



*Seven Keys To
Great Meditation*

*A Neuroscience
Perspective*

Jeffrey L. Fannin, Ph.D.

THE SEVEN KEYS TO GREAT MEDITATION: A Neuroscience Perspective

by
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The brain and meditation have been linked for centuries. Today we have the technology to better understand the true relationship between the brain and the experience of



meditating. The use of EEG (electroencephalogram) technology allows us to monitor and record brainwave activity.

A basic premise to understanding EEG is that ***we are vibrational beings living in a vibrational universe***. All things are vibration. The level of vibration determines our experience of reality, as well as our connection to higher consciousness. The fundamental elements of our physical vibrations we identify as brainwave frequencies. These frequencies are vibrations that are measured in cycles per second (CPS) or what we now call Hertz.



Heinrich Rudolf Hertz, German physicist, born in Hamburg, and educated at the University of Berlin. From 1885 to 1889 he was a professor of physics at the technical school in Karlsruhe and after 1889 a professor of physics at the University in Bonn. Hertz clarified and expanded the electromagnetic theory of light that had been put forth by the British physicist

James Clerk Maxwell in 1884. Hertz proved that electricity could be transmitted in electromagnetic waves, which travel at the speed of light and which possess many other properties of light. His experiments with these electromagnetic waves led to the development of the wireless telegraph and the radio. His name also became the term used for radio and electrical frequencies: hertz (Hz), as in kilohertz (kHz) or megahertz (MHz). The hertz designation has been an official part of the international metric system since 1933. In brainmapping the frequencies measured are identified as Hertz, typically ranging from 0.5-60 Hertz.

During meditation, there are discernable brainwave patterns seen on an EEG. When those patterns are depicted on a QEEG (quantitative electroencephalogram) brainmap it helps us understand how those patterns correspond to physical functions within our bodies. To better understand these brainwave frequencies, consider them from slower (Delta) to faster wave activity (Beta and Gamma). If we understand the function of each frequency grouping we can get a better understanding of how these vibrational patterns not only affect our daily life, but also understand how they affect our meditation experience.

Delta (0.5-3.0Hz) ***The Deep Sleep Wave***

The Delta frequency is the slowest of the frequencies and is experienced in deep, dreamless sleep and in very deep meditation where awareness is fully detached.

Delta is the realm of your unconscious mind, the gateway to the universal mind, the subconscious of the brain, where information is received and otherwise unavailable at the conscious level.

Among many things, deep sleep is important for the healing process – as it's linked with deep healing and regeneration. Hence, not having enough deep sleep is detrimental to your health in more ways than one.

Theta (4-8Hz)

The Light Meditation And Sleeping Wave

Theta brain waves are present during deep meditation and light sleep, including the all-important REM (rapid eye movement) dream state. Along with Delta waves, it is also the realm of your subconscious and only experienced momentarily as you drift off to sleep from the Alpha state, being relaxed and awake, passing through Theta, moving into deep sleep in Delta.

It is said that a sense of deep spiritual connection and unity with the universe can be experienced in the Theta state. Your mind's most deep-seated programs are at the Theta level, it is where you experience vivid visualizations, great inspiration, profound creativity and exceptional insight. Unlike your other brain waves, the elusive voice of Theta is silence. *Achieving a quiet mind is essential for a great meditation session.*

It is at the Alpha-Theta border, from 7Hz to 8Hz, where the optimal range for visualization, mind programming and using the creative power of your mind begins. It's the mental state, which you consciously create your reality. At this frequency, you are conscious of your surroundings however your body is in deep relaxation.

Alpha (9-14Hz)

The Deep Relaxation Wave

Alpha brain waves are present in deep relaxation and usually when the eyes are closed, when you're slipping into a lovely daydream or during light meditation. It is an optimal time to program the mind for success and it also heightens your imagination, visualization, memory, learning and concentration (see Key #4 Theta/Alpha Power Ratio, p.13).

It is the gateway to your subconscious mind and lies at the base of your conscious awareness. The voice of Alpha is your intuition, which becomes clearer and more profound the closer you get to 7.5Hz.

