qEEG Brain Mapping Shows Improved Efficiency in Brain Functions Using Shuzi's Nano Vibrational Technology (NVT)

Abstract:

This study was conducted by Pat Benfield, MHDL, CRT, CBIS-CI, CCAA, Clinical Director and qEEG NeuroPsychoPhysiology Clinician, at Benfield & Podger Associates, a private clinic that specializes in the treatment of brain injury and other neurophysiological and stress related disorders in Hickory, NC. (March 2013)

The study utilized 11 subjects to quantify the effects of Shuzi's Nano Vibrational Technology (NVT) on the human brain after an interval of 30 minutes and 7+ days by utilizing a scientifically accepted methodology of brainwave testing called Quantitative Electroencephalogram (qEEG). An EEG is the recording of electrical activity along the scalp utilizing sensors attached to one's head. The "q" in qEEG represents "quantitative" and is a technique used to neurometrically extend the analysis of a traditional EEG. A qEEG utilizes the raw EEG data by converting the data into digital signals. These digital signals are compared to a database of thousands of normalized subjects with the intention of isolating patterns. qEEG test results are completely objective as the results are driven by software calculations and are not open to subjective interpretations.

The results of testing show that Shuzi's NVT Technology had an average improvement in emotional efficiency of 17.0% (eyes closed) and in cognitive efficiency of 22.3% (eyes opened) after 30 minutes. These averages increased to 20.8% (eyes closed) and 26.9% (eyes opened) after wearing Shuzi's NVT for seven days or more.

Purpose:

To measure the effects of Shuzi's Nano Vibrational Technology (NVT) on the human brain by utilizing generally accepted scientific methodologies and testing protocols.

Introduction:

The human body is a complex system which works best when all the systems are working together in harmony, with the brain controlling and coordinating the functions of all systems. Furthermore, stress originates from the brain and the key to efficiently and effectively handle stress lies in the ability to self regulate one's cognitive, mental and physiological states throughout each day.

Growing amounts of research show that the effects of stress interfere with the natural balance of the human body. When a natural healthy balance among these systems cannot be maintained, states of "dis-ease" will become evident.

In a review of the scientific literature on the relationship between stress and disease, Carnegie Mellon University Sheldon Cohen, PhD, has found that stress is a contributing factor in human disease, and in particular depression, cardiovascular disease and HIV/AIDS. Cohen's findings will be published in the Oct. 10, 2013 issue of the *Journal of the American Medical Association (JAMA).* The article was co-authored by Denise Janicki-Deverts of Carnegie Mellon and Gregory E. Miller of the University of British Columbia.

In fact, "…stress is one of the major factors contributing to chronic disorders…" (Decker et al, 1996; Lawrence & Kim, 2000).

"Chronic stress may lead to and accelerate Alzheimer's Disease…", according to a study recently completed by Dr. Sara Bengtsson from Umeå University, Faculty of Medicine, Department of Clinical Sciences, Obstetrics and Gynaecology, 2013 (UNC).

The following information is intended to provide a high level explanation to provide clarity with the scientific terms and is essential to understanding the rationale regarding the specific procedures used in testing Shuzi's Nano Vibrational Technology and conclusions.

What is a Quantitative Electroencephalogram (qEEG) Brain Map?

qEEG is a scientifically established methodology measuring and digitally recording electrical activity patterns produced within the brain which primarily reflect cortical electrical activity or "brainwaves." (Nuwer, 1997) (at p. 278).

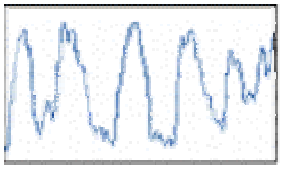
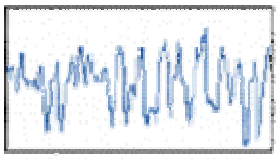
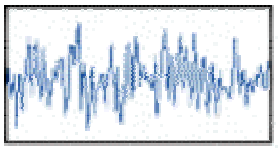
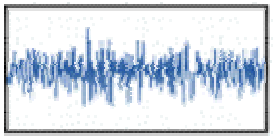
For reference, an EEG is the recording of electrical activity along the scalp utilizing sensors attached to one's head. The "q" in qEEG represents "quantitative" and is a technique used to extend neurometrically the analysis of a traditional EEG. A qEEG utilizes the raw EEG data by converting the data into digital signals. These digital signals are compared to a database with the intention of isolating patterns, which are then turned into a visual mapping sometimes referred to as "brain map".

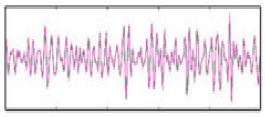
Brain maps are complex mathematical analyses and statistical tools comparing recorded results to norms or averages. The norms are based upon thousands of individuals without any known neurological, developmental, or psychiatric disorders. On the surface, brain maps can provide information relating to difficulties in daily life functioning such as problems with attention, anxiety, mood, learning, or behavior. Further, brain maps help to identify variations in brain functions that have been associated with psycho-neurological disorders such as:

- Addictions
- Anxiety
- Attention Deficit Disorder (ADD)
- Autism
- Learning Disabilities
- Depression
- Dementia
- Mild Head Injury
- Migraines,
- Obsessive/Compulsive Disorder
- Sensory Integration Disorder
- Sleep Disorders

Types of Brain Waves

Brainwaves occur at various frequencies. Some are fast and some are quite slow. The classic names of these EEG bands are Delta, Theta, Alpha, Beta, and Gamma.

Brainwave	Image of Band	Brainwave Frequency Cycles per second	Mental States and Associated Processes
Delta		0.1 - 4.0 Hz	Deep sleep, no dreams, physical healing and recuperation, healing of the limbic system, may positively improve symptoms of PTSD, empathy. Believed to help with inner growth, wisdom and recovery from trauma.
Theta		4.0 - 8.0 Hz	Transition to sleep, dream state, creative inspirations, hypnogogic state, enhanced visualization, deep meditation, sleep spindles, deep relaxation, inner peace and sense of well being, long term memory. Believed to increase inner wisdom, enhanced intuition, reduce stress and transformational help for limiting beliefs. May negatively affect attention disorders such ADD and ADHD
Alpha		8.0 - 12.0 Hz	Associated with lighter meditative states, associated with super learning. More relaxed. Relaxed yet alert but not necessarily engaged in active processing. Ready to respond, positive thinking, creative problem solving. Mood elevations, stress reduction, enhanced creativity, bridges the conscious with the unconscious mind, better access to resources involved in creativity, can be a source of motivation and inspiration. Good healthy alpha production promotes **mental resourcefulness**.
Beta		12.0 - 30.0 Hz	Wide awake – sensory motor awareness. Focused and alert, analytical thinking, learning new information quickly, complex mental processing. Usually associated with peak mental and physical performance. Also associated with stress and anxiety. Can be used to enhance the absorption and processing of new information. Beta activity is fast activity. It has a frequency of 13 and greater Hz. It reflects desynchronised active brain tissue. It is usually seen on both sides in symmetrical distribution and is most evident frontally.

Gamma		30.0 - 60 - 90 Hz	Compassion, Empathy, Decision making under stress, higher brain functioning and processes, influences sensory organization processing and integration. Believed to strongly influence the organization and interpretation of sensory data. Believed to have a strong impact on social consciousness and right and wrong. Enhanced self awareness and insight. GAMMA frequencies are found naturally in higher amounts in long term practitioners of various forms of meditation. Believed to enhance the ability to achieve goals. Improves clarity of thought and believed to improve intuition.

Reliability of qEEG/Brain Maps

Currently (as of March 2013), qEEG is one of the only objective measurement tools for many neurologically based disorders. The reliability of qEEG data has been validated through the identification of specific brain wave patterns or morphology and compared to other medically accepted testing methodologies such as LORETTA, MRI, PET, and CT. Further, the qEEG software has received FDA clearance under section 510 (k) device number K974748 and is currently used in hospitals, clinics and research centers around the world. There is an estimated 16,000 qEEG practitioners in the US alone.

In the last 40 years, over 90,000 qEEG studies are listed in the National Library of Medicine's database that can be accessed at: https://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed.

There is an extensive body of peer reviewed literature quantifying the superior reliability (i.e., reproducibility or the ability to repeat a measurement), validity and specificity of qEEG. To date, there have been over 1,400 peer-reviewed scientific articles using qEEG as a clinical research tool.

Professional Organizations which endorse the usage of qEEG:

- American Medical EEG Association (AMEEGA)
- The EEG & Clinical Neuroscience Society (ECNS)
- The American Psychological Association (APA)
- The Association for Applied Psychophysiology and Biofeedback (AAPB)
- The International Society for Brain Electromagnetic Tomography (ISBET)
- The International Society of Neurofeedback and Research (ISNR)

Limitations in qEEG

It is important to understand that a qEEG is not the same as a "clinical EEG" which is used in medical diagnosis to evaluate epilepsy or determine if there is serious brain pathology, such as a tumor. Benfield & Podger Associates does not use qEEG to make a medical diagnosis. We use qEEG to evaluate the manner in which a person's brain functions and to help in developing an appropriate remediation plan to correct, normalize and/or improve abnormal brain functioning and reduce problem cognitive and emotional symptoms.

qEEG and Shuzi's NVT

Our bodies are exposed to elements on a daily basis, some are physical and others are mental, but they all have consequences. These consequences can be supportive or degrading to our health and well being. As such, Shuzi's Nano Vibrational Technology (based on quantum physics principles) emits a subtle vibrational energy that resonates from a proprietary metallic chip and is thought to synchronize and be supportive of the natural functions of human body systems.

The purpose of this study is to scientifically measure the effects that Shuzi's NVT has on the human brain and its efficiency to function using qEEG.

Demographics:

The subjects were 11 volunteers (8 females and 3 males) ranging from ages 8 to 67 years. The subjects are divided into two groups:

Group 1: consists of six subjects who were not being treated with qEEG Neurofeedback. Only one subject in Group 1 takes a prescribed medication for sleep on a prn or as needed basis. Additionally there is one subject who has had two head traumas and a back and neck injury who is not taking medications.

Group 2: consists of five subjects who are being treated with qEEG Neurofeedback* (NFB). Four of these subjects have sustained a traumatic brain injury and, of these four, one has Post Traumatic Stress Disorder (PTSD).

All five subjects have a diagnosis of anxiety and four of them have a diagnosis of depression.

**NFB is a biofeedback training for the brain using operant conditioning. It is performed by attaching sensors to the scalp at the areas of the brain that are not regulating properly. Electrical impulses from the brain are captured by the sensors and subsequently sent through an amplifier into the computer which will interpret the impulses into numbers. If the numbers fall within the range established for training, the computer will provide rewards in the form of auditory and/or visual feedback. Neurofeedback has proven to be successful in treating various types of neurophysiological and psychological conditions.*

All subjects completed a Medical History, Physiology Rating Scale, Interactive Symptoms Inventory (ages 16 and up) and the Client Evaluation Checklist. Informed written consent was provided by all subjects before completing questionnaires and undergoing qEEG assessment.

Below are two tables summarizing each individual's profile divided by groups. The top table represents subjects who were not receiving NFB training, while the second group was receiving NFB training during the time they participated in the study.

Group 1 (Without NFB)					
Subject	**Gender**	**Age**	**Pre-existing conditions**	**Medications/ Supplements**	**ISI-Symptom Endorsement ***
BP	Female	8	Anxiety, mild Separation issues	None/ Probiotic vitamin	Not normed for this age
TP	Female	12	Anxiety, moderate Adjustment D/o Abdominal migraines OCD tendencies	None/ Probiotic	Not normed for this age
LR	Female	40	Restless leg Indigestion Post Concussive Symptoms from a fall about 1 yr. ago	None/ None	Anxiety-Moderate Depression-severe Avoidant-WNL
CP	Female	43	Tension & Migraine HAs Compound Fractured skull-left frontal -40 yrs.ago-MVA mTBI-15 yrs ago-MVA Neck/back pain & PT HAs –22 yrs. Ago-MVA	None/ Vit.D/Xylitol	Anxiety-mild Depression-WNL Avoidant-WNL
LK	Female	44	Anxiety Depression Tension & Migraine HAs Panic Attacks TMJ Allergies Trouble sleeping	Lorazapam PRN/ None	Anxiety-Severe Depression-severe Avoidant-Moderate
TR	Male	67	Healthy	None/ None	Anxiety-WNL Depression-WNL Avoidant-WNL

*Note: The **Interactive Self Inventory Test (ISI)** is a statistically validated instrument based on social psychological dimensions of behavior, many of which correlate with EEG distribution. Practitioners can have clients fill out the questionnaire and acquire an output graph indicating potential problem areas of social interaction that are contributing to the client's problematic social behavior and which are likely to interfere with the neurofeedback process. We've noted their calculated psychological dimensions as it relates to anxiety and depression just to provide a more complete profile of each subject.

"Avoidant"--Individuals high in avoidance are typically anxious in nature and frequently susceptible to depression.

