

Brainwave Changes Associated with VibroAcoustic Therapy: A Case Study

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Brainwaves 101

In general, there are six types of brain waves: Delta, Theta, Alpha, Beta, Hi Beta, and Gamma. Delta, Theta and Alpha can all be considered “slow” brainwaves. When they are dominant or increase significantly, the brain is generally in a more relaxed or quiet state. Beta, Hi Beta, and Gamma brainwaves are considered “fast” brainwaves. When these are dominant or increase, the brain is active and engaged. By measuring brainwaves before and after a specific task or experience, we can get a picture of how the brain was impacted; did it become more alert and aroused or more relaxed and quiet?

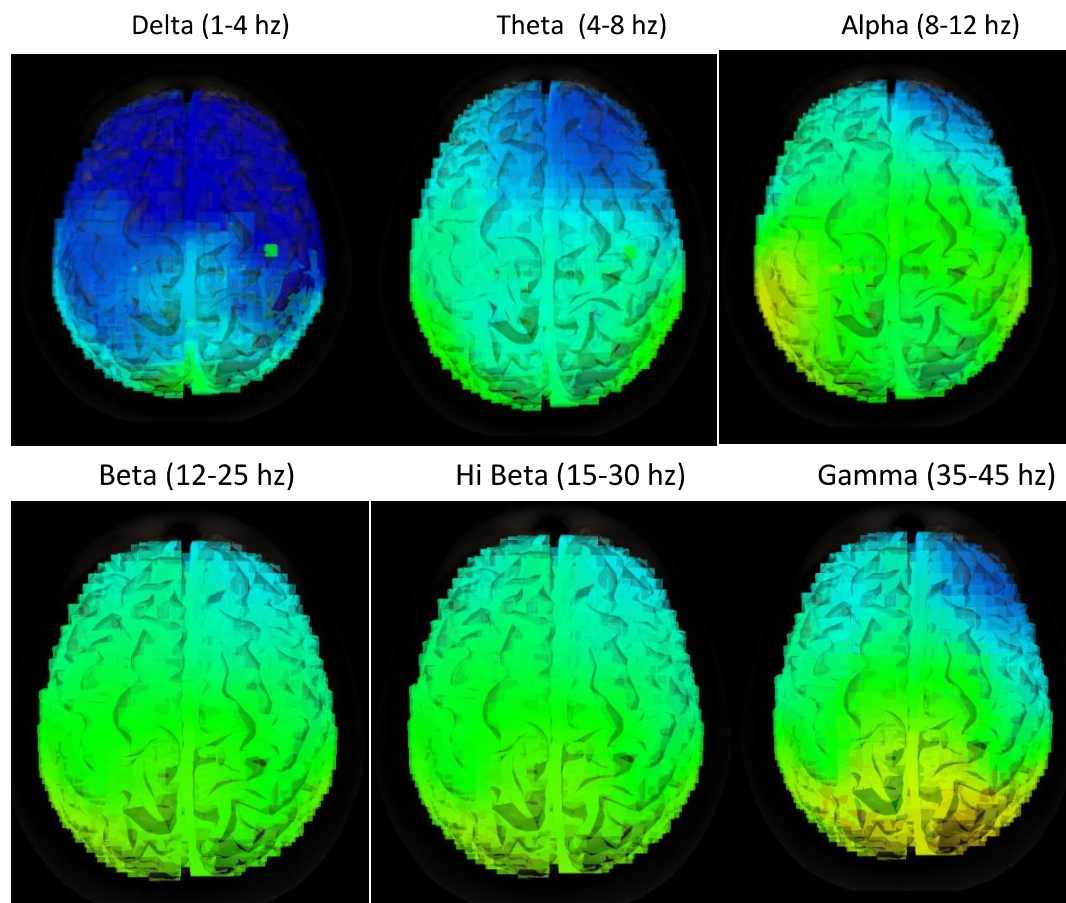
Methods

For each individual case study, we obtained a baseline measurement of brainwave activity, in an eyes closed, lying down position using a 19 channel BrainMaster Discovery EEG system. Brainwaves were then recorded as the subject participated in a 35 minute VibroAcoustic Therapy Session (VAT) divided into three distinct segments. The first segment was approximately 6 minutes, 30 seconds long and was designed as a muscle tension and trauma release protocol. The second segment was approximately 19 minutes, 30 seconds in length and was designed as a rejuvenation protocol based on the use of cymatics to bring ease and fluent energy to the mind-body. The third segment was approximately 9 minutes long. This protocol utilized different frequencies to activate and stimulate the muscles while balancing and centering the mind. Immediately following the VAT session, the brainwaves were measured again.

