

# BRAIN TRAINING

## INSTITUTE

AND PSYCHOLOGICAL SERVICES



# INTERPRETIVE REPORT

By: Dr. Debra W. McClendon PhD

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 909.374.7935

**Client: Anon Ymized**

 100 Pierre Rd Unit A,  
Walnut California 91789



Date: **9/28/2022**  
Patient Name: **Anon Ymized**  
Date of Visit: **08/17/22**  
Chart Number: **NUG2022-04578**

Date of Birth: **06/24/1989**  
Age: **33** Gender: **Male**  
Type of Visit: **Intake Assessment**

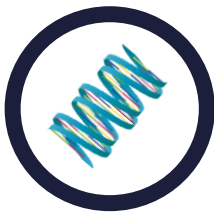
**Attending Practitioner: Dr. Debra McClendon PhD, (Researcher & Human Development Specialist)**

## OVERVIEW LETTER

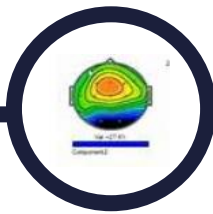
Date: 09/28/22

To: Anon Ymized,

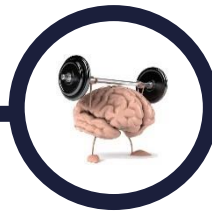
Brain Training Institute LLC delivers a holistic approach to mental health related services from four key perspectives: Nutrigenomic (genetic) testing, EEG Neurofeedback (EEG NFB), Brain Mapping and Applied Clinical Psychology. This report provides an overview of these key perspectives, followed by an interpretation of your recent test results.



The process starts at the cellular level with Genetic testing. Providing customized supplements based on one's genetics to jump start the healing from inside.



A QEEG/ERP brain map is used to record electrical activity in the brain, allowing us to see how the brain is actually functioning. These maps guide accurate use of EEG NFB protocols and other recommended treatments.



EEG Neurofeedback is the first layer of support used to balance brain function and support the brain in learning new coping skills (without medication). When medication is required, EEG NFB supports that process.

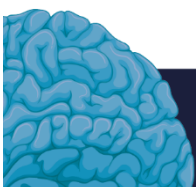


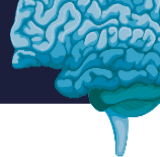
We firmly believe that psychotherapy is the best tool for reshaping thoughts, behaviors, and emotions around the newly acquired brain function. Helping to eliminate fear, depression, anxiety, PTSD, ADHD, etc.

This report represents my personal opinion of the clinically relevant data related to the genetic alterations found in your GX Sciences genetic report along with a list of customized vitamin supplementation recommendations based on those polymorphisms. It also contains a scientific interpretation of your QEEG/ERP Brain Map results using the scientific HBImed normative database and a correlation with other pertinent neuropsychological assessment data, questionnaires and intake information available at the time this report was created. Some of these opinions and correlations can vary or change slightly as more clinical information becomes available about each particular polymorphism and normative HBImed data. **None of the recommendations in this report are meant as a medical cure or diagnosis and some have not been approved by the USFDA.** Please also seek medical advice from your primary care physician before starting vitamin supplementation.

Thank you for allowing me to participate in your progress towards a better quality of life. I hope you find this information helpful in your continued progression toward wellness. Please contact me at **909-374-7935** or **info@btibraintraining.com**, if you would like to discuss more and to answer any questions that you have.

Attending Practitioner: Dr. Debra W. McClendon PhD  
Dr. Debra W. McClendon PhD





## HOW TO USE THIS REPORT

This interpretation report is a detailed analysis of all the tests that were performed during your initial intake or follow-up visit. These tests were performed with the purpose of investigating multiple touch points by which to support a diagnosis from your doctor as well as to confirm the diagnosis and provide a customized treatment plan.

There is a lot of information included in this report. Therefore, it is suggested that you keep the following in mind as you read through this report.