Group 2 (With NFB)					
Subject	**Gender**	**Age**	**Pre-existing conditions**	**Medications/ Supplements**	**ISI-Symptom Endorsement ***
MD	Male	52	TBI-MVA-6 yrs. Anxiety Depression Memory problems Tinnitus HBP Trouble sleeping	Lexapro Lotrel Ambien Sulindac Percocet/ None	Anxiety-mild, Depression-moderate Avoidant-Severe
LN	Female	26	TBI-MVA- 15 yrs. ago Anxiety Depression ADD Panic Attack Migraine Sleep D/o	Methyphenaldate*	Anxiety-WNL Depression-WNL Avoidant-WNL
CW	Female	36	TBI-MVA-16.5 yrs. ago Anxiety Thyroid Migraines Seizure D/o Memory D/o	Keppra Levothyroxine Venlafaxine HCL ER Zyrtec Meclizine prn Maxalt Mlt prn Zonisamide Rozerem prn Nortriptyline HCL Tylenol Magnesium Multivitamin Calcium/VitD Vit B12	Anxiety-WNL Depression-WNL Avoidant-mild
DR	Female	53	Depression Migraine Tinnitus Insomnia Allergies Thyroid	Effexor SR Claritin Topamax Synthroid, Maxalt Flexeril Celebrex Adderal* Tramadot Acetaminophen Allergy Shots VitD3 Biotin Cinnamon MVI MSM	Anxiety-WNL Depression-WNL Avoidant-WNL
JM	Male	56	TBI-Assault-3 yrs`ago PTSD	Seroquel XR Clonazepam	Anxiety-very severe, Depression-very severe

			Depression Panic attacks HBP Thyroid Sleep D/o	Nortriptyline Synthroid B12 Norvasc/ Mulltivitamin OTC supplements	Avoidant-very severe

While it is possible for various medications to affect qEEG readings, the subjects had no changes in medications and continued taking all their medications as usual, with the exception of psycho-stimulants. Psycho-stimulants appear to be rapidly metabolized to ritalinic acid and the half-life* seems to be relatively short. In addition the subjects were also instructed to not drink caffeine or smoke cigarettes for a minimum of 12 hours prior to testing.

*A drug's half-life is the time it takes for half of a given dose to be eliminated from the body or bloodstream. This value varies considerably between different types of medications, and even different preparations of the same one.

Equipment, Assessment Tools, and Brain Mapping Programs Used:

BrainMaster Atlantis 4x4 Amplifier and MiniQ-II is the system that was used. The BrainMaster is a clinical quality, FDA -registered, EEG training system intended for clinical work and research in EEG biofeedback. It is designed for "production" EEG training.

The BrainMaster MINIQ- II (patent pending) is a type of EEG switch device that allows 4 channel EEG to take multiple channel recordings in sequence. It obtained recordings at a sampling rate of 256 Hz. The electrode impedance was maintained at less than 5 k Ω.

Evoked Potential Electro-Caps was the EEG electrode application technique used. They are made of an elastic spandex-type fabric with recessed, pure tin electrodes attached to the fabric with tin ear clips. The electrodes on the standard caps are positioned to the International 10-20 method of electrode placement. Heads were measured to assure proper fitting.

Electro-Gel that has been specifically formulated for the use with Electro-Cap products to prevent high electrode impedance and various types of electrode artifacts was applied with a 5cc syringe and a 16g special blunted needle.

The NewMind QEEG Analysis is a comprehensive integrative system for analyzing EEG brain maps. Richard Soutar, Ph. D., a distinguished pioneer in the field of Neurofeedback, developed this system. It is the first report system to provide a wide variety of conveniences for clinicians, such as an At a Glance Report, Automatic Protocol Generation, Metabolic Confound Report, Supplement Recommendations and a Simplified Client Report section for clients to read. This system also offers the ability to compare brain maps identifying the anterograde and retrograde compensatory changes and overall changes in cognitive and emotional efficiency.

Procedure:

Each volunteer followed the procedures below:

Assessment Phase I

1. Special instructions regarding hair, contact lenses, and intake of caffeine, nicotine, and psycho-stimulant medications.
2. Completion of Medical History, Physiology Rating Scale, Client Evaluation Checklist, and Individual Symptoms Inventory.
3. Obtain a qEEG baseline in two resting state conditions (eyes opened and eyes closed) *(explanation of why two resting states were used is below in the "Conditions" section)*
4. Put on Shuzi Sports Band containing Nano Vibrational Technology and wait 30 minutes
5. Reassess using qEEG in two resting state conditions (eyes opened and eyes closed)
6. Analyze both sets of qEEG data in the form of Brain Maps using New Mind Mapping System
7. Compare the results of the two sets of Brain Maps for each resting condition to assess changes as a result of wearing Shuzi technology for 30 minutes.

Assessment Phase II

1. Subject continues to wear the Shuzi Sports Band technology for 7 or more days
2. Special instructions regarding hair, contact lenses, and intake of caffeine, nicotine, and psycho-stimulant medications.
3. Obtain new baselines using qEEG in two resting state conditions (eyes open and eyes closed)
4. Analyze qEEG data in the form of Brain Maps for each condition
5. Compare the results of the qEEG from the initial Brain Maps in both conditions obtained without Shuzi NVT with the Brain Maps in both conditions obtained 7-28 days later

Conditions:

- Overhead fluorescent lights were off with use of filtered sunlight and a daylight lamp. Assessments were administered in the morning at approximately the same time with both conditions (eyes open and eyes closed).
- Sitting quietly with **Eyes Closed condition (EC)** is used to measure **emotional and mood regulation efficiency** or normalization as it relates to regulation (under arousal), depressive (inhibited) and anxiety (over arousal) symptoms and overall ability to regulate as a whole (under arousal).
- Sitting quietly with **Eyes Opened condition (EO)** measures overall **cognitive efficiency** or normalization that takes into account executive functions, memory processing, verbal and visual processing, and math and reading comprehension.
- A placebo group was not included in this study due to the inherent validity and reliability of qEEG testing methodologies. The reliability of data sourced from a qEEG test has been evaluated by credible third parties. According to Dr. Robert W. Thatcher's published work in the Journal of Neurotherapy (2010) titled "Validity and Reliability of Quantitative Electroencephalography (qEEG)", he states:

> "*QEEG is distinguished from non-quantitative EEG ("eyeball" examination of EEG traces), with the latter showing low reliability (e.g., 0.2–0.29) and poor interrater agreement for nonepilepsy evaluation. In contrast, qEEG is greater than 0.9 reliable with as little as 40-s epochs and remains stable with high test–retest reliability over many days and weeks. Predictive validity of qEEG is established by significant and replicable correlations with clinical measures and accurate predictions of outcome and performance on neuropsychological tests."*

Dr. Thatcher continues with comparing data correlations to independent accredited measurement devices to further validate the reliability of qEEG data.

> "*Content validity of qEEG is established by correlations with independent measures such as the MRI, PET and SPECT, the Glasgow Coma Score, neuropsychological tests, and so on, where the scientific literature again demonstrates significant correlations between qEEG and independent measures known to be related to various clinical disorders. The ability to test and evaluate the concepts of reliability and validity are demonstrated by mathematical proof and simulation where one can demonstrate test–retest reliability as well as zero physiological validity of coherence and phase differences when using an average reference and Laplacian montage*."

In short, qEEG data is stable and with high test-retest reliability, which can be concluded that if a placebo were effective in changing the readings, the reliability would not be regarded as stable or "high test-retest reliability". As such, a placebo group was considered not necessary for this particular test.

Explanation of Data Obtained:

The NewMind Brain Mapping System analyzes magnitude, dominant frequency, inter-hemispheric connectivity, hemispheric asymmetry, and phase of delta, theta, alpha, beta, and high beta brain wave activity in 19 standard locations around the skull. These dimensions were chosen based on clinical relevance and correlation with psychometric and neurocognitive measures, functional MRI (fMRI) research and traditional neurological texts. These findings were compared to normal brainwave patterns of healthy adults and children.

Each row of heads pictured below shows five different brain wave frequency bands beginning with delta, the slowest wave, and progressing to the right with high beta being the fastest brain wave frequency band shown.

Understanding of two key indicators is necessary when looking at these comparison maps:

1. The color key located to the right side of each head indicates whether they have too much of that particular brain wave frequency band (too much of that power band) with red (hi) and yellow (very hi) representing one and two or more standard deviations respectively; green indicating a normal amount of that frequency band (the right amount of that power band); and light blue (Lo) and dark blue (very lo) not enough of that frequency band (not enough power) representing one and two or more standard deviations below the normal population.

2. When comparing two brain maps, the red and green circles or outlines around the color coded locations on the second row of heads indicate the anterograde (green) and retrograde (red) changes to achieve better balance for more healthy or optimal performance.

The NewMind Brain Mapping System analyzes the brain network systems and compares brain maps by showing the cortical reorganization or changes that occur in an effort to achieve the best balance among the networks in order to sustain the most normal or highest level functioning possible. The changes that occur to maintain a balance for the most efficient performance are in the form of anterograde (movement toward normal distribution) and retrograde (movement away from normal distribution) changes.

These are non-linear adaptations that naturally occur in order to optimize or maximize normal performance, or in the face of brain damage, attempt to maximize performance by using underutilized non-damaged brain structures.

> **Note:** In the brain map reports below anterograde (changes toward normal distribution) are represented by **green** while retrograde (movement away from normal distribution) changes are represented by **red** circles around the colored sites to signify a change. It is important to note that the appearance of retrograde changes does not correlate directly with a "negative" effect as this shifting is occurring to achieve a better balance and improved performance overall. Both anterograde and retrograde changes are considered to be a positive change for the brain as it is optimizing the performance also sometimes known as brain's resiliency.

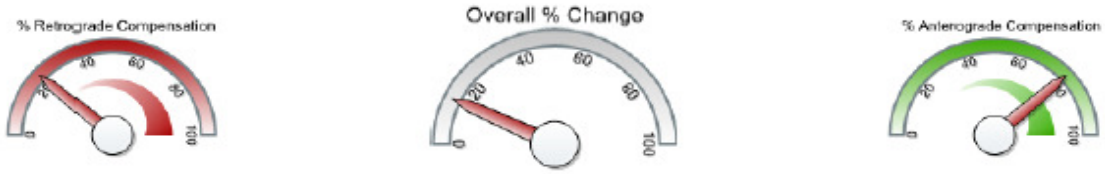
The percentage of efficiency reported in the data represents the amount of change toward more normalized performance or improved healthy functioning in the emotional and cognitive areas as a result of Shuzi's NVT.

The complete brain map comparisons **(Appendices 1-4)** for one of the subjects not being treated with NFB (CP) are attached to show the original report's format as an example of what was obtained for each subject. CP's reports are being shown in detailed form as a walk-through explanation of the data. The other 11 patients' data was summarized in tabular form.

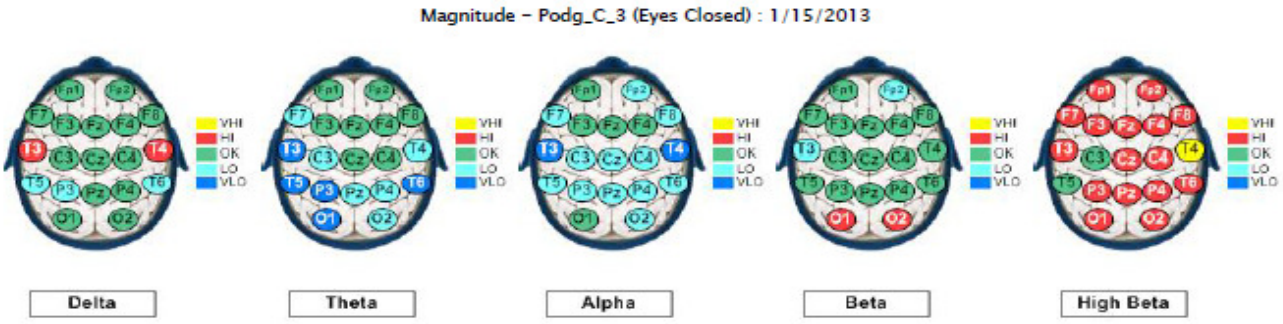
> **Background of Subject -** CP is a 43 year old female who has a history of multiple head traumas as a result of motor vehicle accidents. She had a compound fractured skull (left frontal) at age 3.5 years and bone fragments were surgically removed. Although she was an "A" honor student throughout school, she had to work hard for her grades and attributes her difficulties grasping math, abstract concepts--geometry and logic and probability to her early injury. She compensated by using a pocket planner in high school and daily planner in college. She experienced mild to moderate anxiety and frequent headaches. At age 18 years, she was rear-ended while at a dead stop causing back and neck injuries, frequent severe headaches, and moderate anxiety and depression. At age 26 years, she sustained a mild traumatic brain injury and dislocated collarbone when another vehicle hydroplaned on wet pavement into an intersection in the path of CP's car. She experienced severe post-traumatic headaches and tinnitus for over a year, attention and memory problems, and extremely high anxiety. She still experiences increased anxiety while driving in rain and going through intersections. Over three years ago when her father was diagnosed with cancer and deceased several months later, she experienced an increase of tension and migraine headaches and complained of pain that appeared to be related to situational depression and increased anxiety. Despite recommendations for pharmaceutical treatment from her doctors, she relied on complementary and alternative therapies, i.e., chiropractic care, herbal and homeopathic remedies, naturapathic practitioners, etc., and cognitive rehabilitation therapy**.**

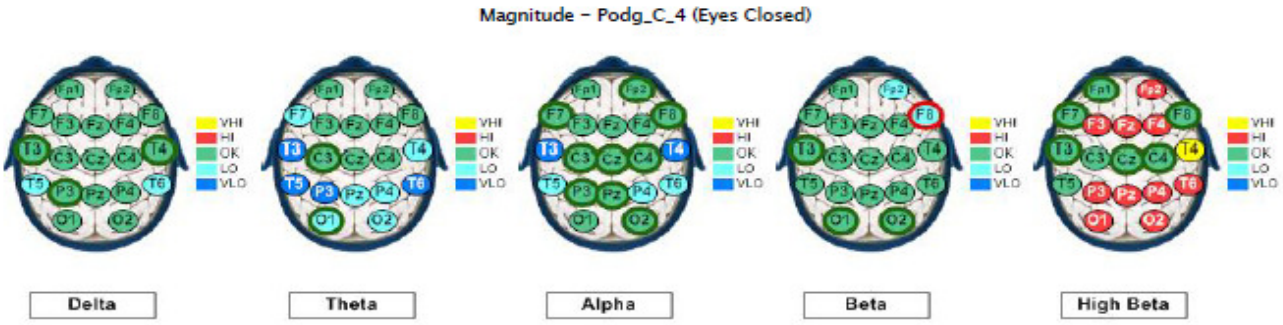
<u>Subject CP with eyes closed</u> From file: CP_Q_13_0115_13_0115_ec; This testing was performed 30 minutes after wearing Shuzi's NVT and compared to the original baseline measurements (without Shuzi's NVT). **(Appendix 1)**

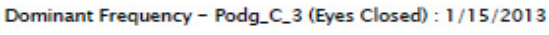
Eyes Closed condition (EC) is used to measure ***emotional and mood regulation efficiency*** or normalization as it relates to regulation (under arousal), depressive (inhibited) and anxiety (over arousal) symptoms and overall ability to regulate as a whole (under arousal).



14% Overall Change



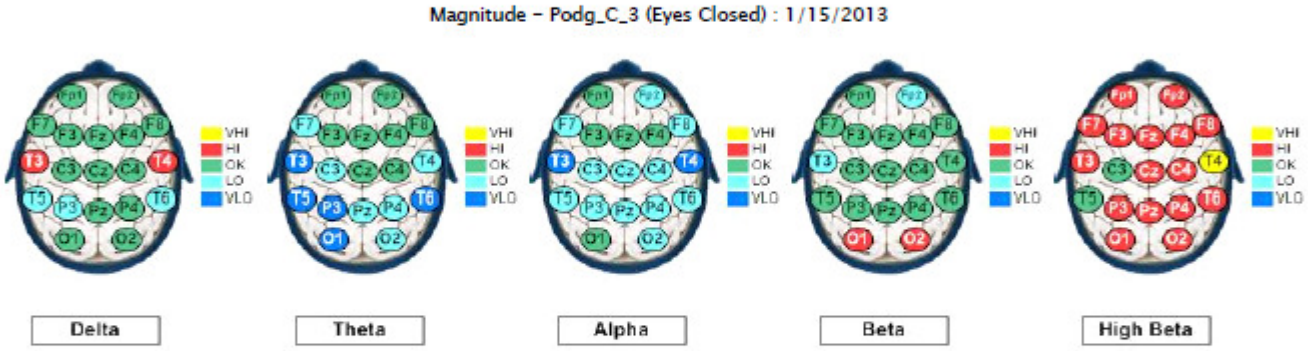


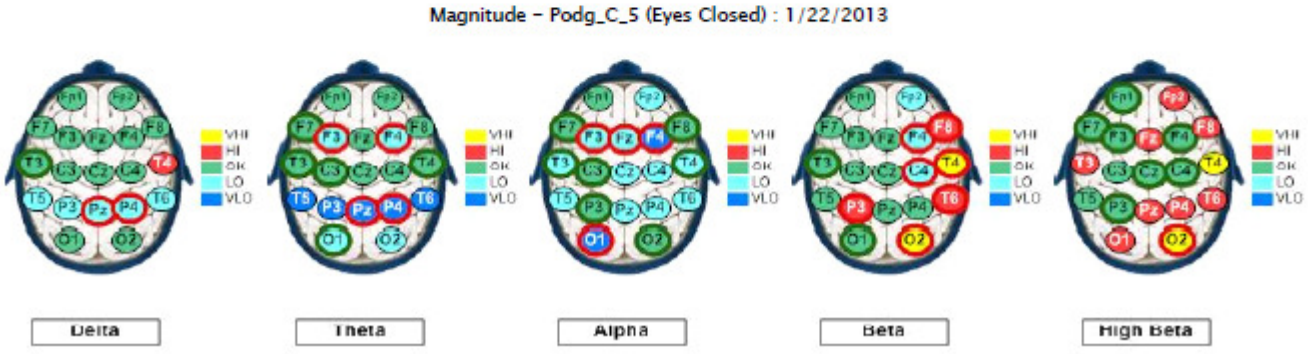


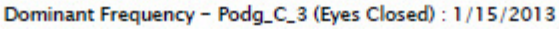
After 30 minutes of wearing Shuzi's Nano Vibrational Technology a 14% improvement in emotional functioning can be seen in this particular subject with their eyes closed.

From file: CP_Q_13_0122_13_0115_ec contains CP's test results (eyes closed) after wearing Shuzi's NVT for 7 days. **(Appendix 2)**

36% Overall Change





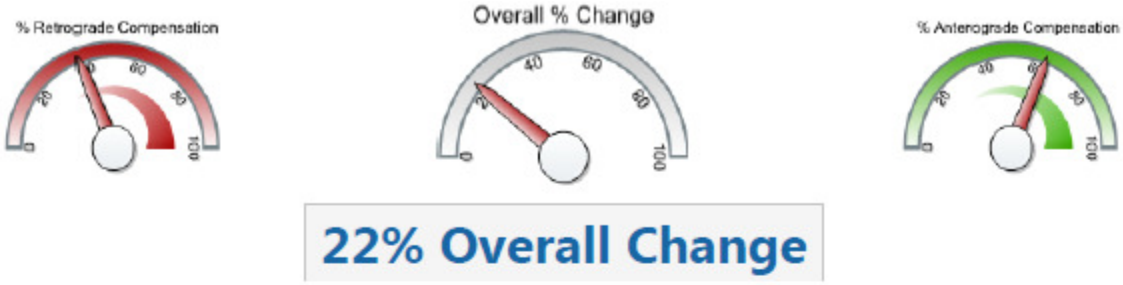


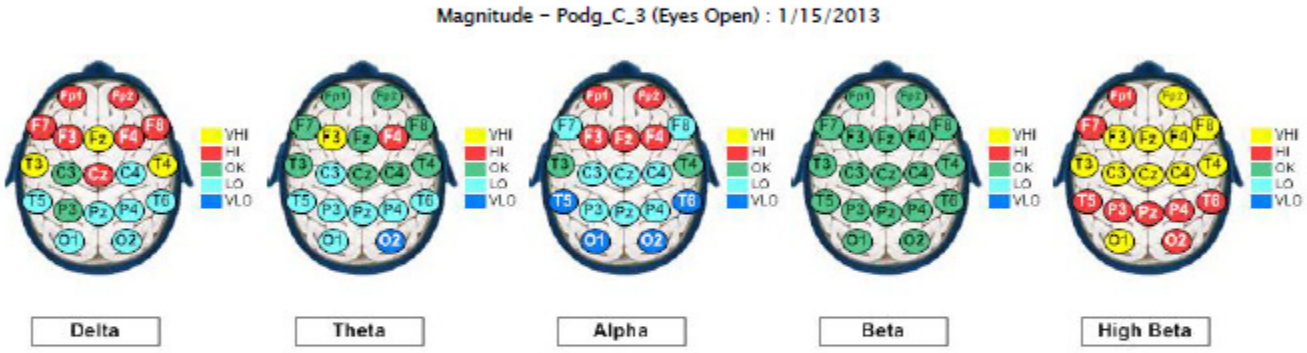
Report Conclusion: After 7 days of wearing Shuzi NVT, CP's emotional efficiency improved by 36%.

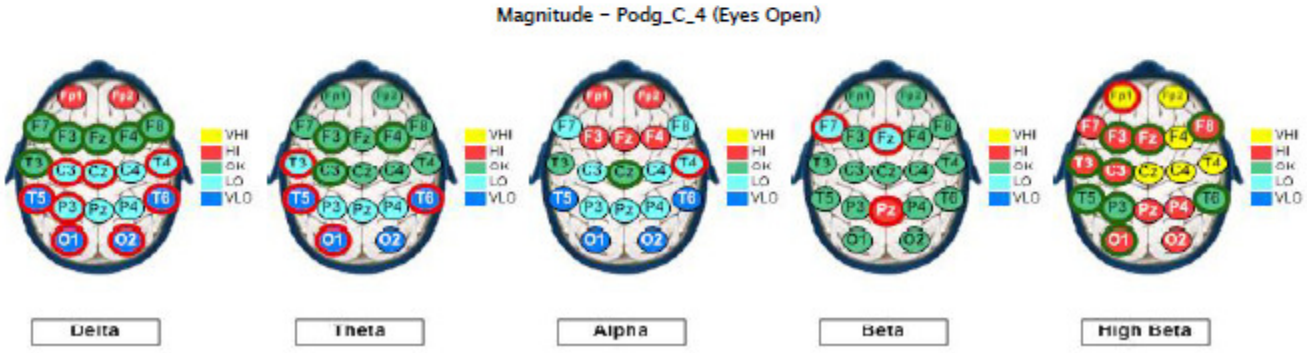
The following shows improvement in cognitive efficiency with eyes open:

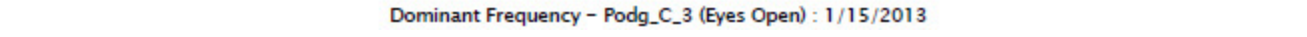
Eyes Opened condition (EO) measures overall ***cognitive efficiency or normalization*** that takes into account executive functions, memory processing, verbal and visual processing, and math and reading comprehension.

From file: CP_Q_13_0115_13_0115_eo **(Appendix 3)**



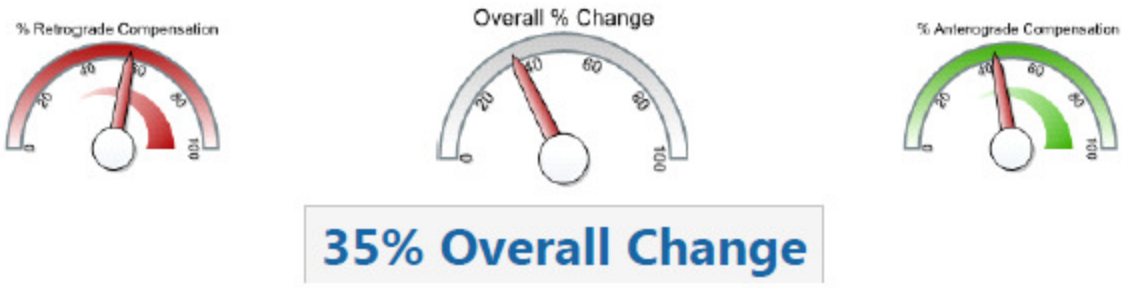


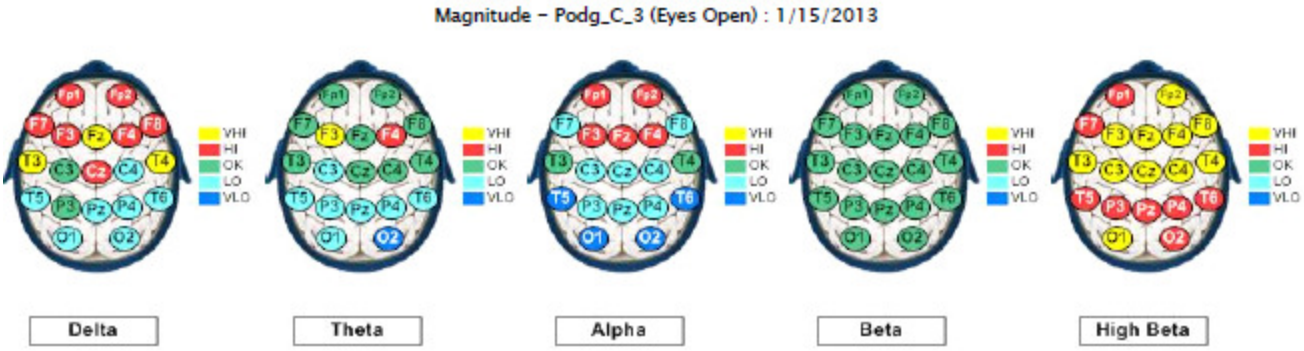


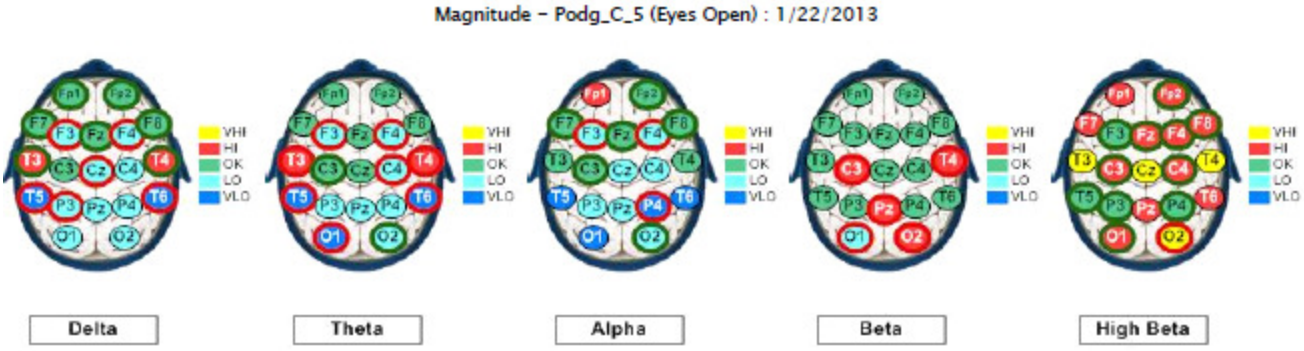


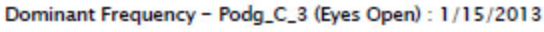
After 30 minutes wearing Shuzi NVT, CP's cognitive efficiency improved by 22%.

