

QEEG GUIDED LORETA Z-SCORE NEUROFEEDBACK

3D Neurofeedback expands on the capabilities of surface neurofeedback with a full range of new advances; bringing to bear the next generation of 3D brain imaging and training tools. In the hands of a skilled clinician, it is the ultimate brain training toolkit.

Using a full 19 sensor cap, the clinician is able to train any number of areas together (as opposed to individual surface areas with the more common 2 sensor neurofeedback). By using a medical research database ([Z-score](#)) and deep brain source imaging ([LoRETA](#)), 3D neurofeedback can directly train entire brain networks; targeting overall electrical activity (amplitude), brain connectivity (coherence), processing speed (phase), and more. This is made possible by more advanced imaging capability – if you can detect it, you can train it. Better imaging equals better results. Better targeting means better reliability. Training multiple areas at once means less sessions.

For clinicians, being able to see exactly what is going on over the entire brain at all times is a real advantage, and by integrating research software the clinician can [map](#), track, and keep the training entirely up to date. [3D neurofeedback](#) takes more skill and experience to operate, and the equipment required runs at a good twenty times the cost of basic equipment. Hence, sessions usually cost about a third more than for traditional neurofeedback – however one requires far fewer sessions to see results. By identifying the specific brain activities that relate to your symptoms (QEEG), we help train that activity towards a more comfortable and efficient state (Z-score) using 19 sensors and 3D (LoRETA) [neurofeedback](#).

What is 19 Channel Neurofeedback?

Unlike our normal one or two electrode [neurofeedback training](#) protocols, where we mainly concentrate on lowering the power in one specific region of the brain, **19 channel neurofeedback** (also known as Z-score neurofeedback or “full cap” neurofeedback) can train up to 5700 variables at one time. This complex brain wave data is analyzed by a computer program and compared to people the same age, and the result is the QEEG. These variables are compared to the normative database that contains the data for all ages; therefore, the patient in question is compared to people the same age. Of importance are the deviations the patient has compared to the norms with respect to all these variables, which is shown in terms of standard deviations and Zscores. What is interesting is that the QEEG patterns are lawful and describe certain pathologies in a reliable way. Thus, attention deficit disorder, dementia, affective disorder, traumatic brain injury, and obsessive–compulsive disorder all have distinctive patterns to their QEEG.

The benefits of 19 lead Z score biofeedback are:

- Offers more information to the practitioners and clients than any other EEG biofeedback system
- May significantly reduce the number of sessions required for successful EEG biofeedback training.
- Offers the brain a tremendous amount of information from which the brain can learn better energy economics and resource management.
- Helps the brain improve self-regulation, flexibility, and appropriateness.
- May increase the neuronal flexibility and variability within the brain. Variability is regarded as a measure of health. Once the brain becomes more flexible, it will explore a greater range and variability.

- Teaches the brain how to be dynamic, change and adapt.

LORETA (Low Resolution Electromagnetic Tomography) **neurofeedback** is available at the clinic. LORETA neurofeedback is based on the work of Robert Thatcher, PhD. This approach is based on the data gathered from the Quantitative EEG (QEEG) and Dr. Thatcher's QEEG database. It uses a mathematical process called the "inverse solution" to suggest what is happening in deep structures beneath the cortex. LORETA provides a 3-Dimensional source correlation of Brodman areas to a reference Magnetic Resonance Imaging (MRI). This allows the use of neurofeedback directly on deep brain areas such as the Cingulate Gyrus. The built in symptom checklist is combined with LORETA Z scores measured during a QEEG analysis to aid in linking a client's symptoms to functional networks within the brain. It is of particular use for Traumatic Brain Injury, Migraines and Autism or for those clients with multiple diagnoses.

LORETA neurofeedback is based upon computer-based operant conditioning. It allows the practitioner to select single or multiple voxels within the brain to provide real time feedback. LORETA teaches the brain self-regulation and executive control. Self-regulation is the primary component in learning. The LORETA is also used to enhance and optimize a healthy brain to improve peak performance, improve cognitive functioning, brain brightening and athletic and artistic performance. The advantages of LORETA Neurofeedback are typically fewer sessions. Traditional Neurofeedback utilizes one to several electrodes on a given region or lobe of the brain and trains the surface lobes. The LORETA uses a full 19 sensor EEG cap which trains the brain's deep structures and also creates 3 dimensional images of the brain. Traditional Neurofeedback is unable to reach these deep structures and focuses on the surface lobes of the brain. The LORETA can treat multiple issues during a single session.