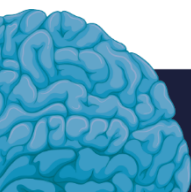
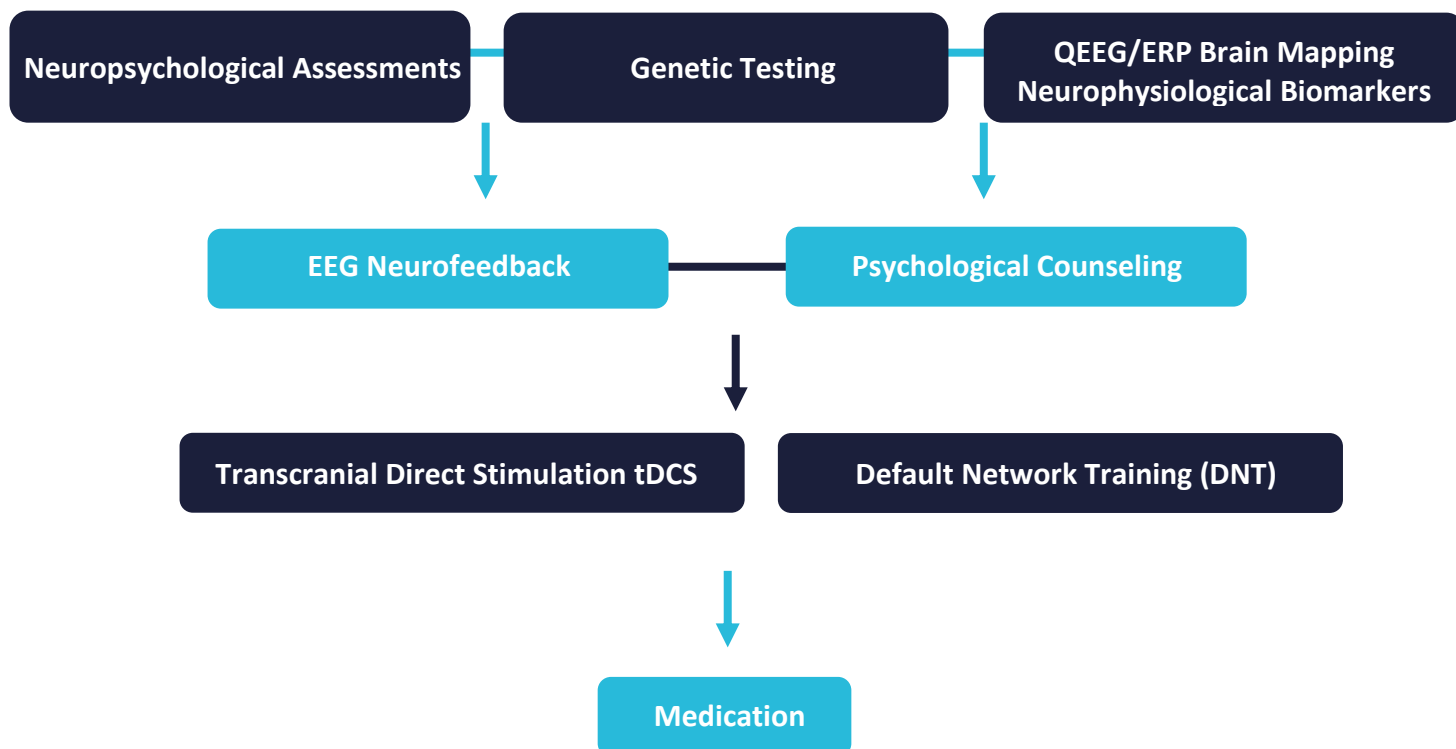
**Pages 1-3** Provides an overview of services

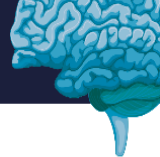
**Pages 4-13** Provides a high-level practical summary of all findings

**Pages 14-61+** Appendices, research and definitions discussed in this report

The treatment plan recommended is unique to your specific genetics and the way in which the voltage in your brain is firing when stimuli is presented. The test that is used to analyze the voltage is called “*Event Related Potentials (ERPs)*”. ERP a scientifically validated and proven technique used to understand brain function. ERPs are not intended to know all and see all issues related to the brain. However, it will accurately monitor brainwave activity that has been impacted by these issues and provide customized information to guide a tiered treatment plan approach as follows. The brain map performed is a neurological biomarker map, designed specifically to guide the practitioner in developing Electroencephalogram Neurofeedback (EEG NFB) protocols.

### Tiered Treatment Plan





## SUMMARY OF FINDINGS

A summary of all tests are provided here to correlate results for treatment and contribute to an integrated care team discussion. Research shows that mental health issues often have multiple points of reference. This summary correlates nutrition, brain function, and neuropsychological assessments to provide information for treatment.

### Nutrigenomics (Genetic) Report Overview

Genetic testing is a report of mutations or SNP's (Single Nucleotide Polymorphisms) generated from your specific DNA sequence. The GX Sciences report will indicate one of three possible findings for each gene: no mutation (-/-), a heterozygous (+/-) or a single mutation, or homozygous (+/+) or two mutations for that specific gene. It is important to know that having a gene mutation does not always mean that the protein / enzymes it creates is defective. However, in some cases, it indicates an altered state of efficiency of that particular protein or enzyme.

The **Developmental Panel** is intended to provide an overview of 24-35 Genes variants tested for SNPs (Single Nucleotied Polymorphisms). The specific areas of focus are External Inflammation Potential, Autophagy Consideration, Neurotransmitter Processing, Sugar Sensitivity, Detoxification and Methylation Consideration. The goal is to provide a baseline for the overall nutrition of the body/brain and to customize nutritional supplements based on genetics, which supports the client's nutritional needs from a cellular perspective.