Beta (14-40Hz)

The Waking Consciousness And Reasoning Wave

Beta brain waves are associated with normal waking consciousness and a heightened state of alertness, logic and critical reasoning. While Beta brain waves are important for effective functioning throughout the day, however, too much Beta can translate into stress, anxiety and restlessness. The voice of Beta can be described as being that nagging little inner critic that gets louder the higher you go into range of frequencies and cognitive functioning. This type of excessive activity is typically found from 25 to 30 Hertz. Therefore, with a majority of adults operating at Beta, it's no surprise that stress is today's most common health problem.

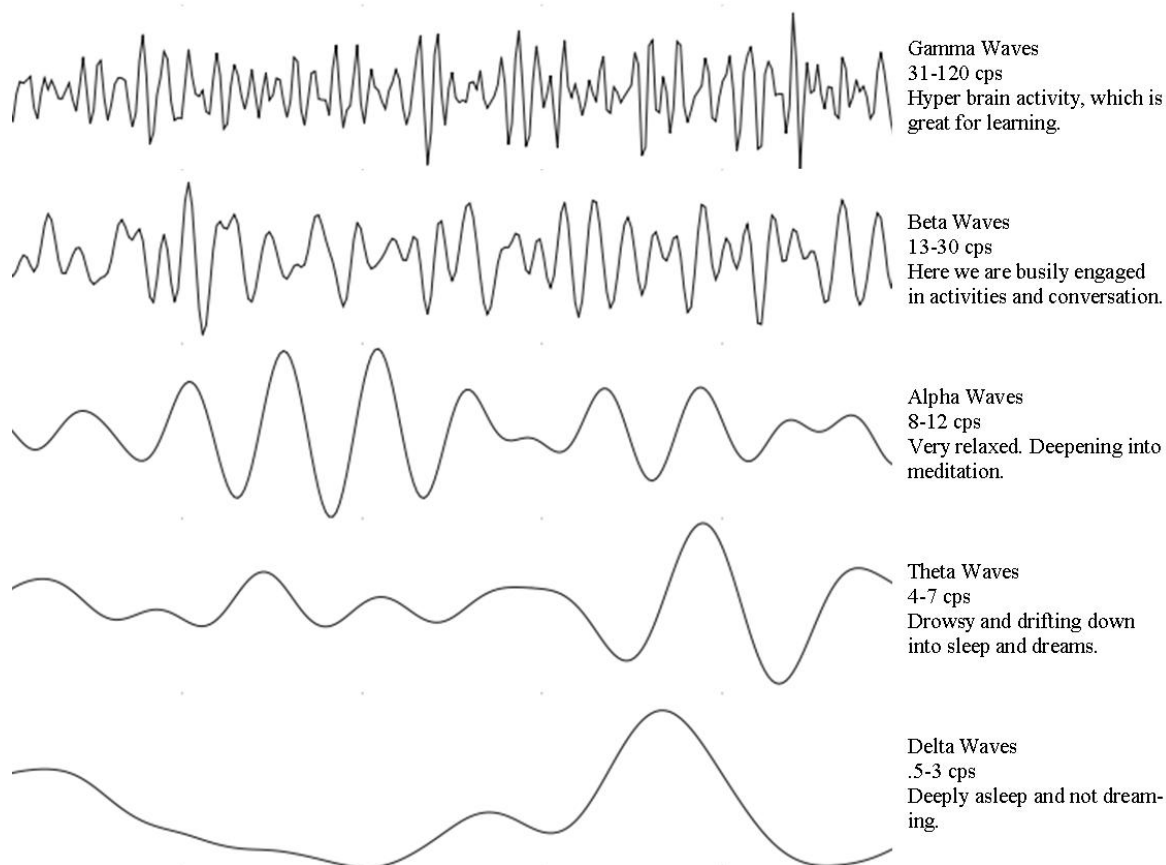
Gamma (40-80 Hz)

The Insight Wave

This range is the most recently discovered and is the fastest frequency at above 40Hz. While little is known about this state of mind, initial research shows Gamma waves are associated with bursts of insight and high-level information processing. Gamma brain waves are the fastest brainwave frequency with the smallest amplitude. They are associated with the **“feeling of blessings”** reported by experienced meditators and are associated with **peak concentration and extremely high levels of cognitive functioning.**

Neuroscientists believe that gamma waves are able to link information from all parts of the brain – the gamma wave originates in the thalamus and moves from the back of the brain to the front and back again *40 times per second* – not only that, but the entire brain is influenced by the gamma wave. This rapid “full sweep” action makes the gamma state one of peak mental and physical performance. **Gamma is the brainwave state of being “in the Zone,” that feeling that you can do anything.**

Brain Waves Graph



The benefits of meditation have been heralded for thousands of years. One of the biggest challenges most of us face in striving to live a high-vibration life is quieting our minds.

