

# Definition of a Qeeg

## “How to read a brain map”

The **Qeeg** is an interpretation of electrical activity associated with brain activity when the eyes are open. This data from the Qeeg recording are compared statistically to healthy, well performing individuals of comparable maturity, sex, and handedness for neuro-therapeutic behavioral purposes. This recording is not a substitute for a neuropsychological evaluation or a neurological exam. However, it is used in determining **LORETA Neurofeedback and Neurofield training**.

The human brain is a complex organism controlling physiological functioning, and cognitive, behavioral, movement, and mood processes. It's functioning has both chemical and electrical aspects. The functioning is performed by regional areas ranging in size from the size of a quarter (coin) and larger. In order for these processes to be efficiently performed, each regional area has frequencies that are dominant. Each of these areas has an amplitude, or voltage range of efficient functioning.

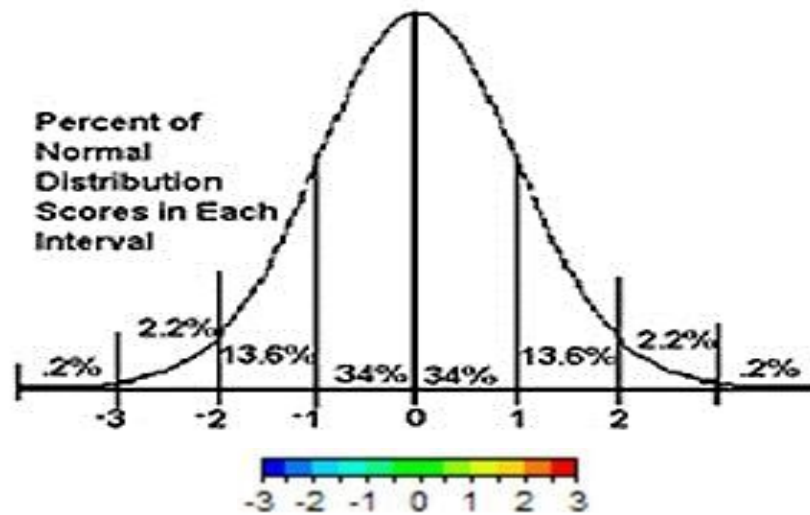
Dysfunction in the brain occurs when a regional area makes a frequency that is not appropriate for that region or when the amplitude is either too high or too low. When the eyes are open or closed, certain features of the **EEG** are expected to be present. Dysfunction is present when features are not present in the appropriate condition. Dysfunction also occurs when the regions of the brain do not communicate in a timely manner with other regions. The timeliness of communication is precisely measured in thousandths of seconds.

The **EEG analysis** used is a quantitative comparison of an individual's EEG to a normative group. The quantitative comparison is the product of selecting artifact free EEG from the entire record producing an overall average of the EEG. The normative group is a dysfunction free group which has been screened for any possible aberrant features. This group is considered to be healthy in all psychological and physiological characteristics.

The frequencies of the brain are the following: Delta, Theta, Alpha, and Beta:

1. **Delta frequencies** (1-4 HZ) are produced during sleep are widespread in the frontal central region. Delta is necessary for sleep and stillness.
2. **Theta frequencies** (4-8 HZ) are associated with selective attention, retrieving newly learned information, and preceding sleep. Theta aids creativity and problem solving.
3. **Alpha frequencies** (8-12 HZ) appear in the posterior when the eyes are closed. It is associated with idling and resting, not sleep. Excessive Alpha is associated with decreased cognitive performance and quieted excitation and responsiveness. Alpha can be restorative and restful.
4. **Beta frequencies** (13-30 HZ) are primarily considered to be a cognitive frequency range. Beta conducts the rational, reasoning aspect of cognitive solutions.

Color coded key for reading the color brain maps and understanding standard deviation:



The **Absolute Power** and **Relative Power** colored brain maps are based on standard deviations above and below the norm, and color coded per the chart above accordingly. One standard deviation (SD) above the norm is yellow, two SD above the norm is orange, and three SD is red. '0' is the mean within the green and light green range. One SD below the norm is light blue, two SD below is darker blue, and three SD is darkest blue:

The Amplitude Asymmetry, Coherence, and Phase Lag in Delta, Theta, Alpha, Beta and High Beta between specific brain areas measured are displayed as maps. The small dots on the maps represent the areas where the electrodes gathered the data. The thin blue line represents one SD below the norm and gets thickest up to three SD below the norm. The thin red represents one SD above the norm and gets thickest at three SD above the norm. No lines mean within normal range.



### **Absolute Power:** How much Brainpower is available?

Absolute Power reflects the actual microvolts recorded at each of the sites. The amplitude or voltage the brain produces is measured at each of the sites, and aids in determining whether enough brainpower within a particular frequency range is present at each recording site. This can be too much or too little.

### **Relative Power:** Who's in Charge Here?

The Relative Power is the distributed total amount of power at each site, and measurement aids in determining whether a particular frequency is overpowering other vital brain frequencies or if the power is low.

### **Amplitude Asymmetry:** The Brain's Balancing Act.

Asymmetry scores reveal to us whether the brain waves between the various parts of the brain are balanced. Excessive activity may indicate an over-firing of brain cells. Insufficient activity may suggest brain cells are not firing sufficiently to maintain proper brain function. Both will lead to inefficient brain function.

### **Coherence:** How efficient is my brain's ability to communicate with itself?

In order for us to understand the complexity of the world and to make and execute decisions the different parts of the brain must share information. Coherence is one of the measurements on

how well the brain is able to perform this inner self-talk. This measure gives us an indication of how efficiently our brain is working to connect and disconnect different parts of it to accomplish a particular task. **Excessive coherence tends to indicate two or more areas of the brain are “overly connected or locked together”.** That is, the brain has become overly dependent on those centers and is not efficiently processing and executing information. **This tends to result in poor day-to-day performance.** Deficient coherence is the EEG sign of a brain not able to efficiently connect cortical areas to perform specific tasks. If coherence is extremely high, measured with Z scores, there is limited regional communication, division of labor, connectivity, and regional cooperation. If coherence is extremely low, measured with Z scores, there is limited to no communication occurring between regions.

**Phase Lag:** Is the brain’s electrical energy moving at the optimal speed for adequate to superior performance?

Many of the brain’s functions are timed events, the energy from one part of the brain arriving at another area at just the right moment to perform a specific task. The **QEEG measurement** is called phase. Excessive phase statistics mean the signals arrive too early; deficient, too late. In either case, the brain is not able to do its job with peak efficiency.