



Extended Report

Quantitative Electroencephalogram (EEG), Event Related Potential (ERP), Biofeedback /Physiological and/or Cognitive/Psychological Measures

Analysis, Summary, and Recommendations

For



<Insert Date>

This is an extensive report which summarizes the multiple assessment data collected from you and makes recommendations for potential treatment at Stable Roots Therapy, as well as practices that you can do at home.

We offer innovative neuroscience-informed, connection-focused counselling and therapy services for children, youth, and adults. Our unique services include options such as farm-based & nature-based therapy, play therapy, in-office psychotherapy, equine facilitated wellness, and neurotherapy. The ultimate goal is to enhance client wellbeing.

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1. CLIENT BACKGROUND INFORMATION

Name: _____

DOB: _____

Age: _____

Sex: _____

Handedness: _____

Medications/supplements which may affect the EEG and physiological findings:

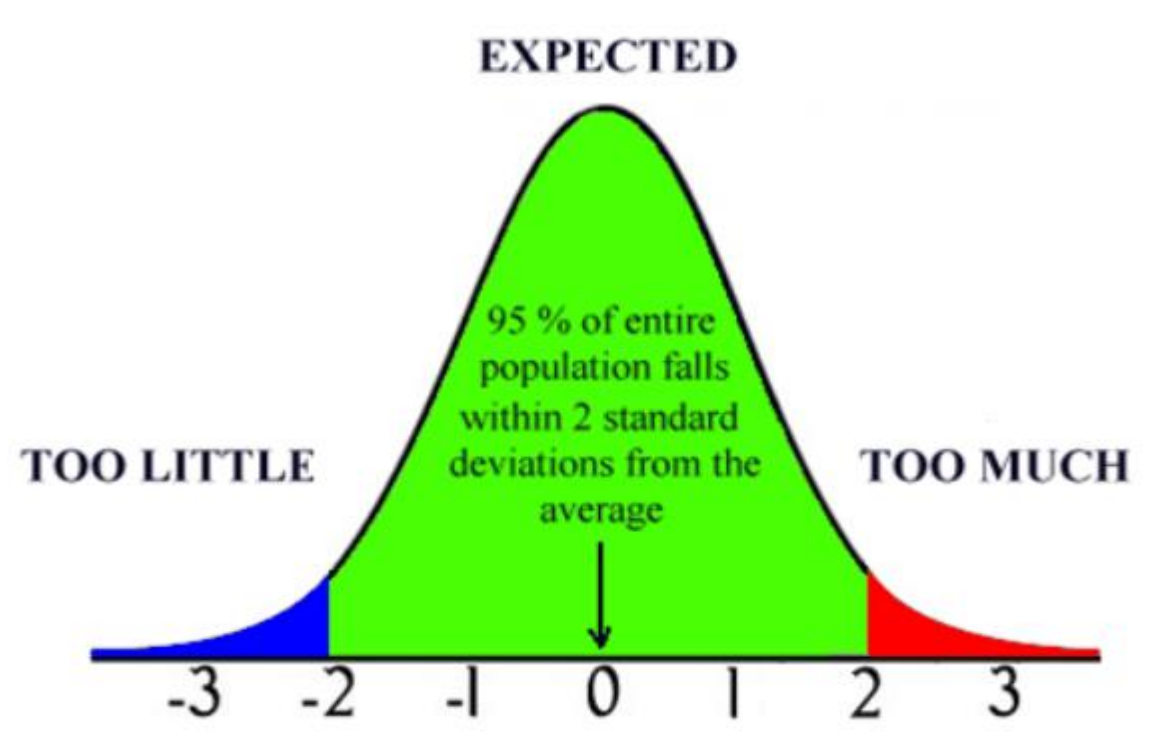
2. PRESENTING SYMPTOMS AND MAJOR CONCERNS