Why Do We Want To Quiet Our Minds?

With meditation, we *do* want to quiet the mind. We want to rid ourselves of what I call “mind clutter,” those thoughts that go round and round in our heads and reach every possible void of quietness we might seek. Any time we meditate and free ourselves from mind clutter for even just one second, we have gained from the experience. ***Any decrease in mind clutter is an increase in our vibrational connection to higher consciousness.***

On a practical level, we want to quiet our minds because it is those extra words spinning around in our heads that distract us, pull our energy down, allow us to worry and brood, encourage us to imagine potential negative situations and obsess over relationship details, and cause us to self-doubt ... What if all that energy was put to a better use?

On a spiritual plane, we want to quiet our minds because it is in those moments of quiet that we are able to better receive guidance and answers to our questions and to feel supported and loved by God and the universe.

There are brainwave patterns that either help to enhance our meditative experience or prevents us from deriving the benefits from meditation. The experience of meditation is purely subjective. We only have our own internal experience to compare against. How do we know that we are gaining the most from the practice of meditation? How do we know if we are even doing it correctly?

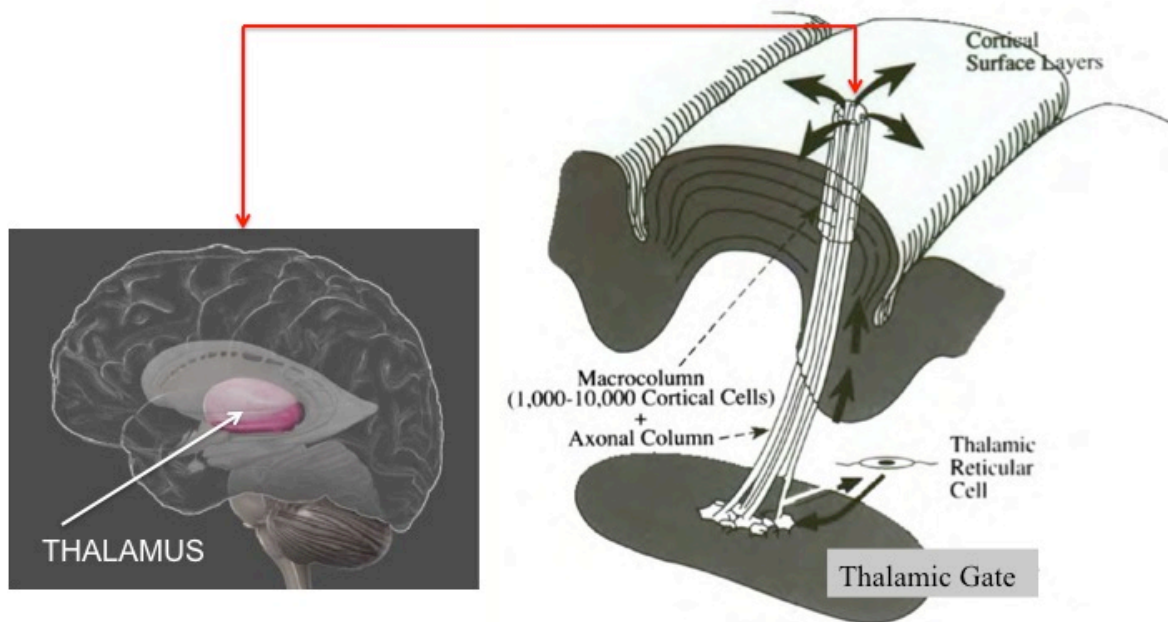
Neuroscience is the answer to those questions. Specifically, it is more than the EEG activity of the brain. More precisely, it is a group of neuropatterns that produce the conditions that resonate within our brain that allows us to experience the 3-dimensional reality of what we describe as meditation. It is also these neuropatterns that allow for the connection to the higher consciousness.

The Thalamic Gate

Have you ever experienced an unexpected thought? A thought that you knew did not come from your own mind. Have you ever wondered how your own individual thoughts mingle with higher consciousness? How is it that information from higher consciousness connects with our 3-dimensional world? The answer lies within the deep centers within the brain, it begins with the *Thalamus*.