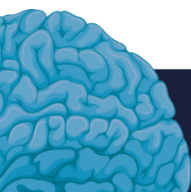
**DEVELOPMENT PANEL:** Summary of results (See Appendix G for the full report.)

Neurotransmitters		Neurotrophic Factors		Autophagy		Inflammatory Environment	
●	COMT v158m,	●	SYN1	●	ATG5	●	AOC1
●	GAD1 RS769407	●	BDNF	●	ATG12	●	HNMT rs11558538
●	GAD1rs3828275			●	ATG16L1	●	HMNT rs12995000
●	MAO-A	Neuro-Inflammation				●	FUT2
●	MAO-B	●	C3	Sugar Sensitivies		●	HLA DQA1
●	SLC6A4	●	CD14	●	ADRA2A	●	HLA DQA2
●	HTR2	●	IL5				
●	TPH2	●	IL6	Detoxification			
●	DBH	●	IL13	●	CTH		
Methylation		●	STAT14	●	GSTM3		
●	FOLR2	●	TNF	●	GSTP1 I105V		
●	MTHFR 677	●	CTLA4				
●	MTHFR 1298	●	DRD2				
●	TCN2						

Legend: ● (Normal), ● Heterogyous, ● Homogyous

### FAMILY NUTRIGENOMIC (GENETIC) DEVELOPMENT PANEL RESULTS

Family Members	Relationship	Development Panel																																							
		Methylation				Neurotransmitters								Neurotrophic Factors				Neuro-Inflammation								Sugar		Detoxification		Inflammatory Environment											
		FOLR2	MTHFR (1298)	MTHFR (677)	TCN2	COMT (V158M)	GAD1 rs769407	GAD1 (rs3828275)	MAO-A	MAO-B	SLC6A4	HTR2	TPH2	DBH	SYN1	BDNF	C3	CD14	IL5	IL6	IL13	STAT4	TNF	CTLA4	DRD2	ATG5	ATG12	ATG16L1 (rs10210302)	ADRAGA	CTH	GSTM3	GSTP1 (I105V)	AOC1	HNMT (rs11558538)	HNMT (rs12995000)	FUT2	HLA DQA1	HLA DQA2			
Chloe Davis	Daughter	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Karen Davis	Mom	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Skyler Wesley	Grandson	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Nathan Wesley	Grandson	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Donta Wesley	Son-in-law	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●





## OVERALL NUTRIGENOMICS (GENETIC) REPORT FINDINGS

### Methylation

No issue converting Folic Acid to Methyl-folate (FOLR2). One MTHFR mutation found with variant 677. No issue absorbing B12 (TCN2). A deeper look at methylation can be found in a GXsciences Foundation panel.

### Neurotransmitters

Minor issue converting Glutamic Acid to Gaba (GAD1). Indicating a very stimulated brain that may have issues calming down or falling asleep at night. No issues creating serotonin in the brain (TPH2). However there is a significant issue using what what is created in the brain (HTR2) and eliminating what is created (SLC6A4). Minor issue converting dopamine to norepherneprine (DBH). There

### Neurotrophic Factors

No issues indicated with synaptic processes in the brain (SYN1) or the Brain Derived Neurotrophic Factors (BDNF). Revealing a good capacity for the brain to heal itself, in the proper environment.

### Neuro-Inflammation

Significant issue with three “on” switches within the immune system (C3, CD14 and IL5). There is also a significant issues with two immune “off” switches (CTLA4, STAT4). Prioritizing the elimination of inflammation will reduce aggressive immune reactions and reduce anxiety.

### Autophagy

Significant issue with autophagy (ATG5, ATG12, ATG16L1), indicating a probability of not being able to remove dead cells from the body, due to an inability to get glucose into the cells.

### Sugar Sensitivity and Mood

Minor issue with sugar sensitivity, meaning there is a probability that this brain will be wired up if sugary foods are eaten.

### Detoxification

No issue creating Glutathione (CTH) overall or using it in the brain (GSTM3). However, there is a significant issue using Glutathione in the gut, lungs, bladder, skin, etc.,(GSTP1). Indicating a probability of not being able to clear toxins such as herbicides/pesticides from the body and having issues in these areas of the body.

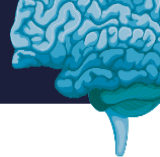
### Inflammatory Environmental

Minor issue processing external/environmental threats like Histamine and creating probiotics in the gut. . Major Gluten and Casein sensitivity (HLA-DQA2).

Thank you for allowing me to participate in your nutrition. I hope you find this information helpful in your continued progression toward wellness. Please review the video, then contact me at **909-374-7935**, if you would like to discuss more and to answer any questions that you have.