LORETA (LOW RESOLUTION ELECTROMAGNETIC TOMOGRAPHY)

Using a full 19 sensor array, LoRETA gives a real-time three dimensional image of your brain activity. With LoRETA imaging we are now able to train deep brain areas; entire networks (brain highways), coherence (connectivity), processing speed (phase) and more; all crucial factors in optimum brain functioning. In practice, this means that we can train all the brain areas involved in your symptoms as a unit; the better imaging and coverage means better efficiency, which in turn means less sessions.

LORETA (Low Resolution Electromagnetic Tomography) is an EEG based Neuroimaging technique that is highly correlated with FMRI's, PET Scans and Spect Scans. The LORETA computes 3 dimensional images of the brain to identify the intracortical and certain subcortical generators of the surface EEG patterns seen in QEEG brain maps. It is considered to be the most accurate of the "inverse solutions". The LORETA divides the cortical gray matter into 2394 7x7 millimeter 3D voxels. This allows the clinician to see which voxels are most activated during an EEG recording. The images reveal the deep structures or generators of the brain and therefore provide information regarding the generator or structures of the brain which reveal the structures, frequencies or communication issues that correlate with abnormal Z scores and psychological or neurological symptoms.

LORETA images show the areas beneath the surface of the cortex as well as well as cortical surfaces of the brain that are the sources of the problem(s) of the particular patient. In order to obtain data to illuminate the three-dimensional properties of the brain, a QEEG is done with all 19 channels. With these data, regression equations are utilized to help locate the sources of the problem(s) and give direct information as to how and where to train the brain with neurofeedback. In the latest developments, the QEEG data plus the NeuroGuide Symptom Check List (Applied Neuroscience, Inc., Seminole, FL) can indicate networks of Brodmann areas to train that reflect the cognitive problems and emotional/behavioral symptoms reported by the patients.

Z-Scores and Normative Databases

Z-Scores are statistical data which help us decipher whether or not an individual's brain is within normal limits as defined by a normative database. A normative database is a collection of data from the brains of hundreds of individuals thought to be of normal functioning in the same sex and age groups as the individual being treated. They tell us whether a particular score is equal to the average, below the average or above the average of what is expected from a "normal" working brain. They can also tell us how far a particular score is away from the average. 19 channel neurofeedback trains your brain using **z-scores**. This can be thought of as "**real time**" training where your brain is getting trained to be within normal limits as defined by a **normative database** in real time. 19 channel neurofeedback can train EEG coherence, phase delay, amplitude and power asymmetry, phase reset, phase lock and phase shift duration.

Z-SCORE

If you want to see if your hormones are out of balance, you need a baseline (z-score) to know if your levels are higher or lower than average. Similarly, neurofeedback practitioners use baselines to see what areas of your brain to train, and how much training is needed. But is there an 'average' brain to compare against? No two brains are quite the same, however a 'comfortable state' looks almost identical in all of us. This content, balanced state is the position (z-score) that we train towards.

"Z Score Neurofeedback is a new technique using a normative database to identify and target a specific individual's area of dysregulation allowing for faster and more effective treatment."

Thatcher, R. W., & Lubar, J. F. (Eds.). (2014). *Z score neurofeedback: Clinical applications*. Academic Press.

Many professionals offer neurofeedback training, but the field has also attracted people with limited experience and little or no training in relevant issues such as mental health. We at the Sterlingworth Center suggest a few things one should look for to ensure their neurofeedback practitioner is a competent professional:

1. Look for a clinician who is board certified by the Biofeedback Certification International Alliance (BCIA), and who is either a licensed professional specializing in psychological or medical disorders, or working closely with someone who is.

2. Determine whether the practitioner is a “good fit” by meeting with him or her before agreeing to a treatment plan.
3. Verify that the practitioner is using up-to-date methods and equipment, since the field is changing rapidly. Ask what research backs up practitioner's methodology and what kind of training he or she has had.