From file: CP_Q_13_0122_13_0115_eo **(Appendix 4)** which is the test results (eyes open) after wearing Shuzi's NVT for 7 days.









After 7 days wearing Shuzi NVT, CP's cognitive efficiency improved by 35%.

Results:

The testing showed a **significant overall movement toward healthy brain activity after wearing the Shuzi NVT for 30 minutes and an even greater improvement toward more healthy brain activity after wearing Shuzi NVT for 7 or more days.**

The following table provides the comparison data results for each of the subjects.

qEEG Results Summary (% Increase in Efficiency)

Subject	Age	Time Wearing Shuzi	% of Increased Efficiency Wearing Shuzi NVT after 30 minutes		Time Wearing Shuzi NVT	% of Increased Efficiency Wearing Shuzi NVT for 7 or more days	
		in Minutes	Eyes Closed	Eyes Open	# Days	Eyes Closed	Eyes Open
Not receiving Neurofeedback Treatment (Group 2)							
LR	40	30	23%	19%	7	25%	38%
CP	43	30	14%	22%	7	36%	35%
TP	12	30	16%	17%	7	18%	22%
BP	8	30	28%	25%	7	17%	33%
TR	67	30	16%	32%	7	15%	28%
LK	44	30	12%	25%	28	21%	24%
Average	**35.7**	**30**	**18.2%**	**23.3%**	**10.5**	**22**	**30%**
Receiving Neurofeedback Treatment (Group 1)							
MD	16	30	16%	20%	7	18%	28%
LN	26	30	14%	26%	16	14%	20%
CW	36	30	16%	18%	7	17%	18%
DR	53	30	19%	26%	14	29%	31%
JM	56	30	14%	16%	16	20%	20%
Average	**37.4**	**30**	**15.8%**	**21.2%**	**12**	**19.6%**	**23.4%**
Total Averages (both groups)							
	36.5	**30**	**17%**	**22.3%**	**11.3**	**20.8%**	**26.7%**

Note: Each testing evaluation (wearing Shuzi NVT after 30 minutes & 7+ days) was compared against the original baseline (without Shuzi's NVT). The percentages increases shown above are representative of the increase compared to the original baseline.

Analysis of Results:

Eleven (11) subjects have been assessed and all 11 subjects showed increase in healthy brainwave patterns for cognitive and emotional functioning (efficiency/normalization) after wearing a Shuzi bracelet for 30 minutes and when retested after 7 or more days.

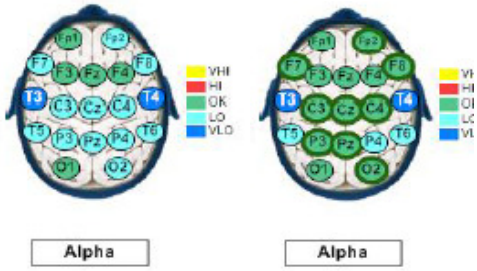
Through the testing performed, a general trend of improved cognitive and improved emotional efficiency was observed.

The impact of improving the cognitive state is that subjects typically felt better focus and attention, clearer thoughts, more motivated, more ease with problem solving and decision making, improved memory and ease in learning new information, clearer and more precise vision and, generally, less stress as cognitive functioning is correlated to attention, executive functions, memory processing, verbal and visual processing, and math and reading comprehension.

The results of improved emotional efficiency are typically correlated with more stable mood regulation, a general sense of inner calmness, less agitation and irritability, better impulse control, improved anger control, more easily adaptable to change, and a general overall balance which may help to overcome the results of depressive or anxious symptoms.

Below is an example of side by side comparison and explanation of the before and after results of wearing Shuzi's NVT:

Before **After**



Magnitude of Alpha Brain Waves

Occipital Lobes Region of the Brain

The results above show that the region of the brain labeled O2 improved which is related to the visual cortex.

The visual cortex is comprised of the Occipital lobes which is responsible for:

- visual processing

- visual memories
- input for reading
- mood regulation

Additionally, the Occipital lobes play a key role in helping to locate objects in the environment, see colors and recognizes drawings and correctly identify objects, reading, writing, and spelling depend upon an accurate visual field, and some connections extend to the amygdale which correlates with anxiety and depression.

Further, traumatic memories are often accompanied by visual flashbacks and are typically processed in the Occipital lobes. This seems to correlate with reports of improved and more crisp/clear vision.

Frontal Lobes

From the diagram above, there is a noticeable difference noted in the frontal lobes (Fp2, F7, and F8) which are responsible for:

- Immediate and sustained attention
- Social skills
- Emotions empathy
- Time management
- Working memory
- Moral fiber or character
- Executive planning
- Initiative.

All subjects in this study showed improvements in the frontal lobe areas which are related to attention, memory, social awareness, character, motivation, and planning.

Sensorimotor Cortex C3, Cz and C4

In the above example we noted improvements in the regions of, C3, Cz, and C4 and this subject reported improved sleep, less frequent and intense headaches, and an improved sense of well-being and inner calmness. This is consistent with key functions of this area which acts as the hub and switching station between voluntary muscles of the body and the brain and helps to encode and orchestrate both physical and mental processes.

- Body position and awareness
- Body movement
- Coordination of sensory input with motor output
- Processing of basic body signaling
- Gross and fine motor movements
- Spatial discrimination.

This may explain why many subjects reported improved sleep and sports performance and decreased pain.

Subjective Reported Results:

During and after the testing period, the subjects reported various improvements in their daily lives. Below is a record of what was reported. Please note these claims were not substantiated and are merely listed to provide further insight when designing future testing protocols.

Group 1 (With NFB)						
Subject	**Gender**	**Age**	**Pre-existing conditions**	**Medications/ Supplements**	**Results** **30"**	**7+ days**
BP	Female	8	Anxiety, mild Separation issues	None/ Probiotic vitamin	**Emotional:** 28% 17% **Cognitive:** 25% 33% **Reported Improvements in:** Sleep Sports performance, Confidence socially w/ bully Assertiveness Anxiety Focus & attention	
TP	Female	12	Anxiety, moderate Adjustment D/o Abdominal migraines OCD tendencies	None/ Probiotic	**Emotional:** 16% 18% **Cognitive:** 17% 22% **Reported Improvements in:** Sports performance-volleyball Coping w/ stress caused by her teacher "being mean" to kids Fewer & less intense headaches Fewer pre-puberty mood swings Focus & attention	
LR	Female	40	Restless leg Indigestion Post Concussive Symptoms from a fall about 1 yr. ago	None/ None	**Emotional:** 23% 25% **Cognitive:** 19% 38% **Reported Improvements in:** Motivation Initiating & completing tasks at home Energy level Started an herb garden Restless legs at night Indigestion gone Inner calmness Better focus Less anxiety while driving Sleep	
CP	Female	43	Tension & Migraine HAs Compound Fractured skull- Left frontal -40 yrs.ago-	None/ Vit.D/Xylitol	**Emotional:** 14% 36% **Cognitive:** 22% 35% **Reported Improvements in:**	

			MVA mTBI-15 yrs ago-MVA Neck/back pain & PT HAs – 22 yrs. Ago-MVA		Focus & clear thoughts Being more productive Less anxious More calm overall w/sense of well-being Vision being crisper Fewer & less intense headaches Not having to wear new prescription glasses Sleep
LK	Female	44	Anxiety Depression Tension & Migraine HAs Panic Attacks TMJ Allergies Trouble sleeping	Lorazapam PRN/ None	**Emotional:** 12% 21% **Cognitive:** 25% 24% **Reported Improvements in:** Joint pain Focus & attention Fewer & less intense headaches Internal calmness Anxiety symptoms More energy Motivation Initiation & completion of tasks Better sleep quality & earlier onset w/o taking Lorazapam since wearing bracelet
TR	Male	67	Healthy	None/ None	**Emotional:** 16% 15% **Cognitive:** 32% 28% **Reported Improvements in:** Attention/concentration Inner peace & calmness More energy Sleep

Group 2 (Without NFB)					
Subject	**Gender**	**Age**	**Pre-existing conditions**	**Medications/ Supplements**	**Results**
MD	Male	52	TBI-MVA-6 yrs. Anxiety Depression Memory problems Tinnitus HBP Trouble sleeping	Lexapro Lotrel Ambien Sulindac Percocet/ None	**Emotional:** 16% 18% **Cognitive:** 20% 28% **Reported Improvements in:** Anger control Assertiveness Setting boundaries More confident socially

					No pain where multiple breaks in Leg Motivation Attention & better focus Sleep
LN	Female	26	TBI-MVA- 15 yrs. ago Anxiety Depression ADD Panic Attack Migraine Sleep D/o	Methyphenaldate	**Emotional:** 14% 14% **Cognitive:** 26% 20% **Reported Improvements in:** Better focus & attention More energy Sleep Noticeably less muscle tension in neck & shoulders that massage therapist has not been able to work out
CW	Female	36	TBI-MVA-16.5 yrs. ago Anxiety Thyroid Migraines Seizure D/o Memory D/o	Keppra Levothyroxine Venlafaxine HCL ER Zyrtec Meclizine prn Maxalt Mlt prn Zonisamide Rozerem prn Nortriptyline HCL Tylenol Magnesium Multivitamin Calcium/VitD Vit B12	**Emotional:** 16% 17% **Cognitive:** 18% 18% **Reported Improvements in:** Migraines less intense & easier to get rid of Motivation Initiating tasks w/o arguing Sleep Better focus & attention Anxiety symptoms
DR	Female	53	Depression Migraine Tinnitus Insomnia Allergies Thyroid	Effexor SR Claritin Topamax Synthroid, Maxalt Flexeril Celebrex Adderal Tramadot Acetaminophen Allergy Shots VitD3 Biotin Cinnamon MVI MSM	**Emotional:** 19% 29% **Cognitive:** 26% 31% **Reported Improvements in:** More energy Better focus & attention More calm & sense of well-being More relaxed Joint pain gone Restless leg gone Indigestion Sleep
JM	Male	56	TBI-Assault-3 yrs`ago PTSD	Seroquel XR Clonazepam	**Emotional:** 14% 20% **Cognitive:** 16% 20%

			Depression Panic attacks HBP Thyroid Sleep D/o	Nortriptyline Synthroid B12 Norvasc/ Mulltivitamin OTC supplements	**Reported Improvements in:** Balance Better focus & attention Quicker recovery from illness Less intense headaches Clearer speech Fewer symptoms of anxiety

Effects of Medicine on Brainwaves & Shuzi's NVT

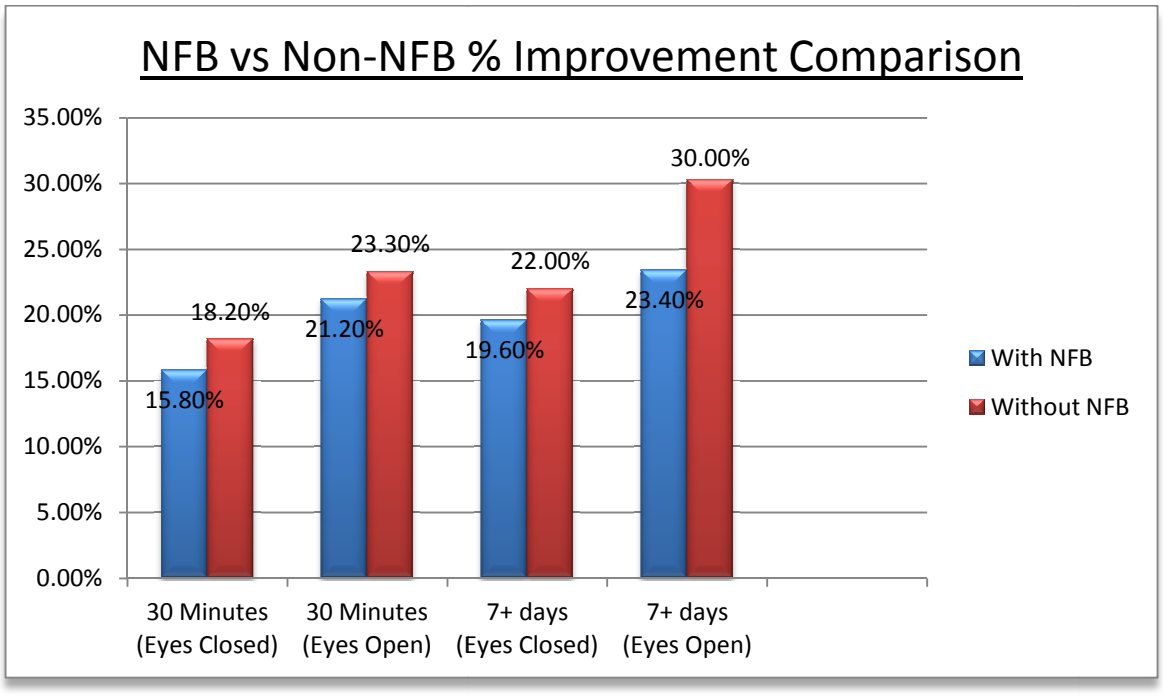
During these tests variables were minimized with the intention of isolating Shuzi's Nano Vibrational Technology as the only variable.