<insert summary here>

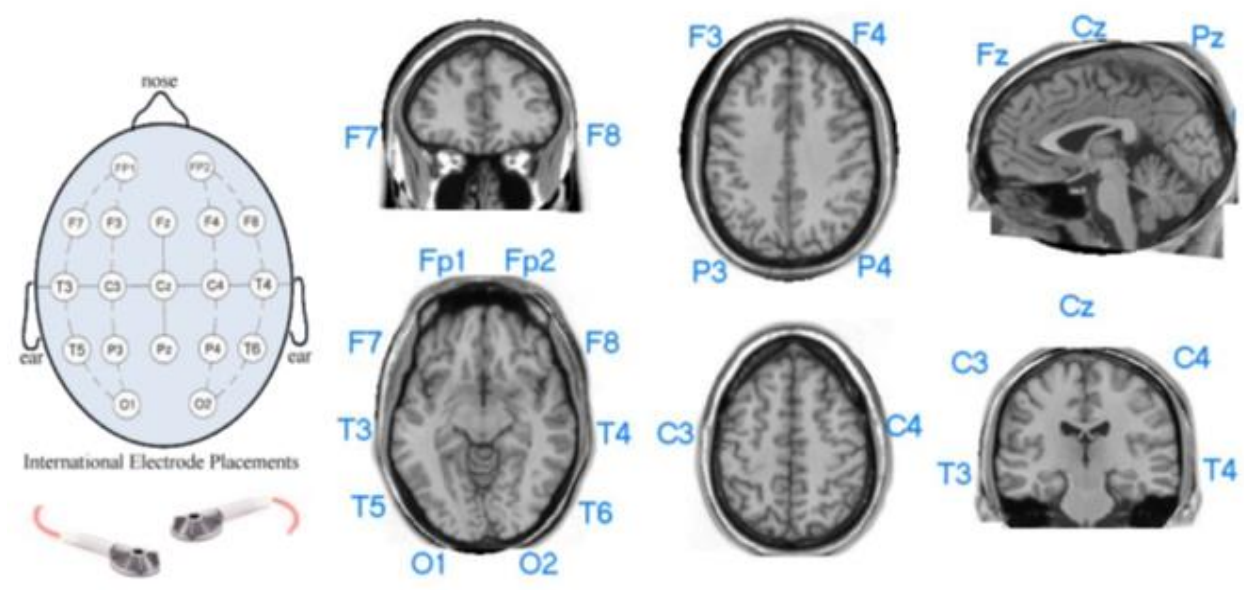
3. QUANTIFICATION OF THE EEG AND BIOFEEDBACK MEASURES, AND COGNITIVE/PSYCHOLOGICAL ASSESSMENTS

Electroencephalogram (EEG)

A quantitative EEG (QEEG) 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 (SDs) from or within the “normal” distribution (comparable age-based and demographic sample) their brain data occurs. In the brain map, green is considered “normal” while excesses are red and deficiencies are blue (both more than 2 SDs from the norm).



The international 10-20 system for electrode placement is used and electrode impedance of less than five kilo ohms is used. Activity at the functional regions of the brain, including Brodmann areas (BAs) are incorporated into the findings with the use of Low-Resolution Brain Electromagnetic Tomography (LORETA) software.



BIOFEEDBACK MEASURES



Since the brain and body are intricately connected, it is important to also collect physiological data. The Thought Technology system is used with the BioGraph Infiniti encoder. Sensors are placed on the thumb (to measure heart rate/pulse), shoulder (to measure muscle tension), around the waist (respiration), pointer and ring finger (skin conductance - sweat), and pinky finger (skin temperature).

During one of the EEG recordings we also attach a tin sensor to just below the bottom left rib in order to measure heart rate variability, and sympathetic and parasympathetic levels.

4. RECORDING AND ANALYSIS OF THE EEG/ERP

A 19 channel EEG is recorded using either a BrainMaster Discovery 19 or a Neurofield Q20 EEG amplifier. The EEG is recorded in two conditions, eyes open and eyes closed. The data are analyzed using various Z-score normative databases (QEEGPro, NeuroGuide, Neurofield) and software programs (such as the Neurofield EEG and ERP programs, EEGLAB in MATLAB, WinEEG Independent Components Analysis, and LORETA 3-D inverse mapping solution). Data are also analyzed in various montages such as Linked Ears referential, Average Reference, and a Laplacian.

Specific definitions can be found in the appendix.

Recording Date:

Recording Type and Length: EEG: , ERP:

5. ASSESSMENT FINDINGS

A. Personal Wellness Ratings: Personal wellness ratings are completed on a 1-10 scale with 10 being the best/most desirable.

