

# EcoMeditation and Emotional Freedom Techniques (EFT) Produce Elevated Brain-wave Patterns and States of Consciousness

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## Abstract

**Background:** Stress-reduction techniques can be used in combination with each other. Two such methods are Emotional Freedom Techniques (EFT) and EcoMeditation. EFT is an evidence-based self-help method. Reviews and meta-analyses examining more than 100 studies demonstrate the efficacy of EFT for anxiety, depression, and post-traumatic stress disorder (PTSD). EcoMeditation is a secular meditation technique that combines neurofeedback, mindfulness, and heart coherence. Studies demonstrate that EFT and EcoMeditation can improve cortisol levels, heart rate, and other health markers.

**Objectives:** EFT is most commonly used to relieve stress and treat traumatic childhood memories, while EcoMeditation is used to produce calm emotional states. This study sought to elucidate whether the release of traumatic stress facilitated by EFT would enhance entry into meditative states, and secondly whether EcoMeditation prior to EFT might establish a baseline of well-being that assists in the resolution of trauma.

**Methods:** The Mind Mirror 6 (MM) electroencephalogram (EEG) was used to assess brain states in eight participants attending a weekend workshop. The MM measures changes in three advanced neurophysiological states of consciousness characterized by relative amplitude relationships between brain-wave frequencies: 1) the Awakened Mind pattern of lucid awareness, creativity, insight, intuition, and spiritual connection; 2) the Evolved Mind of nondual unity consciousness; and 3) the Gamma Synchrony pattern of whole-brain synchrony, mental integration, nonlocal awareness, and insight. Assessments included eyes-closed (EC) and eyes-open (EO)

states, in order to determine whether changes in consciousness were sustained in waking life. Baselines were collected at the start and end of each day, and after EcoMeditation, which was performed for 20 minutes on day two.

**Results:** A statistically significant EO post-test change was found in the Awakened Mind pattern ( $p = 0.003$ ). Cohen's  $d = 0.79$  indicated a large treatment effect. Increased brain-wave coherence—a measure of efficient brain function—was found in all participants in at least one frequency category, while six increased EO Gamma Synchrony. Coherence analytics showed increased brain-wave coherence primarily in alpha but also in theta and delta and occasionally in low and midrange gamma. During EcoMeditation, all participants generated high-amplitude 45–65 Hz gamma frequencies and Gamma Synchrony values, some at the top of the statistical range, with high synchrony at posttest.

**Conclusions:** EcoMeditation produced extraordinarily high levels of Gamma Synchrony. In two days, many participants acquired elevated brain states normally found only after years of meditation practice. EcoMeditation facilitated participants' ability to induce and sustain the alpha brain waves characteristic of high-level emotional, mental, and spiritual integration. A combination of the two methods produced statistical gains in the EO Awakened Mind, indicating that participants were able to carry elevated mental states into waking consciousness.

**Keywords:** EEG, EcoMeditation, EFT, Emotional Freedom Techniques, Mind Mirror, gamma, brain waves

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For decades, conventional psychological assessment has relied on self-report as well as clinician diagnosis using structured interviews and questionnaires. More recently, advancing technology has permitted the objective measurement of psychological states. Endocrine assays can determine the rise and fall of markers such as cortisol, epinephrine, and immunoglobulin (Bach et al., 2016). Genes expressed during emotional states can be evaluated from a molecular biological level (Church, Yount, Rachlin, Fox, & Nelms, 2016). The role played by epigenetic markers such as microRNAs in the regulation of gene expression can also be probed (Yount, Church, Rachlin, Blickheuser, & Cardonna, 2019). Signaling by and between brain regions is measured by tools such as electroencephalograph (EEG), functional magnetic resonance imaging (fMRI), magnetoencephalograph (MEG), and similar technologies. This body of work currently contributes to an objective biophysical examination of the physiology of psychological conditions such as anxiety, depression, posttraumatic stress disorder (PTSD), and stress. Comparisons of pre and post readings enable assessment of the effectiveness of psychotherapy (Feinstein & Church, 2010).

A number of advanced tools have recently been brought to bear on enhancing scientific understanding of popular stress-reduction practices. These include meditation, acupuncture, yoga, and qigong (National Center for Complementary and Integrative Health, 2010; Newberg & Waldman, 2017). A form of meditation called EcoMeditation combines elements of heart coherence training, neurofeedback, mindfulness, compassion, and acupressure (Church, 2018b). Pilot studies have found that EcoMeditation simultaneously improves psychological and physiological health

(Church, 2018b; Groesbeck et al., 2018). The same co-occurring improvements are noted with an acupressure-based self-help technique called Emotional Freedom Techniques (EFT; Church, 2018a). There are over 100 studies of EFT (see research. EFTuniverse.com) and meta-analyses that demonstrate very large treatment effects for anxiety, depression, and PTSD (reviewed in Church, 2018a).

While many different types of EEG hardware and software exist with various multiple methods to interpret EEG readouts, several generally agreed-on standards and interpretations of results have been established: Brain waves are measured in frequencies, the speed at which neurons fire, measured in cycles per second or hertz (Hz). Frequencies fall into five primary categories from the slowest (delta) to the fastest (gamma). They may be further subdivided, such as into high and low beta, high and low gamma, and very slow delta (sub-delta). Alpha waves are characteristic of meditation, flow states, and relaxation.

Many healing effects are measured when cells are exposed to frequencies in the theta and delta ranges, including increased stem cell production, reduced cortisol, and increased telomere length (Church, 2018b). A review of 175 papers on the effect of electromagnetic frequencies on health published between 1950 and 2015 found pervasive positive effects associated with the frequencies produced by the brain's endogenous waves (Geesink & Meijer, 2016). The literature concurs that a reduction in high beta, coupled with expansions in alpha, theta, delta, and gamma, represents a generally desirable state (Church, 2018b). Furthermore, the "size" of each wave is measured in amplitude: the distance from the peak to the trough of a wave. As "more" of a frequency is generated, amplitude increases. When investigators describe increased amounts of a frequency, they are referring to increased amplitude. Amplitude is measured in microvolts (uV).

One of the challenges of evaluating the efficacy of different forms of meditation is that few common standards for interpreting EEG readouts exist. However, there is consensus in the literature that an increase in alpha brain-wave amplitude is indicative of a meditative state. It has been proposed that a meditator's ability to sustain alpha for 15 seconds or more, coupled with an improved ratio of delta to high beta waves, may be a reliable marker across meditation traditions (Church, Yang, Fannin, & Blickheuser, 2019).

Newberg and Waldman (2017) have used fMRI to analyze the brain states of adepts from many traditions. They have also assembled a database of over 2,000 self-reports from individuals who report enlightenment experiences. They define enlightenment as a mystical experience that propels us out of a limited state of consciousness and into a state of self-realization. Enlightenment produces epiphany, transformation, and a new worldview.

They identify five characteristics common to these experiences. The first is a sense of *unity*, a feeling of connectedness with the universe and everything within it. Individuals also report a heightened sense of *intensity*; these experiences are often described with phrases such as “more real than reality” and they demand complete *surrender* of the local and personal ego and will. Acute *clarity* about the purpose and meaning of their lives is also expressed by individuals as they emerge from these experiences. The final characteristic is the sense that one’s personality and being has been suddenly and permanently *changed*. These experiences are common to people from all faith traditions, those who consider themselves “spiritual but not religious,” and to agnostics and atheists (Newberg & Waldman, 2017). A belief in God is not a requirement for an enlightenment experience.

These elements are also associated with brain waves (reviewed in Church, 2018b). Delta is associated with *unity*, an expansive sense of being one with the universe. In this state, marked deactivation of the brain’s parietal lobe, which is responsible for proprioception and the interpretation of where one’s body ends and the outside world begins, occurs. The subjective experience of a meditator in delta is a dissolution of the boundaries between self and other. Theta is a brain wave predominant in healers, and many studies find that it produces beneficial changes in cells, such as enhanced signaling, repair, and regeneration (Geesink & Meijer, 2016). Gamma is associated with insight, as information from many different parts of the brain is integrated. It was first discovered in the brains of meditators. This aligns with Newberg’s third characteristic, a fundamentally different way of seeing things, along with sharp *clarity*. In the alpha states that initiate intense meditation, the activity of the prefrontal cortex, the seat of the sense of self, is reduced. While its energy consumption usually fluctuates no more

than  $\pm 5\%$ , during enlightenment experiences it can abruptly drop by 40%. This produces a *surrender* of the sense of a separate self, an *intensely different experience* from the usual state, and the ability to perceive reality without the filters that usually keep our beliefs in place, resulting in *change* (Kotler & Wheal, 2017). EEG shows that in these states, beta is sharply attenuated. High-frequency beta is the signature wave of stress, anxiety, and the “monkey mind” that distracts meditators.

Notably, increased gamma has been identified at the moment of creative insight (Jung-Beeman et al., 2004), advanced meditation (Ferrarelli et al., 2013; Lutz, Greischar, Rawlings, Ricard, & Davidson, 2004), and mystical states (Beauregard & Paquette, 2008). Gamma is also associated with whole-brain synchrony (Engel, Konig, Kreiter, & Singer, 1991), increased perceptual organization (Elliott & Muller, 1998), associative learning (Miltner, Braun, Arnold, Witte, & Taub, 1999), the efficiency of information flowing across synapses (Sheer, 1975), meditative concentration and samadhi (Das & Gastaut, 1995), and healing (Hendricks, Bengston, & Gunkelman, 2010).

Alpha waves have been described as the “bridge” between the conscious and superconscious frequencies of beta and gamma, and the subconscious and unconscious frequencies of theta and delta (Cade & Coxhead, 1979). Alpha is the signature wave of a person entering a meditative state.

## The Mind Mirror

The Mind Mirror 6 (Vilistus, Durham, UK) is a unique, dual-hemisphere EEG that maps the interrelationships of brain-wave frequencies and categories in order to depict states of consciousness. The Mind Mirror was invented by British biophysicist, psychobiologist, and meditation master C. Maxwell Cade in 1976. Cade used it to study the brain-wave patterns of more than 4,000 subjects, including advanced meditators, psychics, dowrsers, mediums, healers, and other spiritually conscious individuals. Cade identified a brain-wave pattern common to all adept meditators regardless of spiritual tradition known as the Awakened Mind (AM; Cade & Coxhead, 1979). He suggested that this pattern accompanied mental clarity, creativity, insight, intuition, and a sense of oneness with the universe, the “unity consciousness” reported by advanced

meditators (Newberg & Waldman, 2017). His protégé, humanistic psychologist Anna Wise, spent more than 6,000 hours mapping the Mind Mirror patterns of high performers in the US and other countries (Wise, 1995). She found that brain-wave biofeedback meditation could help individuals attain the Awakened Mind pattern of creative flow and peak performance (Wise, 2002).

In 2012, Judith Pennington founded the Institute for the Awakened Mind (IAM), an international consortium of certified Awakened Mind consciousness trainers, and codeveloped the Mind Mirror 6 with UK neurofeedback/biofeedback manufacturer Vilstus. IAM’s Awakened Mind trainers use the advanced data analysis tools in the Mind Mirror 6 to train and research peak performance and extraordinary states of consciousness (Pennington, 2012). This type of training is possible because of the intuitive readout produced by the Mind Mirror 6. Conventional EEGs portray brain-wave activity as oscillating horizontal lines on a computer screen, with time intervals plotted vertically and amplitudes indicated by the peak-to-trough height of the waves. In contrast, the Mind Mirror 6 displays a single graphical image for the operator and user. Divided into left and right hemispheres, with frequencies conventionally stacked horizontally from delta to gamma, the Mind Mirror 6 depicts amplitudes as the size of each frequency’s horizontal bar.

The Mind Mirror 6 shows brain-wave activity in horizontal barographs in a bilateral display. The display panel has two columns of bar graphs that represent the left and right hemispheres (LH & RH). Each barograph represents one filter. The filters that analyze the brain signals are centered on the following frequencies: 0.5 Hz, 1.5 Hz,

3 Hz, 4.5 Hz, 6 Hz, 7.5 Hz, 9 Hz, 10.5 Hz, 12.5 Hz, 15 Hz, 19 Hz, 24 Hz, 30 Hz, 38 Hz, 49 Hz, 59 Hz, 69 Hz, 79 Hz, and 91 Hz, as shown in Figure 1.

The graphical depiction of brain waves allows subjects to read their own waves as they enter various mental states. A subject with a low amplitude of alpha, for instance, can see this on the screen immediately. No explanation from the Mind Mirror 6 operator is required, other than an initial explanation of pattern meaning. When the subject produces more alpha, it is seen immediately. The same applies to the other brain waves. This ease of use makes the Mind Mirror 6 ideal for training.

Mind Mirror 6 operators are typically concerned with three primary patterns: 1) the Awakened Mind state of creative problem-solving, “aha” insights, and peak performance; 2) the Evolved Mind of egoic surrender, bliss, and unity consciousness; and 3) the Gamma Synchrony pattern of the Superconscious Mind, consisting of enhanced creativity, insights, and cognition, together with compassion, transcendence, and mystical union. These patterns are shown in Figure 2.

The Awakened Mind and Evolved Mind patterns are composed of frequencies ranging from 0.5 to 44 Hz, which is inclusive of low gamma (30–43 Hz). The Gamma Synchrony pattern adds 44–64 Hz frequencies to the pattern and encompasses 0.5 to 64 Hz. All three patterns can extend up to 100 Hz in amplitude.

