

Raiders of the Lost ARTS:

Manifesting Ancient Meditative Arts to Heal Chronic Pain/Negative Affect

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Ancient Meditative Arts: to Heal Chronic Pain and Negative Affect

In a United States “sample of 1,801 older primary care patients,” Unutzer, Ferrell, Lin, Marmon (2004) found that “79% reported functional impairment from pain within the previous month.” In fact, in the US, pain related costs in 2010 climbed to \$300 billion (Gaskin and Richard, 2011). Besides the socio-economic burden accompanying situations of chronic pain, treatment of this health problem is characterized by a myriad of side effects, as well as cases where no relief is attained. In fact, physician’s protocols are removing dangerous Opioids from treatment options for chronic pain. Clearly the new, high prevalence rates of pain and the lack of medical options for treatment, demonstrate a need for non-medical pain reduction interventions. Unfortunately, healing from chronic pain usually includes healing from negative affect as well (Bair, Robinson, Katon, Kroenke, 2011). As a result, the high co-morbidity of chronic pain and mental health issues brings the treatment of negative affect into the fold of chronic pain management. To assist, many alternative so-called treatments have been sold whose outcomes are unknown. If Meditation works, as the practitioners say, is it placebo, or, is there something changing in the brain? Therefore, the thesis of this paper is to explore selected meditative arts effects on the brain and to discuss research on the meditative arts for the mitigation of chronic pain and negative affect.

The first part of the paper will serve as a small neurology ‘primer’ describing neurological changes in the brain (highlighted brain locations, brainwaves, breathing, psychology/cognition, and bio chemistry) due to the use of selected meditative practices (in order, Meditation, Guided Imagery, and Yoga). The last part of this paper will focus on the neuro and psychological mechanisms of improving Chronic Pain and Negative Affect with techniques of the meditative arts. Meditation refers to an “intentional self regulation of attention,” (Newberg and Iversen, 2003, p. 894, in Aftanas and Goldsheykin) and includes Theravada which is attention focused (FAM) Meditation; Metta which is loving-kindness Meditation (LKM). Also, mindfulness refers to where one “becomes the “onlooker to

his stream of consciousness” (Coleman, 1988, p. 4). Guided Imagery as listed by the National Cancer Institute (2012) is “imagining scenes, pictures, or experiences to help the body heal and Sahaja Yoga meditators are denoted as (SYM). Negative affect herein includes anxiety, depression, and anger (Chapin, Darnall, Seppala, Doty, Mackey, 2014) and also includes a discussion of associated cognitions. Although an in-depth look at the bio psycho social spiritual paradigm is beyond the scope, it is a given premise herein.

In fact, this bio psycho social spiritual paradigm is a vital reason the Eastern Meditative practices have become relevant to the Western management of chronic pain at this time. A significant social and scientific change in the definition of pain itself rejects the dualistic, Cartesian principle of pure nociception (without psycho-social considerations). The Cartesian definition only refers to a lesion in a specific region of the body as it is interpreted by corresponding functional areas of the brain (Wachholtz and Pearce, 2010, in Plante). Now known as the 1999 neuro-matrix concept of pain, the new definition describes the bio psycho social aspects of pain including a *sensory, emotional, and cognitive component*, a substantial improvement from Melzack’s own Gate theory of Pain (Melzack, 1999). This resulted in a major Western scientific and cultural change -- opening the way for the acceptance of holistic interventions such as Meditation.

The first neurological change discussed here due to the meditative arts is the neural activity and/or brain wave changes. In a study by Lee, Leung, Tang, Yin, et al (2012) they compared the neural activity of two forms of Meditation Theravada (FAM) and Metta (LKM) the results showed that both produce not only neural activity during Meditation but distinct neural activity distinguishable from each other. FAM subjects showed right thalamus activity which not only increased attention but also correlates to higher scores on certain cognitive instruments for long term ‘expert’ meditators (but inverted u-shape curve for meditators who logged large numbers of hours meditating). Furthermore,

the authors have suggested that for the expert FAM meditators, “there may be a trait-like effect on controlling for omission errors, but a state-like effect on inhibiting commission errors” (Lee et al, 2012, p. 8). The FAM is known to benefit mediators by showing a bigger mismatch between the negativity amplitudes and measure of attention which results in improved attention. On the other hand, LKM meditators are thought to have a higher level “of integration of sensory-perceptual processes and affective responses” (Lee et al, 2012, p. 2). fMRI results demonstrate more neural activity in certain parts of the brain such as the amygdala, right temporal-parietal junction, and others, including regions correlated to emotion (discussed more later).