While it was recorded that subjects on medication had noticeable improvements, the changes documented in subjects without prescription medicine was even greater. This type of observation leads us to believe that the medication was not a contributing factor to the results.

Neurofeedback Group vs. Non-Neurofeedback Group Results

The NFB group was previously tested with qEEG prior to this study and it was noted that on average the group had a 25-40% increase in efficiency seen in the initial baseline used for this study, meaning that these subjects exhibited a better "starting point" than the non-NFB group. Regardless of the better "starting point", the NFB group still showed significant improvement but not as well as the non-NFB group.

On average, the NFB group's increase in efficiency was about 2.4% less than the average improvement in the non-NFB group.



The results of this test show that Group 1 (not being treated with NFB) had greater gains in both conditions (eyes open vs. eyes closed) and both time frames (30 minutes vs. 7+ days).

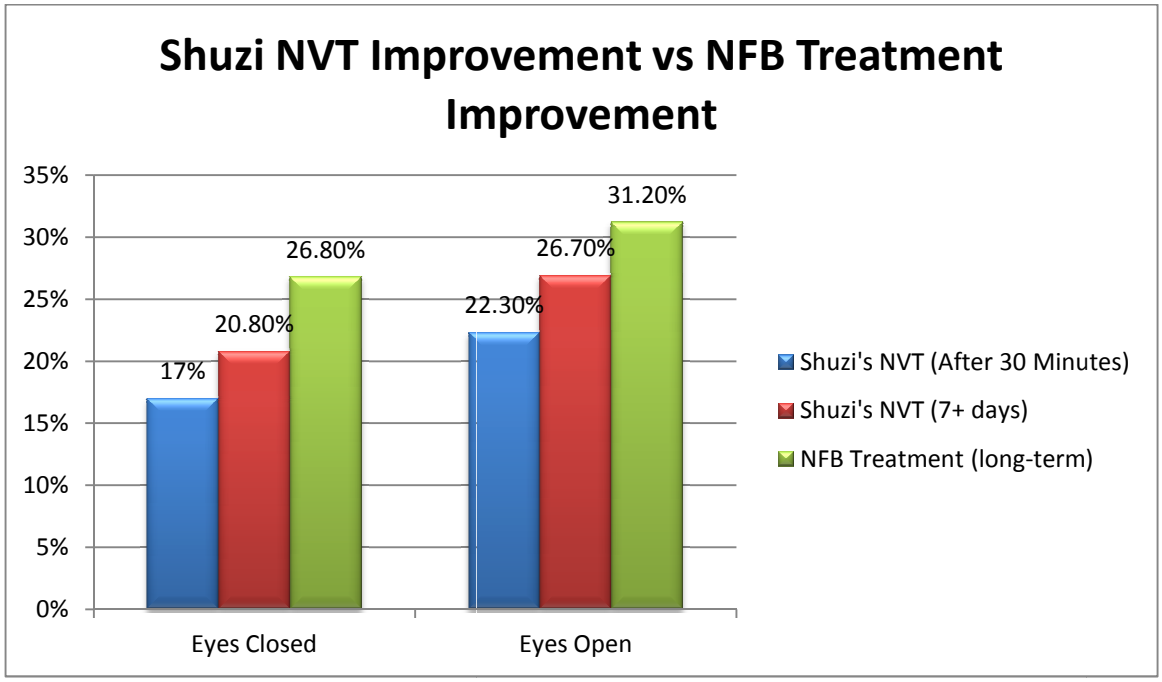
Comparison of Shuzi's NVT to NFB Training:

For those receiving NFB training, the amount of progress expected is 20-45% improvement after about 20 sessions of training.

Some of the subjects used in this study have a history of receiving NFB training and a qEEG brain map was obtained to analyze progress with NFB Training before Shuzi NVT was introduced. The following chart shows their progress after 20 or more sessions with only NFB (before Shuzi's NVT).

Subject	Eyes Closed	Eyes Open
LN	21%	31%
DR	30%	34%
CW	29%	34%
MD	24%	21%
JM	30%	36%
Average:	**26.8%**	**31.2%**

The graph below depicts the average improvement for a subject wearing Shuzi's NVT compared to a subject receiving long-term NFB training.



Without the benefit of NFB training, Shuzi's NVT results showed on average of 17.0% (eyes closed) and 22.3% (eyes open) in 30 minutes. These averages increased to 20.8% (eyes closed) and 26.9% (eyes open) after seven days or more with Shuzi's NVT.

Conclusions:

This qEEG and neuropsychophysiology clinician concluded that Shuzi Nano Vibrational Technology has a significant positive impact on the subjects' brain functions and improvement in healthy brain wave patterns.

This testing performed shows the results after thirty minutes and seven plus days wearing Shuzi's NVT. Shuzi's NVT appears to evoke a state of calm, health-promoting activity in the brain. The benefits of wearing the Shuzi NVT on a long term basis appears to have a cumulative effect.

As the efficiency of the subjects' cognitive and emotional functioning appears to continue to improve over time suggesting that the effects of Shuzi's NVT have a cumulative effect.

> "Many people suffer from stress in their everyday life. While there is a close relationship between stress and mental health, psychological stress (and associated emotions such as anger, anxiety, and depression), interferes with cognitive functioning, and can also have effects on physical health. Indeed, chronic psychological stress can change the responsiveness of central-peripheral regulatory systems" (Fuchs & Fluegee 1995; Fuchs, Uno, & Fluegge 1995)

Shuzi's NVT contributes to your brain's ability to maintain an efficient, healthy style of function as you go through your day. While, people are able learn methods to better manage psychological and physiological stress (ex. breathing exercises, meditation, etc.) and enhance performance, however this requires dedication and time to practice for automaticity on these strategies. In comparison, usage of Shuzi's Nano Vibrational Technology only requires the person to wear jewelry embedded with the technology enabling the passive process to achieve the benefits of improved balance, cognitive functioning and emotional functioning. While results vary from person to person, this clinician's testing found Shuzi's NVT to be effective and beneficial in helping to manage and regulate responses to stress, but should not be solely relied upon as the only means of managing stress.

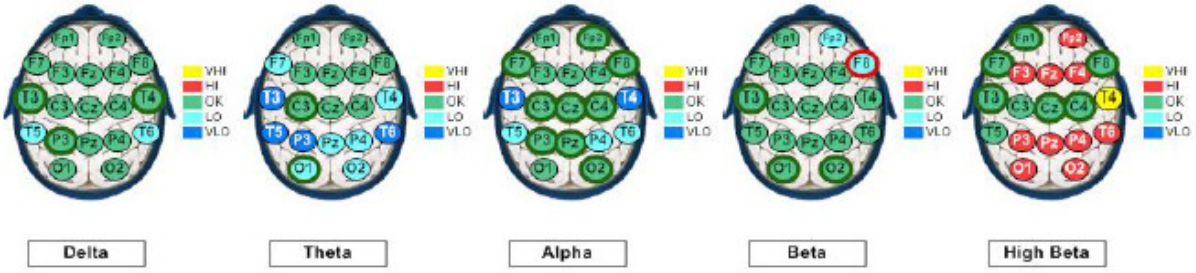
The immediate and accrual benefits of wearing the Shuzi NVT found were significant. As such, the results of this study highly suggest that NVT could promote quicker results and better outcomes when being used in conjunction with trainings and/or treatments.

Appendix 1

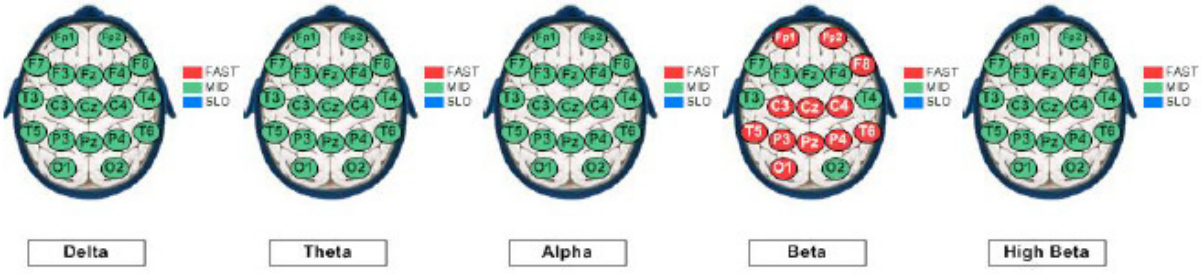
14% Overall Change

Magnitude – Podg_C_3 (Eyes Closed) : 1/15/2013

Magnitude – Podg_C_4 (Eyes Closed)

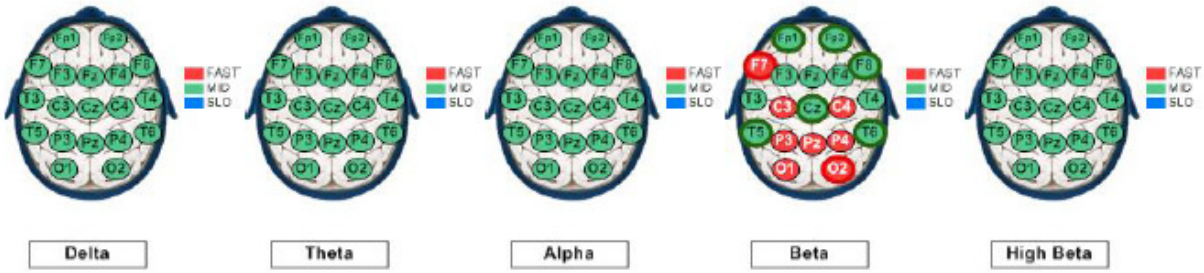


Dominant Frequency – Podg_C_3 (Eyes Closed) : 1/15/2013

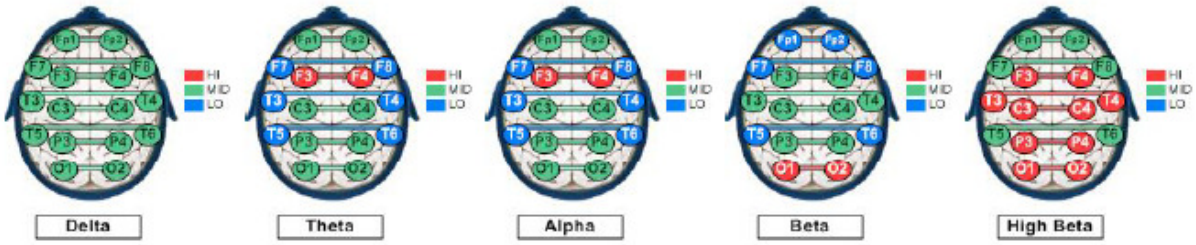


Dominant Frequency – Podg_C_4 (Eyes Closed)

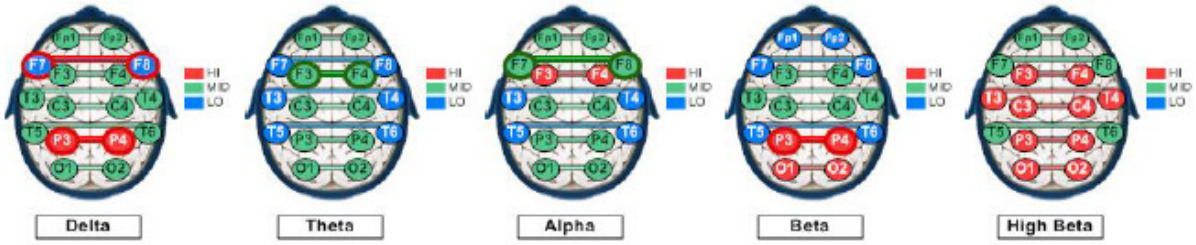
Page 1 of 3



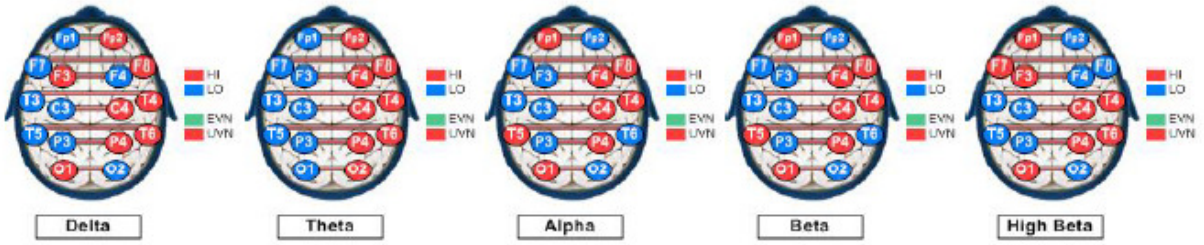
Inter-Connectivity - Podg_C_3 (Eyes Closed) : 1/15/2013



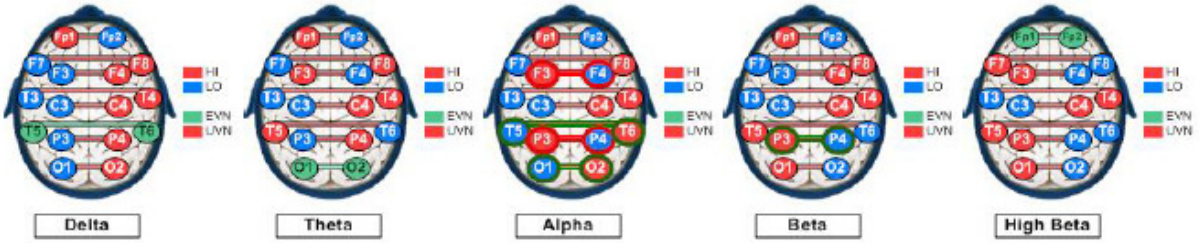
Inter-Connectivity - Podg_C_4 (Eyes Closed)



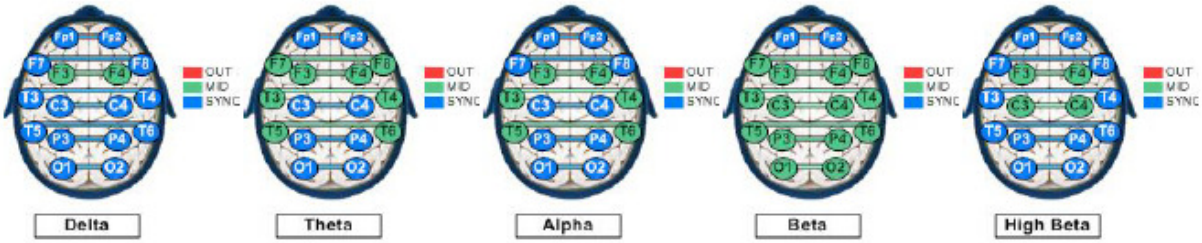
Asymmetry - Podg_C_3 (Eyes Closed) : 1/15/2013



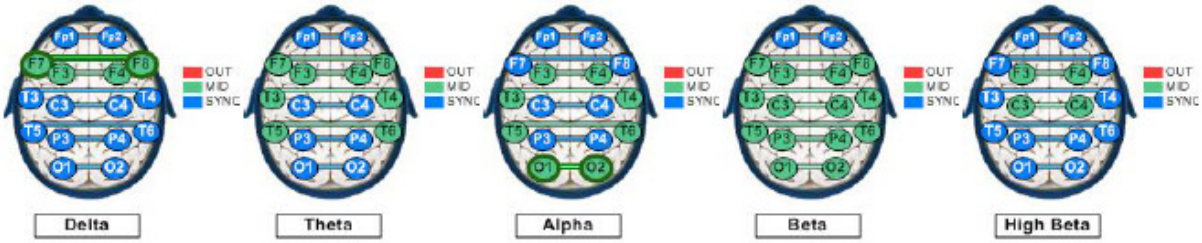
Asymmetry – Podg_C_4 (Eyes Closed)



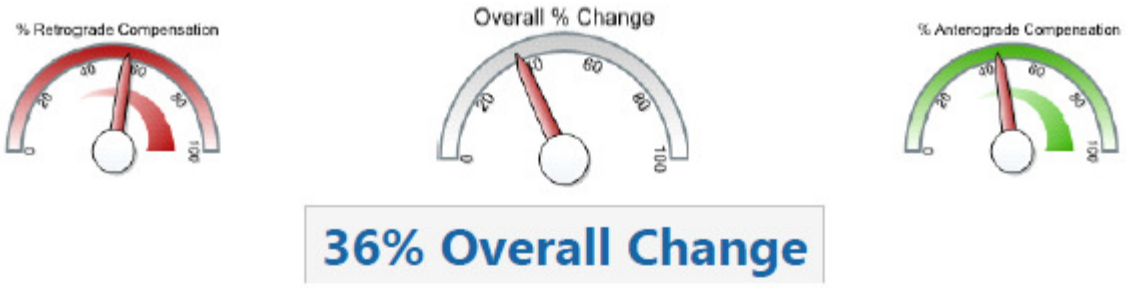
Phase – Podg_C_3 (Eyes Closed) : 1/15/2013



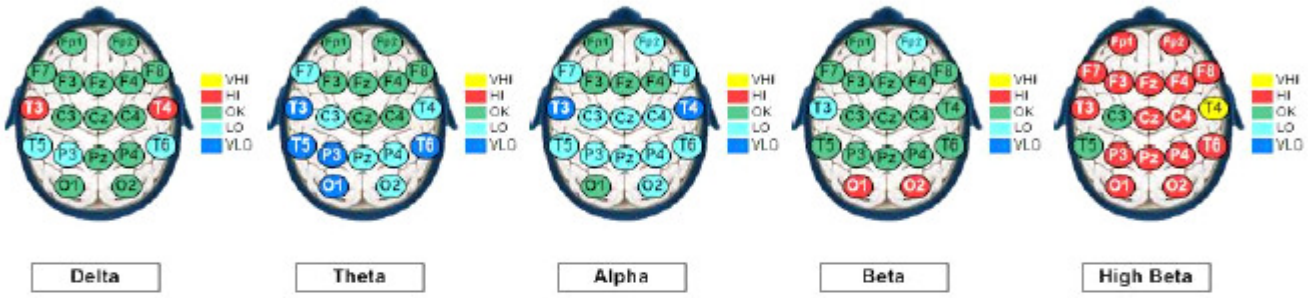
Phase – Podg_C_4 (Eyes Closed)



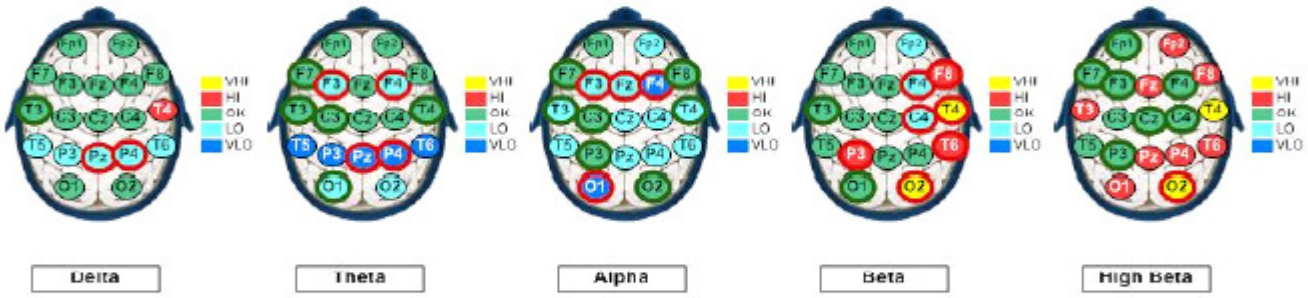
Appendix 2



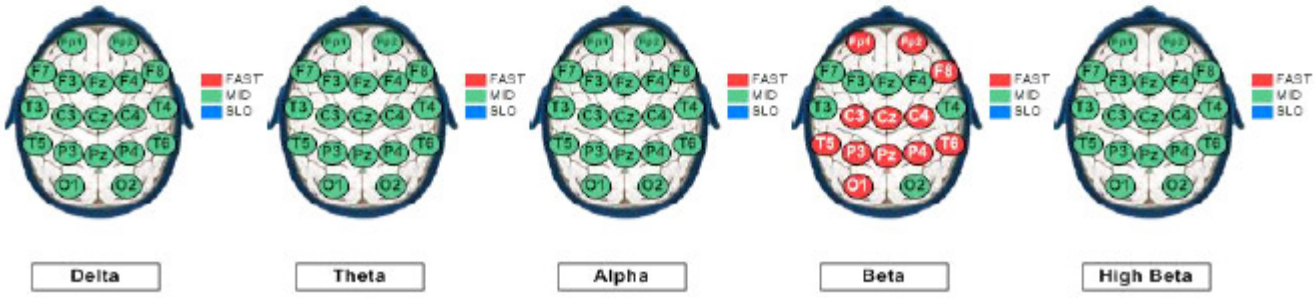
Magnitude – Podg_C_3 (Eyes Closed) : 1/15/2013



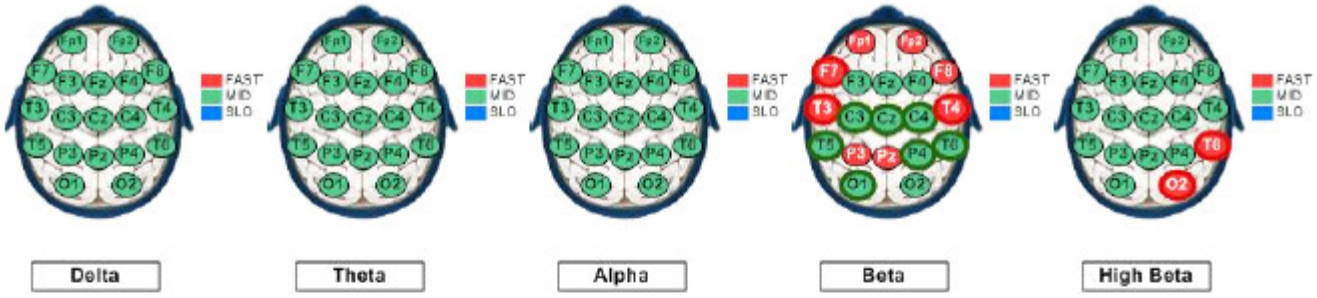
Magnitude – Podg_C_5 (Eyes Closed) : 1/22/2013



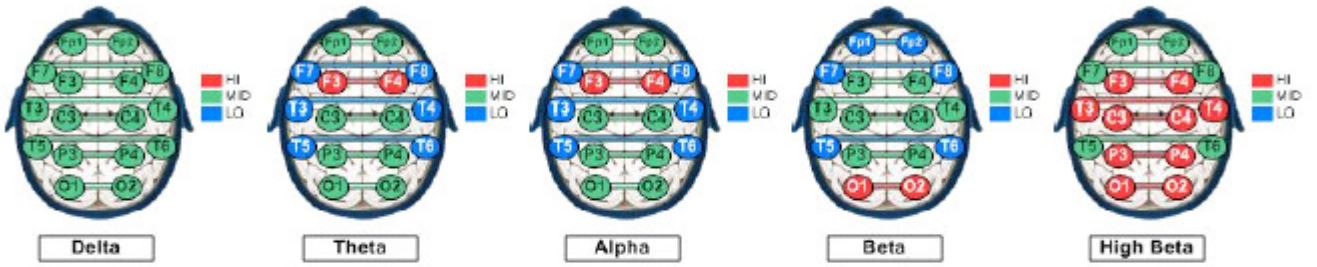
Dominant Frequency – Podg_C_3 (Eyes Closed) : 1/15/2013



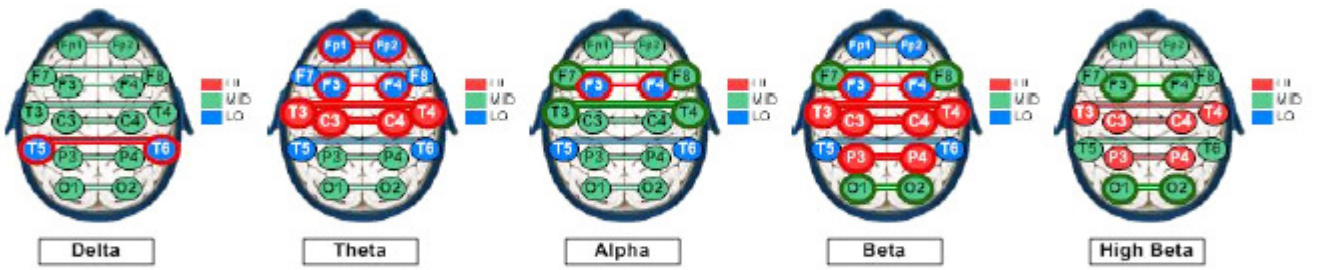
Dominant Frequency – Podg_C_5 (Eyes Closed) : 1/22/2013



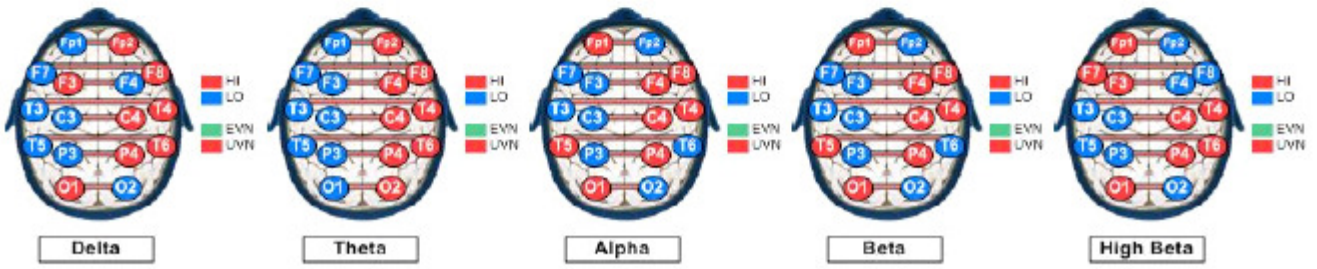
Inter-Connectivity - Podg_C_3 (Eyes Closed) : 1/15/2013



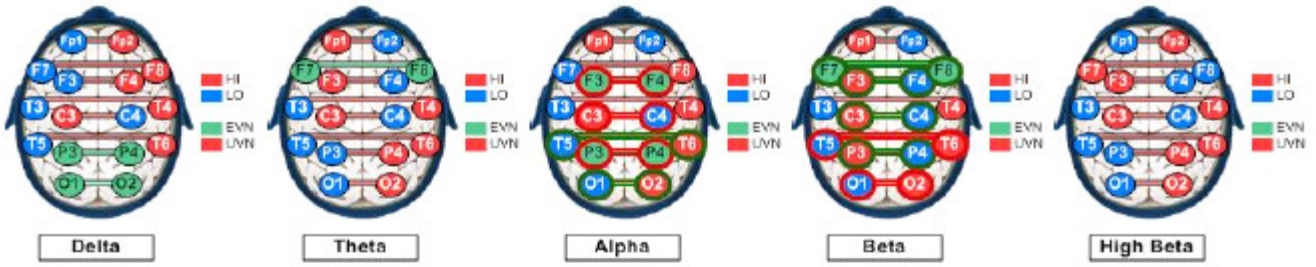
Inter-Connectivity - Podg_C_5 (Eyes Closed) : 1/22/2013



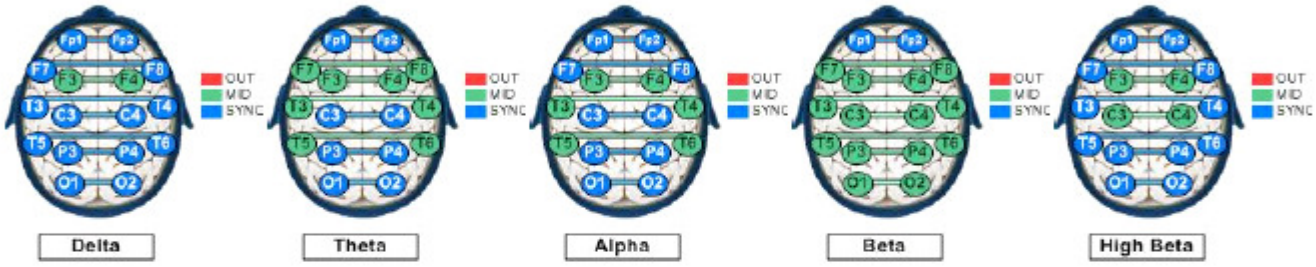
Asymmetry - Podg_C_3 (Eyes Closed) : 1/15/2013



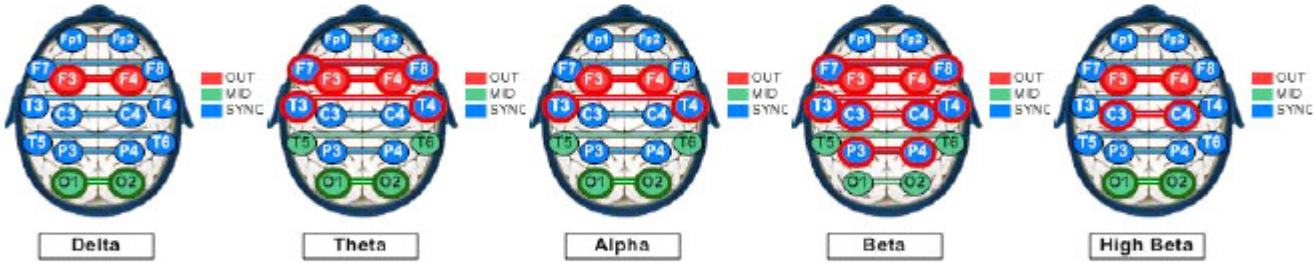
Asymmetry – Podg_C_5 (Eyes Closed) : 1/22/2013



Phase – Podg_C_3 (Eyes Closed) : 1/15/2013



Phase – Podg_C_5 (Eyes Closed) : 1/22/2013



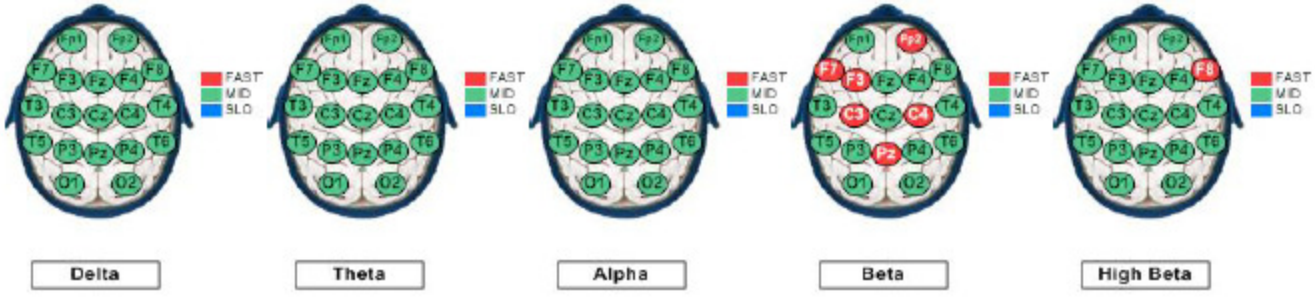
Appendix 3

22% Overall Change

Magnitude – Podg_C_3 (Eyes Open) : 1/15/2013

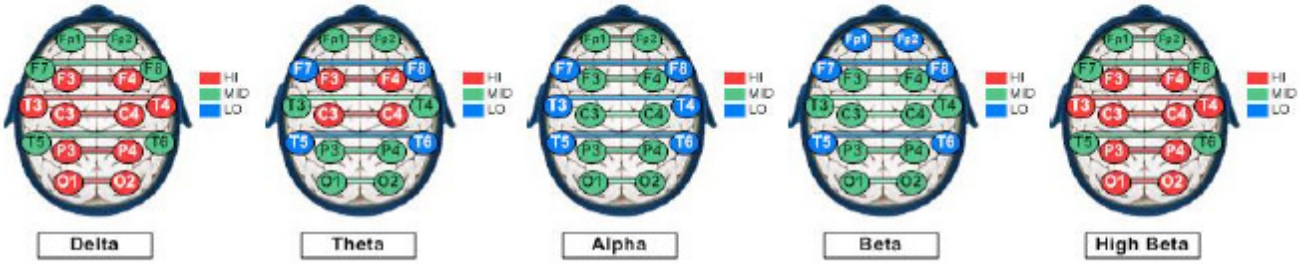
Magnitude – Podg_C_4 (Eyes Open)

Dominant Frequency – Podg_C_3 (Eyes Open) : 1/15/2013

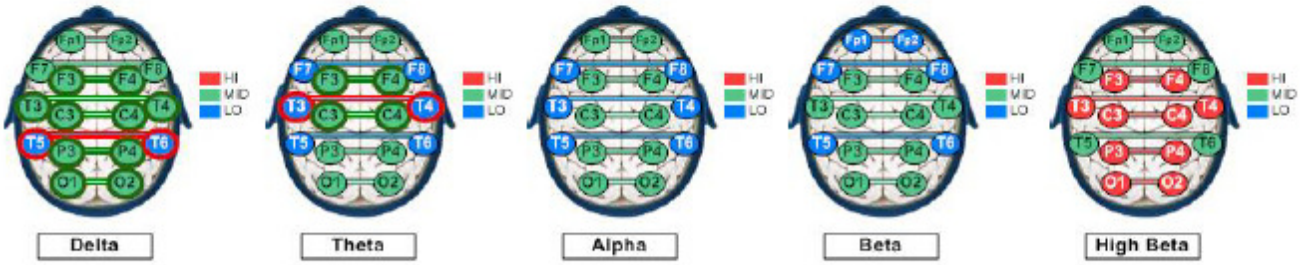


Dominant Frequency – Podg_C_4 (Eyes Open)

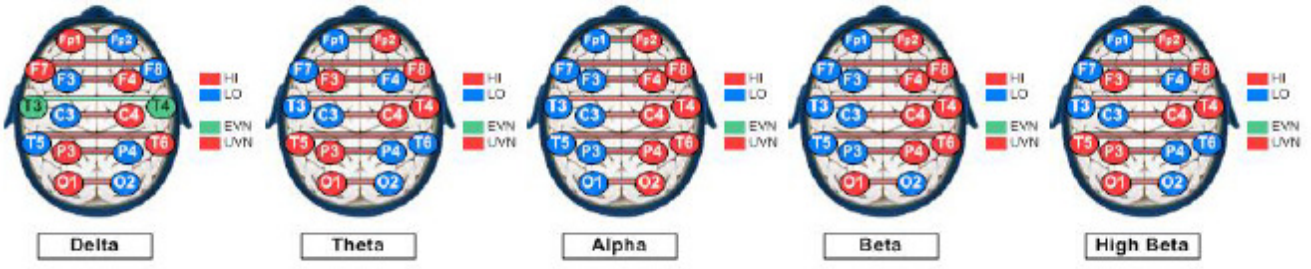
Inter-Connectivity - Podg_C_3 (Eyes Open) : 1/15/2013



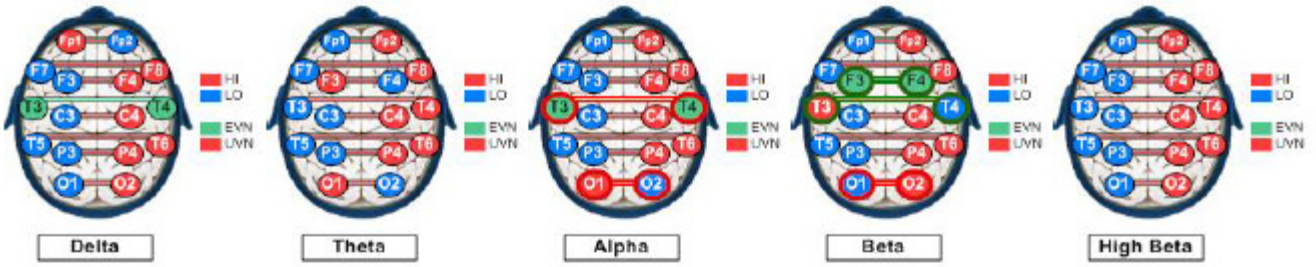
Inter-Connectivity - Podg_C_4 (Eyes Open)



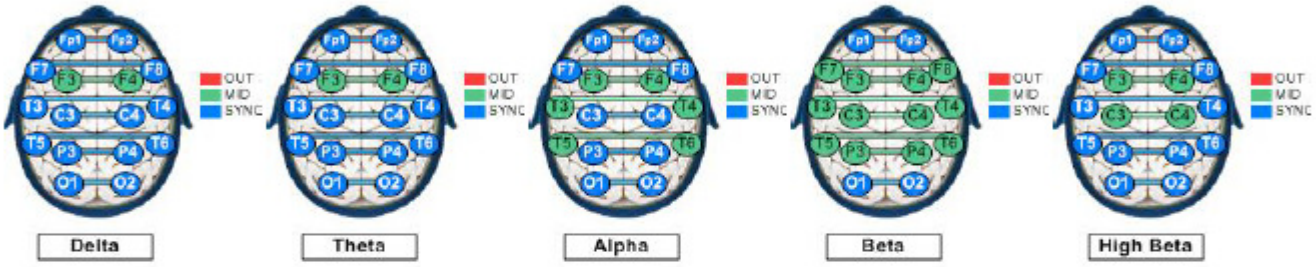
Asymmetry - Podg_C_3 (Eyes Open) : 1/15/2013



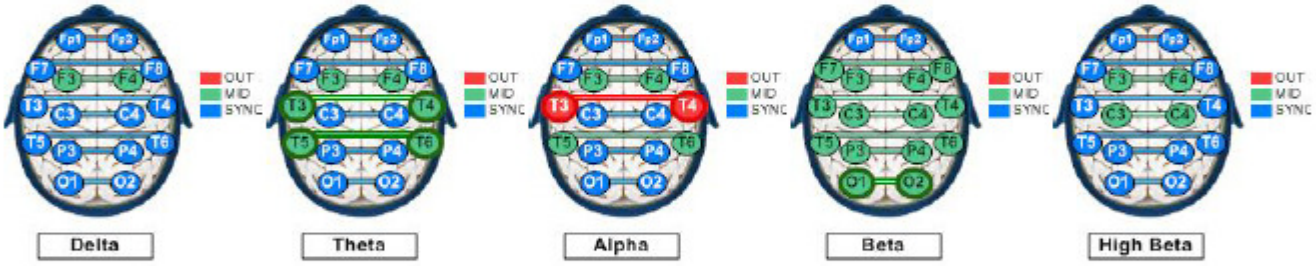
Asymmetry – Podg_C_4 (Eyes Open)



Phase – Podg_C_3 (Eyes Open) : 1/15/2013

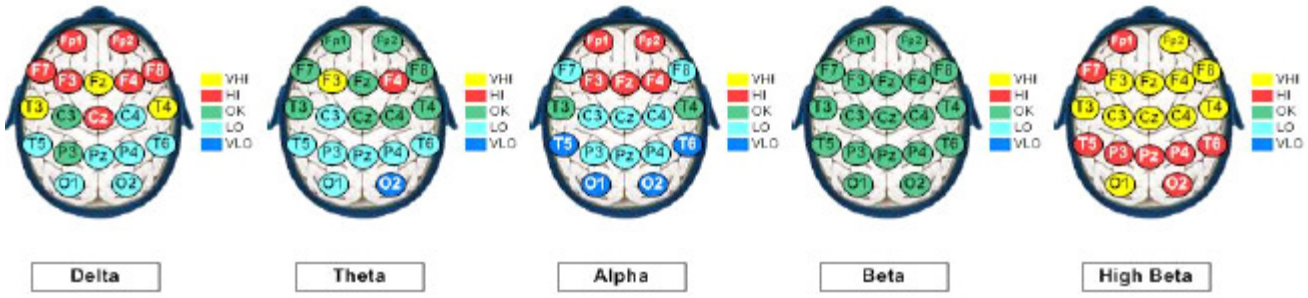


Phase – Podg_C_4 (Eyes Open)

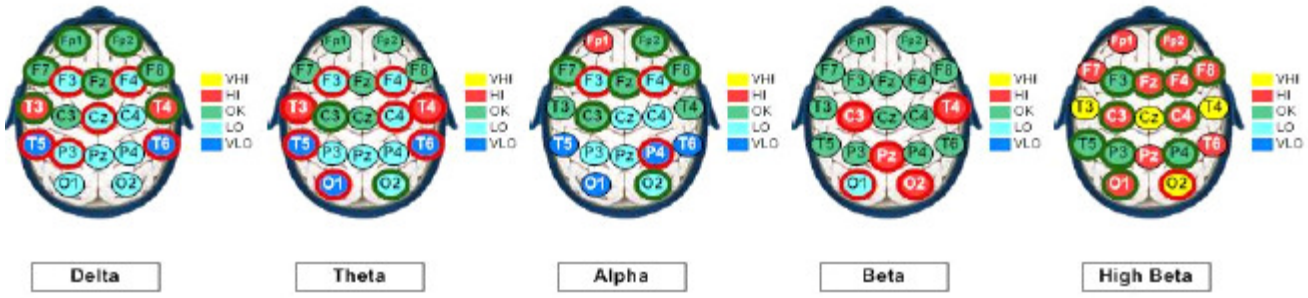


Appendix 4

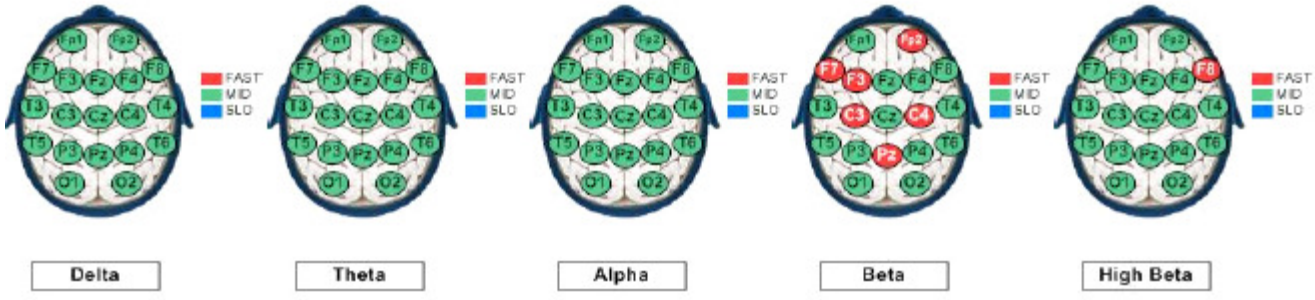
Magnitude – Podg_C_3 (Eyes Open) : 1/15/2013



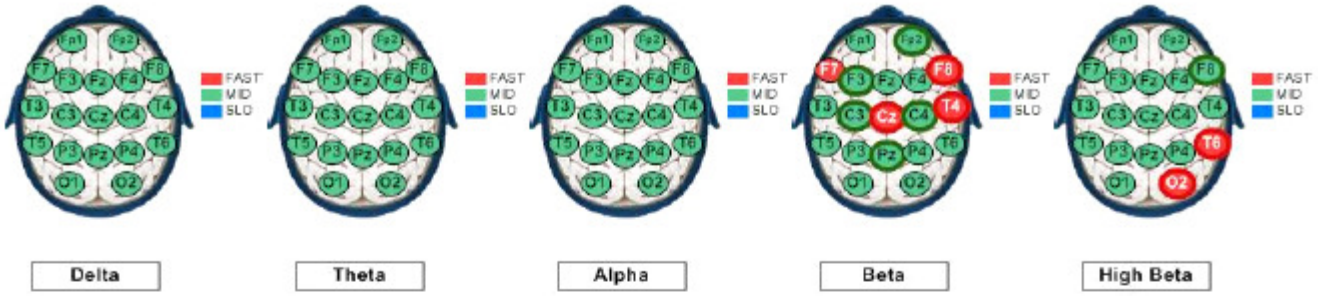
Magnitude – Podg_C_5 (Eyes Open) : 1/22/2013



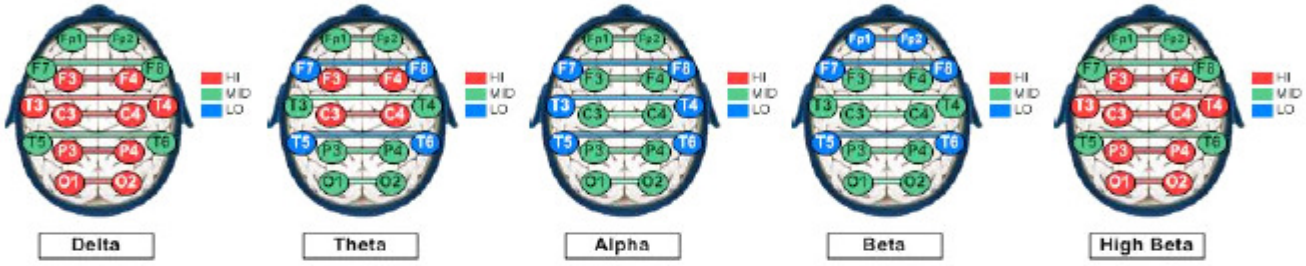
Dominant Frequency – Podg_C_3 (Eyes Open) : 1/15/2013



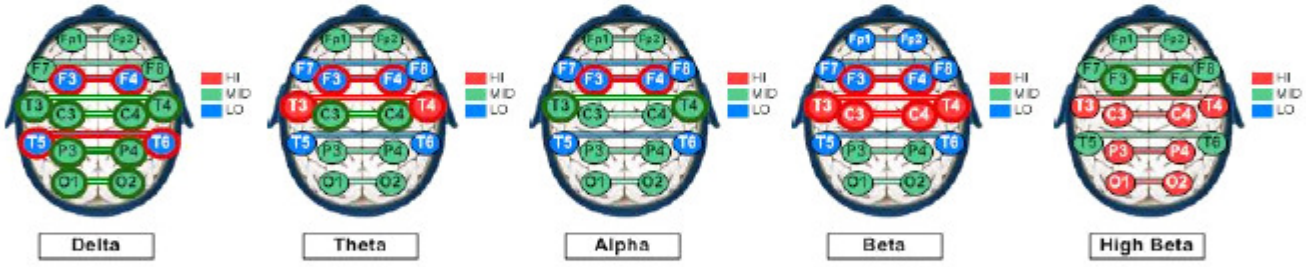
Dominant Frequency – Podg_C_5 (Eyes Open) : 1/22/2013



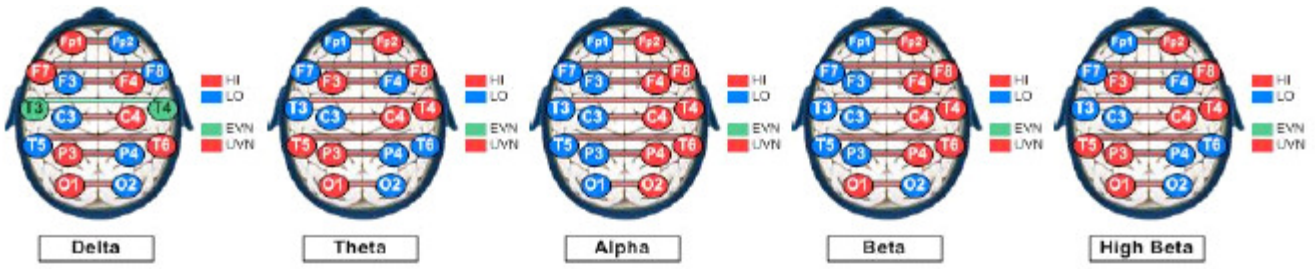
Inter-Connectivity – Podg_C_3 (Eyes Open) : 1/15/2013



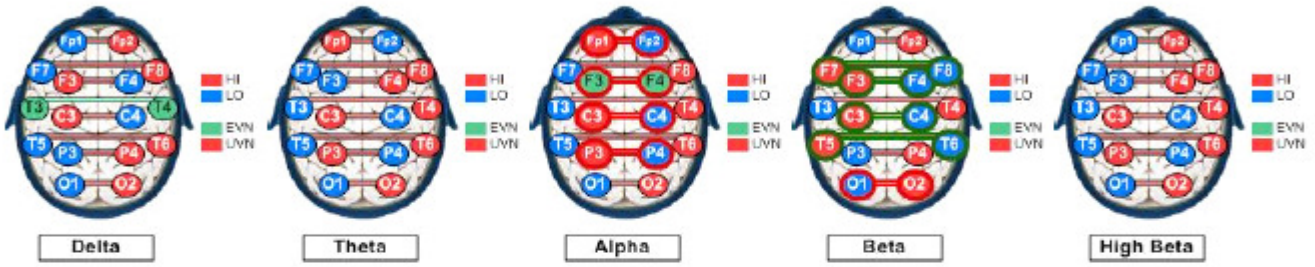
Inter-Connectivity – Podg_C_5 (Eyes Open) : 1/22/2013



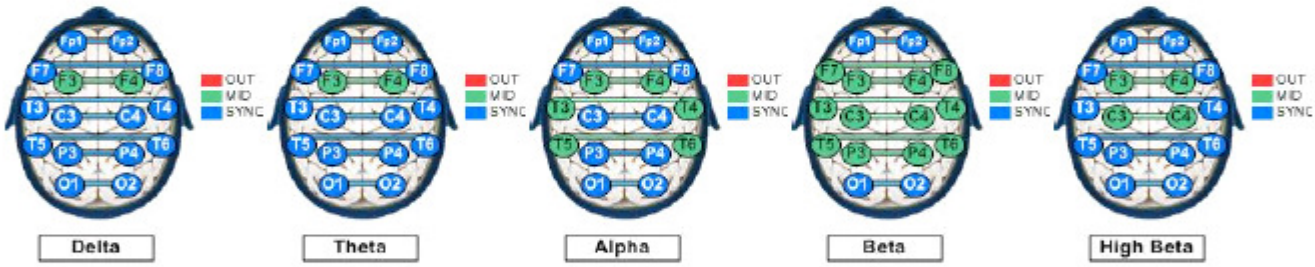
Asymmetry – Podg_C_3 (Eyes Open) : 1/15/2013



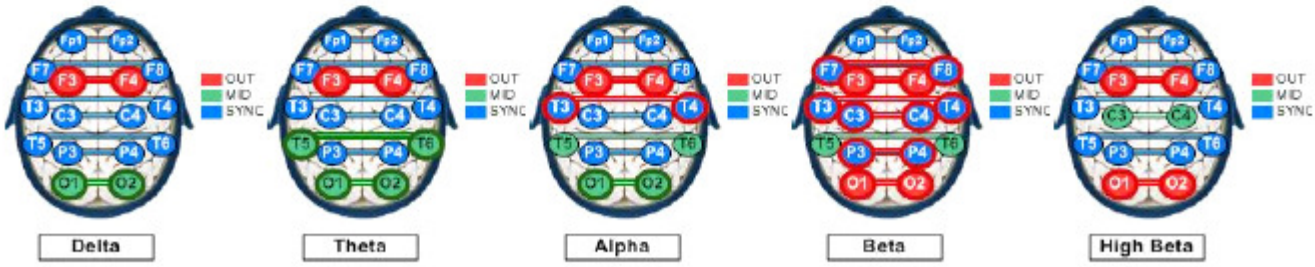
Asymmetry – Podg_C_5 (Eyes Open) : 1/22/2013



Phase – Podg_C_3 (Eyes Open) : 1/15/2013



Phase – Podg_C_5 (Eyes Open) : 1/22/2013



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