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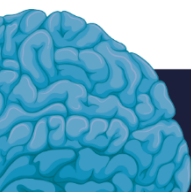


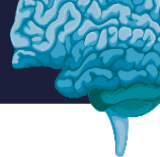


**CUSTOMIZED SUPPLEMENTS BASED ON NUTRIGENOMICS**

Categories	Mutation	Recommended Supplement	Descriptions
Methylation	Yes	Methyl-Folate Plus	Mutations in this area indicate an inability to convert Folic Acid to Methyl-Folate, affecting over 250 systems in your body.
Neurotransmitters*	Yes	Pro Gad Enhancer Calming Cream Melatonin Full Focus Mood Plus	Mutations in this area indicate an inability for various neurotransmitters to communicate with each other, produce hormones, use these hormones, or discard them from the brain. This condition produces specific effects in the nervous system contributing to a risk of anxiety, depression, and dysphoria.
Neurotrophic Factors	No	N/A	Mutations in this area indicate the body’s ability to heal itself after injury has occurred.
Neuro-Inflammation and Inflammatory Environment	Yes	PEA Sooth Support CBD Oil (No THC)	Mutations in this area indicate aggressive immune reactions due to broken “ON” and “OFF” switches in the immune system, which significantly increases inflammation in the brain and body.
Autophagy	Yes	D-Chiro-Inositol	Mutations in this area indicate an inability to get glucose into the cells, causing an issue discarding dead cells from the body.
Sugar Sensitivity and Mood	Yes	N/A	Mutations in this area indicate a sensitivity to sugar. Creating a highly aroused brain.
Detoxification	Yes	N/A	These genes indicate one’s ability to create Glutathione (CTH) and use it in the brain (GSTM3), skin, bladder, lungs (GSTP1). A mutation in this area indicates a need to supplement glutathione. CTH is responsible for clearing chemicals and metabolites from the body, damaging intracellular biochemical functions. Mutations in these areas can have a significant negative effect on the nervous system and can result in decreased “quality of life” and even decreased “life-span”.

\*Plant based perscriptions are also recommended by the GxSciences lab for a more aggressive approach. See paage 7 of the GxSciences report for these customized recommendations. Consult psychiatrist or primary care physician for perscription considerations.





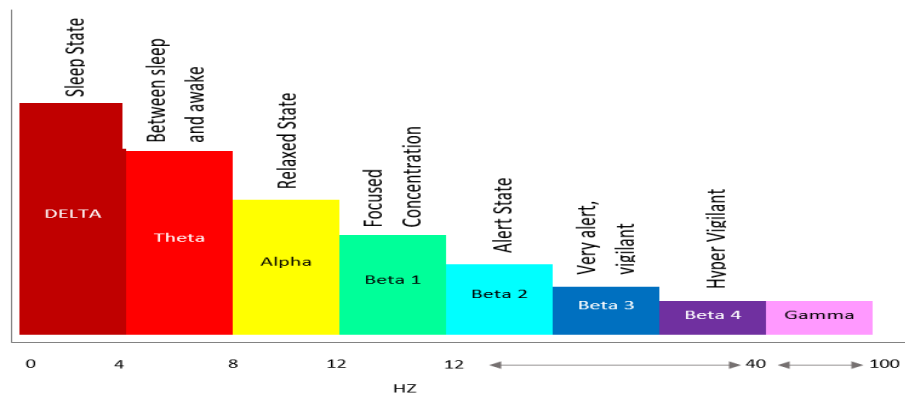
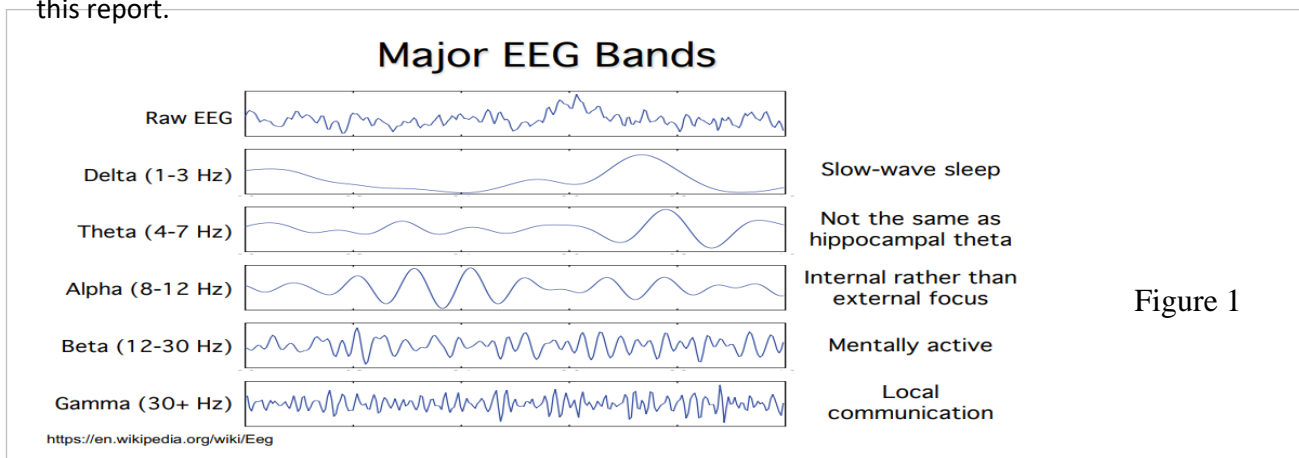
## QEEG/ERP Brain Mapping Overview

