterations in the neuroendocrine and neurochemical systems caused by ELS have also been linked to depression. Kendler, Neale, Kessler, Heath, and Eaves (1992) used a twin study to show that ELS brought on by loss of a parent due to separation increases the risk for major depression later in life. They also concluded that depressive episodes in adulthood are exacerbated by stress which supports the hypothesis that ELS makes individuals more susceptible to ongoing stress later in life. This is not to say that all persons suffering from depression experienced ELS but the connection is interesting because it points to one root of depression and also raises interesting implications for the treatment of ELS and depression. It is possible that ELS affected depressive patients may respond to treatments that differ from non-ELS patients (Heim, Plotsky, & Nemeroff, 2004).

### Meditation

Another instance of what could be considered neuroplasticity due to expertise has been demonstrated in monks who have practiced the art of meditation for over 10,000 hours through their lifetime, the generally accepted number of hours required to qualify as expertise. Matthieu Ricard, a European-born Buddhist monk, recently participated in studies at University of Wisconsin where he was scanned in an fMRI while performing a compassion meditation. In this meditative state there was significant activity in the left frontal gyrus, an area associated with joy and enthusiasm. In another University of Wisconsin study, Ricard's brain state during this compassion meditation was compared to 150 other people's normal brain states and Ricard's reading showed the most extreme activation of the positive emotion center in the brain ever recorded (Barasch, 2005).

Along similar lines, research has examined the brain activity of Buddhist monks who have spent at least 10,000 in a meditative state. In a resting state, not during meditation, activity in the left side of the brain far exceeded activity in the right side of the brain where negative emotions and anxiety are centered (Flora, 2005).

Ricard also participated in a study that tested his startle reflex in comparison to others'. Subjects were given a warning that after a countdown from 10 they would hear a loud noise, similar to a gun firing near your ear, and even with this warning and countdown subjects were never able to suppress this startle reflex. Ricard, however, was able to minimize any sign that he had been startled by the noise; Ekman commented that he didn't think it was possible to stifle such a primitive and fast reflex (as cited in Boyce, 2005). Although these studies demonstrate the skills of experienced meditators effects can still be seen in those with less experience as well. In this section I provide a background of meditative practices, some applications of these practices and introduce a broader picture of what may be hoped for from learning said practices.

### *Different Exercises*

The meditative methods discussed in this paper will be Buddhist meditations and more contemporary practices that are derived from Buddhist meditation. One of the central concepts of Buddhist meditation is mindfulness. Our western culture involves very goal-oriented future thinking and this is, to a great extent, what brings stress into our lives. Eastern thought is non-linear present thinking that grounds people in the present. The corollary Buddhist practice is mindfulness. Mindfulness promotes a lack of judgment, instead of reacting to everything as we normally do, placing a label on it of "good" or "bad" we need to learn to not claim everything as ours and instead observe our

experiences. The practice of mindfulness should be applied to meditation but even more so it should be applied to daily living. Practicing mindfulness during meals, while you get ready in the morning, or while you walk to class is a great place to start and will help in further meditative practices (Kang & Bucknell, 2006).

The most basic Buddhist meditation is mindfulness of breathing which develops mental discipline, cultivates relaxation, and leads to better concentration. This meditation is done simply by sitting in a comfortable position with your eyes closed and counting your breaths up to thirty. Avoid manipulation of your breath, breaths should just be counted and allowed rise and fall naturally. Attention and focus should also not be dealt with harshly, if attention strays just bring yourself back to the breath and begin counting again from one; similarly if thoughts come up, acknowledge that they have come then let them go just as peacefully. It is recommended that mindfulness of breathing be practiced once a day for 15 minutes to begin with and eventually to work up to 45 minutes a day (Kang & Bucknell, 2006).

When you first begin to meditate it may be helpful to practice guided meditation; this is meditation lead by someone who is more experienced. A guided meditation allows you to focus completely on the meditation and not have to think about what the next proper step is. There are a wide variety of guided meditations, or guided imagery, and these have proven to be particularly helpful if you want to try meditation practices with children. The wave meditation instructs meditators to imagine they are on a wave, riding up and down with their breath and tells them to think about what they see and how they feel. The circle and dot meditation involves concentrating on the spot between your eyes then placing a dot there with a circle around it; then you imagine you are the dot and the

circle is the world and you observe the individual colors until the dot expands and becomes one with the circle. The white light meditation directs the meditator to picture a waterfall of white light that cascades over them and enters their body and to focus on the white light and how it feels. A final guided meditation is the energy meditation which takes the meditator through each part of the body, starting from the toes and moving up to the top of the head, instructing them to focus on each part of the body and to feel them then to feel them disappear into light. Then at the end, when the body has disappeared, you are told to go into the real you, the you that exists without the body (Murdock, 1978).

### *Applications*

One example of the applications of meditation was presented by Murdock (1978) who introduced the practice of meditation to her kindergarten classroom. She had recently taken up meditation herself due to personal stress and enjoyed it enough that she introduced it to her 6 and 8 year old who also took to it. Due to her success with her children, Murdock thought that her students may benefit from the practice as well as possible benefits for classroom relations. Over the course of the school year she saw changes in the social interactions of the children and saw that they exhibited more consideration than most children of that age. Some parents brought the practice into their homes, and in some cases this idea was proposed by the child. Their meditations were referred to as “quiet time” so as not to attach a stigma to the practice. The daily sessions began with breathing, followed by either a muscle tensing and relaxing exercise or a guided meditation.

In the paper, Murdock discusses two concerns that often arise in meditation. The first is that meditation can appear to be such a solitary practice that it seems like it may

divide a group, especially one such as a classroom that already has a variety of social challenges. To this Murdock replied that meditation more often leads to a centered-self as opposed to self-centeredness. This means that through meditation you are able to become more aware of ourselves and our interactions with others which ultimately leads to more respect and awareness for how we impact those around us. The other concern is one of results. People are often put off by the fact that after a week of meditation they can't see any results or tell a difference. While Murdock was correct in saying that it is a matter of time and you must be patient, Davidson & Harrington give a more thorough and informed response to this complaint:

Buddhism teaches that although meditation requires formal periods of practice, its purpose is to acquire mental abilities that are valuable insofar as they manifest in everyday life. The long-term effects in question are mental traits that may have profound implications for mental health and education, and these are distinct from any more fleeting unusual mental states that are achieved during actual meditation practice, however intriguing such possible states might be. (pg. 6)

This caveat is not meant to say that unique states of mind may not be reached through meditation, the contrary is demonstrated at the beginning of the meditation section, it is only meant to warn that meditation should not be pursued with such goals in mind. That said, only time will tell what practices will surface as truly beneficial, but in the meantime the practice of mindfulness is something that everyone would benefit from. As demonstrated in the next section, the simple act of taking time to sit down and be mindful of one's breath is being incorporated into an increasing number of therapies as a means of tempering the extreme stress that can accompany work, family gathering, or monetary trouble that loom in the future.

## Therapies

Just as mindfulness is a cornerstone of meditation, it is a key element to the therapies discussed in this section; the meditative influence on these practices is evident in the emphasis on mindfulness, self-awareness, and the practice of not passing judgment on thoughts or situations. The application of mindfulness is particularly important in times of stress; instead of trying to ignore the situation or responding mindlessly, the aim is to have patients be present in the moment which can allow them to respond consciously and rationally (Teasdale, Segal, & Williams, 1995). A similar concept that is equally important to these various therapies is metacognitive awareness, or meta-awareness. This state of awareness “describes a cognitive set in which negative thoughts and feelings are seen as passing events in the mind rather than as inherent aspects of self or as necessarily valid reflections on reality” (Teasdale, Moore, Hayhurst, Pope, Williams, & Segal, 2002, p. 285). These therapies can all generally be said to have a cognitive therapy base which essentially implies that patients are helped to reassess the validity of their thoughts so as to replace negative thoughts with more positively realistic thoughts (Moore, 1996). Because of the cognitive nature of these therapies they are able to treat the psychological aspects of affective disorders but they do not address the physiological side of the disorders and as far as we know there are no structural changes that occur in the brain as a result of any of these therapies. These therapies are therefore most often used in conjunction with pharmacotherapy, in the event that pharmacotherapy is ineffective, or as a mode of relapse prevention when the patient’s disorder is in remission.



*Cognitive Therapy (CT)*

The specific cognitive processes which underlie the effects of CT are unclear but there have been a number of hypotheses have been posited. One theory is based on the assumption that major depression is due to particular underlying dysfunctional attitudes and assumptions, especially those related to self-worth based on approval or others. In this case it is hypothesized that by practicing CT patients learn to change the cognitive sets of attitudes associated with depressive episodes. This means that they learn to respond to depressive episodes and problematic or stressful situations in a productive way instead of recoiling from them. Another hypothesis is that while CT may not decrease the instances of depressive episodes significantly, it provides patients with a means of coping with these episodes (Teasdale, Scott, Moore, Hayhurst, Pope, & Paykel, 2001).

A recent element that's being explored is a shift of patients' cognitive set, known as "decentering" or "disidentification," which means that patients learn to dissociate themselves from negative emotions and thoughts so that they may see them on a larger scale awareness. This larger awareness additionally prompts patients to alter the view that bad events are caused by an internal, stable, global cause. When this feeling of uncontrollability arises in patients it can lead to a feeling of "depression about depression" but in this decentered state a patient is metacognitively aware and more capable of remaining removed from a depressive episode (Teasdale, Moore, Hayhurst, Pope, Williams, & Segal, 2002).

*Cognitive Behavioral Therapy (CBT)*

The methods used in CBT draw on behavioral modification as well as CT and takes into account individual conceptions of reality and social cognition (Beck &

Fernandez, 1998). In this approach a therapist and a client work together to identify and understand the patient's problems in terms of thoughts, feelings, and behaviors and replace negative cognitions with a positive feeling. A "here and now" frame of mind is applied in combination with behavior theories, such as learning theory, so that productive reactions to difficult situations may be constructed so as to reduce avoidance behavior which may perpetuate problems and worsen situations. Once these reactions or solutions are constructed between the patient and the therapist, the patient is ideally able to retain the skills they learned in therapy and apply them on their own in the future. It is this skill acquisition that is essential because it allows a patient to feel confident that they are able to manage problems on their own (Grazebrook & Garland, 2005).

Research has shown that, in some cases, CBT can be just as effective in treating depression as medications although different mechanisms underlie the recovery. Goldapple, et al. (2004) compared the brain activity in depression patients before and after treatment, some participants received Paxil others completed 15-20 sessions of CBT. All subjects experienced a lifting of their depression, but upon inspecting the PET scan it was shown that the two conditions produced opposing results. Patients who took Paxil had increased activity in their frontal cortex, where analysis and higher thought occurs, and decreased activity in the limbic system, which is the emotion center; patients who participated in CBT showed the reverse effects. These results point to a unique mechanism in CBT and further research building on these findings could turn up an explanation of what makes CBT and other therapies work.

*Mindfulness-Based Cognitive Therapy (MBCT)*

This therapy was originally referred to as Attentional Control Training but was renamed. As the name Attentional Control Training implies, MBCT essentially teaches patients to be aware and approach situations with intentionality as opposed to moving through life on auto-pilot. This therapy doesn't encourage patients to replace negative thoughts with positive ones as CBT does but instead encourages mindfulness. Patients are instructed to just be mindful of their negative feelings, just as one would be mindful of one's breath; you should allow the negative thoughts to proceed as they will, observe them as they come and go. This therapy takes the stance that perhaps the urgent need to push away undesired feelings only worsens the existing negativity. Additionally, the practice of decentering that is seen in CT is applied in this therapy (Teasdale, Segal, Williams, Ridgeway, Soulsby, & Lau, 2000). Ma and Teasdale (2004) tested the efficacy of MBCT with recurrent depressive patients by randomizing treatment as usual (TAU) and TAU plus MBCT. They found that in 55 patients with at least 3 previous episodes of depression the relapse in patients treated with TAU plus MBCT was reduced from 78% to 36%. They found that MBCT was most effective in patients with at least 3 previous depressive episodes and in patients who experienced their first episode before adulthood.

*Acceptance and Commitment Therapy (ACT)*

Similar to CBT, ACT derives its effectiveness from empowering patients with the ability to take control of negative situations they previously felt were out of their control. ACT diverges from CBT however in that it does derive this control by altering or correcting a patient's cognitions but instead by changing a patient's relationship with their cognitions, thoughts, and feelings. Through the use of acceptance strategies,

experiential exercises, and mindfulness practices patients ultimately learn how to live a more flexible and care-free life. This is one of the more flexible therapies both in the practices used and how they vary greatly with the therapists and patients, but also because this therapy provides a novel way view of previously intimidating situations ultimately allowing the patient a more care-free and enjoyable existence. ACT, however, is a much newer therapy and research is still being conducted so that empirical evidence can be gathered to support the use of this therapy (Guarna, 2006).

### *Imagery*

A final emerging branch of therapy is imagery which typically consists of a person visualizing either moving a limb that is currently injured or the body overcoming a current ailment. This practice is similar to guided imagery in meditation where the body can be pictured in a different form or a person can place themselves in another location. Page (2000) tested the efficacy of imagery in recovering movement in chronic stroke patients, 8 patients participated in a 4 week occupational therapy program and 8 patients participated in this program as well as practicing imagery. Patients were scored on the upper extremity section of the Fugl-Myer Assessment of Sensorimotor Recovery and Page found that patients participating in both occupational therapy and imagery had significantly more improvement in their motor function than those receiving only occupational therapy. Imagery is also commonly used in injured athletes to manage pain, enhance mental toughness, help maintain concentration, and maintain a positive attitude. Imagery can consist of imagining being fully recovered, imagining the pain dispersing, or imagining various positive things to distract from the pain. After interviewing 10 injured athletes Driediger, Hall, and Callow (2006) concluded that imagery as a compliment to

physical therapy was an inexpensive and positive addition that helped to expedite athletes' recovery.

### Conclusion

As seen in the therapy section, there is an expanding body of literature that supports the effectiveness of eastern-influenced therapies which incorporate mindfulness, imagery, and general self-awareness. Although depression, stress, anxiety, and other disorders have a neurological basis that cognitive therapies cannot alleviate, they also all have an emotional or cognitive core. While some hard-nosed western scientists are still skeptical about mindfulness and see it as a flaky approach to medicine (Davidson & Harrington, 2002) others are becoming believers and developing programs based on mindfulness. Jon Kabat-Zinn founded the Center for Mindfulness in 1995 and soon word of his Stress-Reduction Program spread. The program attracts people suffering from stress, anxiety, sleep disorders, chronic illness and pain, and high blood pressure among other things who come with hopes of alleviating their ailments through awareness. The program includes guided meditations to promote mindfulness, group dialogues, daily assignments, and individually tailored instructions (Kabat-Zinn, 2007).

Shapiro, Schwartz, and Bonner (1998) tested the efficacy of a mindfulness-based stress reduction intervention modeled after Kabat-Zinn's program within a highly stressed population: medical and premedical students. Students in this field of study and work live busy lives in a high-stress environment and such levels of stress could be dangerous since it can interfere with memory function and could potentially affect their professional effectiveness. Shapiro et al. recruited 78 participants who were either medical or premedical students and assigned them to either a 7-week mindfulness-based

intervention or a wait-list control group. All participants, including controls, were assessed before the intervention and shortly after the intervention which coincided with an exam period so as to test the efficacy of the intervention during particularly high-stress times. During the first assessment no difference between the experimental and control groups were found but significant differences were found upon the second assessment. The group which had undergone the intervention reported less depression, less state anxiety, less trait anxiety, and an increase in empathy even though both groups were under stress since it was an exam period.

Some preliminary research even supports structural changes induced by mindfulness in obsessive-compulsive disorder (OCD) patients, similar to the meditation-induced plasticity seen in monks. Repeated practice of mindfulness can alter circuitry in the basal ganglia so that positive practices could be evoked during the occurrence of obsessions or compulsions, although this does involve a considerable amount of effort. To override an inert urge such as the obsessions and compulsions seen in OCD patients is difficult but mindfulness is actually one of the most logical ways to go about it. The best way to override the natural instincts that reside in the limbic system and hypothalamus (the emotional centers that tend to operate more automatically) would be to activate the logic-driven pre-frontal cortex. By remaining aware of their current state OCD patients can objectively assess whether they really want to perform a certain action or if a particular thought is really logical, and eventually a mindful response to obsessions and compulsions becomes second nature (Schwartz, Gulliford, Stier, & Thienemann, 2005).

These findings show that stress-reduction interventions are effective even in high-stress environments, but what about those of us who cannot participate in such programs? As Flora (January/February 2005) says, “Most of us don’t have 10,000 free hours to devote to brain resculpturing. But the findings [see therapy section] suggest if we train ourselves to be more mindful and slow down our sense of passing time, we can learn to monitor our moods and thoughts before they spiral downward.” Similar to the way that mindfulness can aid OCD patients, everyone can benefit from the awareness and purposefulness that mindfulness infuses your actions and frame of mind with. By being more connected to your internal state you become more aware of your actions and the control that you have over them which in turn can evoke an awareness of the control you have over your emotional state if you chose to take control.

While it would be beneficial to conduct further research to confirm that the neurological plasticity observed in monks is in fact due to their meditation practice and explore how this is related to the plasticity seen in OCD patients, there are some obstacles to overcome. Many monks are hesitant to travel to the United States to participate in studies because of the experience of Lobsang Tenzin, a monk who went to Boston to participate in an experiment. Tenzin not only recounted his experience as uncomfortable physically and psychology but he passed away 4 months after returning from his trip. Although the trip and his death are most likely unrelated it has still made many of his friends apprehensive. The Dalai Lama however, is very enthusiastic about continuing research and although he is not an authoritative figure his followers revere him to the point that his wishes are responded to almost as orders. So while the Lama’s wishes are incentive enough for his followers to participate in studies there are still concerns beyond

Tenzin's experience. Many monks are nervous about what the findings will reveal; they feel anxious about producing data that shines favorably upon the Buddhist practice (Davidson & Harrington, 2002).

There is one final and significant concern that I have, aside from hesitations on the part of researchers or participants in the studies, which involves the inherent nature of the west. As I have mentioned, the goal-focus of the west is brought on by the desire for the right job, the right life path, the right family, the right salary, and any other comfort that can be obtained. These are all things that could bring temporary satisfaction but ultimately cause stress when they are not obtained. The people who live high-stress lives are the people who would benefit the most from being more mindful and present in the moment, regardless of any disorders or conditions they suffer from. The mere lifestyle of constantly trying to keep up with daily demands as they try to reach their ideal is reason enough to practice mindfulness but these are also the individuals who feel most strongly that they have no time for such things. I think that mindfulness as it can be applied in therapies to treat stress, depression, and other disorders is an invaluable teaching that Buddhism has shared with us but I also think that it is a practice that will take more work and hard evidence to sufficiently incorporate into western culture.



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