Sleep – Exercise – , Diet – , Social – , Technology Use –

B. Physiological Stress Test: This is a psychological stress test to note changes in physiological responses while at rest, and during stress and recovery periods. This information can help clients realize the connection



between the brain and body. In addition, it indicates the type of stress response the client has, and how long it takes for the physiology to recover.

<insert image here>

Baseline Stroop Test Rest1 Math Test Rest2 Paced Breathing Rest3 <insert

<insert table here>

<insert commentary here>

C. Heart Rate Variability (HRV) and Sympathetic/Parasympathetic Levels: HRV is associated with overall health and wellness. Sympathetic levels tell us how much your body is in “fight or flight” response, while parasympathetic levels tell us your body’s level of “rest and digest”.

<insert image here>

<insert commentary here>

The patient’s average heart rate is about [redacted] beats/min. The LF (Low Frequency), the yellow bar, is primarily produced by the sympathetic nervous system (SNS). The HF (High Frequency), green bar, is primarily produced by the parasympathetic nervous system (PNS). In this case, the sympathetic/parasympathetic [redacted]

The SDNN is [redacted] ms which is [redacted] normal range (normal 50-100 ms) and indicates that the heart is not as adaptable and flexible.

D. LENS Top 10: The LENS (Low-Energy Neurofeedback System) Top 10 is based on a questionnaire which uses a 10 point scale to rate the severity of symptoms related to resiliency, sensitivity, reactivity, and central nervous system functioning.

<insert image here>

<insert commentary here>

- E. CNS Vital Signs: CNS Vital Signs is a computerized norm-referenced test that measures basic neurocognitive functioning related to memory, attention, processing speed, and reasoning.

<insert image here>

<insert commentary here>

- F. NeuroPsych Questionnaire (NPQ) SF-45 (significant areas of concern): The NPQ (SF-45) asks the client to rate the level of concerns for various neuropsychiatric disorders. The results are not diagnostic, but rather serve as a baseline measure for growth or change. Ratings extend from 0 – no problem to 3 – extreme problem.

- Attention - █/15
- Impulsive - █/10
- Memory - █/12
- Anxiety - █/15
- Panic - █/9
- Depression - █/15
- Mood Instability - █/12
- Aggression - █/12
- Fatigue - █/9
- Sleep Issues - █/6
- Suicide Ideation - █/9
- Pain - █/12

- G. PTSD Checklist - Military Version (PCL-M) SF-17 (significant areas of concern): The PLC-M (SF-17) is a 17-item self-report measure of symptoms typically related to PTSD. The results are not diagnostic, but rather serve as a baseline measure for growth or change. Ratings of “how much are you bothered by this problem” in the last month extend from 1 – not at all, to 5 - extremely.

- Memories/Thoughts related to Military Experience/Traumatic Event - █/25
- Optimism/Future - █/15
- Social Contact - █/5
- Sleep - █/10
- Mood - █/10
- Concentration - █/5
- Agitation - █/15

H. Amen Clinic Brief Brain System Questionnaire: The Amen Brain Systems Questionnaire is a self-report checklist that helps to predict areas of strength and weakness in the main brain areas. The rating scale of symptoms ranges from 0 – Never to 4 – Very Frequently and each section is out of a possible 40 points. The higher the score, the more likely the area of the brain is contributing to symptomology.

- Prefrontal Cortex – [redacted]
- Anterior Cingulate Gyrus – [redacted]
- Deep Limbic System – [redacted]
- Basal Ganglia – [redacted]
- Temporal Lobe - [redacted]
- Cerebellum – [redacted]

I. Significant EEG Findings (Surface and Cortical): The EEG findings are based on approximately 5 minutes of each eyes open (EO) and eyes closed (EC) resting state conditions, using a 19-channel cap and the either the Discovery24 or Q21 amplifier. A 60Hz lowpass filter is used.

a. Raw EEG (EO) (Average Reference Montage)

<insert EO image here>

EO Artifact – [redacted] eye blinks and [redacted] lateral eye movement (for example, see [redacted] channels between the [redacted] and [redacted] sec. marks).

Background Rhythms – The predominant rhythm is [redacted] amplitude [redacted]. There [redacted] alpha attenuation in the EO condition.

Raw EEG (EC) (Average Reference Montage)

<insert EO image here>

EC Artifact – [redacted] lateral eye movement (for example, see [redacted] channels between the [redacted] and [redacted] sec. marks).

Background Rhythms – The predominant rhythm is [redacted] amplitude [redacted]. There [redacted] alpha bursts in the EC condition.

b. Surface Maps, Coherence, Phase Lag, Power Ratios, Comodulation (EO)

<insert EO images here>

- some _____; _____coherence across the _____band and hyper-coherence across the _____band, with _____phase lag in the _____band (related to inefficient brain functioning); Power Ratios show _____; some Comodulation in _____ areas (related to cognitive inflexibility)

Surface Maps, Coherence, Phase Lag, Power Ratios, Comodulation, Peak Alpha (EC)

<insert EC images here>

- some _____; _____coherence across the _____band and hyper-coherence across the _____band, with _____phase lag in the _____band (related to inefficient brain functioning); Power Ratios show _____; some Comodulation in _____ areas (related to cognitive inflexibility); peak alpha (_____, _____, respectively) (which is an indication of the brain's ability to take in and process information)

c. Cortical Maps - sLORETA (EO)

<insert EO images here>

Cortical Maps – sLORETA (EC)

<insert EC images here>

<insert commentary for both EO and EC here>

- J. TBI Discriminant Analysis (EC) – The TBI analysis compares EC EEG recording to subjects in a database who have diagnosed brain injuries (impact, non-impact, toxic exposure). The client EEG is compared to those subjects in this particular database.

<insert image here>

- K. EEG Network Findings (EO or EC): It is important to examine how the brain functions as a unit, and not just the individual lobes or Brodmann Areas. Below are the most significant reports (networks)

<insert images here>

- L. ERP Finding (Visual or Auditory): The ERP provides information about how the brain functions under task, not at rest. The number of trials for this test was .

<insert images here>

<insert commentary here>

- M. ICA Findings (from EEG or ERP): To enhance our analysis even further, we sometimes use independent component analysis software. This helps to pinpoint where in the brain processing may be breaking down (dipole sources), which then informs which neurotechnology to use to address your symptoms.

<insert images here>

<insert commentary here>

Components # , , and showed dipole sources in the .

6. **SUMMARY AND RECOMMENDATIONS**

This assessment was initiated to . In terms of body functioning, . These somatic issues are . The Stress Indicated that . 's HRV indicated . Sympathetic and parasympathetic measures .



The cognitive testing (CNS Vital Signs) found [REDACTED]. Concerns related to focus and memory were also noted in the NPQ.

The results from the QEEG (surface and cortical), network analysis, and ICA substantiated. _____.

Physical Recommendations:

- [REDACTED]

Nutritional/Supplemental Recommendations:

- [REDACTED]

Counselling/Psychotherapy Recommendations:

- [REDACTED]

Neurotherapy Recommendations:

- [REDACTED]

** Please note that this report is for clinical purposes (planning and progress monitoring) and is not diagnostic.

Kim Calder Stegemann, Ph.D., M.Sc., M.A.
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Certified in Neurofeedback (BCIA – Fellow)
Certified Clinical Counsellor (CCPA)

APPENDIX (adapted from Neurofield Therapy)

Definitions

- Absolute Power - Absolute power is the total voltage, or energy, that the brain is emitting, measured in disparate frequencies.
- Heart Rate Variability (HRV) - HRV is a measure of the difference between heart beats when you breathe in and when you breathe out; it is associated



with overall body and brain health. If one has good variability / flexibility, their body can be more resilient to stress.

- Independent Components - Independent components are spatially and spectrally independent patterns in the brain, which are used foremost in sourcing content.
- Parasympathetic Levels - As part of the autonomic nervous system, the parasympathetic system is your relaxation response and is responsible for regulating the “rest and digest” functions. It’s more active during periods of rest, sleep and is active when your body is healing. Too much parasympathetic activity can lead to a “freeze or feign” response.
- Phase - Phase is any one point or portion in a recurring series of changes, as in the changes of motion of one of the particles constituting a wave or vibration.
- Relative Power - Relative power is a measure of clients’ EEGs, viewed in relation to their absolute power profile, comparing each brainwave amplitude to the others.
- Sympathetic Levels - As part of the autonomic nervous system, the sympathetic system is responsible for the “fight or flight” response. It manages increases in heart rate and blood pressure in stressful situations.