The most important aspect of brain mapping is the understanding and interpretation of brainwave patterns found in the Electroencephelogram (EEG). These patterns are directly related to the function of the brain and can provide a roadmap to understanding what could possibly be going on along the surface of the brain and causing your symptoms.

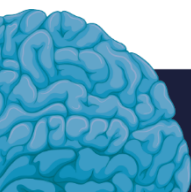
Our Brain map is only used to describe deviations in comparison with the normative HBimed database. It is not used to indicate that this type of information processing of deviations results in a specific symptom, disease or diagnosis. It simple indicates that information processing at some level or at some stage is different and may confirm symptoms and inform diagnosis. For example, this information can show us where increased brain activation and increased/decreased amplitude exists in early, mid or late brain potentials. This is all analytic work used to correlate genetic polymorphisians to self-reported symptoms and brain activation to support more accurate diagnosis. More importantly it was designed to guide the EEG Neurofeedback practitioner in developing the appropriate NFB protocol and to understand the unique brain processing mechanisms of the client.

Our brain mapping technique is non-intrusive and the information is being used to support brain dysregulation for brain training purposes. Our preference is to do a brain map prior to starting EEG Neurofeedback (NFB) and at the end of an agreed amount of NFB sessions, in an effort to confirm that the symptoms reported can be supported by EEG Neurofeedback and are not related to more severe medical conditions. When the later is true, the client will be asked to seek immediate medical attention and be cleared by a medical doctor before proceeding with EEG Neurofeedback.

Attached are two views of basic brainwave patterns which serve as the foundation for the information provided in this report.



**Disclaimer.** In all cases, the brainwave information pr **Figure 2** d be considered as ADDITIONAL INFORMATION that you can use to follow-up with your doctor or integrated care team, in order to further investigate your symptoms. These findings, are used solely by the practitioner to determine a brain training protocol for presenting symptoms and is not being used by the practitioner to make a diagnosis, a





cure, or prescribe medication. It should not be confused with the brain mapping done by a neurologist, which are looking at deeper brain structure for medical purposes.

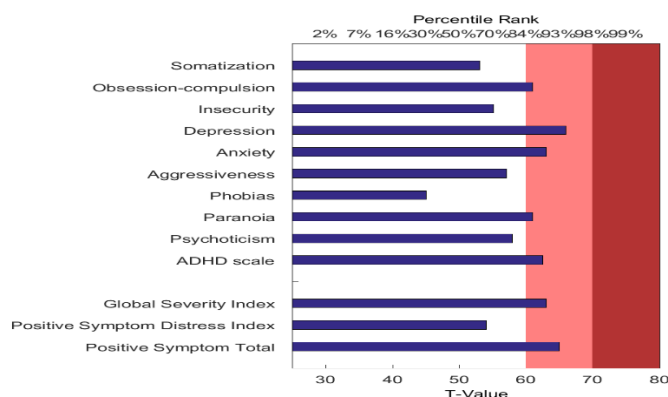
## SUMMARY GRAPHS OF Questionnaires

**Note: None of the questionnaire results represent brain function, but rather how the client self-reported their symptoms and feelings.**

### SCL90 Questionnaire Results

**Description:** This chart explains Anon Ymized’s answers to the SCL90 questionnaire, categorized by *various diagnosis*. This graph does not represent brain function, but simply highlight how Donta frequently feels on a daily basis.

**Findings:** Anon Ymized’s answers on this questionnaire reveal statistically significant findings in obsession-compulsion, depression, anxiety, paranoia, impulse control, and psychological distress. Indicating a possible decreased interest or pleasure in sex, loss of energy, or slowing down of their movements. As well as suffering from recurring thoughts, words, or ideas they cannot get out of their mind, nervousness, panic attacks, etc. All of which can be supported with EEG Neurofeedback, Alpha-theta, and vitamin supplementation.