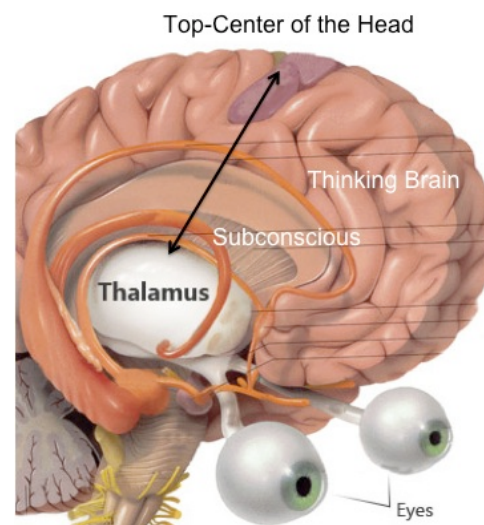
The Thalamus is an almond-shaped organ in the center of the brain. One of its functions is to regulate the frequencies of the brain. At the top center of the Thalamus is an area often referred to as the *Thalamic Gate*.

THALAMIC GATE



What makes up the thalamic gate is a set of *reticular cells*, seen in the image above. The neuroscience term for these cells is a *stroma*, which is a matrix of cells supporting tissue of an organ, in this case...forming the base of the thalamic gate. This matrix consists of bone marrow and lymphatic tissues whose processes make contact with cells of a similar type to form a network of cells that have a specific function. These cells transmit energy vibrations.

When vibrational energy causes the cells to *resonate* within the brain, that vibrational energy moves up the *axonal column* from the subconscious area of the brain. It moves through the *neocortex*...the conscious thinking part of the brain, and comes out at the top-center of the head. That spot on the top of the head is about where the soft spot would be on a baby's head. In some cultures this area is identified as the *crown chakra*. Energy from outside the brain travels the opposite direction to the thalamus.



Neuroscience teaches us that the cortex, or outer portion of the brain, processes at 40 bits per second. In contrast, the subcortical region where the thalamus resides is capable of processing at 40 million bits per second.

Therefore, the vibrational frequencies from our subconscious, or the *resonation* from within us, actually does connect directly to higher consciousness via this process and is capable of processing massive amounts of information very quickly. It is also how *oscillation* (information from the higher consciousness) enters this conduit, and is slowed to *resonate* within our physical body. This information is interpreted by the brain for processing as emotions and provides vibrational instructions to the cells of the body.

Managing Our Brainwaves



The brain consists of about 20 billion neurons which all generate electro-chemical vibrational impulses. When these neurons work together in synchrony, tiny alternating electrical potentials occur in the synapses, which are specialized junctions between the neurons. The more neurons that work in synchrony, the larger the potential (amplitude) of the electrical oscillations, they are measured in microvolts (see Key #1 Coherence). The faster the neurons work together, the higher the frequencies of the oscillations that are measured in Hertz. These parameters: amplitude, frequency and coherence are the primary characteristics of brain waves.

The Meditation technique exercises the critical prefrontal cortex of the brain—to make the brain healthier, more integrated, and better able to function together as a whole. The *Whole-Brain State* provides a unified system putting all of our brain functions and communication at our disposal.

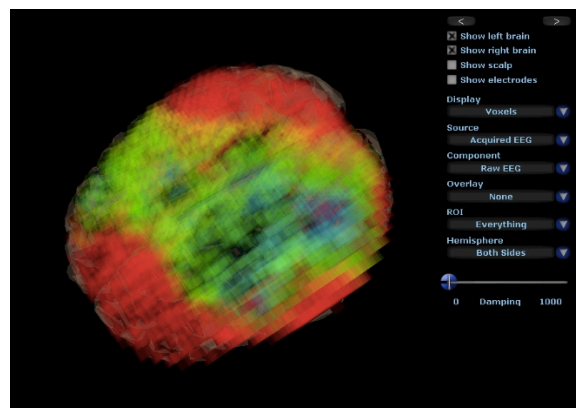
Why Is The Whole-Brain State Important?

The fact is, our thoughts and beliefs drive our actions and they create the outcomes we get, thereby creating the reality we experience. By changing our conscious thoughts and *subconscious beliefs*, we facilitate changes in our behaviors and consequently in the results we experience on a daily basis.