The Mind Mirror 6 database consists of informal studies and books published by Cade, Wise, and Pennington, as well as informal studies on individual and groups by certified practitioners. This research forms the Mind Mirror 6 database. Studies are published on IAM’s website

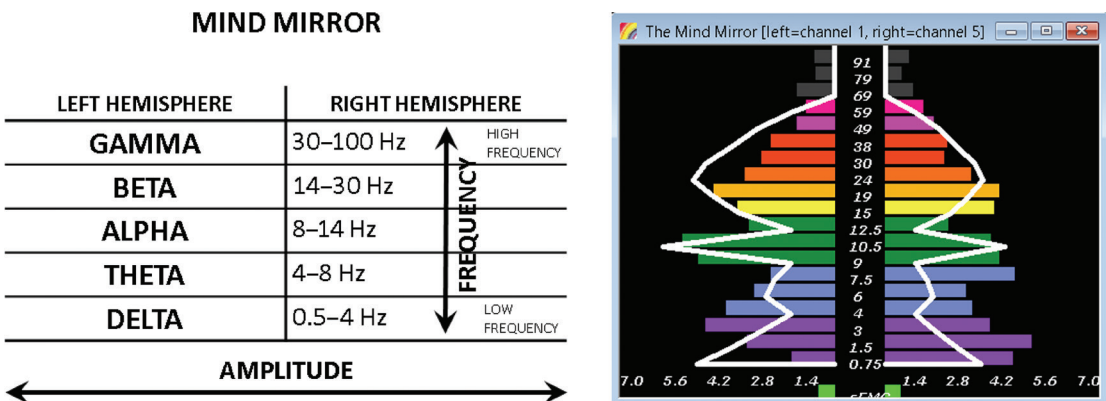


Figure 1. Left, frequencies and amplitudes; Right, the Mind Mirror 6’s graphic readout of the Awakened Mind state.

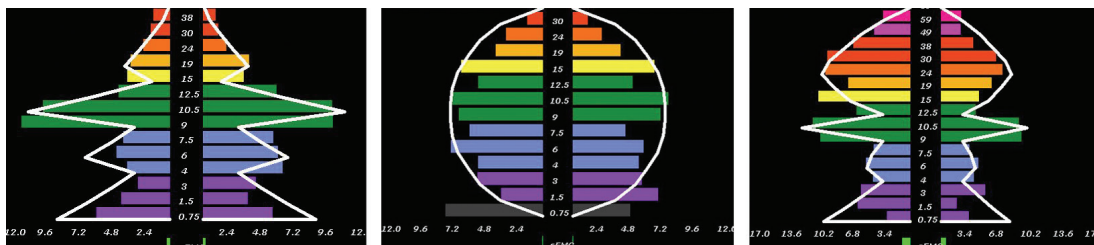


Figure 2. Left, Awakened Mind; Center, Evolved Mind; Right, Gamma Synchrony.

and discussed by Mind Mirror 6 self-trainers and practitioners during monthly webinars. Two formal studies with the Mind Mirror 6 have been published. One study found that the Awakened Mind state was an effective way of measuring the creativity noted in the flow state. Effective intervention also improved participants' ability to enter the Awakened Mind later on, using somatic reminders of the desired state (Szuster, 2018). The other study, a single patient case of traumatic brain injury, used the Mind Mirror 6 to reveal increasing brain-wave patterns associated with relaxation and self-awareness as the treatment progressed (Craig, Bach, Groesbeck, & Benor, 2009).

The Awakened Mind brain-wave pattern is used for problem-solving during eyes-closed meditation and with practice can be acquired with the eyes open in waking life. It is a calm, inwardly focused state of consciousness. Both in meditation and everyday life, this ideal state of awareness has constant access to elevated emotions, intuition, creativity, and spirituality (Wise, 2002).

The Awakened Mind, produced during “aha” realizations, peak experiences, and personal transformation, is characterized by an open flow of awareness and unity with oneself, others, and the universe. The awakened person is lucid, creative, insightful, intuitive, empathetic, compassionate, self-actualized, and of service to others while living life in joy and fulfillment. Creative people and meditators with high levels of attentional awareness usually produce consistent flares of this pattern with the eyes closed (EC) in meditation. Sustaining and generalizing the pattern to eyes-open (EO) awareness requires the integration of the conscious mind's ego (seen in the EEG as beta) with the person's essential subconscious being (seen as theta). Clearing psychological and spiritual blocks while in theta releases suppressed creativity, evolves consciousness, and improves health.

Committed meditation practice, inner transformation, and personal surrender to unity consciousness amplify brain waves beyond the brain-wave category amplitudes and ratios of the Awakened Mind into the rounded oneness of the Evolved Mind pattern seen in Figure 2. Those experiencing it report blocks in consciousness dissolving as the mind unites with a force greater than itself and experiences the bliss of absolute knowing (Wise, 2002). In this circular pattern of self-transcendence, beta curves inward to merge with alpha; alpha and theta amplify and merge; and delta curves upward as what was unconscious becomes conscious. The feeling of the subject in unity consciousness is that of a sense of oneness with everything and an expansion into enlightenment. The result is a profound sense of inner peace and universal awareness.

The literature has associated gamma with feelings of love and compassion, highly focused attentional awareness, mental integration, mystical union, spiritual ecstasy, and the efficient flow of energy and information through the brain. Neuroimaging studies have shown that gamma waves synchronize the four lobes of the brain across frequencies and engender coherence (bilateral amplitude symmetry and waveform coupling). In turn, this facilitates synchronous activity in neighboring neurons, links brain networks, improves information flow and lucidity, and thereby stimulates attentional awareness, mental integration, and insights (Bowyer, 2016). Accordingly, the MM community refers to the Gamma Synchrony pattern as the Superconscious Mind. High amplitudes of 35–100 Hz gamma are infrequently seen in people engaged in silent meditations, including those with long-term practices (Pennington, 2012), but are fairly common in psychics, healers, mediums, and other highly developed and spiritually conscious people. Oscillations of coherent low-frequency gamma (35–45 Hz) stimulate the

highly organized Awakened Mind and Evolved Mind patterns (Pennington, 2012).

Composed of high-amplitude gamma (44–64 Hz) over a lower-frequency Awakened Mind, the Gamma Synchrony pattern of the Superconscious Mind is produced by single-pointed attentional focus, compassion, and elevation into mystical transcendence. Gamma evokes whole-brain synchronization and intense mental clarity and lucidity. It makes the conscious mind more efficient and able to access higher perspectives and insights. The Superconscious Mind is illuminated by these insights. Gamma is associated with neuroplasticity, neural repair, and the integration of information from many parts of the brain (Goleman & Davidson, 2017). The result includes heightened peace, calm, and sensory perception coupled with high-voltage brainpower, enhanced intuition, supercharged healing abilities, out-of-body experiences, and spiritual illumination. This extremely advanced brain-wave pattern is most often seen in meditation masters, intuitives, mediums, healers, and other highly developed and spiritually awakened individuals (Newberg & Waldman, 2017).

### Analyzing the Mind Mirror 6 Reports

The Mind Mirror 6 produces several reports. The Mind Mirror Summary consists of: 1) an averaged brain-wave graph, 2) Training Summary statistical chart of pattern attainment, and 3) Summary Plot (i.e., timeline of pattern attainment). Mind Mirror practitioners look primarily at three patterns: The Awakened Mind of creative flow and peak performance, the Evolved Mind of unity consciousness, and the Gamma Synchrony pattern of the Superconscious Mind.

The Mind Mirror Summary brain-wave graph is an average of each frequency band over the course of a session. It is also possible to obtain a Mind Mirror Summary for segments of a session. The summary brain-wave pattern may or may not be symmetrical, depending on the person’s brain-wave production.

The Mind Mirror Training Summary (presented in Figure 3) provides pattern attainment statistics that are based on the ratios of a variety of patterns. For example, the Awakened Mind pattern consists of the following ratios: beta 1, alpha 2, theta 1.6, and delta 1. Pattern attainment is based on the alpha amplitude and

the proportions of all other categories to it. The Training Summary, developed for self-trainers, is divided into 10 challenge levels, where the easiest training level is 10 and will be 100% and the most difficult training levels are 1 and 2. Training Level 10 (TL 10) allows for 100% deviation from the ratios of the pattern; TL5, 50% deviation and 50% compliance with the ratios; TL 4, 40% deviation and 60% compliance.

Lower challenge levels require increased compliance with the pattern ratios; therefore, the lower the number, the more refined the pattern is. As a benchmark, advanced meditators and other highly developed and spiritually conscious people typically score 75% to 98% rewards at TL 5 for the Awakened Mind. Frequently, individuals with TL 5 scores in the 90th percentile will score between 20% and 40% attainment at TL 4. Low TL 3 scores are considered remarkable, as this would entail 70% compliance with the pattern ratios.

Figure 3 indicates that for the Awakened Mind, the subject scored TL 5 78% and TL 4 23%. This is an advanced meditator whose Evolved Mind at TL 5 39% is also a high score. The subject produces some 49/59 Hz gamma, as seen in the Gamma Synchrony score of TL5 22%.

To analyze a session, the Mind Mirror 6 practitioner would first look at the averaged Mind Mirror Summary brain-wave graph and the Training Summary. For an overview of when the meditator produced the most Awakened Mind patterns, for example, the practitioner would look at the Summary Plot for density in the dots at the lowest (and most refined) training level. The Summary Plot in Figure 4 indicates quite a few pattern attainment reward dots at TL 4, particularly around the 28-minute mark. This helps guide the practitioner

Mind Mirror Training Summary										
	1	2	3	4	5	6	7	8	9	10
Awakened Mind	-	-	0%	23%	78%	86%	93%	99%	100%	100%
Evolved Mind	-	-	-	1%	39%	87%	98%	100%	100%	100%
Meditation Pattern	-	-	-	5%	58%	76%	88%	99%	100%	100%
Gamma Synchrony	-	-	0%	4%	22%	88%	99%	100%	100%	100%
Beta Reduction	-	-	29%	50%	78%	89%	91%	100%	100%	100%
Alpha/Theta	-	-	2%	6%	69%	94%	96%	100%	100%	100%
Delta Expansion	-	-	2%	35%	85%	89%	98%	100%	100%	100%
Alpha Synchrony	-	-	-	41%	60%	71%	97%	98%	100%	100%

Display Type:  Count  Percentage  Enforce Symmetry  Accumulate statistics

Figure 3. The Mind Mirror Training Summary.

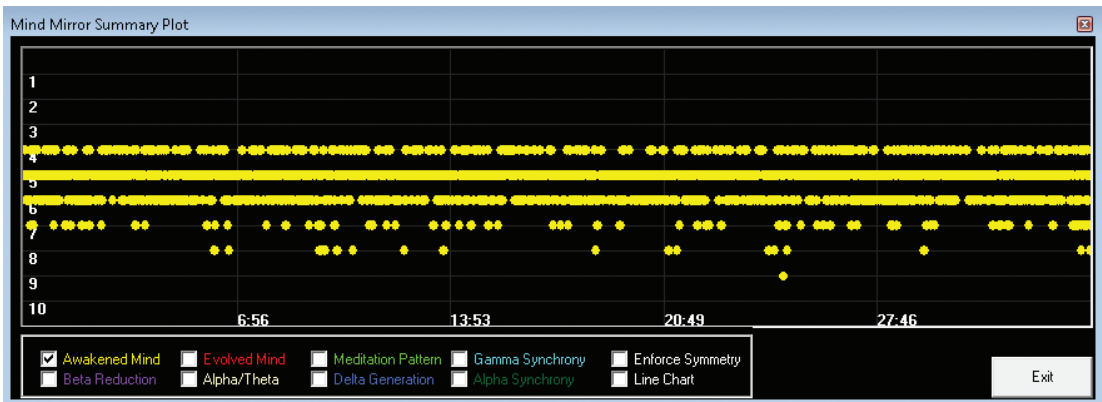


Figure 4. The Mind Mirror Summary Plot.

to identify the period of time during which the most profound Awakened Mind patterns were produced.

The Composite Display window shown in Figure 5 traces the amplitudes (left column) of the selected brain-wave categories, potentially including beta, alpha, theta, delta, low gamma, mid gamma, and upper gamma. Using the color guide at top right, the practitioner studies the interaction of the amplitude lines to determine whether the categories are firing in phase or not, and whether this in-phase activity suggests brain-wave coherence and synchronization.

The Composite Display window (Figure 5) shows highly synchronized, or in-phase, brain-wave categories, with consistent and stable alpha (green), theta (blue) that sometimes exceeds alpha, and consistent delta (purple) and beta

(yellow). At the bottom of the graph are the three gamma categories, consisting of low gamma (35–44 Hz), mid gamma (45–64 Hz), and upper gamma (65–100 Hz). Note the surge in alpha and low gamma (top gamma line) at the 36-minute point. Close inspection of this graph for each hemisphere of the brain provides an overview of Mind Mirror 6 patterns and important insights into the interrelationships of each brain-wave category.

The final report provided by the Mind Mirror 6 is the Coherence Report. Coherence refers to inter-hemispheric amplitude symmetry and coupled neuronal and network connectivity (synchronization) across both hemispheres of the brain within a specific frequency range or bandwidth. The synchronization of brain-wave frequencies and/or categories implies amplification of the microvoltage of associated neurons in the part of the brain being

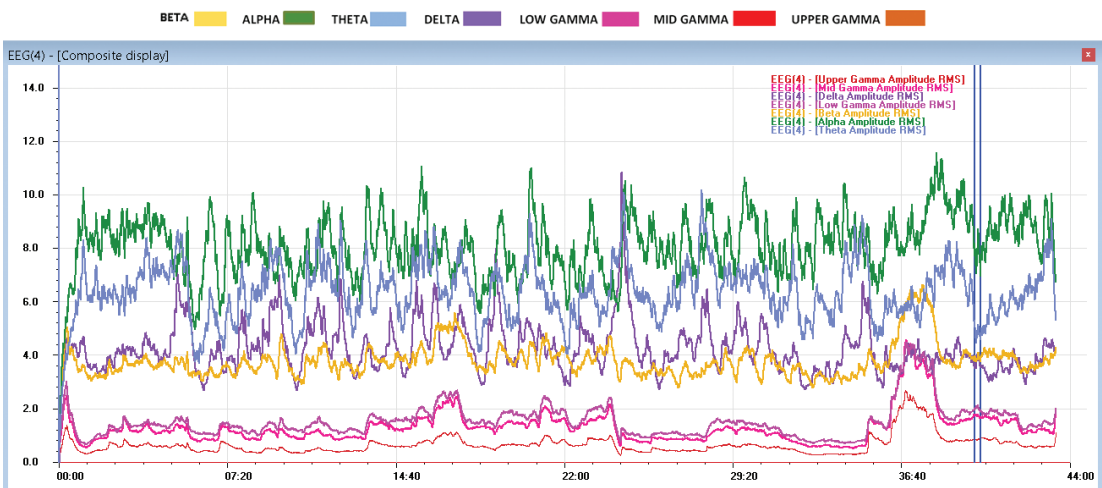


Figure 5. The Composite Display.

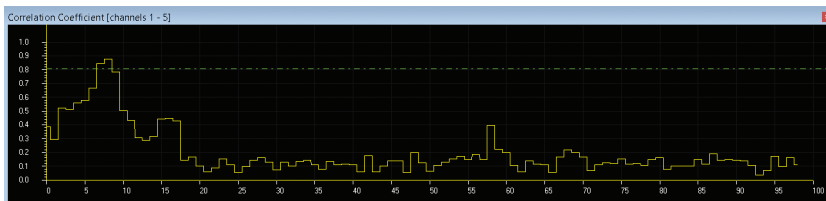


Figure 6. Correlation Coefficient, showing high coherence above 0.8 from 7 Hz high theta to 10 Hz alpha.

measured—for the Mind Mirror 6, the temporal and occipital lobes. However, electrical diffusion occurs across the scalp, so coherence in one electrode location suggests coherence across a larger area of the brain (Bowyer, 2016). Coherent waveforms, brain-wave categories, neurons, and brain lobes accommodate an open flow of awareness through the brain, which in turn suggests that brain networks are synchronized and working together more efficiently, effectively, and healthfully. The coherent, peak-performance brain processes high-gamma frequencies more easily and projects a more powerful electromagnetic field within and around the body (Bowyer, 2016).

The Mind Mirror’s Coherence Reports are derived from Physionet open-source code housed at MIT in Cambridge, Massachusetts. Physionet is supported by the National Institute of General Medical Sciences and the National Institute of Biomedical Imaging and Bioengineering under NIH grant number 2R01GM104987-09. The Vilistus software engineering department modified the coherence processor code to interface with the Mind Mirror 6. (For further information on Physionet, see <https://physionet.org/physiobank/about.shtml>.)

The Mind Mirror’s Coherence Reports include two summary windows that measure inter-hemispheric amplitude symmetry on a left scale range of  $-1$  to  $+1$ , where  $+1$  indicates the strongest possible coherence and  $-1$  the least coherence. High coherence means amplitude symmetry and suggests the highly desirable waveform coupling

of brain wave and network synchronization. The Correlation Coefficient window (Figure 6) shows a statistical relationship between two sets of variables, in this case left- and right-hemisphere amplitude symmetry. The graph shows the strength of relationship of each frequency from 1 to 100 Hz (the scale at bottom). Coherence is considered to be high at a value of 0.8.

The second Coherence Report is the Coherence Summary (Figure 7), which can be obtained for any range of frequencies or categories, such as low alpha (8–10 Hz), high alpha (10–14 Hz), or a combination of the two in alpha (8–14 Hz). The coherence range is  $-1$  to  $+1$ , with high coherence at 0.7. The x-axis across the bottom is a time plot.

The Coherence Summary for alpha shown in Figure 7 depicts a rising trend line that indicates coherence is steadily increasing as 8–14 Hz alpha synchronizes across the left and right hemispheres of the brain. Comparison of Coherence Summaries across a series of brain-wave sessions indicates whether coherence is decreasing or increasing and at what levels. Coherence Summaries for beta, alpha, theta, delta, and low, mid, and upper gamma were checked for all of the participants in this study.

Used together, these three analytical tools—the three-part Mind Mirror Summary, Composite Display windows, and Coherence Reports—enable practitioners to provide clients and subjects with useful overviews that enhance understanding and improve brain-wave production. Readings are taken both with participants eyes closed (EC), as



Figure 7. Coherence Summary for alpha, with high coherence attained consistently from 6:30 to 11:15 minutes.



is usual in meditation, and with eyes open (EO). Though acquiring elevated states of consciousness is desirable, the ability to maintain the state with eyes open means that the meditator is able to integrate the practice into daily life.

Given the rich datasets provided by the Mind Mirror 6, the current study used this method to assess brain-function change in eight participants during a two-day workshop in which participants used both EcoMeditation and EFT.

## Method

### Participants and Procedures

Participants were enrolled in a weekend workshop taught by the third author. All provided informed consent. Fifty-five participants (approximately 50% of the sample) volunteered to be assessed using the Mind Mirror 6. However, eight were randomly selected for the current study, which included one male and seven female participants ( $M_{\text{age}} = 46$  years). All eight participants were highly educated and self-actualized in rewarding professions. Six had graduated with master's degrees and two with doctoral degrees. Four participants maintained a regular or occasional meditation practice. One participant had 10 years of meditation experience.

Participants sat in comfortable chairs positioned around two conference tables in a large, quiet meeting room at a training institute. Two monitors certified as Awakened Mind consciousness trainers, including the first author, applied two active and two passive electrodes to temporal and occipital sites on the abraded scalps of each participant, using the international 10–20 system (Jasper, 1958), which replicated the positions Cade used for his original Mind Mirror readings: O1/O2 for the passive electrodes, T5/T6 for the active electrodes, and the ground wire on the forehead or back of the shoulder.

Corruption of high frequencies in the gamma range (25 or 30 to 100 Hz) was minimized by protective shielding within the neurofeedback unit, the use of peripheral USB emission filters on both EEG devices, and the operation of laptop computers on battery power. Outlying spikes of surface electromyography (sEMG) artifact caused by participant movement or tension in the head, neck, and shoulders were removed before the EEG data were analyzed.

Eyes-open EFT tapping exercises require physical movements that cause sEMG artifact; consequently, this study presents results from non-tapping exercises only. Baseline readings were taken at the start and end of each of the two days. These consisted of one-minute eyes-open (EO) and one-minute eyes-closed (EC) readings followed by three segments titled Neutral Memory, Traumatic Memory, and Heart Care, the latter a reflection on love and appreciation. During the Neutral Memory segment, participants were instructed to visualize an emotionally neutral past event. During the Traumatic Memory segment, participants were asked to recall an emotionally triggering event. The reports on each participant below are for the non-tapping EO and EC baselines taken at the start (pretest) and end of the workshop (posttest), as well as EO and EC before and after EcoMeditation, with a third reading taken during the procedure.

### The EFT Intervention

Since its inception in 1995, EFT has been a manualized method (Church, 2018a) leading to uniform application in research, training, and clinical practice. In a typical treatment sequence, participants state a negative cognition associated with a specific emotionally traumatic event and pair this cognition with self-acceptance. This is called the “Setup Statement” and a typical example is, “Even though I experienced that terrible car crash, I deeply and completely accept myself.” The first half of the Setup Statement emphasizes exposure, while the second half frames the traumatizing event in the context of self-acceptance.

The participant also identifies a part of the body where the feelings of distress are focused and rates the discomfort on a Likert-type scale from 0 (minimum) to 10 (maximum) distress. The scale is referred to as Subjective Units of Distress (SUD; Wolpe, 1973). The somatic component of EFT involves tapping with the fingertips on acupuncture points (acupoints) while verbalizing the cognitive pairing. A “Reminder Phrase” maintains exposure during the acupoint stimulation process; while tapping each point, the client repeats the most emotive portion of the Setup Statement, e.g. “the terrible car crash.” The process is repeated until the SUD score is 0 or a low number. Because it includes tapping on acupoints, EFT is often colloquially referred to as “tapping.”

## Data Analysis

The Mind Mirror 6 practitioners used artifact markers to isolate and remove sEMG spikes and breaks in signal quality on the few occasions when electrodes loosened or detached. The data were analyzed with the Mind Mirror 6 assessments described previously.

## Results

Six of the eight participants increased their EO statistics at Training Level 5 for the Awakened Mind pattern of clarity, creativity, insight, intuition, and spiritual connection, by as much as 31, 39, and 41 points in three cases. This means that these participants generalized their alpha frequencies, which are typically present only with EC, to an EO, waking state of consciousness. Clinical measurements with the Mind Mirror 6 of thousands of individuals show that this is a rare achievement (Pennington, 2012). For most long-term meditators, it is a goal reached after years if not a lifetime of practice (Cade & Coxhead, 1979; Wise, 1995). Yet participants in the workshop attained this brain state after two days of practice. Five participants increased their EC Awakened Mind statistics by as much as 10%, 13%, and 25%, another remarkable stride among practiced meditators, particularly over a brief period of time (Cade & Coxhead, 1979; Wise, 1995). The remaining three participants decreased their EC Awakened Mind scores from day-one pretest to day-two posttest by only 1%, 2%, and 8%.

Three participants increased their Evolved Mind patterns for both EO and EC. That is, participant brain-wave frequencies merged into

the circular shape of nonduality and connection with the nonlocal field. This dual-hemisphere brain-wave pattern is not easily attained, as it involves surrender of the ego to nonlocal awareness and insight.

Six participants increased their Gamma Synchrony patterns for EO by as much as 24%, 39%, and 46%. Three participants increased their Gamma Synchrony patterns for EC, by 1%, 14%, and 31%. The Gamma Synchrony pattern is attained when the meditator produces 45–65 Hz gamma and integrates those frequency bands with the 0.5–44 Hz Awakened Mind pattern (Pennington, 2012).

Prior to main analyses, Mind Mirror 6 data were imported to SPSS 25.0 and screened for accuracy, plausibility, skewness, and kurtosis. One outlier was detected (Case 1 in EcoMeditation for Evolved Mind, EO), which was more than three box-lengths from the boxplot edge. Inspection of this value revealed the value to be a genuinely unusual score and was retained for further analysis. Furthermore, as the Shapiro-Wilk test results suggested that the assumption of normality was met for all data ( $p > .05$ ), data normality and normality of differences scores were assumed.

Descriptive statistics were performed on statistical scores for day-one pretest and day-two posttest measures (see Table 1).

Two-tailed, paired-sample *t*-tests with an alpha level of .05 were used to compare day-one pretest and day-two posttest measures for Awakened Mind (AM), Evolved Mind (EV), and Gamma Synchrony (GS) measures (Hz) in eyes-open (EO) and eyes-closed (EC) conditions. On average,

**Table 1.** Descriptive Statistics for Day 1 Pretest Scores and Day 2 Posttest Scores (N = 8)

	Eyes Open			Eyes Closed		
	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>
Awakened Mind						
Pretest	40.00	16.47	5.82	74.00	25.62	9.06
Posttest	56.00	26.73	9.45	80.75	29.27	10.35
Evolved Mind						
Pretest	34.25	14.39	5.09	25.75	16.34	5.78
Posttest	36.75	11.91	4.21	30.13	24.25	8.57
Gamma Synchrony						
Pretest	29.13	18.02	6.37	37.38	27.14	9.60
Posttest	40.13	28.05	9.92	37.25	27.42	9.69

participants' posttest Awakened Mind EO scores were 16 points higher than pretest scores, 95% CI [-3.45, 35.45]. However, this difference was not statistically significant,  $t(7) = 1.95, p = .093$ . Awakened Mind posttest scores in the EC condition were 6.75 points higher than pretest scores, 95% CI [-2.09, 15.59]. The difference was also not statistically significant,  $t(7) = 1.81, p = .114$ . Posttest scores for Evolved Mind in EO and EC conditions were both higher than pretest scores by 2.50 points, 95% CI [-11.57, 16.57] and 4.38 points, 95% CI [-7.78, 16.54] respectively. These results were not statistically significant,  $t(7) = .42, p = .687$  and  $t(7) = .85, p = .423$ . Posttest scores for Gamma Synchrony were 11 points higher in the EO condition than pretest scores, 95% CI [-11.68, 33.68]. However, this difference was statistically non-significant,  $t(7) = 1.15, p = .289$ . Gamma Synchrony posttest scores for the EC condition were on average  $-1.13$  points lower than pretest scores, 95% CI [-13.53, 13.28]. However, this difference was not statistically significant,  $t(7) = -.02, p = .983$ .

The language in the guided EcoMeditation exercise focused on the chief characteristics of gamma: love, compassion, and the transmission of healing energy to self and others. During this meditation, six of the participants attained mid to high coherence levels in 35–100 Hz gamma; one showed high coherence in delta, the other in alpha. Two people who produced disorganized brain-wave patterns the first day synchronized their brain waves on the second day during EcoMeditation, and this synchronization carried

into their second-day posttest baseline patterns and statistics. Two-tailed paired-sample  $t$ -tests were used to compare mean differences in Awakened Mind (AM), Evolved Mind (EV), and Gamma Synchrony (GS) measures before and after EcoMeditation for eyes-open (EO) and eyes-closed (EC) conditions. Table 2 displays means and standard deviations scores for pretest and posttest measures for EO and EC conditions.

On average, participants' posttest Awakened Mind scores were 17 points higher in the EO condition, 95% CI [8.07, 25.93] than their pretest scores. This difference was statistically significant,  $t(6) = 4.66, p = .003$ , and represented a large effect,  $d = .79$ . Awakened Mind posttest scores in the EC condition were also 8.29 points higher than pretest scores, 95% CI [-2.05, 18.62]. However, the difference was not statistically significant,  $t(6) = 1.96, p = .097$ . Posttest Evolved Mind scores in both EO and EC conditions were also higher than pretest scores by 2.71 points, 95% CI [-20.52, 25.95], and 4.57 points, 95% CI [-1.23, 10.37], respectively. These differences were not statistically significant,  $t(6) = .29, p = .785$  and  $t(6) = 1.93, p = .102$ . Posttest scores for Gamma Synchrony were 2.71 points higher in the EO condition than pretest scores, 95% CI [-12.73, 18.16]. This difference was statistically non-significant,  $t(6) = .43, p = .682$ . In contrast, Gamma Synchrony posttest scores for EC condition were on average  $-20.42$  points lower than pretest scores, 95% CI [-46.85] and this difference was not statistically significant,  $t(6) = -1.89, p = .107$ .

**Table 2.** Descriptive Statistics for EcoMeditation Pretest and Posttest Statistical Scores for Awakened Mind, Evolved Mind, and Gamma Synchrony (N = 7)

	Eyes Open			Eyes Closed		
	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>
Awakened Mind						
Baseline	39.71	20.39	7.71	77.71	27.10	10.24
After EcoMeditation	56.71	22.90	8.66	86.00	17.80	6.73
Evolved Mind						
Baseline	34.57	24.57	9.29	28.71	17.09	6.46
After EcoMeditation	37.29	20.64	7.80	33.29	21.38	8.08
Gamma Synchrony						
Baseline	39.86	26.44	9.99	50.43	32.79	12.39
After EcoMeditation	42.57	13.78	5.21	30.00	28.65	10.83

The following summaries of each person's brain-wave activities trace their advances over the course of the two-day workshop.

### Participant 1: LO

LO is a professional caterer with a business focused on healthy eating and self-care. She had been a regular meditator for the previous year. Her EO scores for the Awakened Mind were impressive, ranging from a day-one pretest of 52% to a day-two posttest of a remarkable 83% (Figure 8), one of the highest scores in the Mind Mirror 6 database. These statistics steadily increased as the participant performed EFT over the course of the two days. The participant's remarkably strong EC Awakened Mind pattern statistic was consistently in the 90th percentile, reaching 96% during EcoMeditation and 98% during the EcoMeditation posttest (Figure 9).

LO's gains in the EO Awakened Mind pattern are all the more impressive because of her strong left-hemisphere dominance in beta and gamma, which suggested stress, anxiety, panic, and/or

trauma. She reduced this LH dominance dramatically as she cleared past traumatic memories following EFT tapping. The participant's final EO Awakened Mind score of 83% was extremely rare and will likely externalize into everyday waking life. It is the pattern of peak performers and the most spiritually awakened people.

LO's EC Awakened Mind value of 96% for EcoMeditation is near the top of the 75–98% range for advanced meditators, as is her high Gamma Synchrony score of 67% during EcoMeditation (Figure 9). She maintained her high Gamma Synchrony values for her less extended right hemisphere with a remarkable EO score of 77% and EC score of 71% during the day-two posttest.

### Participant 2: JC

JC is an author and social worker in private practice. She reported that as a child she had out-of-body experiences and, for the past 10 years, has engaged in daily prayer and meditation. The statistical values provided by the Mind Mirror 6 for JC's brain-wave patterns varied over the two days but

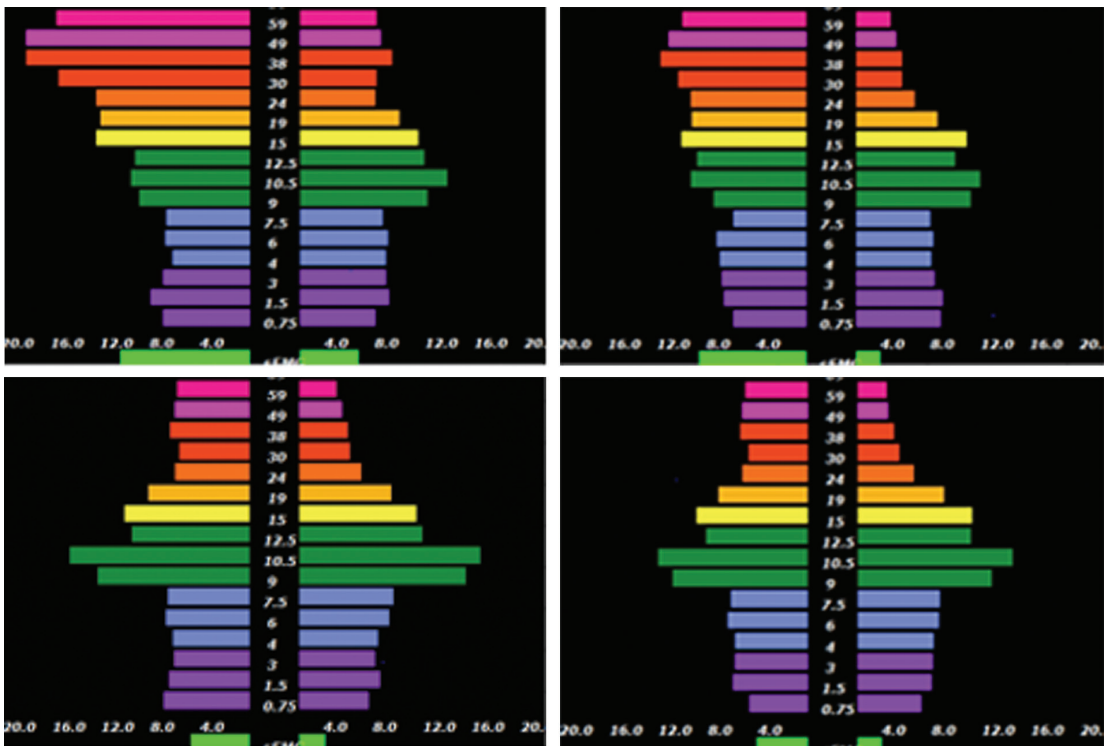


Figure 8. LO's EO baselines: day-one pretest (AM 52% EM 10%, GS 53%) [right hemisphere]; day-two posttest (AM 83%, EM 35%, GS 77%) [right hemisphere]. EC baselines: day-one pretest (AM 95%, EM 35%, GS 80%); day-two posttest (AM 94%, EM 45%, GS 71%).

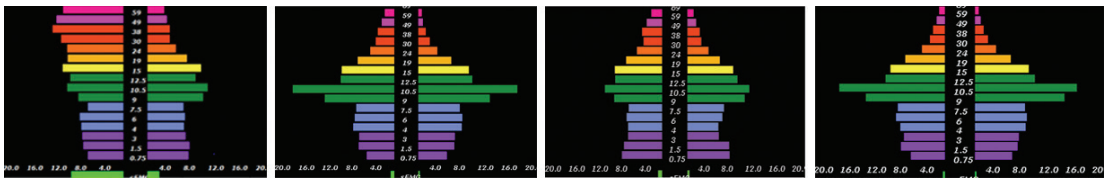


Figure 9. LO's day-two EO EcoMeditation pretest (AM 66%, EM 9%, GS 48%) [right hemisphere]; EC EcoMeditation (AM 96%, EM 18%, GS 67%); post-EcoMeditation baseline EO (AM 90%, EM 61%, GS 39%); post-EcoMeditation baseline EC (AM 98%, EM 42%, GS 4%).

only by a few percentage points. Her most important gains were for the Awakened Mind, with EO from 56% to 58%, and EC from 91% to 95%.

JC's low alpha (8–10 uV) reached a high coherence level of 0.85 during EcoMeditation. Until the closing baseline—possibly due to fatigue—her alpha waves grew increasingly more consistent and stable throughout the weekend, firing at between 15 and 25 uV throughout EcoMeditation and arousing low and mid gamma, which reached 64% pattern attainment for Gamma Synchrony. Although she had several high Gamma Synchrony scores during various baselines, this high EcoMeditation statistic is the most reliable, as by the nature of the meditation it relates to the

expanded, transcendent awareness that is associated with the Gamma Synchrony pattern. During the study weekend, she increased her EC Gamma Synchrony pattern from 49% during the day-one pretest to 68% during the day-two pretest. Figure 10 shows the participant's day-one pretest to day-two posttest patterns with EO and EC.

Notable in the MM displays in Figure 11 is the increase in JC's theta amplitudes during the EcoMeditation baseline on day two; this amplified theta, an indicator of activity in the frequencies of healing (Cade & Coxhead, 1979; Oschman, 1997; Pennington, 2012; Wise, 1995), carried into her day-two closing baseline. Her theta amplification links to an increase in her midrange gamma

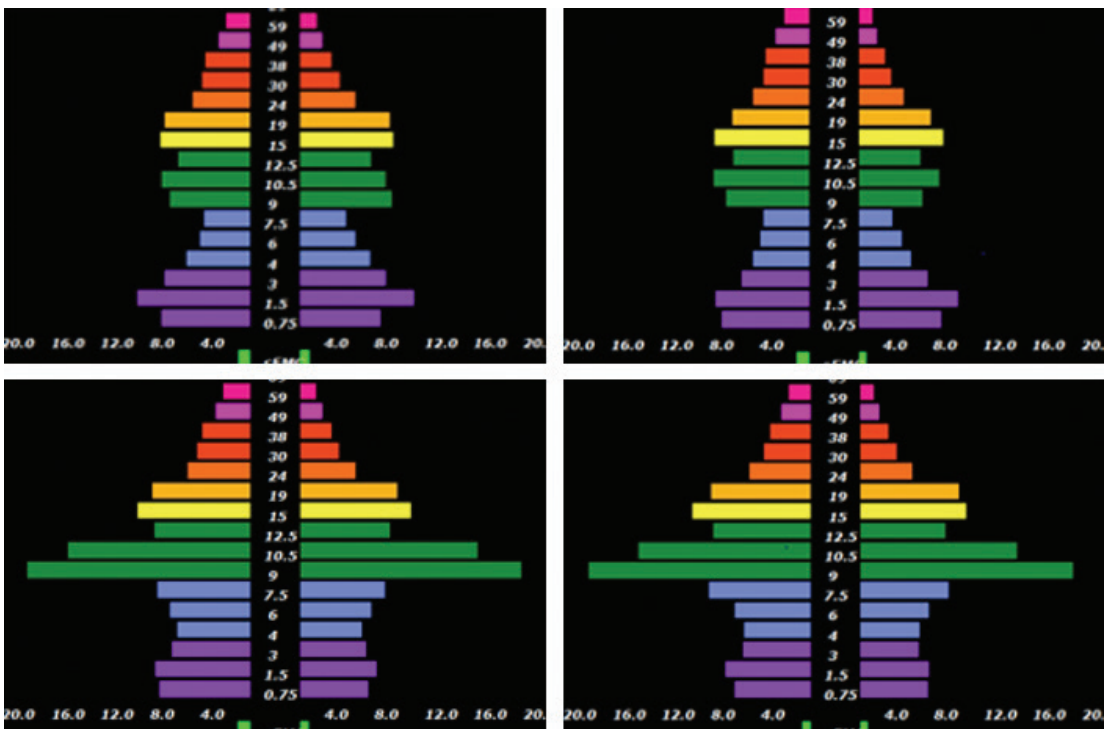


Figure 10. JC's EO day-one pretest (AM 56%, EM 41%, GS 46%); day-two posttest (AM 58%, EM 31%, GS 50%); EC day-one pretest (AM 91%, EM 23%, GS 49%); day-two posttest (AM 93%, EM 28%, GS 68%).

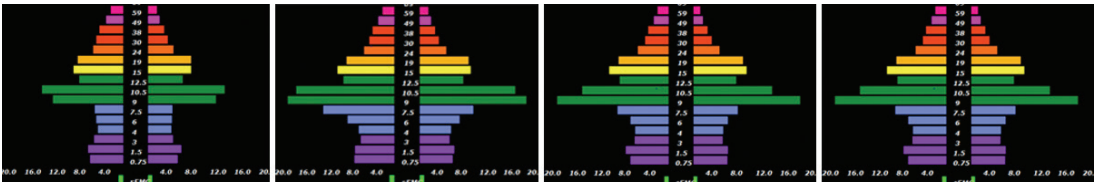


Figure 11. JC's day-two EC: pretest (AM 93%, EM 28%, GS 68%); EcoMeditation (AM 93%, EM 24%, GS 64%); EcoMeditation posttest (AM 95%, EM 26%, GS 23%); day-two posttest (AM 95%, EM 24%, GS 43%).

amplitude during EcoMeditation, which accounts for her Gamma Synchrony score of 64%, as she experienced love and compassion. The Composite Display in Figure 12 shows the theta amplifications that quadrupled JC's midrange gamma amplitudes.

Figure 12 shows that after tapping EFT points to release tension in the body from 0:00 to 1:08 minutes, JC closed her eyes and her alpha-theta amplitudes quadrupled. Theta increases repeatedly stimulated her gamma, more closely seen in the mid gamma amplitude window in Figure 13. During EcoMeditation, JC's midrange gamma (45–65 Hz) quadrupled from 0.5 to more than 2 uV for a period of 3:00–8:00 minutes then declined to 1.5 uV until 13:00 minutes. Meditators report felt changes in the mind and body when gamma increases by as little as 0.5 uV (Pennington, 2012).

The low gamma Coherence Summary graphs in Figure 14 show that JC's alpha-theta amplitude increase upon closing her eyes at 1:08 minutes during EcoMeditation reached high coherence first

in alpha then theta at 0.7. Alpha-theta coherence in turn increased her coherence in low gamma from 0.2 to 3.5 between 6:00 and 13:00 minutes.

High-coherence theta in the 7.83 Hz frequencies of healing (Hendricks, Bengston, and Gunkelman, 2010) stimulated the increase in low (35–45 Hz) and mid (45–65 Hz) gamma amplitudes shown in Figures 12 and 13. JC demonstrated high and near coherence in low alpha (8–10 Hz) and low theta (7–8 Hz) throughout EcoMeditation. This carried into her day-two EC posttest baseline (AM 95%, EM 24%, GS 43%; see Figure 11).

During a segment of EcoMeditation from 3:00 to 11:00 minutes, in which JC imagined her breath coming from her heart, then imagined sending heart energy to another person, her low alpha Coherence (see Figure 14) peaked twice at 8.8. High coherence is 0.7 and above. Her midrange gamma quadrupled, as can be seen in Figure 13. The combination of EFT and EcoMeditation, especially the segment on Heart Care, increased JC's

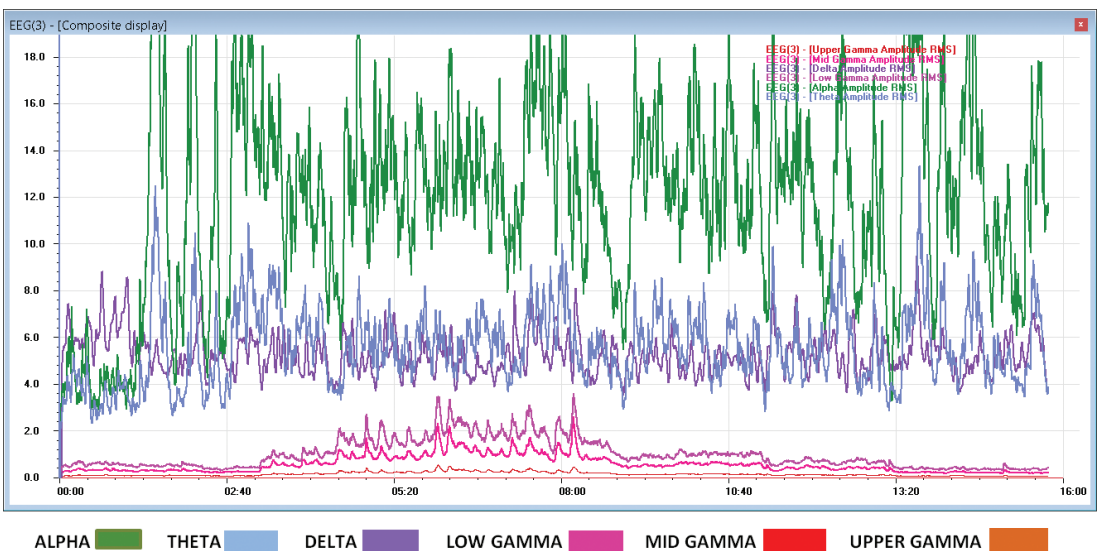


Figure 12. Left-hemisphere Composite Display for EcoMeditation.

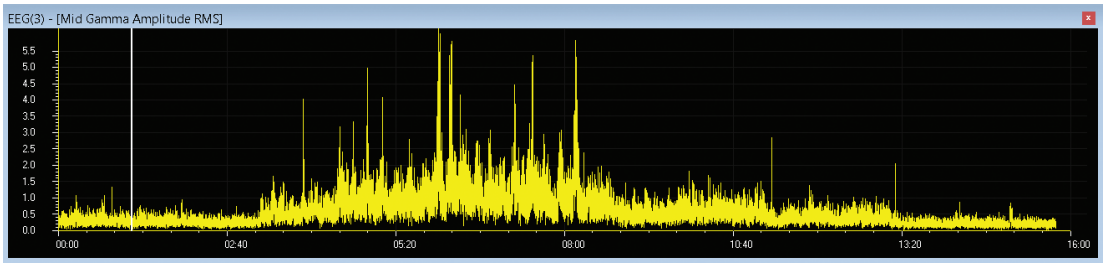


Figure 13. Mid gamma amplitude window for day-two Ecomeditation.

theta, gamma, and alpha coherence on day two, activating the neurons in the temporal and occipital lobes measured by the Mind Mirror 6 electrodes.

### Participant 3: HG

HG is a social worker at a charter school in Washington, DC. She had been meditating daily for the previous two years. During the two-day study, she made remarkable strides in EO brain-wave development consisting of a 20-point increase from a day-one opening baseline of 56% to a day-two closing baseline of 76%. Her

EO score of 76% was within the ideal range for advanced meditators and spiritually aware people *with the eyes closed*. This impressive gain, accompanied by coherence increases for alpha, theta, delta, and all three categories of gamma, could endure beyond the training.

Both EFT tapping and EcoMeditation had a powerful effect on HG's EO readings, which for the Awakened Mind ranged from day-one pretest 56% and day-one posttest 68% to an extraordinary EcoMeditation posttest 88% and closing posttest 76%. Her day-two pretest and EcoMeditation statistics were lost due to an electrode issue.

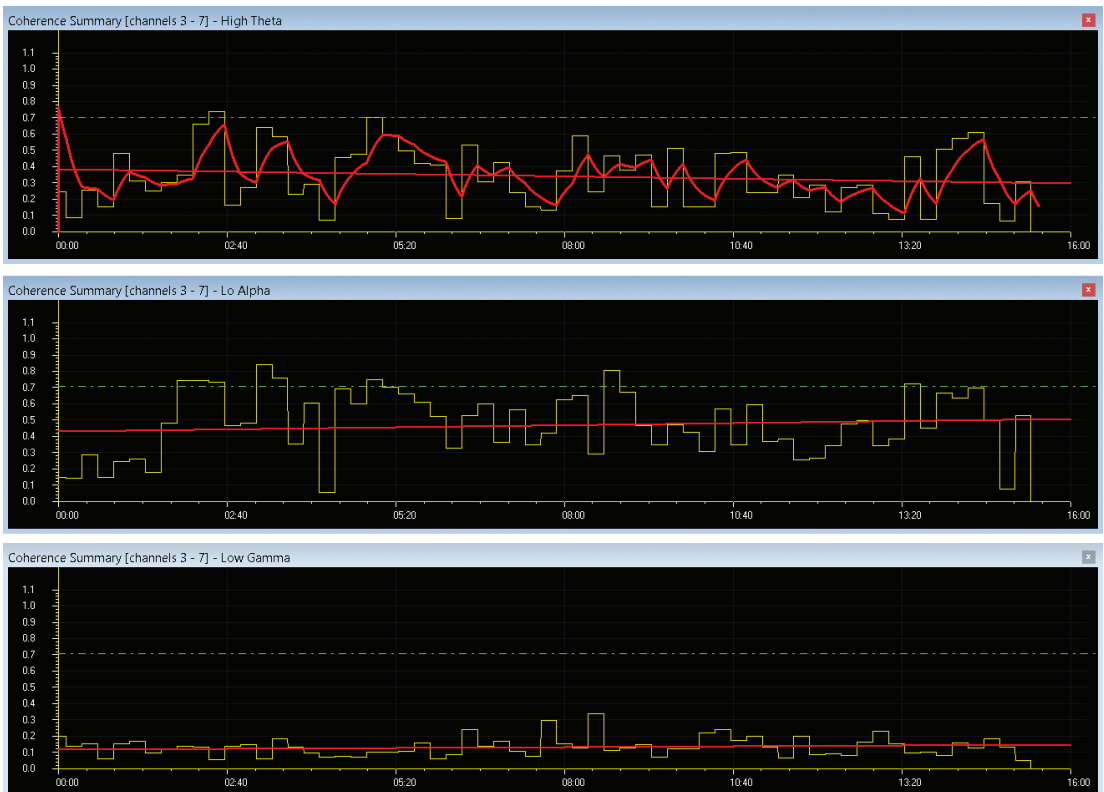


Figure 14. JC's Coherence Summaries for high theta (7–8 Hz), low alpha (8–10 Hz), and low gamma (35–45 Hz).



Figure 15. HG demonstrated low coherence in delta at 0.475 during the day-one pretest and unusually high coherence at .09-.095 during the EcoMeditation posttest.

The EcoMeditation posttest measurements for delta coherence, shown in Figure 15, demonstrate the effect of EFT tapping and EcoMeditation on HG's brain waves. HG's extremely high readings of 0.95 well exceeded high coherence at 0.7.

HG's coherence also increased for low and mid gamma, from the day-one pretest to the EcoMeditation posttest. Her low gamma coherence (Figure 16) increased from a high of 0.15 during the day-one pretest to a high of 0.55 at 6:00 minutes during the day-two EcoMeditation posttest. Her mid gamma coherence (Figure 17)

increased from 0.15 during the day-one pretest to 0.5 at 6:00 minutes during the EcoMeditation posttest.

HG's increased coherence in delta and low and mid gamma from the day-one pretest through the EcoMeditation posttest related to a remarkable EO alpha amplitude increase (Figure 18) and a significant increase in EC theta (Figure 19) during EcoMeditation (data lost), which carried into her EcoMeditation posttest. These increases continued through the day-two posttest and indicate heightened inner peace and unity with self and

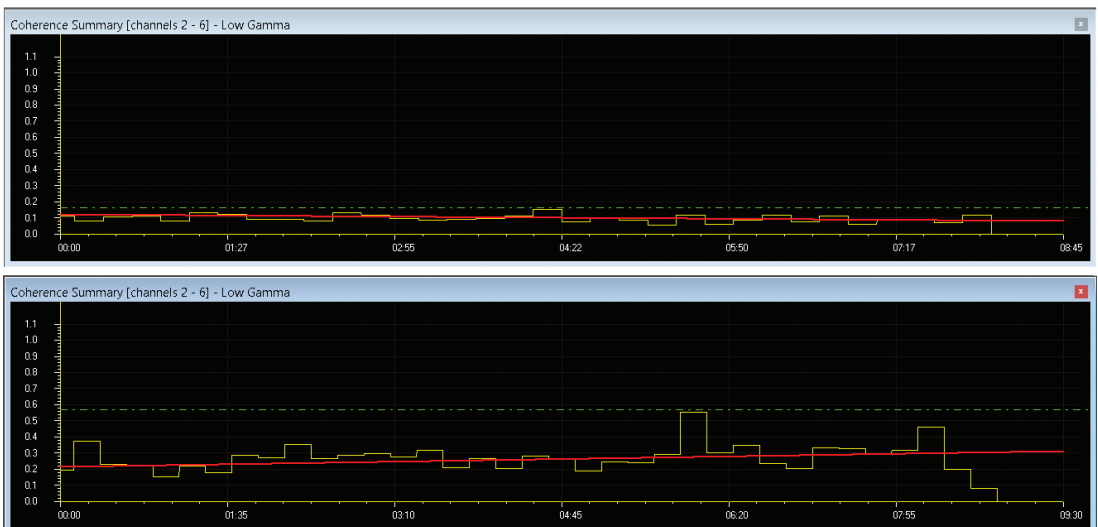


Figure 16. HG's low gamma Coherence Summary: day one pretest and day two EcoMeditation posttest.



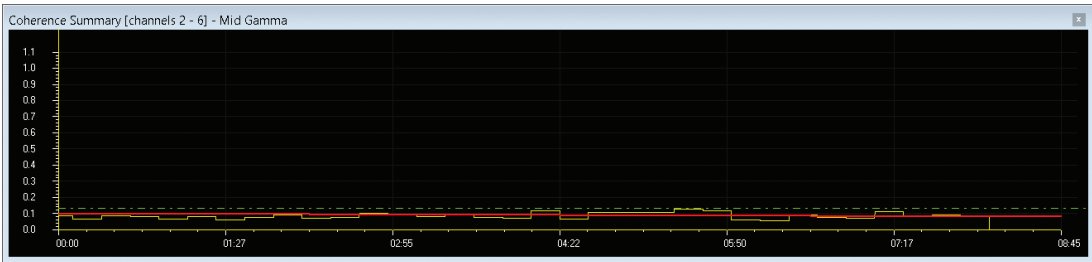


Figure 17. HG's mid gamma Coherence Summary: day one pretest and day two EcoMeditation posttest.

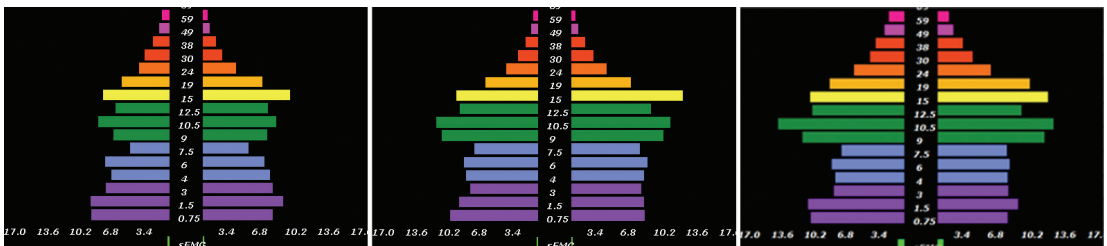


Figure 18. HG's EO: day-one pretest (AM 56%, EM 49%, GS 41%); day-two EcoMeditation posttest (AM 88%, EM 31%, GS 7%); day-two posttest (AM 76%, EM 41%, GS 12%).

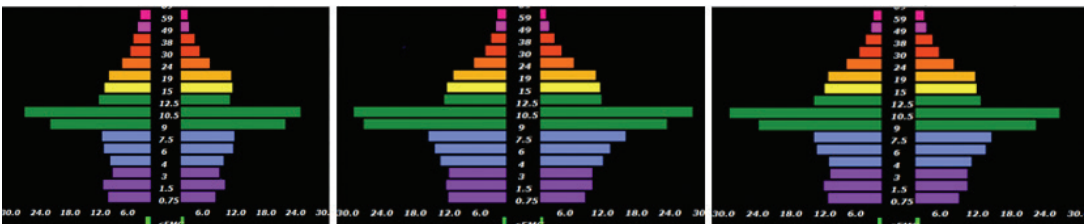


Figure 19. HG's EC: day-one pretest (AM 94%, EM 7%, GS 17%); day-two EcoMeditation posttest (AM 90%, EM 5%, GS 10%); day-two posttest (AM 92%, EM 5%, GS 8%).

others, as well as the awakening of awareness in the EO waking state and EC meditation.

### Participant 4: JL

JL is a psychotherapist who has worked in private practice for 20 years. Her only formal meditation practice was labyrinth walking, although she reported having engaged in hands-on healing over

the past few years. She described receiving intuitive messages kinesthetically while healing others, an ability that likely owes to her high-amplitude delta and gamma. Her powerful delta and gamma, coupled with low-amplitude alpha, account for her very low scores in all three Mind Mirror 6 patterns. She was the only participant who did not increase any of her pattern attainment statistics from the day-one pretest to day-two posttest. However, positive

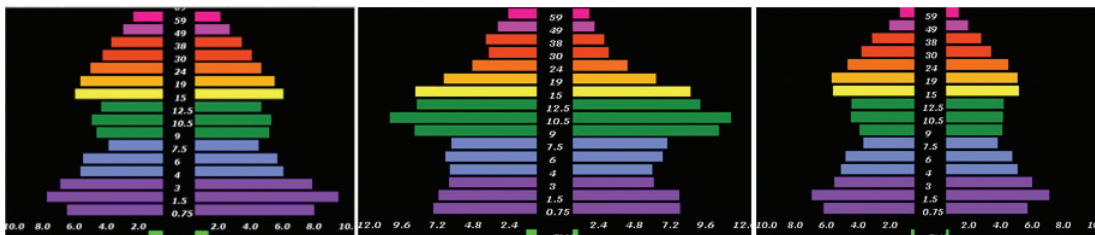


Figure 20. JL's EO: day-one pretest (AM 12%, EM 39%, GS 31%), day-two EcoMeditation posttest (AM 90%, EM 61%, GS 39%); day-two posttest (AM 9%, EM 23%, GS 15%).

and remarkable changes were observed. The EcoMeditation posttest for EO (Figure 20) provided her highest statistic during the training: Awakened Mind 90%, Evolved Mind 61%, and Gamma Synchrony 39%, her EO Awakened Mind score being among the highest in the MM database. EcoMeditation had an extraordinary effect on JL's EC Awakened Mind patterns as well: compare a day-one pretest of 17% and posttest of 15% with a day-two pretest of 20%, the scores for which more than doubled during EcoMeditation 45%, and EcoMeditation posttest 47% (Figure 21). She did not maintain these EO or EC changes during the day-two posttest, in which she scored Awakened Mind EO and EC 9%.

During the day-two EcoMeditation, JL significantly improved her brain-wave patterns by increasing the amplitudes of her alpha, theta, and delta and decreasing her gamma as she focused on her breath and imagined the energy of compassion in her heart, noticed the color and texture of the healing energy, and sent it out to others. She retained these pattern attainment increases through the EcoMeditation posttest: compare EC EcoMeditation AM 45%, EM 49%, GS 5% and EcoMeditation posttest AM 47%, EM 47%, GS 19% (see Figure 21). Most remarkable was her EO EcoMeditation posttest for Awakened Mind 90%, Evolved Mind 61%, and Gamma Synchrony 39% (see Figure 20), all the result of doubling her alpha from day-one pretest 5 uV to EcoMeditation protest (EO) 10 uV.

JL's decrease in her overpowering gamma during EcoMeditation occurred as she shifted her awareness into the lower and more relaxed, expansive frequencies of alpha, theta, and delta, possibly due to the meditation's similarity to the energy healing work she practices.

### Participant 5: IS

IS is a former actress who obtained a master's degree in social work after becoming a mother. She had worked as a clinical therapist in private practice for 17 years. She had no formal meditation practice but engaged in several spiritual practices that elevate her emotions. IS was one of the two people whose statistics improved for both EO and EC in all three Mind Mirror patterns. From the day-one pretest to day-two posttest, she went from EO Awakened Mind 28% to 54%, Evolved Mind 19% to 46%, and Gamma Synchrony 11% to 57% (Figure 22). For EC, she increased Awakened Mind 77% to 87%, Evolved Mind 41% to 52%, and Gamma Synchrony 69% to 83%.

Participant IS's EC Gamma Synchrony statistics were unprecedentedly high, including a day-one closing value of 95%, day-two pretest of 82%, EcoMeditation 79%, EcoMeditation posttest 86%, and a day-two posttest closing of 83% (Figures 22 and 23). These are among the highest values for Gamma Synchrony in the Mind

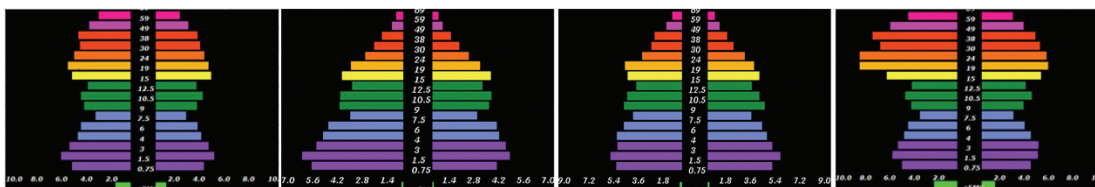


Figure 21. JL's EC: day-two pretest (AM 20%, EM 38%, GS 26%); EcoMeditation (AM 45%, EM 49%, GS 5%), EcoMeditation posttest (AM 47%, EM 47%, GS 19%), posttest (AM 9%, EM 14%, GS 15%) [right hemisphere].

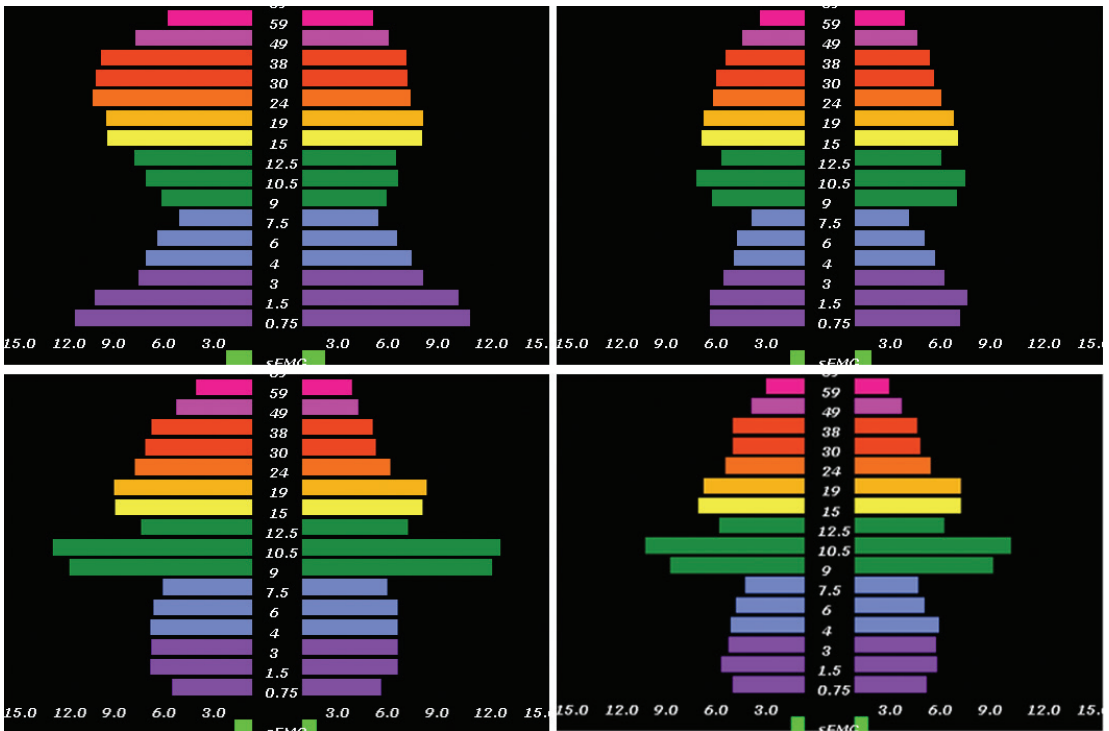


Figure 22. IS's day-one EO pretest (AM 28%, EM 19%, GS 11%); day-two EO posttest (AM 54%, EM 46%, GS 57%); day-one EC pretest (AM 77%, EM 41%, GS 69%); day-two EC posttest (AM 87%, EM 52%, GS 83%).

Mirror 6 database. The highest known value was her day-one closing statistic of 95%, all the more remarkable because, when the eyes are closed, alpha increases and gamma amplitudes typically decrease.

Researchers believe that gamma frequencies stimulate coherence, which enhances the efficiency of the brain (Pennington, 2012). The Mind Mirror displays in Figure 22 show that IS's overall pattern amplitudes decreased from the day-one pretest to the day-two posttest, which appears to be an increase in efficiency (note the attenuation setting decrease from 15 uV in Figure 22 during day one to 10 uV in Figure 23 during day two). This suggests that, as her gamma frequencies

became more symmetrical and her brain-wave patterns increased in coherence, her more efficient brain began to operate on less voltage (Pennington, 2012). The Correlation Coefficient summary windows in Figure 24 show this increase in brain-wave coherence in the beta-gamma range from 20–100 Hz.

The day-one Correlation Coefficient windows in Figure 24 show that participant IS exceeded the high-coherence level of 0.8 for 6–8 Hz low alpha/high theta to begin with, but all of the other frequency bands were in low coherence (below 0.8). The day-two closing baseline shows a slight loss of coherence in 6–8 Hz alpha/theta (from 0.8 to 0.72), but significantly increased coherence in 20–30 Hz

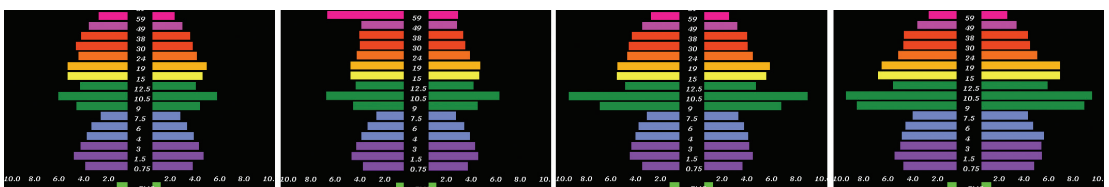


Figure 23. IS's day two: EC pretest (AM 70%, EM 40%, GS 82%); Ecomeditation (AM 72%, EM 46%, GS 79%) [right hemisphere], 1-2 uV artifact RH at 59-49 Hz; Ecomeditation posttest (AM 88%, EM 45%, GS 86%); posttest (AM 87%, EM 52%, GS 83%).

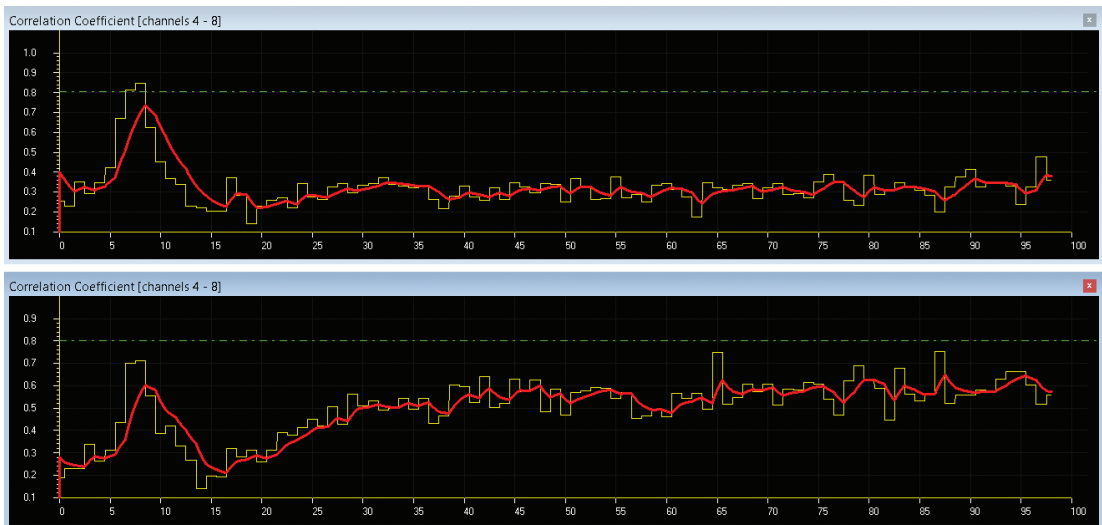


Figure 24. IS's Correlation Coefficients day-one opening baseline and day-two closing baseline.

beta and 30–100 Hz gamma. The increased coherence in IS's alpha and gamma frequencies suggests that she grounded her "stress" gamma (seen during the Traumatic Memory segment) in alpha and externalized it to waking states, which is the point of all mental training and emotional healing work—that is, to maintain the alpha bridge in order to access theta and delta in ordinary life. The increases in her gamma, given this "grounding" sensory alpha, suggest the whole-brain synchronization, neuroplasticity, neurogenesis, and heightened awareness of the Superconscious Mind (Pennington, 2012).

These results suggest that EFT tapping brought about the desired healing and enhanced IS's brain-wave patterns and state of consciousness. It is likely that her verbal report of feeling a greater sense of well-being was due to rewired neural circuitry and will be a lasting change.

### Participant 6: KC

KC is an investigative environmental journalist and author. She holds a master's degree in writing from Columbia University. Her personal background includes a back injury incurred while living in New Zealand, intense fibromyalgia pain persisting over the past two decades, and the recent suicide of her father, which she felt had traumatized her. She has addressed her physical issues as a practitioner of NAET and through energy healing modalities including Donna Eden

Energy Medicine. She turned to EFT to treat the causes of her physical/energetic difficulties. She showed immense changes between her pretest on day one and her posttest on day two. If she is able to re-access these more coherent and stable brain-wave patterns in her daily life, she will be able to continue with the healing and change that occurred over the weekend through EFT (Pennington, 2012).

KC was one of the two participants who maintained or increased her statistical scores for both EO and EC in all three of the advanced MM patterns. Her EC values increased for the Awakened Mind 83% to 96%, Evolved Mind 49% to 73%, and Gamma Synchrony 12% to 13%. Her EO values increased for the Awakened Mind 32% to 73%, Evolved Mind 47 to 59%, and Gamma Synchrony 12% to 13%. KC began the training with low alpha amplitudes and a considerable degree of asymmetry and desynchronization between her left and right hemispheres. Her major gains were increased alpha in EO and EC measurements and increased coherence.

KC's tapping work within theta during Traumatic Memory and Heart Care increased the amplitudes and coherence of her low gamma, synchronized her brain-wave pattern so that categories were firing simultaneously, and in turn evoked coherence first in alpha, then alpha and theta, and finally in beta and alpha during the day-two closing baseline. Her EO alpha amplitudes increased from 6 to 9.5 uV (see Figure 25) and ultimately extended

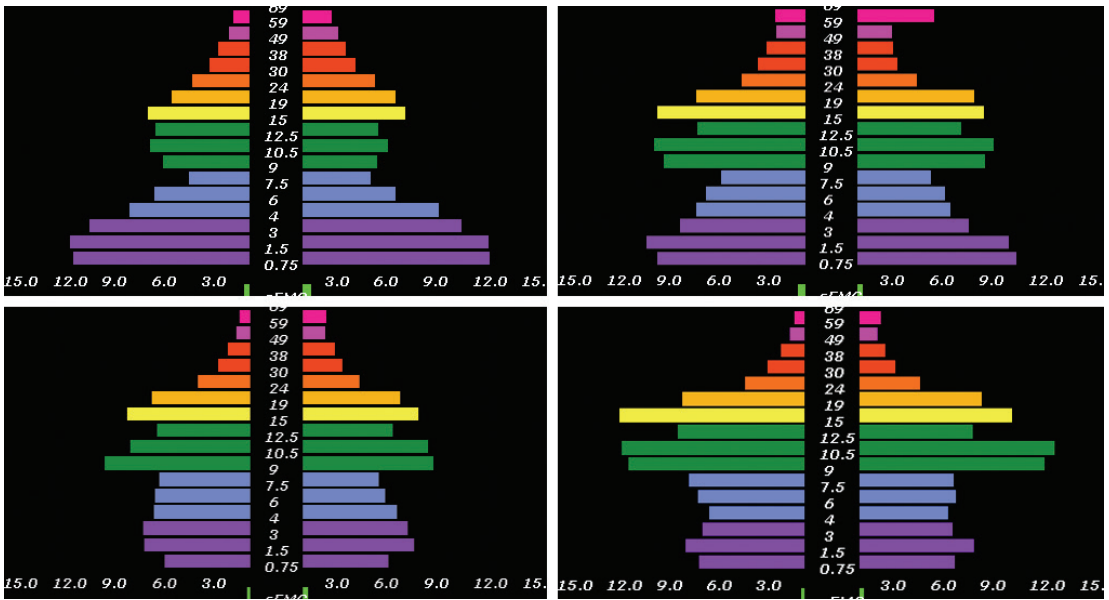


Figure 25. KC's EO day-one pretest (AM 32%, EM 47%, GS 11%) and day-two posttest (AM 73%, EM 59%, GS 27%); KC's EC day-one pretest (AM 83%, EM 49%, GS 12%) and day-two posttest (AM 96%, EM 73%, GS 13%). (Note: the extended RH amplitude at 59 Hz during the day-two EO posttest is electrical artifact.)

her EO alpha beyond her persistent 19/15 Hz beta. KC's EC 15 Hz beta returned during the day-two posttest, but her increased 7.5 Hz theta slightly reduced the amplitudes of other beta frequencies.

KC's Gamma Synchrony scores were not high. Her statistics for EO Gamma Synchrony ranged from day-two pretest 3% to day-two posttest 27%, and for EC from day-two pretest 3% to EcoMeditation posttest 16%. Nevertheless, gamma did affect KC's brain-wave patterns and coherence. During EcoMeditation, she moved into the circular Evolved Mind pattern of unity consciousness (Evolved Mind 47%) while experiencing what she described as warm, loving red energy, a memory of her mother's kiss, and thoughts of her husband, which increased her gamma and alpha, theta, and delta amplitudes, decreased the 15 Hz band of beta, and balanced her left and right hemispheres. EcoMeditation also

increased her brain-wave coherence and day-two posttest statistical scores, as shown in Figure 26. She maintained Evolved Mind circularity during the EcoMeditation posttest at a high 61%. Her Evolved Mind score of 73% during the day-two posttest is one of the highest EC Evolved Mind statistics in the MM database to date.

Deepening into theta to do personal transformation work, particularly on day two during EcoMeditation, amplified KC's alpha, theta, and gamma during EO and EC and extended her peak alpha frequency from 9 Hz upward to a two-band combination of 9 Hz and 10.5 Hz (see Figure 26), which she maintained during the EcoMeditation posttest and day-two posttest. This signifies increased relaxation and a reduced tendency to continually revisit unresolved personal issues stored in the long-term memories of her subconscious theta frequencies. The amplitude increase in 7 Hz

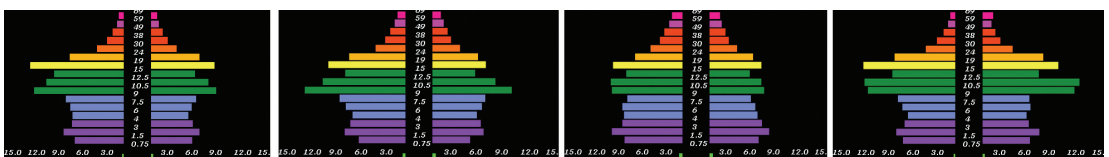


Figure 26. KC's EC day-two pretest (AM 92%, EM 45%, GS 3%); EcoMeditation (AM 93%, EM 47%, GS 11%); EcoMeditation posttest (AM 70%, EM 61%, GS 18%); and day-two posttest (AM 96%, EM 73%, GS 13%).

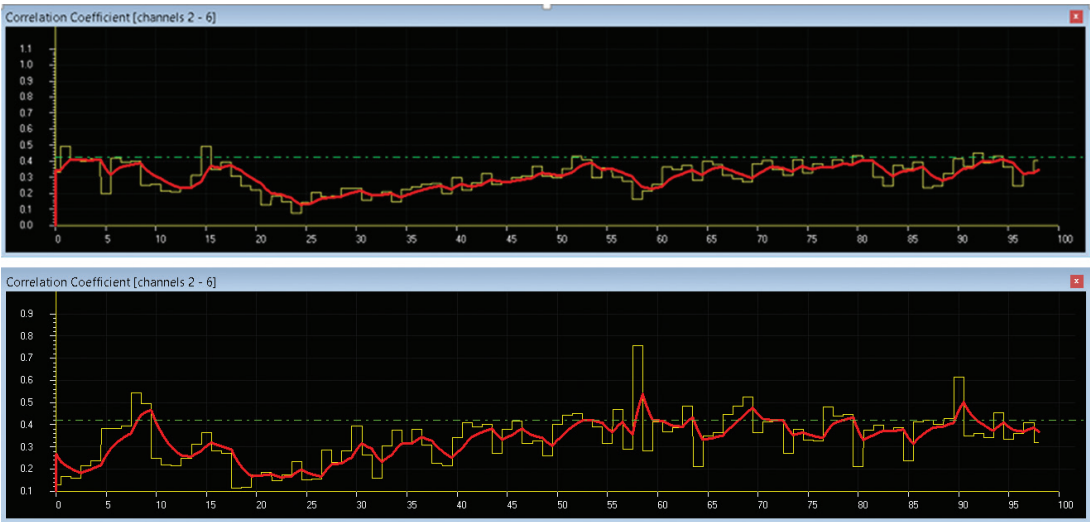


Figure 27. KC's Correlation Coefficients day-one pretest and day-two posttest. (Note: The spike at 58–59 Hz gamma in the bottom window for the day-two posttest is artifact caused by an electrode issue.)

theta further suggests that she accessed healing and released issues in 7.83 Hz alpha-theta.

The Correlation Coefficient summaries in Figure 27 show increased coherence in KC's 7.5 to 9 Hz alpha-theta frequencies: from low coherence of 0.42 during her day-one opening pretest to 0.55 during the day-two posttest (toward high coherence at 0.8).

The day-two closing Correlation Coefficient shows that, through EFT tapping, Heart Care, and

EcoMeditation, KC gained brain-wave coherence in 7–9 Hz alpha/theta and 30–100 Hz gamma, frequencies associated with healing, insight, and brain-wave coherence.

Most revealing are the Coherence Summary reports for KC's day-one pretest and day-two posttest (Figure 28). During the day-one pretest Traumatic Memory segment, her alpha coherence measured a low 0.37; during the day two posttest Traumatic Memory segment, her alpha coherence

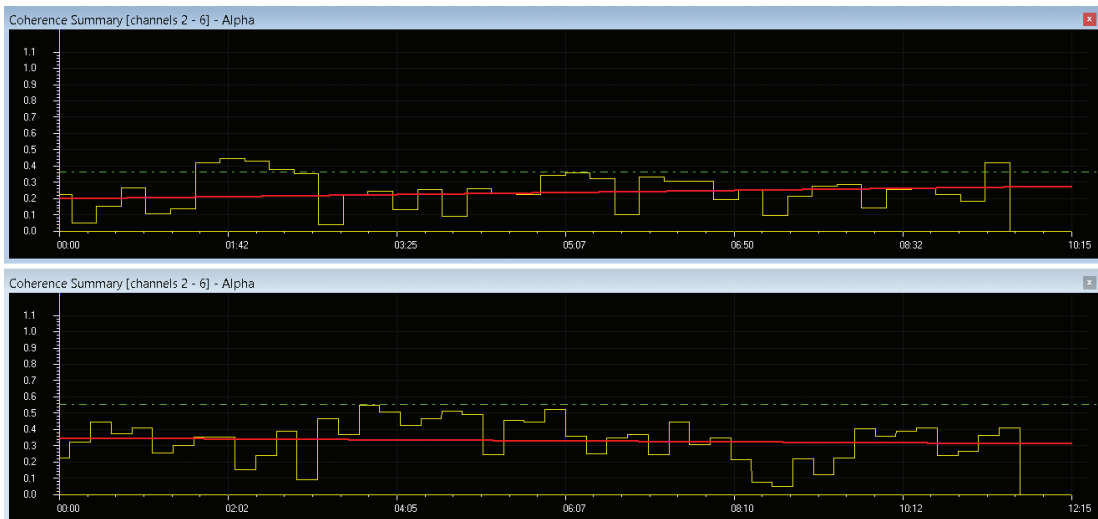


Figure 28. KC's alpha Coherence Summaries for day-one pretest Traumatic Memory segment from 5:50 to 7:45 minutes; day-two posttest Traumatic Memory from 3:00 to 5:00 minutes.

increased to 0.55. Clinical observations indicate that such a change is suggestive of enhanced emotional resilience and decreased emotional reactivity (Pennington, 2012).

### Participant 7: LH

LH was a poet who founded a culinary arts program at a major university in 1989. He graduated with a PhD in anthropology and worked as a chef for 12 years and a chef professor for 15 years. He retired in 2003 and is now a full-time poet. From the day-one pretest to day-two posttest, LH increased his EC Awakened Mind statistics from 72% to 85%, which placed him in the 75–98% pattern attainment category of long-term meditators and other highly advanced and spiritually conscious people. Most remarkably, he increased his EO Awakened Mind statistics from 31% to 70% (Figure 29), a gain of 39 percentage points that was due to an amplification of his eyes-open alpha from 7 to 13.6 uV. His EO alpha-theta ratio increased from 57% to 77%. Both his EO and EC gains suggest a significant reduction of stress, increased inner peace, personal healing, and an evolution in consciousness.

During the day-one pretest, his low alpha (8–10 Hz) coherence for EO was midrange at 0.4–0.5 and reached very high coherence at 0.88 during the EC test from 1:10 to 3:05 minutes (Figure 30).

His EO low alpha coherence sharply increased during the day-two posttest, reaching 0.82 for about 30 seconds during an initial EO settling-in period, 0.6 for 20 seconds during EO, and 0.8 for 30 seconds during a second EO test after Heart Care. This highly significant increase in EO alpha amplitude and coherence provides him with greater access to the theta frequencies of his essential being in the subconscious mind.

On day two, EcoMeditation brought LH’s EO beta and gamma frequencies into hemispheric balance (Figure 29). During the EcoMeditation posttest and day-two posttest, he maintained amplitude symmetry in beta and gamma despite his generation of high-amplitude alpha in the left hemisphere. This increased amplitude symmetry in beta and gamma may account for his remarkable EO alpha increase.

LH increased his Gamma Synchrony score of EC EcoMeditation 46% to 50% during the EO and EC EcoMeditation posttest (see Figure 31).

The balancing of LH’s beta and gamma during EcoMeditation likely increased his low alpha coherence (Figure 30) with EO. His coherent EO alpha on posttest is an achievement that eludes many long-term practitioners of meditation. As LH has no regular meditation practice, his results strongly suggest that the strides he made over the weekend were due to EFT tapping.

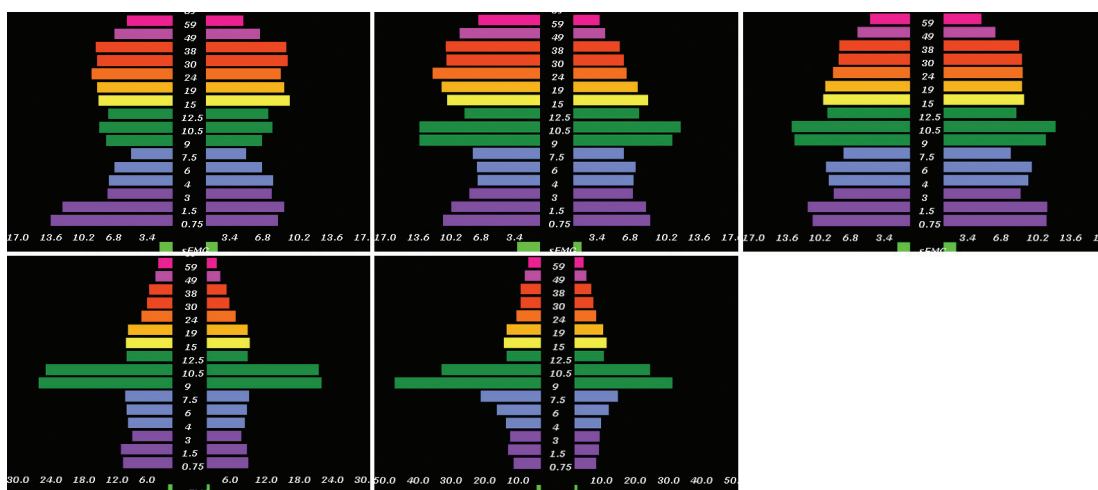


Figure 29. LH’s EO day-one pretest (AM 31%, EM 25%, GS 35%, alpha-theta 57%); day-two first EO posttest (AM 70% [right hemisphere], EM 25%, GS 74% [left hemisphere], alpha-theta 77%); day-two second EO posttest after Heart Care (AM 51%, EM 56%, GS 62%, alpha-theta 60%); day-one EC pretest (AM 72%, EM 18%, GS 32%, 30 uV); day-two EC posttest (AM 85%, EM 6%, GS 30%, 50 uV).



Figure 30. LH's Correlation Coefficients for day-one pretest (EO from 0:00-1:10 minutes); day-two posttest (EO settling-in from 0:00 to 1:03 minutes, EO from 1:03 to 2:01 minutes, second EO after HeartCare from 10:19 to 11:57 minutes).

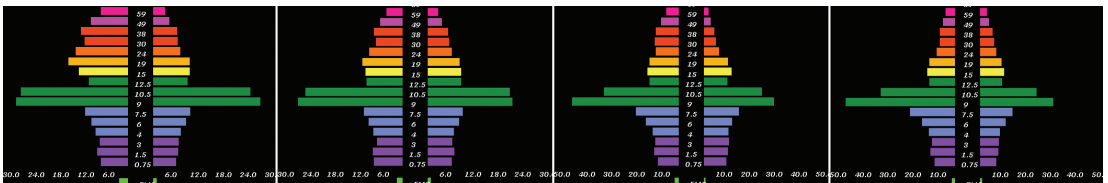


Figure 31. LH's day-two EC pretest (AM 93%, EM 8%, GS 87%, left hemisphere); EcoMeditation (AM 79%, EM 17%, GS 46%); EcoMeditation posttest (AM 93%, EM 10%, GS 50%, 50 uV); day-two posttest (AM 85%, EM 6%, GS 30%, 50 uV).

## Participant 8: VG

VG, an economics major from the Netherlands, left her unfulfilling corporate work after a personal blessing from the Dalai Lama in 2003. She is now a talent coach, employing the Game of Gifts, Reiki, the success principles of Jack Kornfield, and the Law of Attraction to help her clients. The 59 Hz gamma artifact subtracted from VG's EO Awakened Mind and Evolved Mind statistics (Figure 32); otherwise, she would have been the third person in this study with gains in all three patterns for EO and EC. Her EC Evolved Mind pattern increased from day-one pretest 2% to day-two posttest 22%. Her primary improvement was an impressive increase in all of her EC patterns: Awakened Mind 63% to 88%, Evolved Mind 2% to 22%, and Gamma Synchrony 4% to 35%. Her EC Awakened Mind scores steadily increased from a day-one pretest value of 63% to a day-one posttest value of 78%, to a day-two opening value of 87%, and finally to a day-two

closing value of 88%, her highest EC score during the training (Figure 33).

Figure 33 shows that, by the end of day one, VG increased her gamma amplitudes in the 24–64 Hz range of frequencies, which decreased the amplitude of her prodigious alpha from a day-one pretest of 28 uV to a day-two posttest of 20 uV, thus improving her alpha-theta ratio in all three Mind Mirror 6 patterns. Her alpha-theta ratios ranged from day-one pretest 89% and day-one posttest 82% to day-two pretest 94% and day-two posttest 95%, which increased her access to her subconscious mind in theta. Her gamma amplitude increases improved her EC Gamma Synchrony statistics from day-one pretest 4% to day-two posttest 35% (Figure 33), although electrical artifact amplified her 59 Hz gamma by about 1 uV during the day-two posttest.

Figure 34 shows VG's EC maintenance of her gains in gamma during the day-two pretest (GS 22%) and its continuation during EcoMeditation (GS 15%) and the EcoMeditation



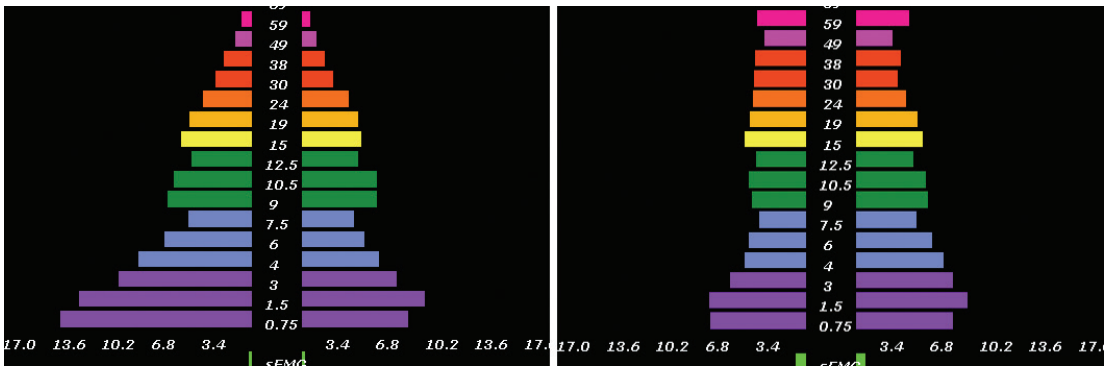


Figure 32. VG's day-one EO pretest (AM 53%, EM 44%, GS 5%); day-two EO closing baseline (AM 30%, EM 35%, GS 18%, 1–2 uV electrical noise at 59–49 Hz).

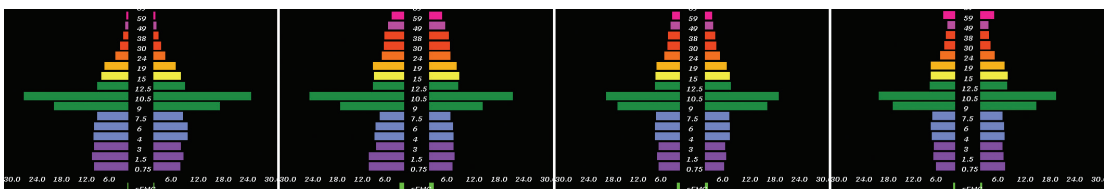


Figure 33. VG's EC day-one pretest (AM 63%, EM 2%, GS 4%); day-one posttest (AM 78%, EM 3%, GS 21%); day-two pretest (AM 87%, EM 2%, GS 22%); day-two posttest (AM 88%, EM 22%, GS 35%, 1–2 uV electrical noise at 59 Hz).

posttest (GS 10%), compared to a day-one pretest of GS 4%. Figure 34 also shows her concentration of consciousness in gamma and sensory alpha during EcoMeditation and an increase in her theta amplitudes from EcoMeditation 5 uV to EcoMeditation posttest 7 uV. This increase in theta suggests a heightened connection with her spirit during EcoMeditation, which continued afterward.

The decrease in VG's alpha amplitude over the two days and her consistent gamma increases likely account for her impressive alpha coherence. The Correlation Coefficient windows in Figure 35 show that she maintained her low alpha coherence (8–10 Hz) with a slight increase at 9 Hz during

the day-two posttest. She gained coherence in the low-gamma range of 35–42 Hz from day-one pretest to day-two posttest.

VG's improved coherence in 7–9 Hz alpha and 35–42 Hz mid gamma and especially her EC Awakened Mind increase from day-one pretest 63% to day-two posttest 88% suggested that EFT tapping and EcoMeditation increased her inner peace, awareness, and mental integration. Her EC posttest score of 88% for the Awakened Mind (Figure 33) places her brain wave patterns well within the 75–98% statistical range of advanced meditators and other highly developed and spiritually conscious people.

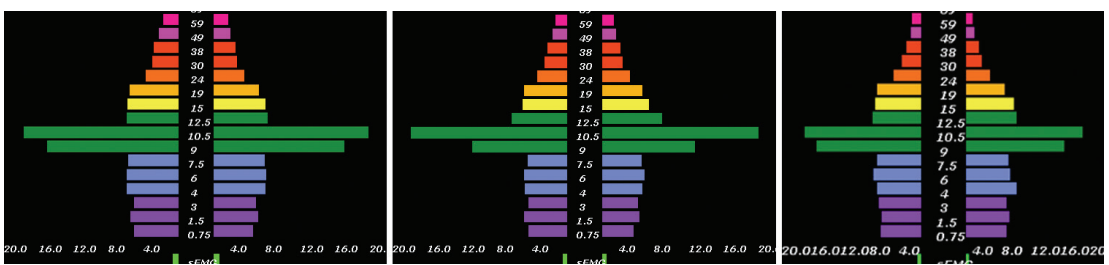


Figure 34. VG's EC day-two pretest (AM 87%, EM 2%, GS 22%); day-two EcoMeditation (AM 66%, EM 31%, GS 15%); day-two EcoMeditation posttest (AM 85%, EM 2%, GS 10%).

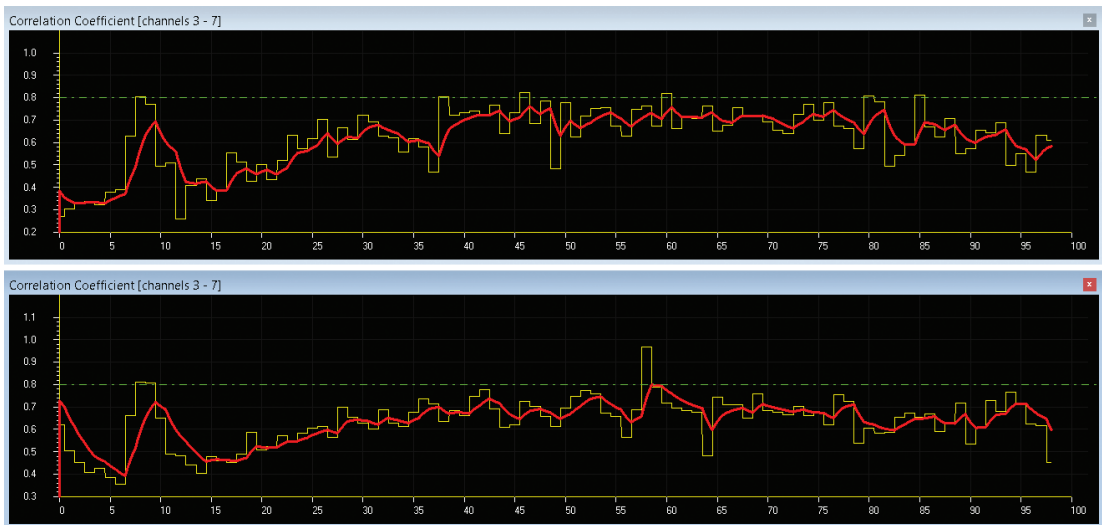


Figure 35. VG's Correlation Coefficients during day-one pretest and day-two posttest. (Note: the coherence spike at 58–59 Hz during the day-two posttest is electrical artifact.)

## Discussion

The basis of the pattern improvements measured in seven of the eight participants was the arousal of delta and gamma frequencies and their resultant alpha-theta amplifications and brain-wave coherence in one or more brain-wave categories. The participants consistently aroused delta and gamma frequencies during EcoMeditation and the baseline Heart Care segments. Four of the seven participants measured during EcoMeditation scored high EC Gamma Synchrony values ranging from 46% to 79%. These gamma increases were typically steady and consistent, as in one person whose EC Gamma Synchrony scores ranged from day-one pretest of 69% to EcoMeditation 79% to EcoMeditation Baseline 86%, culminating with day-two closing 83%.

The secondary factor behind these improvements, which appears to be linked with gamma production, was alpha amplitude increases and coherence. For seven participants, steady and stable alpha production provided access to the healing frequencies of subconscious theta and unconscious delta.

It should be noted that all study participants were highly motivated to achieve mental-emotional and energetic healing. The extraordinary advances of seven people in the EO Awakened Mind or Gamma Synchrony patterns suggest that they accessed subconscious material and/or nonlocal levels of awareness. The results when EFT

was used suggest that the participants resolved traumatic emotions and so increased the relaxed, sensory alpha, which is the basis of the peak performance Awakened Mind of the adepts and the Gamma Synchrony pattern of superconscious awareness. Experience with the Mind Mirror 6 suggests that this gain in unity consciousness produces lasting change (Pennington, 2012).

This study had a number of limitations. The sample size of eight was small, resulting in too low a power to detect statistical significance for most assessments. It was heterogeneous, in that four participants reported that they did not meditate regularly, but two of them occasionally practiced energy medicine. Therefore, only two people served as controls, and one of them had experienced an energetic transfer from the Dalai Lama while the other was a creative writer. True controls would be non-meditators who do not practice energy healing or engage in spiritual endeavor. The pattern improvements of the four non-meditators supports the efficacy of EFT tapping, Heart Care, and EcoMeditation; nevertheless, a more stringent study including inexperienced controls with low expectations of healing could provide more convincing evidence of the efficacy of this modality.

A second limitation related to study design. No in-depth post-program interviews were conducted that would have elicited the participants' subjective experiences. Also there was no follow-up with

the participants after a period of time, to determine whether their brain-wave changes and advances in consciousness were lasting or permanent. Additionally, there was no control group and participants were not randomized. Participants were motivated and unlikely to be representative of the general population. All except one were female.

Future studies could include pre-screened participants to serve as controls; post-program interviews, preferably in person; gender balance; follow-up telephone or email interviews after one and six months; and follow-up brain-wave mapping on the Mind Mirror 6. Repeating this study to increase the sample size to over 100 subjects and randomizing half of them into an active control group would provide stronger statistical evidence of the outcomes.

## Conclusions

Despite the stated limitations, this study is strongly suggestive of the value of EcoMeditation and EFT practiced in combination. Six of the eight participants, some of them quite dramatically, improved their EO Awakened Mind statistics. This was an extraordinary achievement. In addition, over the course of the weekend, two of the eight participants improved both their EC and EO statistics for all three of the Mind Mirror's highly advanced brain-wave patterns.

The consistent enhancement of Mind Mirror brain-wave patterns and coherence does not occur by chance; it can only result from sustained activity in frequencies that are lower and higher than ordinary awareness. Therefore, based on the results of this preliminary study, it appeared that EFT and EcoMeditation assisted all eight participants to access nonordinary brain-wave frequencies, resolve mental-emotional issues, generate positive neuroplasticity, and evolve their states of consciousness to more awakened and enlightened ways of being.

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