After transforming the Pre-VAT EEG into a reference database, this data was compared to the EEG data from the Post-VAT EEG, as well as each segment during the VAT. These analyses provided z-scores of change for all band waves (e.g., alpha, theta, beta, etc.) in 84 regions of interest. Based on previous research (Collura, 2017), any z-scores greater than .8 was considered significant.

Case Study #1: JJ

The 3D brain images below show changes in the brain after 35 minutes of Vibroacoustic Therapy. Cooler colors (blues) indicate that the activity measured decreased whereas brighter colors (yellow, orange, red) indicate that activity has increased. Dark blue shading indicates areas that decreased by at least .8 z-scores. Red areas indicate areas that increased by at least .8 z-scores. Green areas did not change significantly. The first set of images show changes in the cortex (outer layer of the brain) for each of the 6 basic brainwave types (ranging from slow to fast).

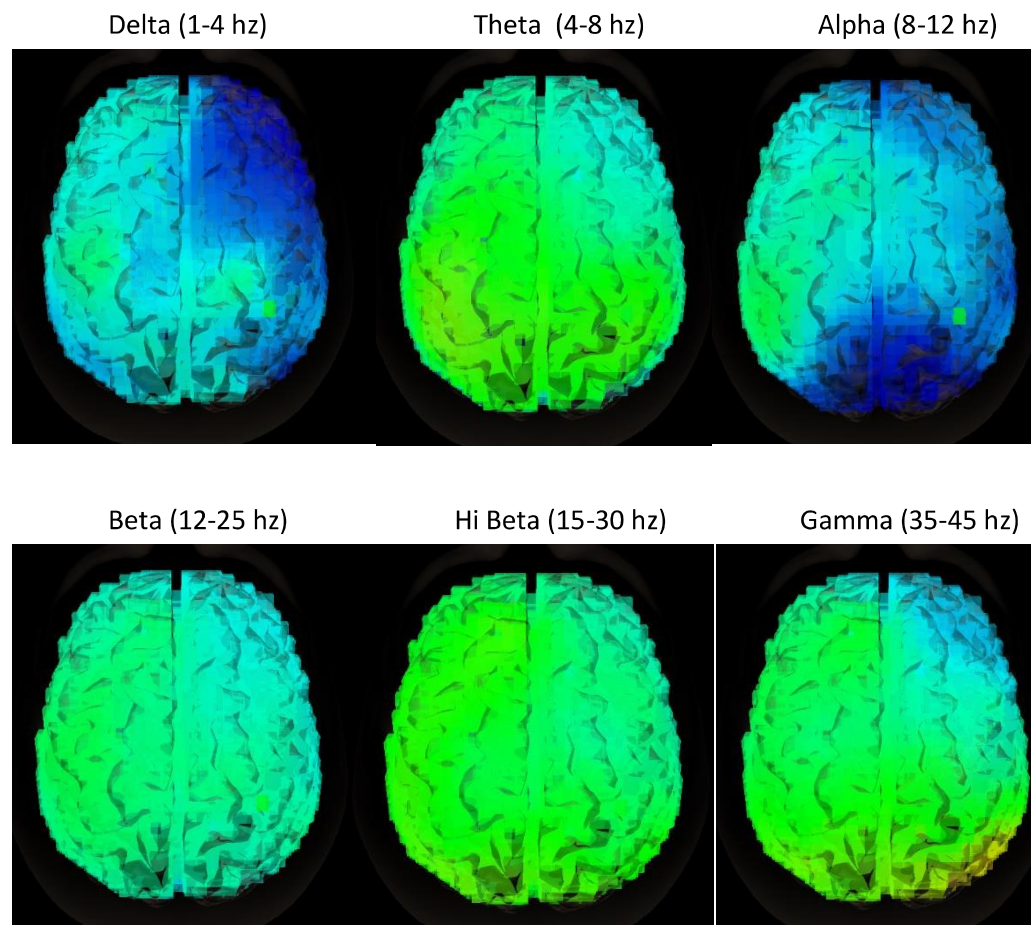


These images allow us to examine overall patterns. When examined this way, we notice that all brainwave bands decreased in right frontal areas. However, this pattern was most obvious with the slowest brainwaves (Delta, Theta). In fact, the area of greatest change was the Right Inferior Frontal Gyrus (-1.182) in the Delta band. There was some increased Gamma activity in occipital regions as indicated by brighter colored voxels, although these did not reach significance.

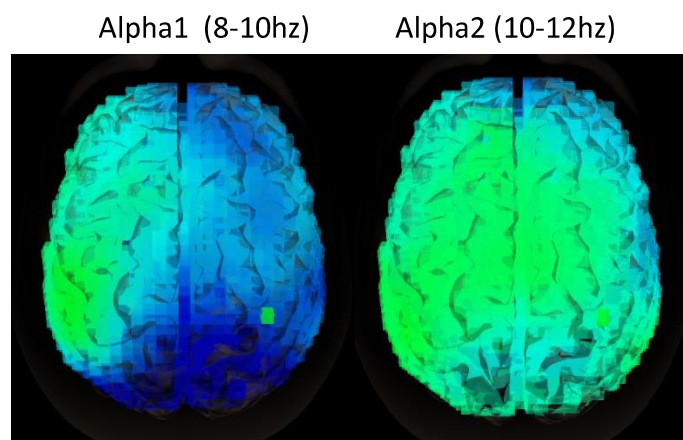
These results indicate that there was a change in brainwave functioning as a result of VAT, which appears somewhat different than what we would expect based on simple relaxation (increased alpha, decreased beta/hi beta). In fact, based on these results, it appears that the brain became more alert and energized, possibly with increased visualization.

To understand the potential impact of VAT on brainwave patterns, we also compared baseline eyes closed EEG data to different segments of time during the VAT session. In this particular session, there were 3 distinct sound/vibration files utilized. Each of these segments was examined compared to baseline functioning to determine if there were any significant changes occurring during treatment and if these changes were consistent (or different) between different vibrational approaches used in the session.

Baseline vs. 1st VAT Segment

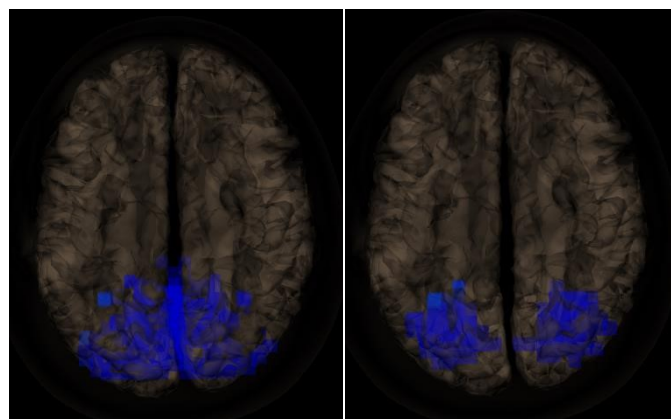


While these results show some similarities to the “before” and “after” images shown above, there are also some important differences, including a significant decrease of alpha activity in parieto/occipital areas. When this was assessed a bit further, it was noted that this decrease was much more pronounced in the Alpha1 band (see images below).



A decrease in overall power may indicate reduced processing of the conscious mind. To examine this idea further, we used a special analysis technique to examine brainwave patterns below the surface of the brain. sLORETA (Standardized low resolution brain electromagnetic tomography), allows us to extrapolate from the surface to deeper brain regions. The specific regions of interest demonstrating the most dramatic decrease of Alpha1 included the Precuneus and Superior Parietal Lobule (see below).

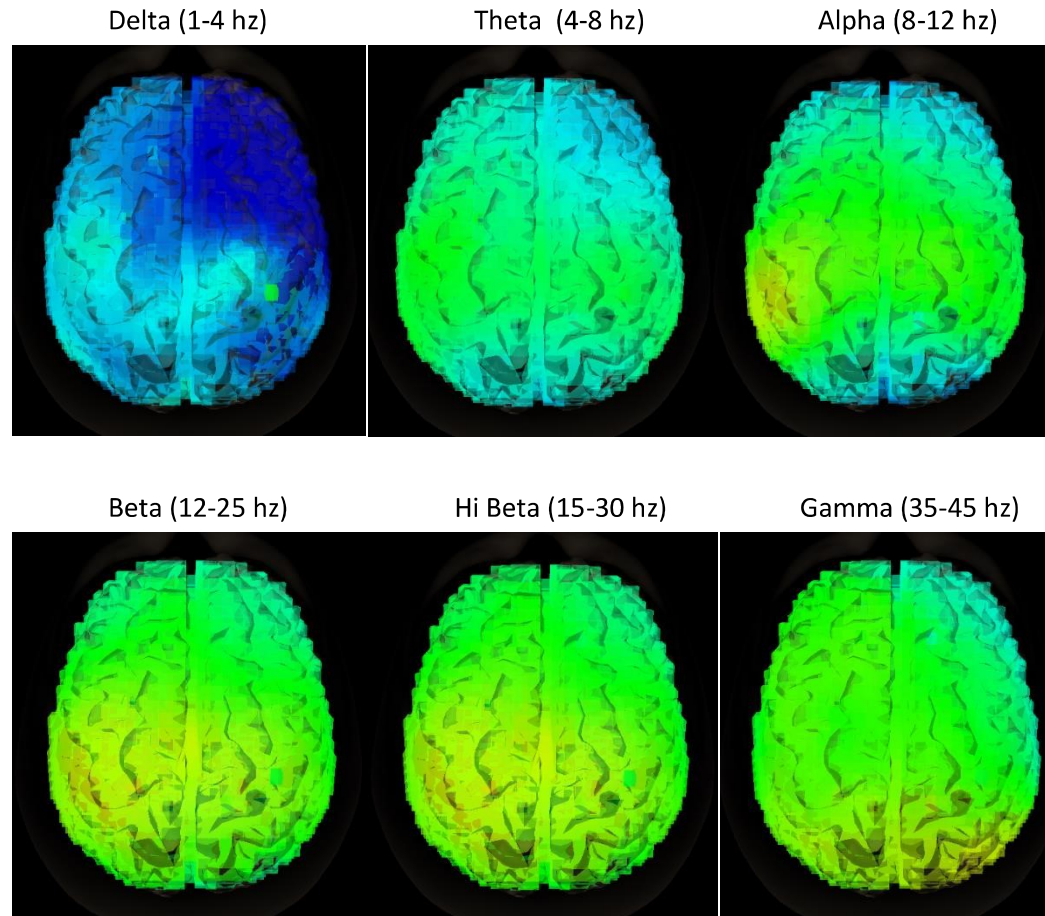
Alpha 1 (8-10hz) Alpha1 (8-10hz)
Precuneus Superior Parietal Lobule



The Precuneus is the hub of a region in the brain called the Default Mode Network (DMN). The DMN is involved in self-referencing, judgment, episodic memory retrieval and other functions that involve creating an identity. For this reason, the DMN is increasingly being thought of as the neurological seat of identity. A decrease in alpha1 in this region suggests that it has become disinhibited; a freeing of the mind's typical restraint and control, potentially allowing for the surfacing and working through of subconscious material.

Baseline vs. 2nd VAT Segment

Next we examined the change from pre-VAT to the second and longest segment of the VAT session. This segment lasted approximately 19.5 minutes. The initial analysis was done in a similar way to previous analyses.

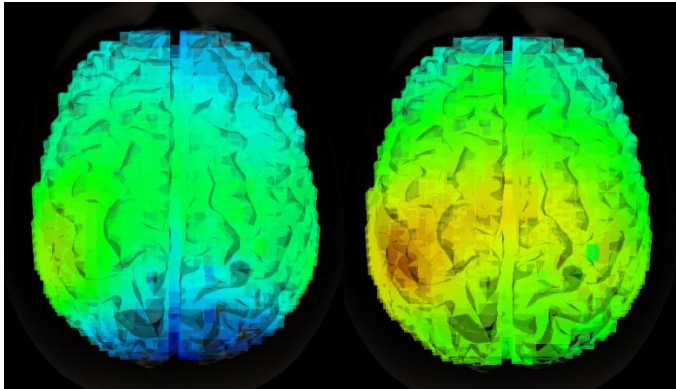


Again, while we see some similarities between the pre-post data and the pre-segment 1 data, namely a decrease of right frontal delta, we also see some important differences. During the second segment we do not see the significant decrease of alpha as observed during segment 1. In addition, we also see an increase of fast activity in left parietal areas. This pattern begins in the alpha frequencies and continues throughout beta and hi beta.

As part of our interest relates to examining similarities and differences between VAT protocols, we separated Alpha1 and Alpha2 the same as was done in the analysis of segment 1.

Alpha1 (8-10hz)

Alpha2 (10-12hz)



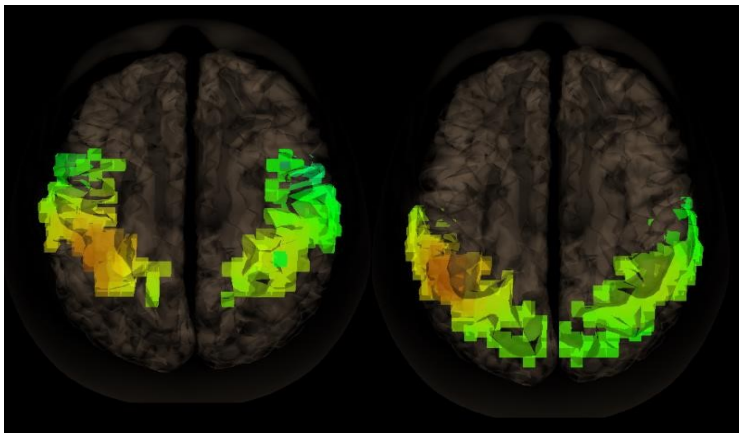
In this case, the differences between alpha1 and alpha2 are even more pronounced than in the segment 1 analysis. Using sLORETA to dig a bit deeper into specific brain regions involved, we can see that the regions with the most significant increase of Alpha2 are in the left sensorimotor strip.

Alpha 2 (10-12hz)

Alpha2 (10-12hz)