Some conventional thinking would suggest that changing brainwave patterns that affect subconscious processing is a lengthy process and occurs slowly over time. Research has demonstrated that the brain has the ability to reorganize brainwave energy, creating the **Whole- Brain State**, and thus allow for more optimal performance of subconscious belief patterns very quickly. It also creates balanced processing of information in the left and right hemispheres, also creating rhythmic harmony from front to back. When these resonating conditions exist, we have a more coherent access to the resources within our brain, as well as a better connection to the oscillations, or information, from the field outside ourselves. In other words, our ability to perceive and understand is increased and our ability to “do” is enhanced.

The Seven Keys To Great Meditation

The QEEG (quantitative electroencephalogram), more commonly known as a *brainmap*, is a very powerful tool. We can glean a great deal of important information from this tool. Due to the scientific nature of the process, it is not a subjective interpretation. It provides critical information related to key functions of the brain during meditation. The image above helps us understand what is working too hard (red) and what is working very well (green & blue). The Seven Keys I have identified not only help us understand if we are achieving the optimal



meditation state, but they also will guide us in understanding what parts of the brain are not serving us in our meditation experience.

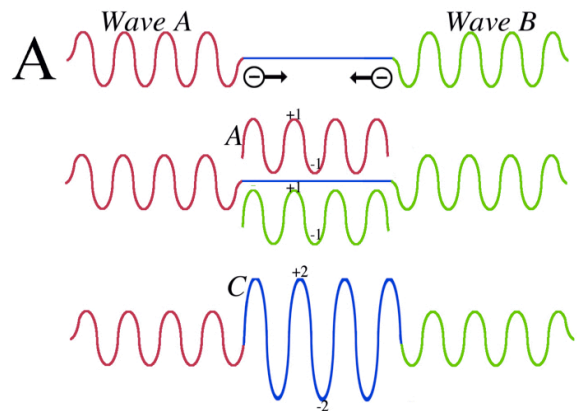
The information provided is not subjective, it is directly provided scientifically from the EEG. That information can be acquired when the brain is in a *baseline* state (eyes open, eyes closed and brain on task) or it can be gathered during the meditation process to compare brain states. Once the data is processed, we engage in some high level analysis.

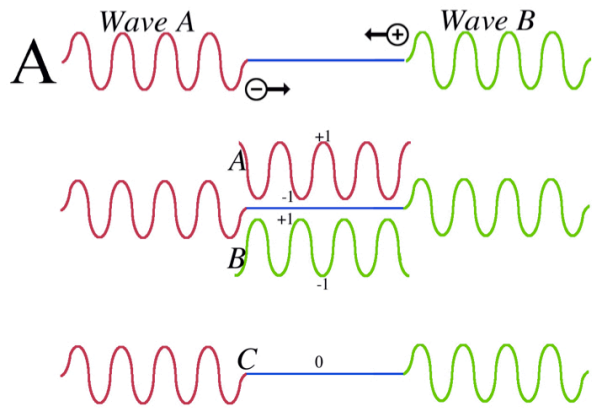
That high level analysis includes the seven markers, or *keys*, that I have identified to offer an unbiased interpretation of brain function during the meditation experience. These seven important keys are known as the ***Fannin Cognitive Performance Index™*** or more commonly identified as the ***Fannin CPI™***.

The Seven Keys of the Fannin CPI™:

1. Coherence
2. Phase Lag
3. Amplitude
4. Theta/Alpha Power Ratio
5. Theta/Delta Power Ratio
6. Time to Enter Meditation
7. Sustainability

KEY#1. COHERENCE - In physics, coherence is a property of waves that enables a wave to be spatially constant, logical, orderly, with an aesthetically consistent relationship to all parts of the wave. When interfering (connecting), two waves can add together to create a wave of greater amplitude than either one on its own. This is called *constructive interference*, as see in the diagram to the right.

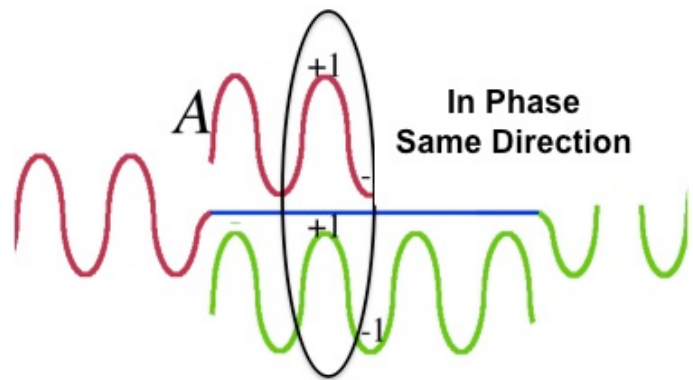




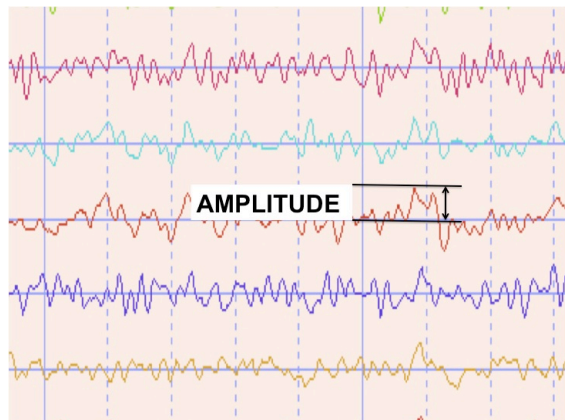
Or, subtract from each other to create a wave of lesser amplitude. This is called *destructive interference*. Two waves are said to be coherent if they have a constant relative phase, going in the same direction (see Phase Lag below). The degree of coherence is measured by the interference, a measure of how perfectly the waves can cancel each other out due to

destructive interference, as seen in the diagram to the left.

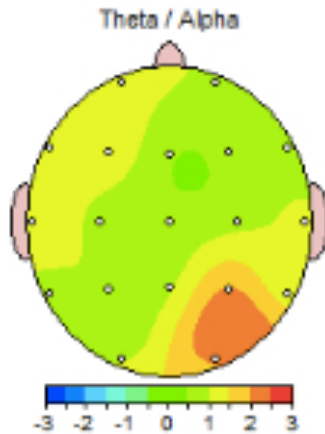
KEY #2. PHASE LAG - is the process of measuring if the coherence is leading or lagging with another synchronous wave. Phase lag is the ability to quantify the degree of order or chaos associated with a brainwave. This contributes to decreasing the distractibility in unified transmissions of slow wave activity in the brain. Basically, dealing with the application of delta and theta frequencies. Proper phase lag is very important to achieving harmony in brainwave activity and the meditative process.



KEY #3. AMPLITUDE is like the volume on a radio. For the brain to function correctly we don't want the amplitude up too high, nor do we want the amplitude too low. Amplitude affects the act of meditation. Amplitude is important for increasing the theta and low alpha



power of the EEG brainwave. Having the right amplitude is necessary to increase theta coherence between different neuropathways of the brain (see Key #4 Theta/Alpha and Key #5 Delta/Theta Power Ratios, p.14).



KEY #4. THETA/ALPHA POWER RATIO

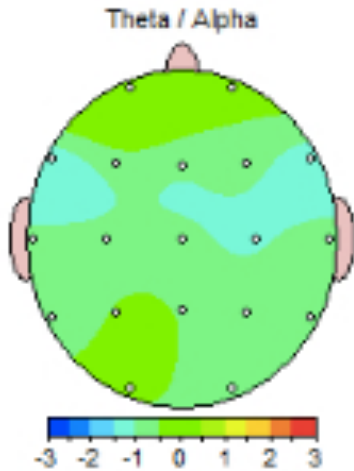
Meditative concentration requires activation of the sympathetic nervous system (SNS). Without the proper amount of alpha and theta, the SNS will be activated in ways that do not serve the meditation process. This ratio is important for task demands in virtual spatial navigation, so that their ability to deal with the space-time continuum is enhanced.

The Theta/Alpha example above, indicates that the ratio in the right hemisphere toward the back of the brain is approximately 2.75 standard deviations above what it should be. This will affect one's ability to visualize and also their ability to deal with the space-time continuum.

The elevations seen in the left temporal and frontal areas in this person will create significant difficulty in experiencing *meditative bliss*. The theta/alpha ratio in the left frontal area also allows for our ability to remain focused and keep sustained attention to the meditation task. This ratio is approximately 1.5 standard deviations above normal, and this individual will find that their mind will jump from topic to topic, finding it difficult to *quiet the mind*.

The theta/alpha ratio has implications for the function of neuroplasticity, the brain's ability to generate new neuropathways.

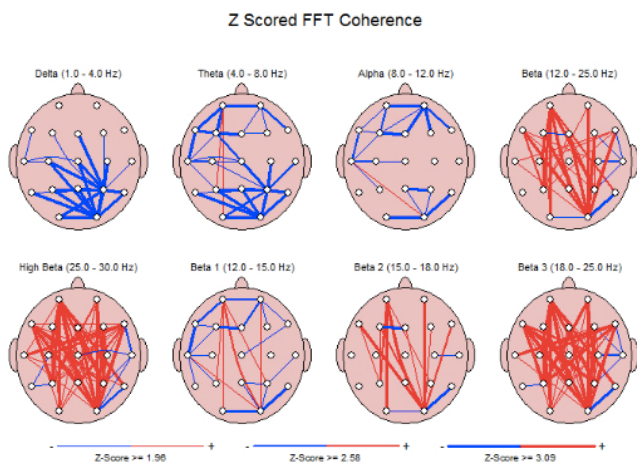
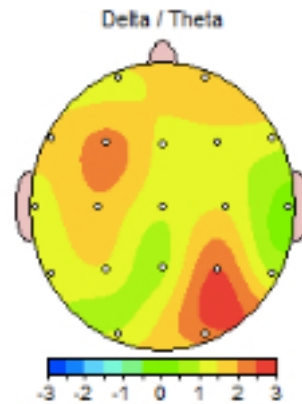
It is also critical for long-term activation of the neuropathways and their ability to process slow wave communication. Slow wave communication is essential for dealing with oscillations (information) from higher consciousness.



Balance of the theta/alpha ratio is crucial for understanding the meaning of the messages we receive and also influencing our emotional domains. The theta/alpha ratio of the individual to the left is well balanced in meditation. It also involves balanced communication between the front and back of the brain. This process illustrates the necessity of the role for theta and alpha waves in mediation. It gives us the ability to interact between the connections communicating front to back and side to side, allowing us to experience and utilize the *Whole-Brain State*. Thus meditation, in part, underpins the need for integrating the attributes of the Theta/Alpha ratio in the brain to achieve optimal meditative performance.

KEY #5. DELTA/THETA POWER RATIO

Intrusive thoughts while meditating is problematic, as seen on the image to the right. This individual not only has a delta/theta ratio that is more than 3 standard deviations above normal, but also experiences excessive hypercoherence, as seen below in red. This person cannot shut off the excessive *mind chatter* during meditation.

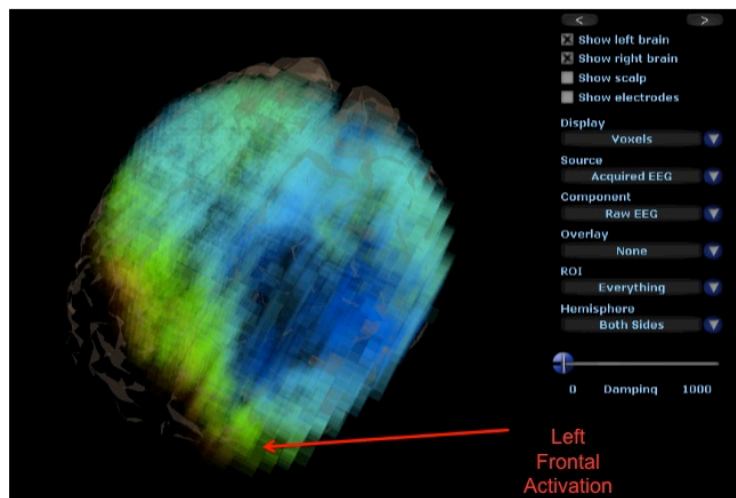


Our research shows that experienced meditators are characterized by an increase in theta and lower alpha power. The Delta/Theta Power Ratio can measure that process. Of particular significance was the increase in slow wave power. It coincided with higher coherence in theta along the long distance

connections between the front of the brain and the regions in the back of the brain. The left frontal region has been associated with positive emotion, consistent with the state of meditative bliss that can be induced when activated.

Interestingly, our research has shown there is an alternating delta/theta pattern in the frontal lobes when a meditator focuses upon it, produces the experience of ***thankfulness and gratitude***. It suggests that the energy, and the feelings of thankfulness and gratitude comes in waves.

Helping us to understand that when the energy alternates between the left and the right prefrontal areas, as seen in the image to the right, there is an experience of thankfulness and gratitude. Also note that this energetic exchange between the left and right hemisphere creates



stimulation between the sympathetic and the parasympathetic nervous systems. Other independent researchers examining EEG patterns during meditation, found this alternating delta/theta pattern in more experienced meditators creating the same condition. Perhaps these are the brainwave correlates for experiencing *thankfulness and gratitude*. That is to suggest that creating balance between the hemispheres frontally seems to be a key issue to great meditation.

It is also believed that the delta/theta ratio in meditation helps to open the “third eye” for meditation practitioners. This “etheric eye” is said to be the channel through which meditation practitioners gain illumination wisdom via vibrations received through the third eye. In practical terms, the delta/theta ratio in meditation also invokes a deep sense of relaxation and also encourages creativity making problem solving and memorization easier. We are also able to better evaluate our past experiences and life

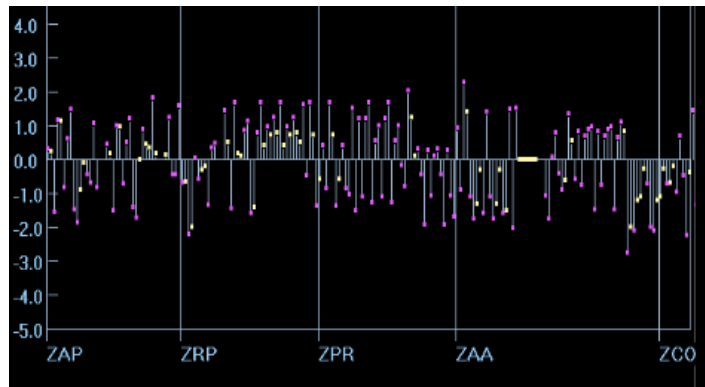
patterns and put them into perspective.

Finally, delta brain waves in meditation are the slowest. Everyone experiences delta waves in deep sleep, but delta brain waves in meditation are said to help experienced meditation practitioners access the subconscious mind. Their existence may also be part of the reason that newly learned skills may be best integrated if one “sleeps on them,” since they are associated with one's ability to integrate newly learned tasks.

KEY #6. TIME TO ENTER MEDITATION is another key component for measuring the effectiveness of the meditation practice. This key is fundamentally based on brainwave synchronization and connectivity within the brain.

Brainwave synchronization is the practice to entrain one's brainwaves to a desired frequency or group of frequencies, by means of a periodic stimulus with corresponding frequency. Practicing meditation on a regular basis enhances brainwave synchronization.

Connectivity is fundamentally the brain's ability to produce neuropathways. That ability is known as neuroplasticity. The image to the right is a depiction of someone's neuroplasticity. By examining this information, we understand how well the brain is utilizing its



neuroplasticity. Neuroplasticity is the key reason that the brain can reorganize itself by forming new brainwave connections throughout a person's lifetime. Neuroplasticity allows the neurons (nerve cells) in the brain to compensate for injury and disease and to adjust their activities in response to *new situations or to changes in their environment*. Neuroplasticity plays a key role in the meditation process as the meditator mentally makes changes to their environment.

KEY #7. SUSTAINABILITY is the brain's ability to remain consistently in a state of meditation over a significant amount of time. The lack of sustainability is a key indicator that the brain is actively doing cognitive tasks other than remaining in a state of meditation. Evaluation of the EEG brainwaves during meditation will support or deny that the brain is consistently in a state of meditation, or it is moving in and out of the meditative state as it is occupied by other cognitive activity.

SUMMARY

Hopefully, this information has been helpful to better understand the brain, the meditation process and how the Fannin CPI™ can assist in guiding you to a more complete meditative process. Knowing how to meditate is only part of the story. Knowing if you are being effective and if there are any issues that are preventing you from achieving an optimal level of meditation should also be helpful.

Your QEEG brainmap will provide you with information in all of these areas. That information will be additional guidance for you to achieve the most from your intended personal transformation.

Get more information at www.enhanceyourbrain.com