Basic Explanation of Brain Waves (Adapted from <http://mentalhealthdaily.com>)

- Delta

Delta brainwaves are the slowest in frequency and represent a state of deep dreamless sleep or unconsciousness. Delta brainwave states have long been associated with healing during comas and while in shock. While Delta brainwaves usually only occur in deep sleep, if Delta is present while awake it may represent areas of traumatic brain injury (TBI) or dysfunction. Also, if Delta is present during a QEEG exam it may indicate artifacts due to nervous eye movement which would force the examiner to discount delta information. The Delta brainwave state normally corresponds to frequencies from 0Hz to 4Hz indicated by many neurophysiology references.

- Theta

Theta brainwaves are another slow wave in frequency and represent a state of internal focus, deep relaxation, meditation, enhanced creativity, stress relief, light sleep and dreaming. Theta brainwave states have been used in meditation for centuries. However, elevated levels of theta while engaged in cognitive activities indicate attention deficits and focus on the internal milieu rather than externally focused on subjects at hand. The Theta brainwave state normally corresponds to frequencies from 4Hz to 8 Hz indicated by many neurophysiology references.

- Alpha



Alpha brainwaves are considered another slow frequency and represent a state of relaxed mental awareness or reflection without processing. Alpha brainwave states are typically associated with contemplation, visualization, problem solving and accessing deeper levels of creativity. However, if present during cognitive tasks indicate brain areas which are idling or not processing when they should be. This is illustrated by the alpha amplitude change in the occipital and parietal lobes during eyes closed vs. eyes opened tasks. When the eyes are closed the alpha amplitude is greater because the visual association areas in the rear of the brain are idling due to the lack of visual input. As soon as the eyes open the alpha amplitude drops by 30% to 50% because all of the visual association areas become active. This phenomenon is called alpha blocking. It is typical to see high alpha frequencies during cognitive tasks in the frontal lobes of substance abusers because even though they try to accomplish executive control tasks the associated neurons idle and can't get up to speed to perform. The Alpha brainwave state corresponds to frequencies ranging from 8 Hz to 12 Hz in most normal subjects.

- Lo-Beta or SMR

The Lo-Beta brainwave state is associated with efficient cognitive processing at a low level. Lo-Beta is called SMR when measured at the Sensory/Motor Cortex (C3/C4). At the Sensory/Motor Cortex increases in SMR amplitude have been proven to increase focus, and body/mind connection. When a person falls asleep, they start by entering alpha, then theta and finally delta. Within a few hours of entering delta the brain awakens and enters REM sleep. If SMR is not sufficient to keep the body in a resting state then the person will awaken. This may be one of the causes of insomnia. Increasing SMR and Beta frequency amplitudes along the Sensory/Motor Cortex has been proven to help regulate unstable brain wave patterns and is the prime application for the treatment of attention issues. The Lo-Beta or SMR brainwave state corresponds to frequencies ranging from 12Hz to 15Hz and may be lower in children depending upon where their alpha frequency ends.

- Beta

The Beta brainwave state is associated with a heightened state of alertness and focused concentration. When the mind is actively engaged in mental activities, the dominant brainwave state will be Beta. A person in active conversation, playing sports or making a presentation would be in a Beta state. The Beta brainwave state corresponds to frequencies ranging from 15Hz to 23Hz.

- Hi-beta

The Hi-beta brainwave state is associated with an extremely heightened state of mental activity. A person in argument, extreme physical or mental competition, or in deep problem solving would be in a Hi-beta state. Also, people who are anxious or have sympathetic nervous system dominance are continuously in a Hi-Beta state. It



is inappropriate to demonstrate Hi-beta brainwaves in a relaxed state and suggests overuse of neuronal faculties making them unavailable for new tasks called on by the individual. The Hi-beta brainwave state corresponds to frequencies ranging from 23Hz to 38Hz.

- Gamma

Gamma brainwave states are the most rapid in frequency. They have received the least attention and research, although more attention is currently being paid to them than in years past. Research has indicated at moments when bursts of insight or high-level information processing occur, there are corresponding increases in brain activity in the Gamma range. The Gamma brainwave state corresponds to frequencies of 38Hz or higher.