Precentral Gyrus

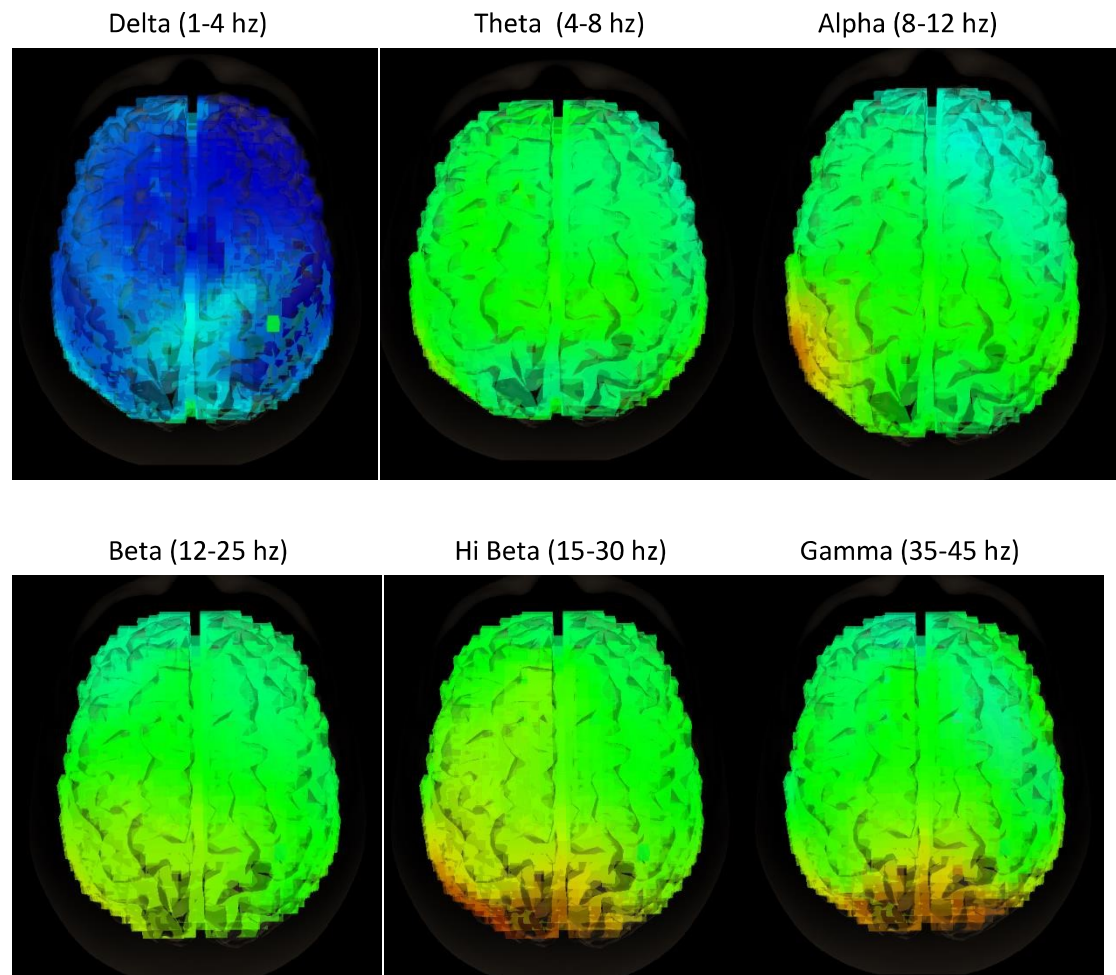
Postcentral Gyrus



Increased activation of alpha2 in the sensorimotor strip suggests an increase of relaxed alertness in the body.

Finally, we examined changes in the 3rd VAT segment compared to baseline:

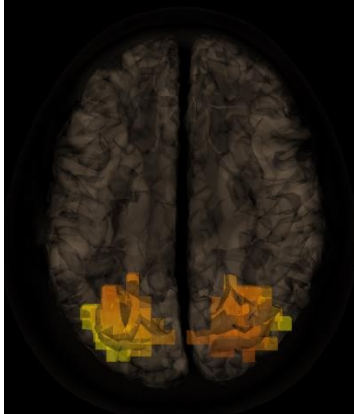
Baseline vs. 3rd VAT Segment



Again, we see similarities with Segment 1 and 2, as well as differences. Similar to the first two segments, Delta activity decreased significantly across the cortex. Interestingly, on this VAT segment, we see increased activation of Hi Beta and Gamma activity in occipital regions, perhaps suggesting increased visual processing and/or integration of information. This second hypotheses is supported by significant increases of activity in the Superior Parietal Lobule (see below).

Gamma (35-45hz)

Superior Parietal Lobule



Conclusions:

This case study demonstrates that VAT can have a significant impact on brainwave functioning AND that different VAT protocols can have differential impacts. The therapist conducting these VAT sessions indicated that the three protocols used were designed to do the following:

The first segment: designed as a muscle tension and trauma release protocol.

The second segment: designed as a rejuvenation protocol to bring ease and energy to the mind-body.

The third segment: designed to activate and stimulate the muscles while balancing and centering the mind.

It is interesting to note that the first segment showed brainwave patterns in brainwave regions that can be associated with the release of traumatic events, namely a decrease of inhibition in the default mode network. The second protocol showed brainwave patterns suggesting a relaxed, alertness in the body; again, suggesting a result consistent with the protocols intention. Finally, the third segment resulted in a brainwave pattern suggestive of increased visualization and/or an integration of information-consistent with the intention to “balance and center the mind.”

Certainly, there are other possible interpretations to these findings. However, it seems important to recognize that each VAT segment has some similar influences on brainwave patterns and some significant differences and these patterns were consistent with the intention of the protocols.

Future studies should examine if the same protocol has the same impact on different individuals as well as the potential additive or synergistic impact of using a series of VAT protocols for a particular person. It would also be helpful to include some type of subjective scale to capture the subject’s emotional/psychological response to the VAT experience.

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