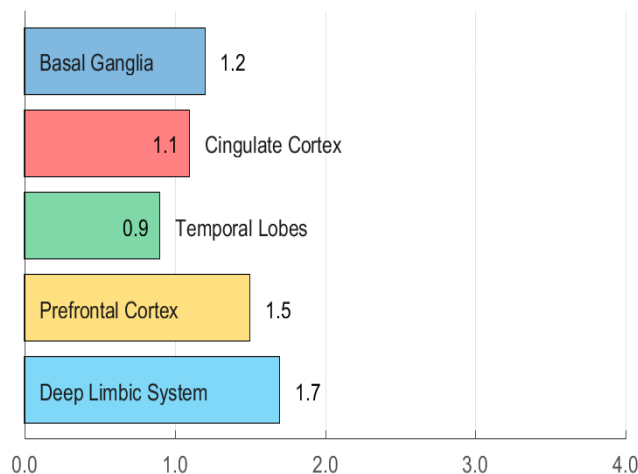


### Symptoms and Cortical Networks (Amen)

**Description:** This chart explains Anon Ymized’s answers to the Amen questionnaire, categorized according to *various brain regions*.

**Findings:** The answers do not show any significant values regarding basal ganglia, cingulate cortex, and temporal lobes.

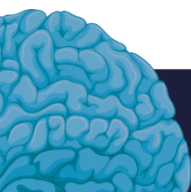
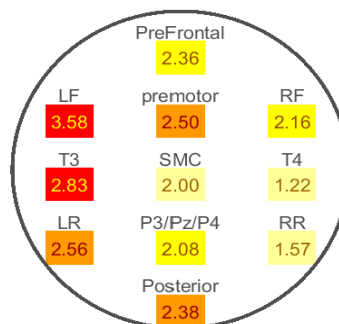
The prefrontal cortex and deep limbic system show a (slightly) high level of strain. The self-rated distress is quite high and therefore clinically relevant. Impacting emotional networks, feelings of helplessness, emotional energy, and related functions. Can be useful in exploring why Donta is not afraid when others as indicated in his answers.



### van Deusen Questionnaire

**Description:** Self-reported questionnaire which categorizes symptoms according to the brain region most effected by the symptoms.

**Findings:** Functions of the left hemisphere, left frontal, left medial temporal lobe, left parietal cortex, and left superior temporal lobe are strongly affected. All of which indicate increased self-blame, unhappiness, difficulties processing when reading and forming logical constructive processing.





**BDI-II (Beck Depression Inventory)**

**Description:** A clinical questionnaire measuring severity of depression

**Findings:** Moderate Depression

**Recommend:** Consultation with psychiatrist given that mood swings exist with suicidal ideation.

Donta scored a 21 on this inventory, As indicated by some key Answers on this questionnaire, such as:

- *I feel sad much of the time*
- *I feel my future is hopeless and will get worse*
- *I feel I am a total failure*
- *I dislike myself*
- *I criticize myself*
- *I feel worthless*
- *I have thoughts of killing myself but would not carry them out.*
- *I feel guilty over many things I have done or should have done*

**SUMMARY Graphs of Behavior Parameters**

**VCPT Performance**

**Description:** This chart indicates Anon Ymized’s behavior during a boring task. Overall, these scores indicate his performance on the task where he was asked to click the mouse when he saw two animals in a row (i.e., stimulus). This chart is looking at Donta’s “click profile”.

**Findings:** Anon Ymized performed well on the performance test. He did as well as her peers of the same age and gender. Even though he had 7 errors and some difficulty maintain response rate overall, he demonstrated good attention and response control.

Group name	Correct	Omission	Commission	RT	VR(RT)
a-a GO	93.0 %	7 (0.139)	0	361 (0.995)	6.8 (0.661)
a-p NoGO	100.0 %	0	0 (0.516)	-	-

**Omission Errors = Attention**

**Commission = Response Control**

**RT = Reaction time compared to peers of the same age and gender.**

**VR(RT) = How long a person can maintain attention during the time.**

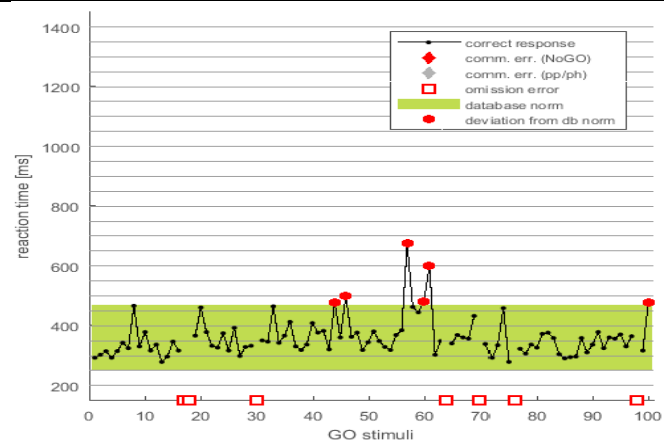
**a-a GO = animal, animal GO Condition**

**a-pNOGo = animal, person NOGO Condition**

**Reaction Time observed over time.**

**Description:** This graph simulates how Anon Ymized moves through tasks on a daily basis, given the challenges that she reported feeling. This is a graphical view of the clicks she made when presented with a stimulus. Everything in the green indicates that she clicked the same as her peers in the same age and gender. Overall, Anon Ymized clicked when she was supposed to and did not click when she was not supposed to, indicating good reaction time.

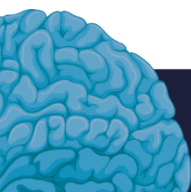
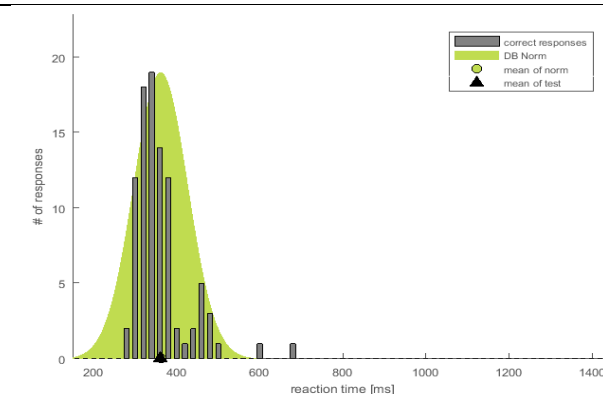
**Findings:** Red squares are omission errors. Indicating that Anon Ymized became tired halfway through the test but was able to maintain focus throughout.



**Reaction Time based on Occurrence.**

**Description:** This is another view of Anon Ymized’s reaction time. It provides an idea of how he reacts to boring tasks and various situations in life.

**Findings:** Even though there were more errors near the end, Donta’s reaction time is similar to his peers (green dot).





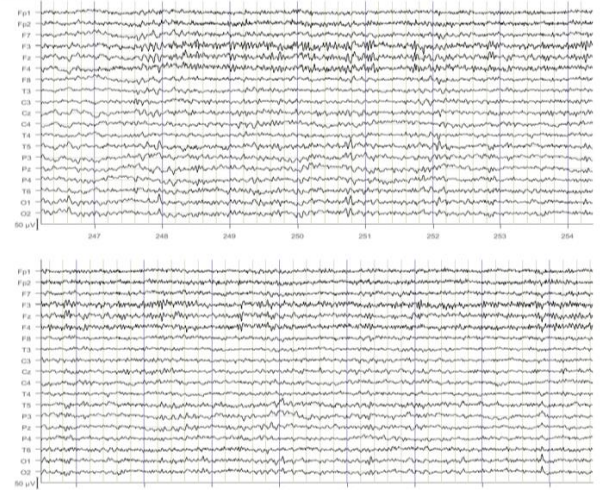
## SUMMARY Graphs of Brain Function Analyses

### Eyes Open

**Description:** This is the raw EEG from the task we gave Donta West, where we asked him to sit still with his eyes open as we recorded the activity in his brain.

**Findings:** There is no probability of neurological abnormalities found in this raw EEG.

Eyes opened

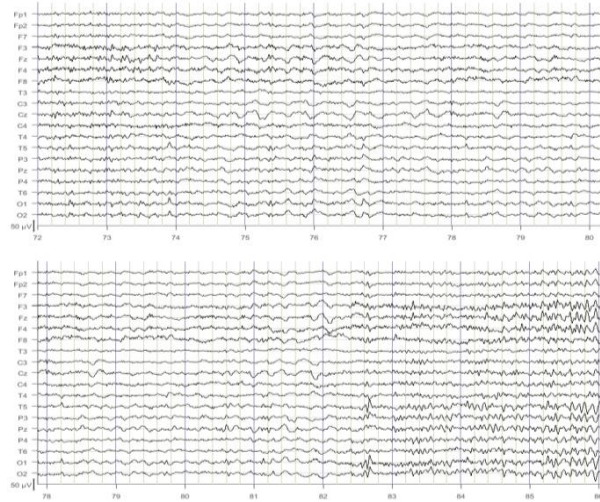


### Eyes Closed

**Description:** This is the raw EEG from the task we gave Anon Ymized, where we asked him to sit still with his eyes closed as we recorded the activity in his brain.

**Findings:** There is no probability of neurological abnormalities found in this raw EEG.

Eyes closed



### Spike Detection:

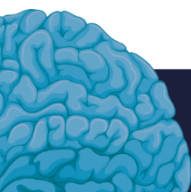
**Description:** This test looks for spikes in the EEG that are sharp transient waves representing interictal epileptiform activity in the brain. There were no spikes seen during Anon Ymized's recording, indicating that there is no probability of epilepsy or seizure activity at the time of this recording.

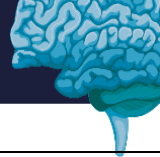
#### Eyes Closed

No significant events were detected.

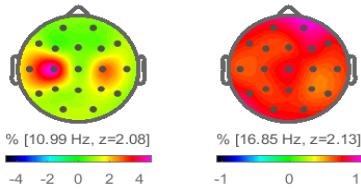
#### Eyes Opened

No significant events were detected.





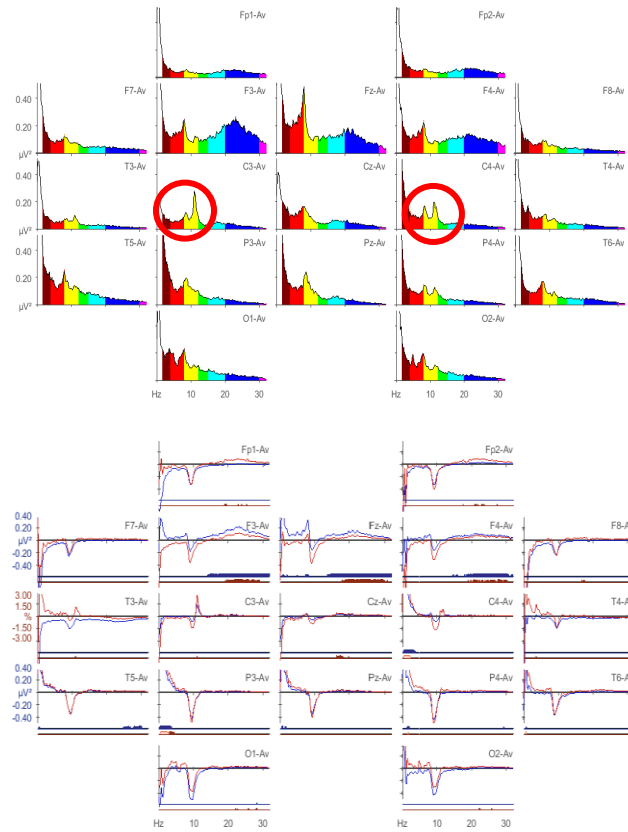
### Spectral Data Eyes Open (5:09)



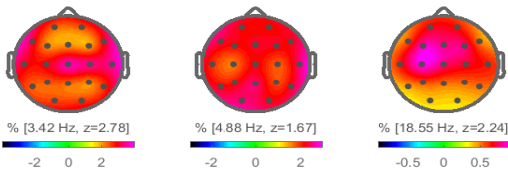
**Description:** This chart is where we begin to see the function of the brain, rather than Anon Ymized's self-report. The spectral was recorded when Donta was asked to sit quietly for approximately 5 minutes with his eyes open, as he tries not to blink. The goal is to monitor brainwave activity at each electrode to determine EEG NFB protocols

**Findings:**

Alpha noted in central regions possibly impacting empathy. Mirror neurons are responsible for empathizing. Indicating probability of social issues, as seen in several conditions. Investigate probability of Mu-Rhythm as indicated by the slight monkey face spectral at C3 and C4. Discuss and consider social implications.

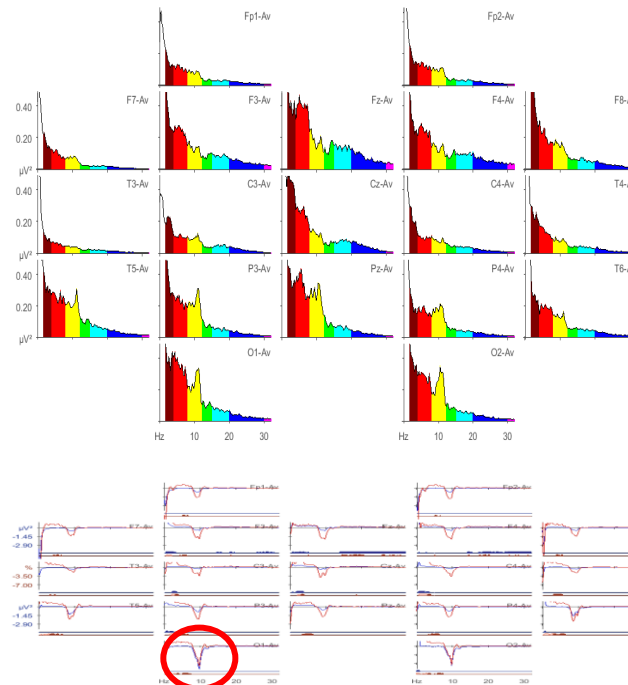


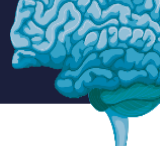
### Spectral Data Eyes Closed (5:18)



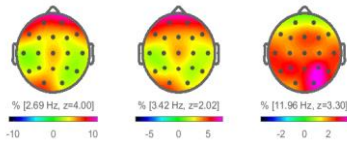
**Description:** This chart tells us that when Donta West was asked to close her eyes for approximately 5 minutes.

**Findings:** