QUANTITATIVE EEG
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Client Information and Summary

I. BACKGROUND INFORMATION

Name: XX

Age: 45

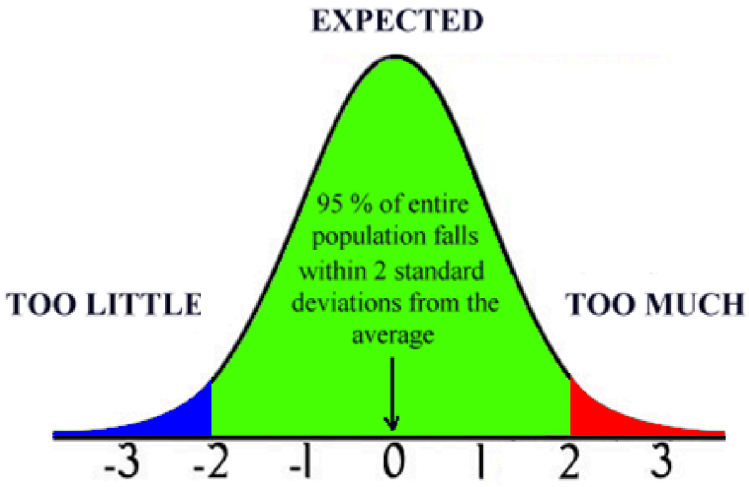
Sex: Male

Recording Date of Test : 5/1/2016

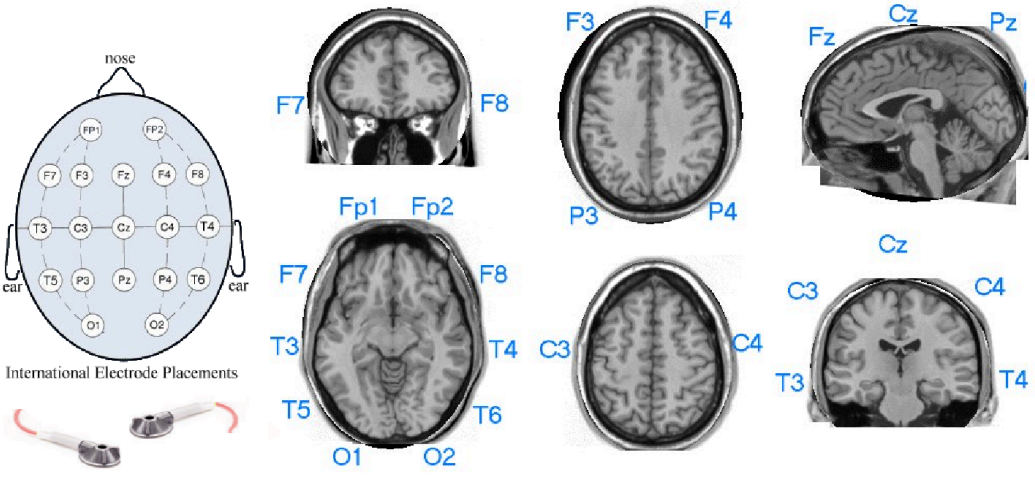
Time of Test: 9:30 am

Recording Length: 10 Minutes Each Eyes Condition: Eyes Open and Closed Ave.

EEG Reliability: 0.98



The quantitative EEG is a test comparing the electroencephalography of the individual (EEG) to a normative database. The individual is then assessed from the perspective of how many standard deviations from the norm their brain data occurs in. In the brain map, excesses are orange to red and deficiencies are blue. Maps are taken using standard deviations from the norm.



The international 10-20 system for electrode placement is used and electrode impedance of less than five kilo

ohms is used. The Brodmann areas of the brain are incorporated into the findings with the use of Low Resolution Brain Electromagnetic Tomography (LORETA) software.

II. PRESENTING SYMPTOMS

Client has come to the clinic for experimental purposes. The client is a peak performance meditator and executive coach. He does not arrive presenting symptoms, but as someone interested in the state of his brain.

III. SUMMARY OF FINDINGS

A 19 channel EEG was recorded using a Neurofield Q20 EEG amplifier. All EEG sites were confirmed to have less than 5 kilo-ohms resistance values. EEG was recorded in two conditions, Eyes Open and Eyes Closed. The data was analyzed using the Neuroguide brain atlas, norm-referenced database and LORETA 3-D inverse mapping solution. Data was analyzed in Linked Ears referential montage and transverse bi-polar montage. The areas of XX's brain which are most The areas of interest include: 1) subtle deficiency in delta, 2) Peak alpha frequency between 12 and 13 Hz, and 3) Cross frequency coupling (also known as 'harmonics') with eyes closed. In addition, what XX does *not* show is also indicative of his abilities to connect to others, states of inner peace, and the ability to process and create with speed, efficiency , and agility: namely, a lack of excessive beta (the presence which would indicates stress and anxiety), a lack of excessive alpha, theta or delta (the presence of which would indicate difficulty focusing, paying attention, and becoming distracted), and an absence of aberrant connectivity (which could indicate many varying states of psychopathology).

The Summary maps (figures 1 and 2) show an overall view, show the client's brain waves (EEG) relative to a normative database of other men his own age. The colors in the first two rows of the map indicate how many standard deviations, or "Z-scores," he is from the normal population. The latter two rows show connectivity issues in coherence (the stability of the phase relationship between different sites in the brain) and phase lag (a measure of how waveforms come into and out of sync).

In this first page summary map, we can see that XX's overall power (which can be seen in the first two rows of both Figures 1 and 2) is under two standard deviations from the normal populations of his peers in all bandwidths. The seafoam blue color seen in the delta column in both figures 1 and 2 is within the normal range of power. The sky blue color indicates deviances of 1.5 to 2 standard deviations below normal. 1.64 standard deviations is clinically significant.

Otherwise of interest is what appears in the map as excessive high amplitude Beta I (seen in figures 5 and 6), but which is actually a very fast alpha peak frequency of 12-13 Hz. This translates into the ability to produce results with less effort, relative to peers; ease in accessing creative states; the ability to handle rapid changes with ease; high levels of performance (as an

athlete, executive, or artist). Of all findings herein, the greatest interest is the harmonic phenomena seen in figure 8. Harmonics in electroencephalography is a highly ordered state, one which is yet unprecedented in empirical research, but a phenomenon which I have witnessed in individuals who enter deep non-dual states in meditation. This phenomenon can result in feelings of peace, alignment (i.e. trusting the process at hand without undue stress), an ability to understand and connect to others, awareness of self, and overall feelings of fulfillment with life.

Overall, this is the brain of a peak performer. The rapidity of XX's alpha (quick cognitive processing), combined with low stress (no excessive beta or hypercoherence), as well as states of peace and deep meditative awareness (seen in the harmonics) show a high caliber individual with minimal work that can be done to "optimize" himself.

Figure 1: Eyes Open Summary Map

Montage: LinkEars

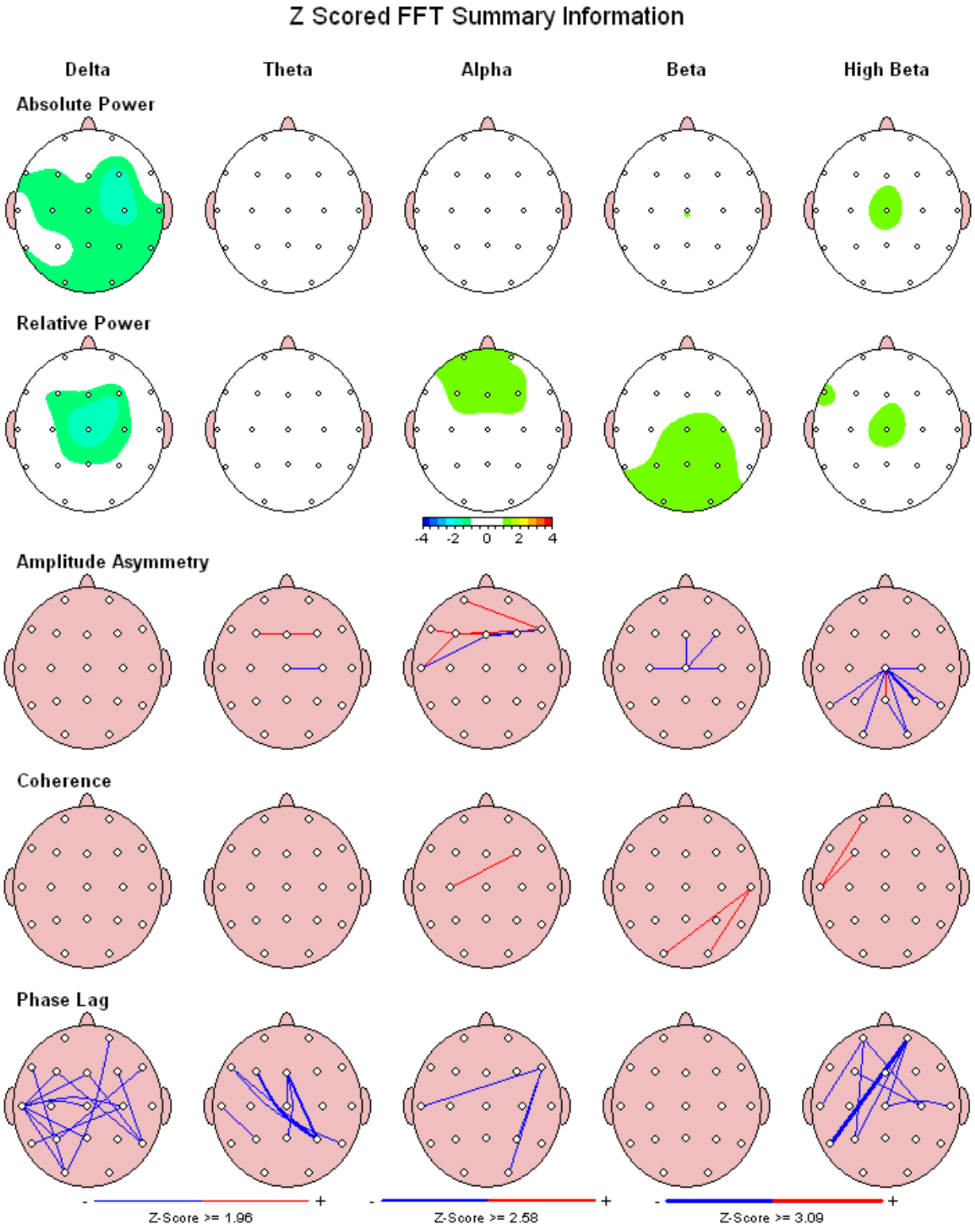
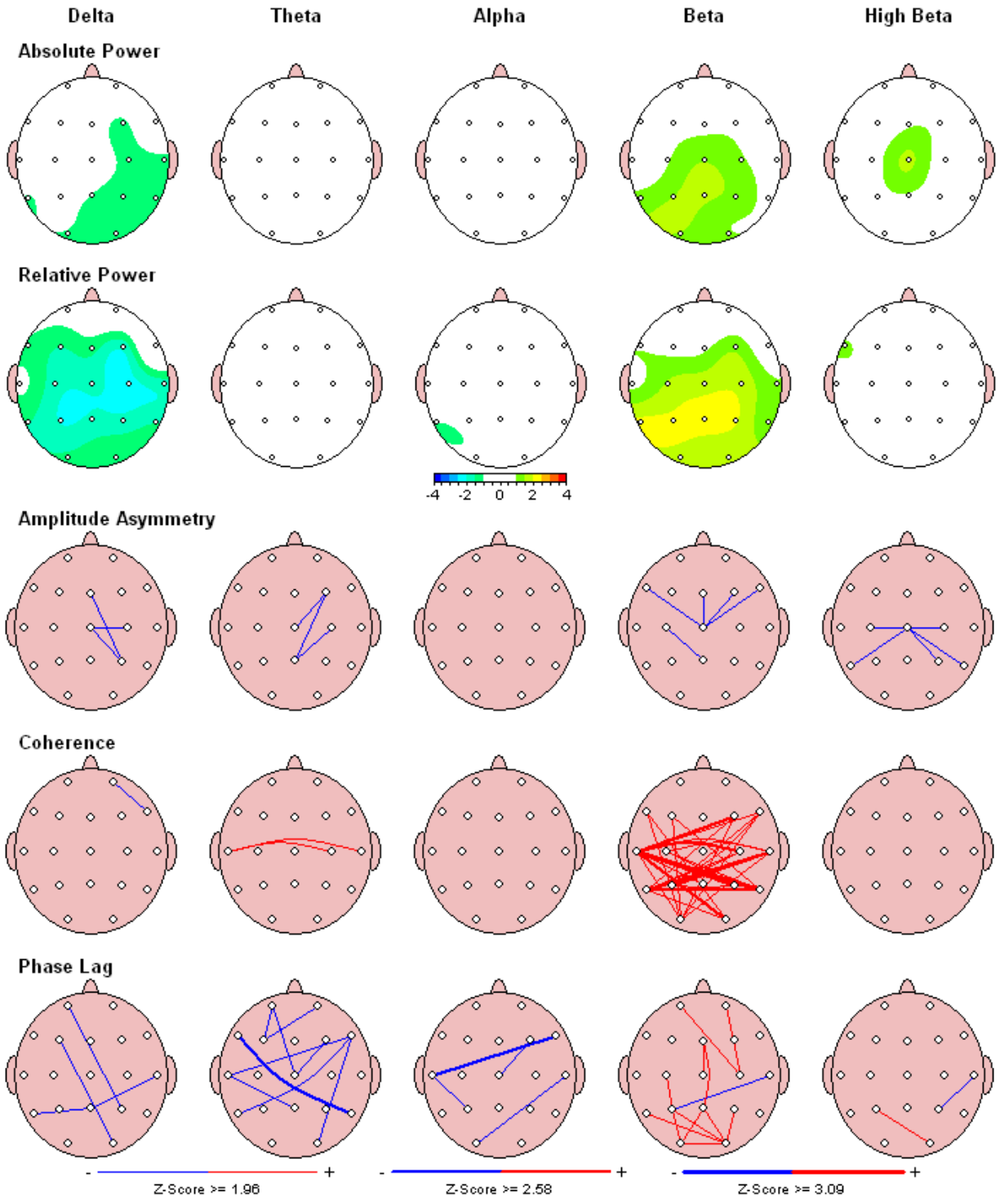


Figure 2: Eyes Closed Summary Map

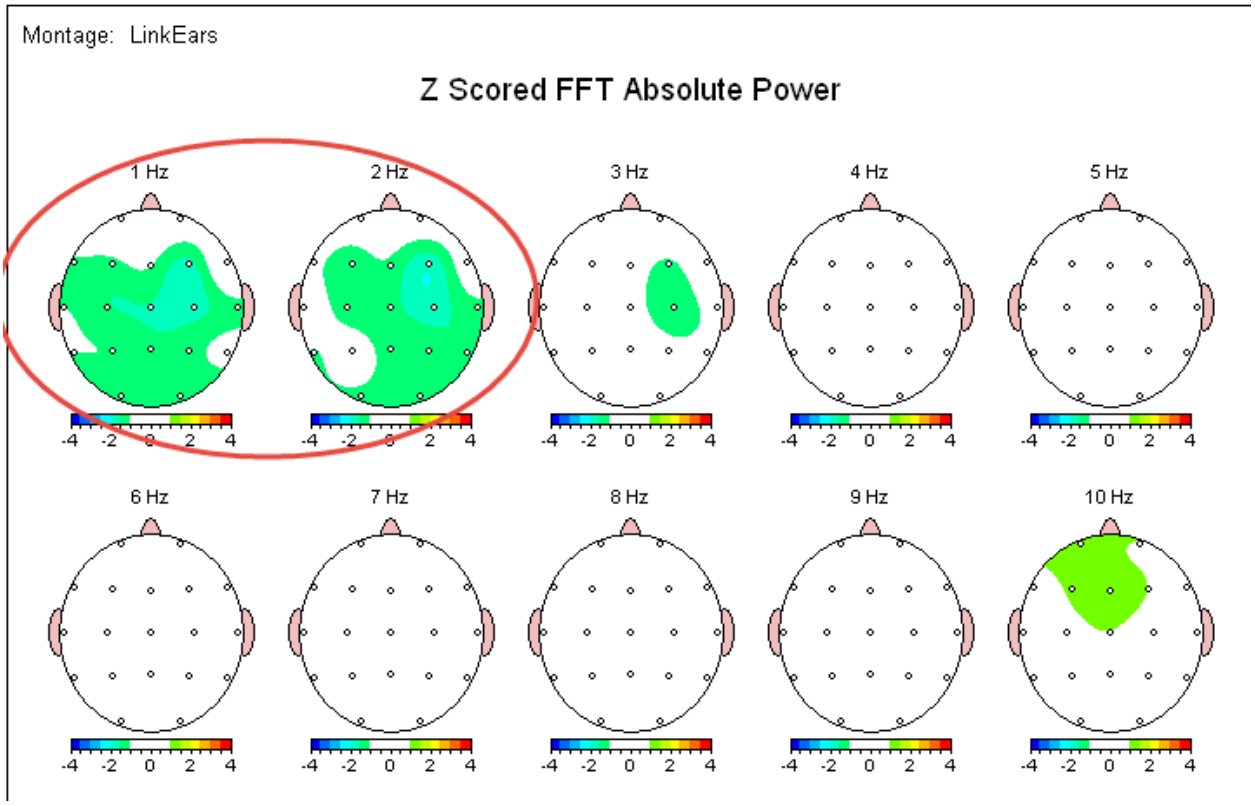
Montage: LinkEars

Z Scored FFT Summary Information



IV. DELTA DEFICIENCY

Figure 3: Subtle Deficiency in Delta (Eyes Open)



These maps show, overall, a very slight deficit in delta (shown in surface maps at the posterior region of the head, the occiput. The small patches of sky blue are the areas within the realm of clinical significance (more than 1.65 standard deviations below normal).

Delta is primarily seen when in deep, dreamless sleep, but also in the early neurogenerative stages in life, as well as in traumatic brain injury (since these are the regenerative slow waves created for the repair of the damaged tissue). It is in these states that the brain is seeking neurogenesis—the generation of neurons and connections. The fact that delta is typically large in amplitude is due to the fact that brain tissue acts as a capacitive filter, so those frequencies that are generated from the deeper neural structures must make it through more tissue to reach the cortex, and then the scalp, from which EEG is read. IN this case, however, delta is smaller.

The initial wiring of the brain is responsible for long connections, which are the long, fibrous, white matter tracts that are fundamental architecture to the brain that allow for slower rhythms of delta and theta to be conducted (von Stein, Chiang, & Konig, 2000). Similar to a musical instrument, the longer the string, the lower the pitch (Kung, 2013). These long connections are architecturally fundamental for the brain's development. For instance, one of

the most basic networks of the brain, which is consistent in all non-pathological humans, is the default mode network, which operates when the individual is at rest, disengaged from any task. The default mode network (DMN) cycles at 0.1 Hz (Fisher, 2014).[1] 0.1 Hz is a very slow delta wave, changing polarities once every 10 seconds. This bandwidth is also known as "infra-low" or "infra-slow" waveforms, which occur at the glial level.

The cultivation of greater delta would behoove the deepening of meditative states and feelings of connectedness, overall. Delta is the rhythm of the heart, the sound of being in utero, the speed of the ocean waves, and the frequency of tribal drums. It is fundamental, instinctual and primal. The cultivation of greater delta would enhance XX's intuition and psi-capabilities. That said, the deficiency is very slight.

Means to stimulate higher amplitude delta would include 1) getting 7.5 - 8 hours of sleep each night (optionally by tracking sleep cycles with the Sleep cycle app) to ensure 5-6 sleep cycles (moving from REM into deeper states or NREM sleep); 2) gardening, walking in the grass, or connecting with the earth via hiking, exercising outdoors, swimming in natural waters, etc.; 3) cleaning the house (i.e. washing dishes, cleaning the bathroom, etc.). The purpose for these kinds of activities is to ground the individual. This type of anchoring will not only increase the depth of his meditation, but will also anchor them to a deeper state, potentially. It has been shown as especially active in individuals who have telepathic capabilities (Persinger & Saroka, 2012). The cultivation of increased delta may sharpen his ability to read others on an even deeper level (tapping into others feelings and sentiments not made explicit). This would lead to even greater understanding of others, feeling connected on a deep level, and potentially inspiring and empowering others more readily as a result.

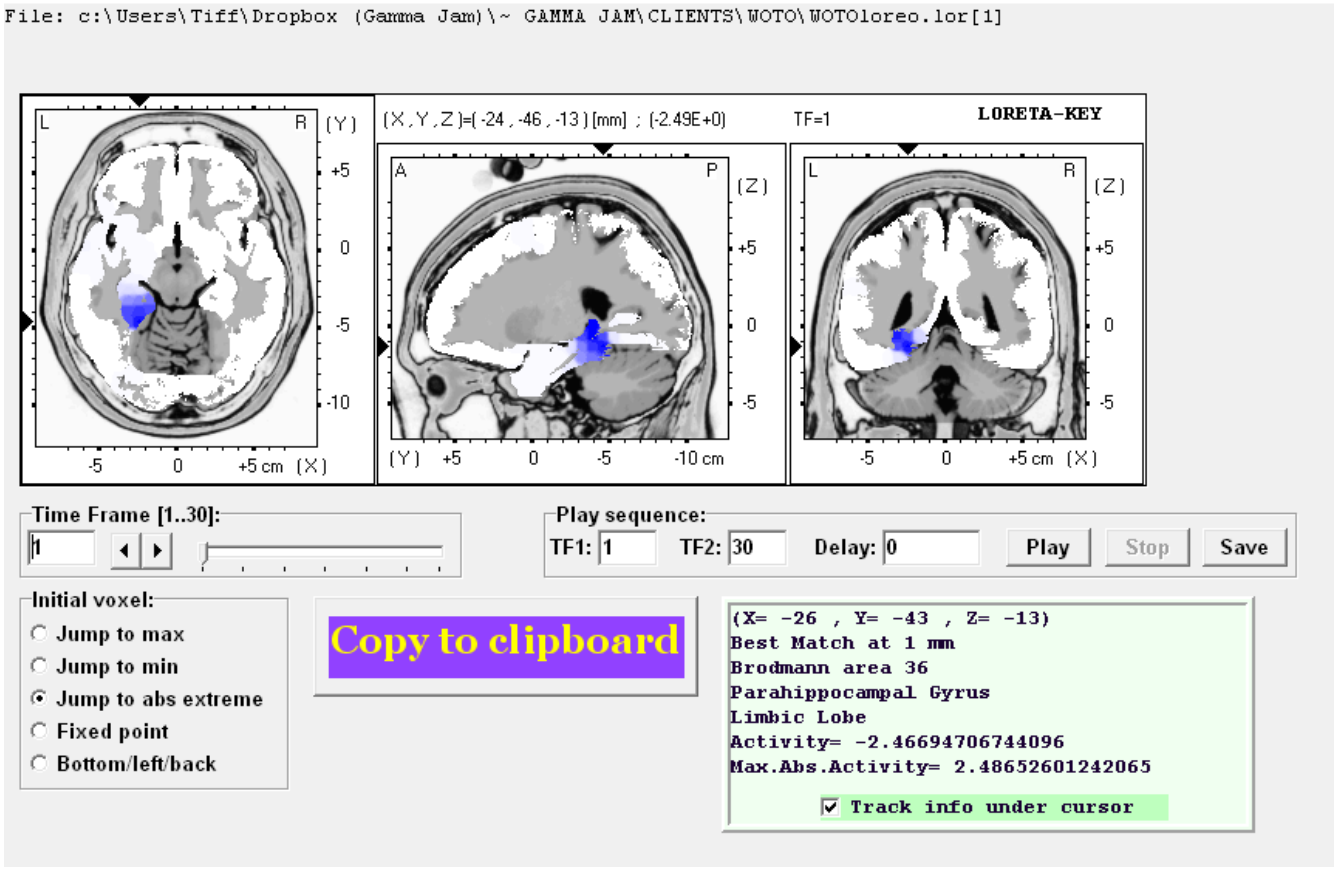
Figure 4 shows the delta deficiency stemming from the parahippocampal gyrus, a region which is responsible for many functions, most notably for short-term working memory. The left hand side is related to more verbal processes than the right. This area of the brain has much to do with the encoding and recognition of scenes; this area of the brain becomes active when taking in topographical scenes (images of cities, landscapes, and rooms—images of places). Furthermore, this area is involved in procedural memory consolidation, recognition, and recall. It is a component part of the networks for autobiographical memory, embarrassment, and regret.

An article by Carhart-Harris & Friston (2010) found that this area of the brain is one which decouples when individuals enter egoless states. There are quite a few possibilities that this area is slightly deficient in delta; one such reason is the frequent practice of meditation has caused a more permanent state of being witness to arise. If this is the case, this subtle deficiency leads to an emotional awareness and an awareness of self and other from a space of

[1] One node in the default mode network, the posterior cingulate cortex (PCC), is thought to mediate a person's existence in space, as well as autobiographical memory. When the individual has undergone developmental trauma, this area is often insufficiently infused with blood, as shown in fMRI studies (Fisher, 2014).

non-attachment. This allows for the situation at hand (regardless of what it is) to be handled without much interference of XX's personal material, so as to provide a balanced perspective and outcome.

Figure 4: Delta Deficiency Shown at the Parahippocampal Gyrus (Eyes Open)

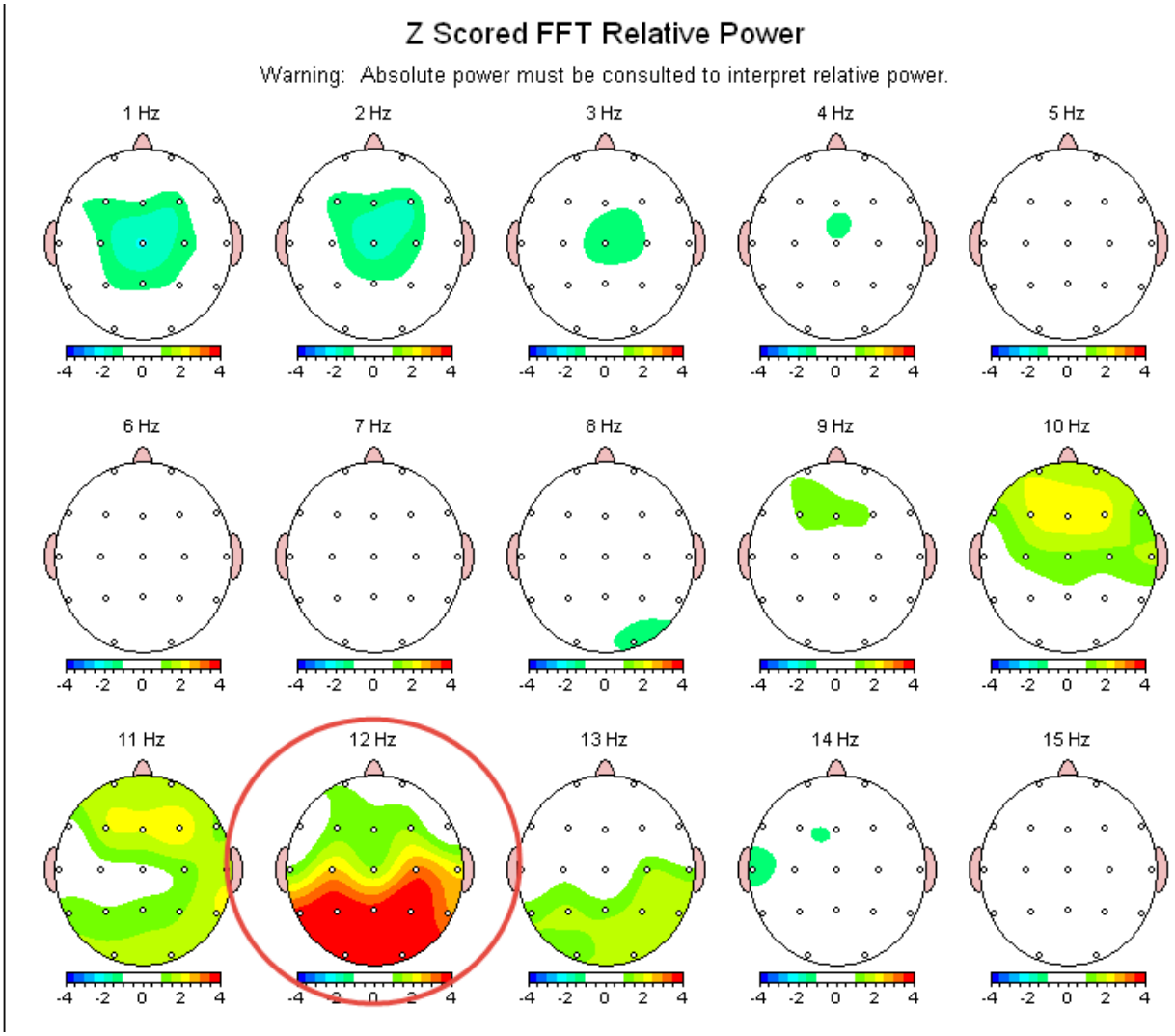


V. FAST ALPHA PEAK FREQUENCY

Alpha peak frequency is thought to be the "idling state" of one's brain. As the first brainwave of consciousness, alpha is the brainwave that links the unconscious states of delta and theta (collective unconscious and personal unconscious) to the waking, alert brainwaves of beta and gamma (Wise, 1995). "When alpha is missing," Wise purported, "the link to the subconscious is broken" (p. 4). Alpha, as seen in Figure 5, occurs in 9-12 Hz. and is a relaxed and open space, responsible for the state of flow, feeling safe, being in the "zone," and creating (art, music, mindless driving, etc.). Alpha is present when we are daydreaming, visualizing, and fantasizing (Wise, 1995). When we close our eyes, we begin to generate alpha from the occipital lobes, which typically increases by at least 50% in most adults (Swingle, 2010). Alpha is also the idling frequency of the brain. The speed of your alpha is called your "alpha peak frequency" and is

analogous to a shutter speed (like that of a camera); the faster the shutter speed, the more data you can take in per second and the sharper the image. We each have a different alpha peak—the faster, the better, as it is often thought in neurotherapy circles. Fast alpha is thought to be one sign of intelligence. Research by Doppelmayr, Klimesch, Stadler, Pollhuber, and Heine (2002) has shown that increasing the amplitude of faster alpha frequencies yields increased intellectual performance. From a depth psychological perspective, alpha can be likened to states of flow and of synchronicity.

Figure 5: High Peak Alpha Frequency (12 Hz), (Eyes Open)



When XX's eyes are open (figure 5), he produces a very fast alpha frequency, at 12 Hz, indicating that he is in flow state even when awake and conscious. When he closes his eyes (which creates an internally

oriented state), his alpha speeds up to 13Hz (Figure 6). A good friend, mentor, and renowned EEG expert, Jay Gunkelman, has told me that 13 Hz is the fastest alpha he has ever seen. I admit, this is the fastest alpha I have ever seen now. 13 Hz peak alpha frequency is a true peak performance state, indicating a rapid, quicksilver mind that is able to connect the dots in ways others can't at speeds which others cannot. 12-13 Hz peak alpha frequency indicates XX's ability to observe and process 25%-30% more data than his peers. Thus, XX can produce more results in less time (than others), with greater efficiency and skillfully handle rapid changes.

Figure 6: Alpha Peak Frequency (13Hz), Eyes Closed

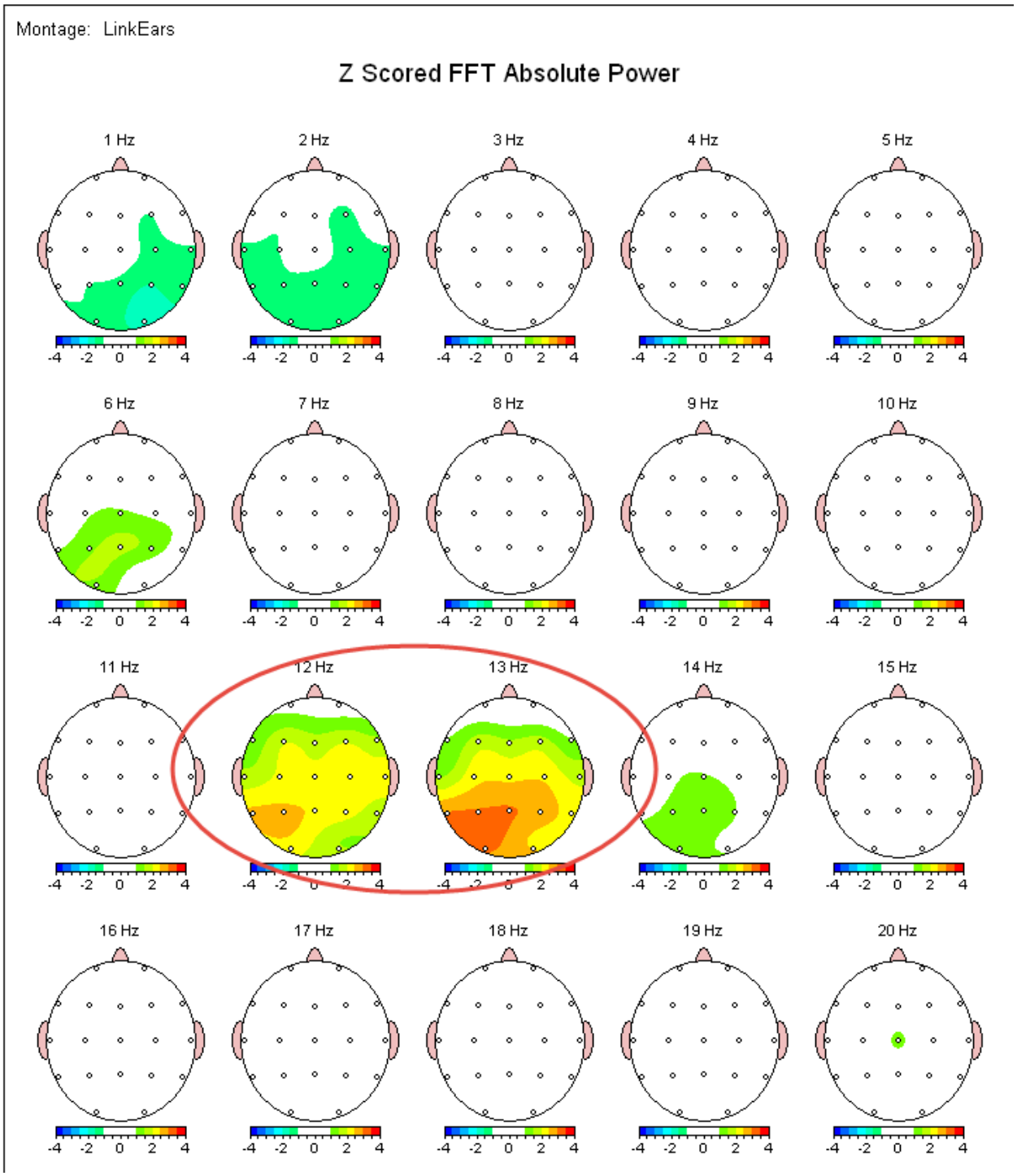
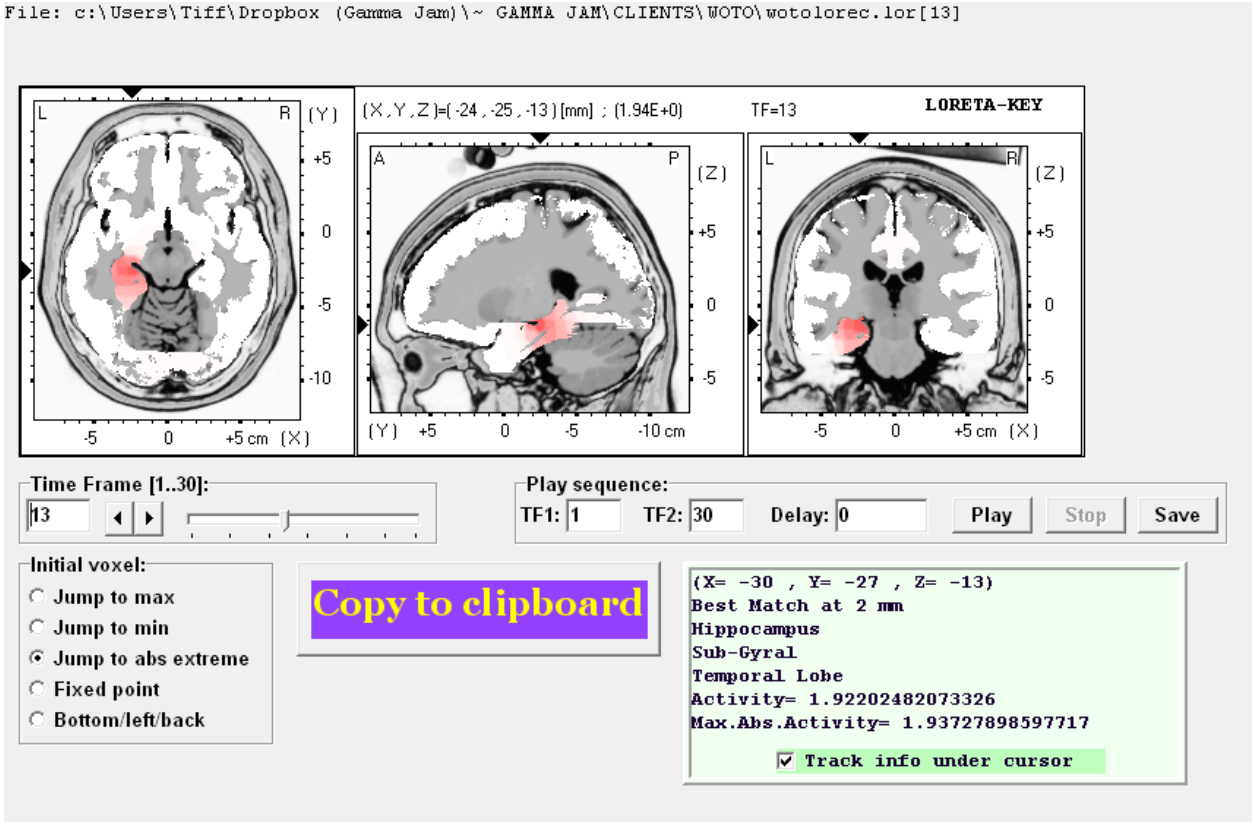
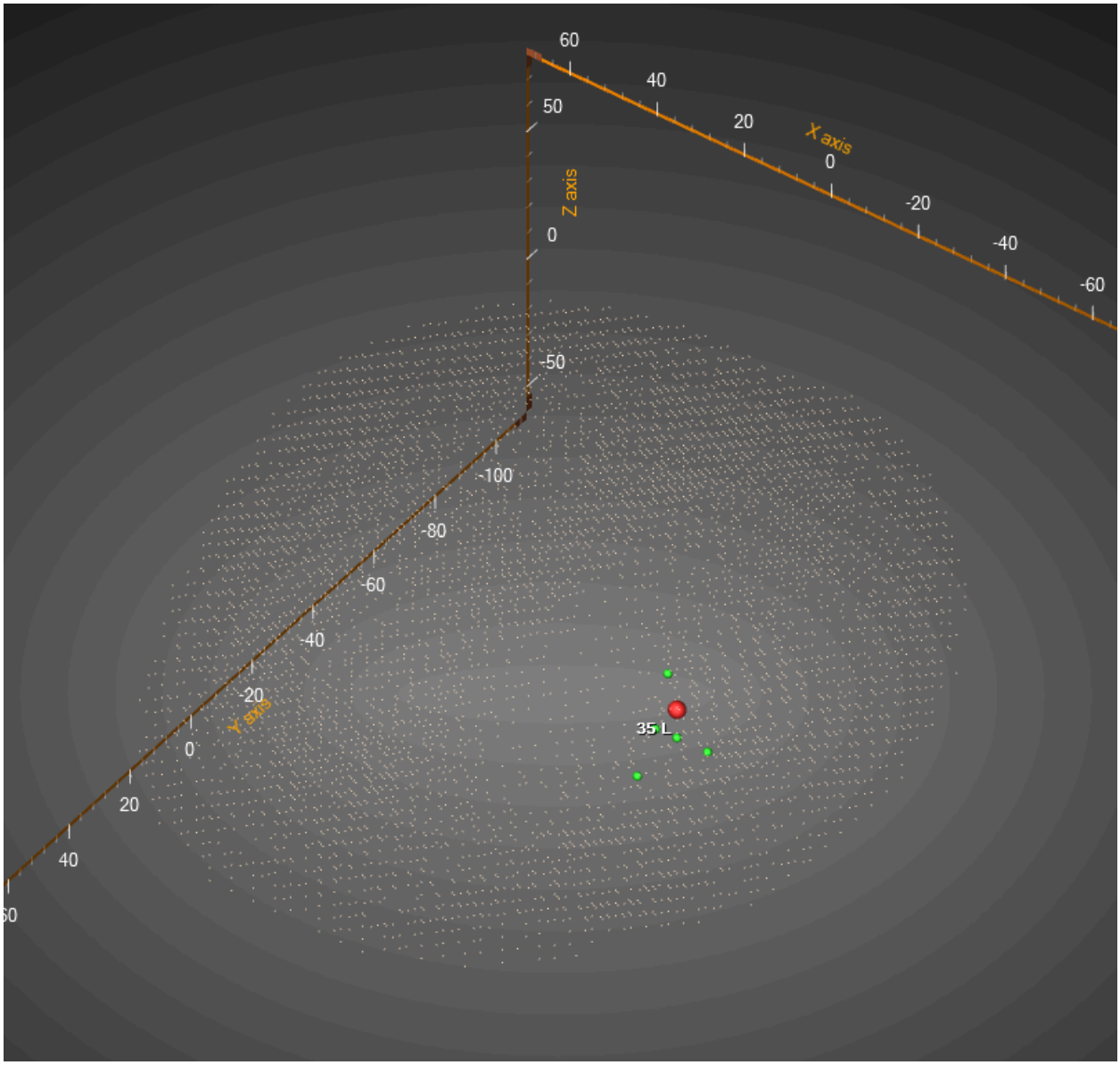

Montage: LinkEars
Z Scored FFT Absolute Power
1 Hz
2 Hz
3 Hz
4 Hz
5 Hz
6 Hz
7 Hz
8 Hz
9 Hz
10 Hz
11 Hz
12 Hz
13 Hz
14 Hz
15 Hz
16 Hz
17 Hz
18 Hz
19 Hz
20 Hz
-4 -2 0 2 4

Figure 7: 13Hz Alpha Peak Frequency at the Hippocampus



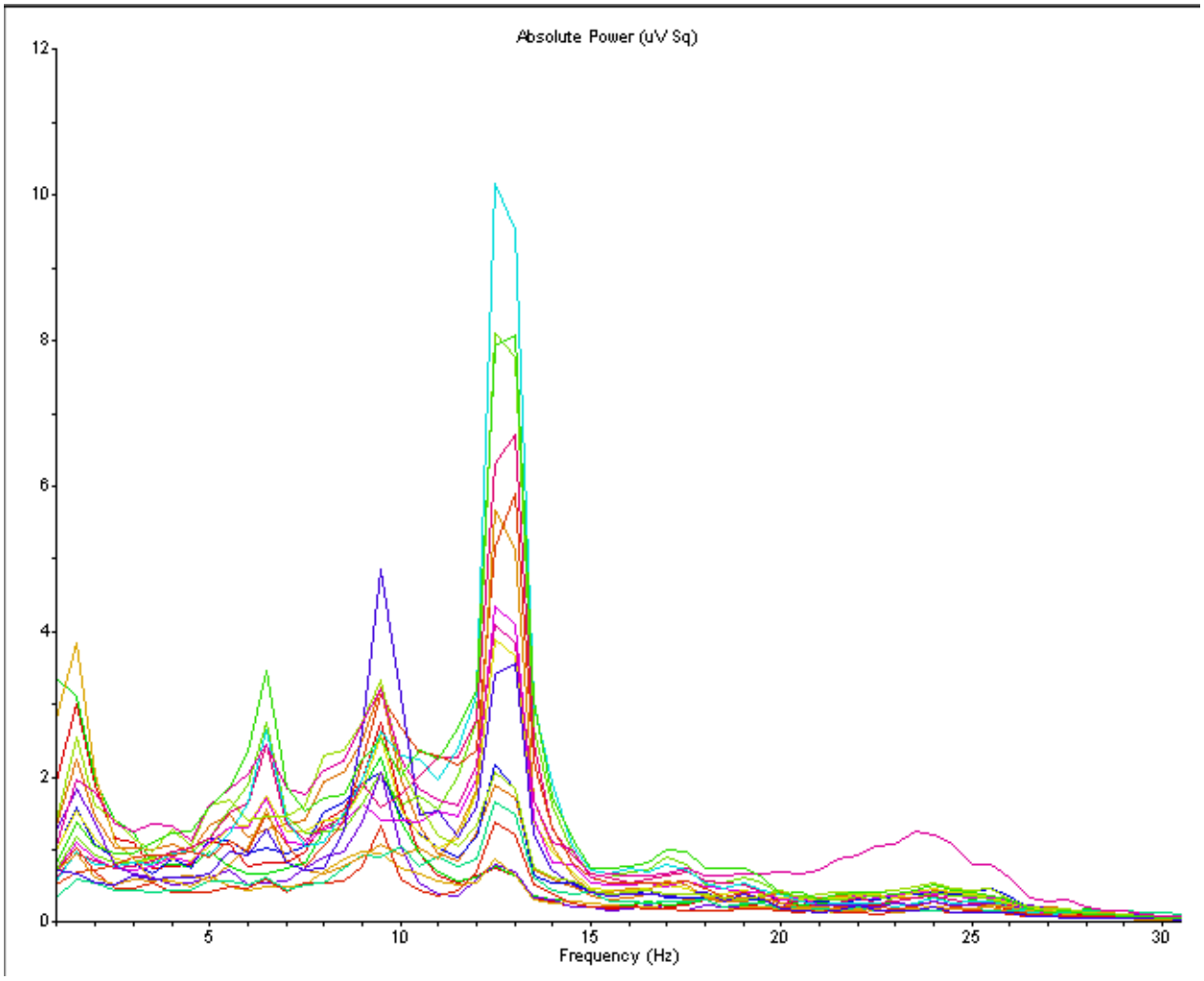
Of interest is the finding seen in figures 7 and 8: The same area which appears to be slightly deficient in delta is also one of the main generators for 13 Hz alpha peak frequency. This would indicate that the same functions affected by the low delta are enhanced by the high alpha. Thus, XX may have superb skills in short-term working memory, memory consolidation, recognition, recall, verbal processes, encoding and recognition of scenes.

Figure 8: 13Hz Alpha Peak Frequency at Parahippocampal Gyrus



VI. HARMONICS

Figure 9: Harmonics at 1 Hz, 6.5 Hz, 9.5 Hz, and 12.5 Hz



The final figure shows frequency on the x-axis and amplitude on the y-axis. By looking at the peaks at 1Hz delta, 6.5 Hz theta, 9.5 Hz alpha (which, in this case, is likely theta for XX), and 12.5 Hz alpha, we can see a "scalloping" of sorts. This is known in the world of EEG as "cross frequency coupling." This is a highly ordered brain state. Other individuals who have been documented showing cross frequency coupling are often healers (and their healees) during the space of healing, as demonstrated in Hendricks, Bengston, & Gunkelman's 2010 paper. In my experience, individuals who I have seen show harmonics are those who have been stimulated with harmonic frequencies and who have entered deep trance-like meditative states. The showing of harmonics is very rare and is indicative of a highly trained mind capable of deep states and insight.

Overall, harmonics in the eyes closed EEG (as seen here) would endow XX with the benefits those with highly cultivated meditative states show: peace of mind, trusting the process at hand, low stress, feelings of alignment, the ability to connect to and understand others, happiness, feelings of fulfillment, high performance, and an overall sense and confidence in self and the situations which present themselves.

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