Hasenkamp (2014) discusses the Meditation brain process as a look into the brain as a complex and fascinating system. Hasenkamp (2014, in Schmidt and Walach) studied Meditation in a macro sense of how not only the brain system operates during Meditation but also how the system shifts gear from each separate state of Meditation to the next step during focused attention Meditation. During each stage of Meditation, a different brain system operates. In fact, she offers a “model” of focused attention Meditation in terms of brain anatomy and physiology including mind wandering (medial prefrontal cortex, posterior cingulated cortex); involving awareness (dorsal anterior, cingulated cortex and insula); shifting attention (dorsolateral prefrontal cortex and parietal cortex); and focusing attention (dorsolateral prefrontal cortex) (Hasenkamp in Schmidt and Walach, 2014, p. 82) .

Jon Kabat-Zinn (2012) suggests that “thoughts cascade through the mind like a waterfall” (p. 37) and it is just that sort of image that is employed in Guided Imagery. Guided imagery and Yoga change neural activity, respiration issues, and emotional/cognitive issues. Lewandowski (2010) has underlined the brain and other areas of the body affected by Guided Imagery.

According to Lewandowski (2010), in Guided Imagery, the lateral prefrontal cortex and medial prefrontal cortex are the most highlighted/affected brain parts. During the Guided Imagery and

Meditation process, the Medial PreFrontal Cortex becomes activated. Rajguru (2012) found the Medial PreFrontal Cortex contains two sections namely; ventromedial medial prefrontal cortex and Dorsomedial Prefrontal Cortex. During the Meditation and Guided Imagery process, the ability of the ventromedial medial prefrontal cortex to process the information is improved.

“Research on Yoga is clearly on the rise” (Richards, 2010, p. 153, in Plante) and 6.1 % of U.S. adults practice Yoga (Richards, 2010, p. 154, in Plante). Even public universities are starting to offer it for both adult community learners and for real college credit so obviously people perceive Yoga as a credible intervention and a desired one as Sahaja Yoga meditators are thought to experience “thoughtless awareness accompanied by an emotionally positive experience of bliss” (Aftanas & Golocheikine, 2005, p. 903). In fact, according to Srinivasan (2012), the physical activities incorporated during Yoga include relaxing, balancing, and physical movement. During the method, the autonomic nervous system undergoes stabilization. These physical and mental activities slowly influence the nerve plexus and endocrine system by triggering an increase in blood flow against gravity. The blood flow is an outcome of the muscular contraction and pressure release due to the relaxation effect. Among the regular Yoga practitioners, there is a reduction in the cholinesterase and cortisol (stress hormone) levels. Yoga changes in the brain include changes in gray matter, the endocrine system, blood gases and blood flow. In one important study on activity levels in adults, Sheffield (2015) reported Yoga practitioners have more gray matter in their brain than physically inactive individuals.

Beyond highlighted brain areas, bio-chemistry and blood flow, studies have also shown that bodily blood gases become an interesting issue when practicing Yoga. For example, Shear (2014, in Schmidt and Walach) reports, that unlike what happens when holding ones breath when not meditating, during meditation “breath stops” or slows down radically, however the CO₂ and O₂ levels

of gas in the blood remains stable, CO₂ being outbreath and O₂ being oxygen. In fact the gases remain the same both during Meditation and ‘frontal EEG alpha coherence’ and there is no breath-catching or compensatory breathing later (Shear, 2014, p. 68, in Schmidt and Walach). This concludes the primer section in which this paper has discussed the measurable neurological changes (highlighted locations, brainwaves, bio chemistry) organized by the type of meditative art, Meditation, Guided Imagery and Yoga.

Next this paper will focus on the mechanisms of improving Chronic Pain and Negative Affect with Meditation, Guided Imagery and Yoga starting with the location of pain processing, and then looking at hyperarousal and endocrine changes followed by a brief look at changes in breath, ending with psychological/cognitive/emotional/spiritual considerations. First, there are theories about where pain is processed in the brain. For example, Santarnecchi (2012) reported the location of activity in the brain that agreed with others (Craig, 2009; Seeley et al 2007; Singer et al 2009, in Hasenkamp 2014, in Schmidt and Walach). In fact, Hasenkamp (2012) wrote:

“that anterior insula and dorsal anterior cingulate have been “implicated in a diverse range of cognitive processes, including conflict monitoring and error detection, interoceptive-autonomic arousal, the moment of perceptual recognition, self-regulation, *emotional aspects of pain*, empathy musical chills pleasurable touch and present moment awareness” (Hasenkamp, 2014, p. 82, Italics mine, in Schmidt and Walach).

As Wachholtz and Pearce (2010, in Plante) pointed out, the meditative arts not only calms the system and/or “provides the cognitive distraction” but the hyperarousal of it could also help with chronic pain. Meditative arts that are active such as Tai Chi may stimulate the body, not just calm it alone (para sympathetic). They report when the body is stimulated (sympathetic) “Endorphins are biochemically very similar to morphine” (Wachholtz and Pearce, 2010, p 216, in Plante) and stop the

“pain impulses at the level of the spinal cord from being transmitted to the brain.” (217). In fact, Yoga is the practice that specifically modulates “the autonomic nervous tone with a decrease in sympathetic activity and an increase in parasympathetic activity” (Richards, 2010, p. 151, in Plante).

Jon Kabat-Zinn at the University of Massachusetts brought the whole mindfulness based stress reduction (MBSR) into medical consciousness --the target of this program of mindfulness initially being to decrease chronic pain. As safety restrictions continue pharmaceutical Opioids, the meditative arts can fill that gap tapping into the body’s own natural system. For example, As Wachholtz and Pearce (2010, in Plante) describe in their chapter on pain, “the neuroendocrine opioid system ... (is) involved in the transmission, processing and integration of pain, auditory and kinetic perception as well as to areas involved in affective states” (p. 216). Wachholtz and Pearce (2010, in Plante) also report, “Serotonin is related to both mood and pain regulation” (p. 216). These systems are so powerful that to engage these chemical reactions sometimes mere muscle stretching for pain (Neha, 2013) results in the release of a natural brain Opioid. Once these bio-chemical systems become dysfunctional, the Meditational arts can be useful.

Often pain results in modification of the breathing frequency while hampering the patterns and depth of respiration process leading to fast, shallow breath. This breathing occurs as a consequence of the emotional elements of pain together with the natural tendency to avoid hurting an already hurting body part by shielding it from further and continuous injury. For example, if the affected body area is located in the torso, the outcome may be reduced respiratory activities of the abdomen and chest. Meditative intervention can be especially helpful to this situation. During the chronic states of pain, the breathing undergoes shallow and invariable straining. From a physiological perspective, this constitutes to continuous stressful state that eventually affects other rhythmic phenomena such as vital cyclic rhythms and neuronal flow. Here, the level of cortisol is comparable to the arousal response.

This is similar to the “Cultivating Emotional Balance (CEB) Meditation program showing improvement in hormone levels” (Wallace, 2009, p. 33).

Moving on to pain relief in Yoga practice, Sheffield (2015) demonstrated that the gray matter tends to dominate in most brain areas such as those associated with pain modulation. In fact these results show that there is a causal relationship between engagement in Yoga and increase in gray matter. Beyond that, Yoga intervention is also recommended as it enables the body to undertake deep yogic inhalation. This breathing results in relaxation of the skeleton muscles, easing pain. Evidence from Davidson and Lutz (2008) examination has established that the yogic intervention resulted in reduced activity of the human central nervous system and augmented tonicity of the parasympathetic nervous system. Yoga is well known to energize as “the autonomic nervous tone with a decrease in sympathetic activity and an increase in parasympathetic activity” (Richards, 2010, p. 151, in Plante). And in terms of brain waves, Yoga often brings an “increase in gamma waves generated by the brain as a whole and heightened neural activity in the left prefrontal cortex” (happiness) (Wallace, 2009, p. 31).

Although almost beyond the scope, note that the meditative practices assist with chronic pain and negative affect in psychological ways not just in terms of the physiology. In a discussion with the Dalai Lama Jon Kabat-Zinn said Meditation, has had “an enormous impact on our physical and psychological well-being,” (Wallace, 2009, p. 30). Some of those psychological improvements are due to meditative arts being able to teach people to direct the mind referred to as “discipline” such as with Yoga. Furthermore, Kabat-Zinn identified seven psychological attitudes such as “non-judging, patience, beginner’s mind, trust, non-striving, acceptance, letting go” (Jazaieri, and Shapiro 2010, p. 25, in Plante). As Oman (2010) writes about the psychology of the meditative practices and also described in MBSR are as well “four shared elements or features... Set-aside time ... Virtues and character

strengths... Practices for centering/stabilizing that are suitable through the day...Spiritual models...” (p. 8-9, in Plante).

Also pushing the scope of the thesis here, but must be mentioned, is the topic of spirituality – especially two salient points. First, note that besides the profound change in the definition of pain to now include the psycho-social; allopathic medicine may still be making a Cartesian flaw. An article by Torkel Falkenberg (2014, in Schmidt and Walach) on Spiritual Phenomena as Exploring Meditation Beyond the Standard Model made the point that secular modern medicine commits “spiritual-stripping of Yoga” and other meditative arts. In fact the current medical model absent of spirituality is teetering on the brink of the Cartesian model due to both its category based system of mind vs body as well as its attempt to be completely without ‘beliefs’ and ‘feelings.’ Second is the spiritual principle of the four immeasurables. Per Trautwein, Naranjoy and Schmidt (2014, in Schmidt and Walach) LKM has been linked to social/spiritual concepts the “four immeasurables” including hopes for the well-being of others, compassion, empathy and equanimity meaning the synthesis of the selves into one. This and the Lee et al (2012) study mentioned earlier means that the wise ancients demonstrated being ahead of their time as long-term LKM meditators are thought to have an enhanced “sensitivity to the emotional experiences of others, which may be similar to empathy” (Lee et al, 2012, p. 2). Indeed, Loving Kindness Meditation increases pro-social love and understanding for others per brain studies -- demonstrating bio psycho social connections (further discussed later). Indeed, Loving Kindness Meditation increases pro-social love and understanding for others per brain studies -- demonstrating bio psycho social connections. After finishing the chronic pain section, negative affect is next.

Now, this paper will end by focusing on the ways Meditation, Guided Imagery and Yoga help with the symptoms of Negative Affect. First this paper will review the co-morbidity of chronic pain and negative affect, and then look at changes in breathing and cognition due to meditative practices,

followed by a look at findings which imply that the gray matter increase is associated with reduced stress and possibly even prevention of brain decline.

There is even a term for the chronic pain and negative co morbidity: ALPIM (anxiety, laxity, pain, immune, and mood) noted by Coplan; Singh; Gopinath; Mathew; Bulbena (2014). The existence of an abbreviation for the co-occurrence of mind/body issues reflects its prevalence and importance. Of course, mental health issues such as depression and anxiety have often been identified as being among the most important features of the experience of pain (Koenig, 2005). Many meditative arts help both. For example, although MBSR originated to specifically reduce chronic pain, it has also “been shown to reduce anxiety and depression symptoms” (Jazaieri and Shapiro, 2010, p. 19, in Plante). According to the explanation provided by Lewandowski and Jacobson (2013), patients suffering from chronic pain mainly exhibit symptoms associated with depression and anxiety. A study by Neha (2013) targeting depressed people established that the gray matter undergoes continuous reduction as a result of exposure to stressing situations. As a result, the gray matter also undergoes changes among the depressed patients undergoing physical pain. Therefore, loss in gray matter is highly associated with both chronic pain and depression.

One fascinating Meditation study looked at mediating both chronic pain and negative affect together. Chapin et al (2014) studied self compassion Meditation and offered that “compassion is the experience of perceiving suffering and wishing to alleviate that suffering” (p. 2). In the study, Chapin et al (2014) showed that compassionate Meditation using diaphragmatic breathing can be added to any medical and/or alternative treatment plan for reducing pain severity and anger. In fact, the National Institute of Health reports “Depression and pain share biological pathways and neurotransmitters, which has implications for the treatment of both concurrently” (Bair in nih.gov/pubmed/). Chapin’s team also found brain research suggesting that “effective cognitive and emotional interventions may

positively influenced these (brain) pathways and reduce pain” (Chapin et al 2014, p.1). Incredibly, Chapin et al (2014) reports these brain pathways are a major influence of “anger” and other negative affect (disappointment, self-blame, animosity, etc). In fact the concept of the bio psycho social features of pain became even more complicated as, “the association between depression and pain ... has been demonstrated consistently,” (Karp and Reynolds, 2009, p. 17) and “even that each may cause each other” (p. 17) giving credence for the need for mind body interventions such as Meditation to use the biopsychosocial approach. True to the bio psychosocial model, all feelings, negative or positive are “distributed throughout the body, produce chemical changes within the entire system” (Dale, 2009, p. 28). Dale (2009) reports “Negative emotions such as anger, frustration, or anxiety disturb the heart rhythm” (p. 28) giving emotion a physiology that can be treated, bringing the discussion back again to biopsychosocial integration.

Davidson and Lutz (2008) not only measured Meditation’s effects on mood but also the cognitive impacts of mindfulness method especially breathing. Davidson and Lutz (2008) established that just as emotions and thoughts affect human breathing pattern, the opposite is also true. The pattern of human breathing is reflected as relaxed or stressed and the breathing pattern is likely to result in consequential physiological changes. It is obvious that slow breathing patterns enable a person to relieve stress. Of course, calm, reflective breathing is rarely found in individuals feeling anxiety and anger. In fact, Davidson and Lutz (2008) establish that there is a significant relationship between the breathing patterns and EEG patterns. In EEG patterns, slow breathing represents an increase in alpha waves. Similarly, the EEG α waves have an inverse correlation to the abdominal breathing. These results clearly show that the breathing patterns are capable of effecting consciousness states including negative affect.

As all cognitive behavioral psychologists know, thoughts highly influence negative feelings. Not only can chronic pain be linked to negative affect but a study by Neha (2013) has reported a prevailing reduction in the cognitive functioning during chronic pain episodes as well. This reduction in cognitive functioning only adds to the negative feelings and perception of pain.

In Guided Imagery, according to Lewandowski (2010), the lateral prefrontal cortex refers to the brain section that allows an individual to explore things from a more balanced, reasonable and rational angle. This part, which is also referred as the assessment center, is actively involved in modulation of the overriding of the automatic behaviors, reduction of the tendency of taking things personally and control of the emotional responses. The emotional responses originate from the fear center section of the brain. The *Me Center* section regulates the brain's ability to process things personally.

As Rajguru (2012) understands it, this outcome in guided imagery is enhanced due to increased blood flow into this section of the brain. The Meditation and Guided Imagery further improves the ability of the Dorsomedial Prefrontal Cortex to process the information associated with the surroundings. This method improves the human ability to develop empathy and social connections and is yet another example of the social aspects of Meditation and the bio psycho social paradigm.

Through another perspective, the medial prefrontal cortex represents the brain mechanism that enables a person to remember the personal experiences. This *Me Center* assist in processing the information from the body senses or sight, hearing, taste and touch. Activation of this brain section triggers daydreaming, imagination, reflection about the past and future, involvement in social activities, inferring other people's thinking, and empathy feeling towards fellow human beings and other living creatures (Lewandowski, 2010) similar to the LKM results mentioned earlier.

According to Santarneckchi (2012), Guided Imagery and Yoga plays a significant role in reducing the adverse impacts of negative affect. Guided Imagery and Yoga improves the interoceptive

awareness while assisting to defeat the emotional detachment that is found often in depressed individuals. Fascinatingly, Santarneckchi (2012) used Guided Imagery and found negative affect symptoms reduced including “worry, state anxiety, depression and alexithymia” (p. 6). According to Santarneckchi (2012), since Guided Imagery enables the body to establish a bridge between body and mind this exercise connects the behavioral, physiological, emotion, perception, and psychological responses. The emotional shifts related to depressive disorder and anxiety is mainly related to the images. The brain ability to generate accepting, warm and powerful images appear to be considerably protective of the despair symptoms. In most cases, the inability to develop warm images constitutes to the development of anxiety, depression and other emotional problems. Therefore, the Guided Imagery intervention reduces the anxiety symptoms while increasing comfort among the patients suffering from depressive disorders.

Another example of negative affect includes SYM Yoga meditators who experience “thoughtless awareness accompanied by an emotionally positive experience of bliss” (Aftanas, and Golosheykin, 2005, p. 903). A study by Aftantas and Golosheykin (2005) looked at two groups (meditators of Sahaja Yoga and non meditators) under three arousal conditions: 1 eyes closed and eyes open, 2 a neutral view movie clip and 3 an aversive experience (negative affect) movie clip to see if differences could be found in hemisphere symmetry and brain wave strength (alpha and theta).

Actually each individual brain cell emits its own electrical signal which combines together with other neurons to make oscillations known as brain waves of certain frequencies (alpha, gamma and theta) measured by electroencephalography (EEG). Synchronization refers to when the hemispheres are both vibrating to the same frequency and are in the same phase (high or low frequency) at the same time, desynchronization is the reverse. The study by Aftantas and Golosheykin (2005) demonstrated a long suspected idea that meditators have better abilities to manage the intensity of emotional arousal.

It also showed that changes in the EEG measured brain waves paired with a regular Meditation regimen are changeable and the results depend on arousal levels. The study also measured hemispheric conditions and found that for meditators (unlike the controls); the negative affect movie clips did not result in synchronized gamma power between different parts of the brain. The non meditators seemed to work much harder. Power refers to greater mental silence as measured by alpha and theta wave strength where low alpha frequency is vigilance attention and the upper alpha band is reflecting task specific processes. Theta activity is involved in both cognitive and affective states. Theta increases during task and memory activities and prolonged theta is thought to be involved with creativity.

According to Richards (2010, p. 153 in Plante) a literature review of Yoga found “a form of Yoga, Sudarshan Kriya Yoga which is a controlled breathing practice, had the most evidence for efficacy as a monotherapy with depressive disorders” although Yoga generally was helpful for mood disorders. In fact, there is “scientific evidence in support of this (Yoga) the majority of studies focusing on the effects of Yogic practice on psychopathologies...” (Richards, 2010, p. 152, in Plante). In fact, “Overall, Yoga was found to have positive effects on depression and anxiety associated with physical illness” (Richards, 2010, p. 6, in Plante).

Furthermore, in his research, Santarneckchi (2012) explored the bio and psychological impacts of Meditation induced by Yoga. The researcher established that meditation plays a significant role in improving the overall cognitive health while increasing the brain gray matter. After a comprehensive research, Santarneckchi (2012) established that embarking on Meditation reduces the patient’s state of anxiety, worry, and depression. Further studies established that the cortical thickness expands on the right side of the insular brain lobe. These findings imply that the gray matter increase is associated with reduced anxiety, stress, and depression. Therefore, there is an inverse relationship between the

gray matter and stress level. This fact was a landmark finding that proved that Meditation plays a significant role in improving the brain psychological performance.

One more salient point needs to be made about the meditative arts: prevention. In terms of prevention, Neha (2013) suggests that among people suffering from chronic pain, the news is that these meditative practices are likely protecting the brain's gray matter from being reduced due to depression and anxiety. This reduction in the neuroanatomical impact is important as some of the damage can be the result of chronic pain in the body, damaging the brain. Evidence from Sheffield (2015) study establishes that the mind and body techniques such as Meditation and Yoga are capable of counteracting the negative side effects of brain anatomy among patients undergoing chronic pain treatment.

In conclusion, Hasenkamp (2014, in Schmidt and Walach) suggested studying Meditation, "has great potential to advance cognitive neuroscience and deepen our understanding of the human mind and the possibilities for its transformation" (p. 76). Indeed, the emerging studies show that the meditative practices such as Meditation, Guided Imagery, and Yoga affect the brain in positive, measurable ways that create a treatment for the bio psycho social spiritual aspects of chronic pain and negative affect. Furthermore, selected meditative arts are proving effective in reversing and even preventing the adverse impacts on the brain of chronic pain and negative affect.

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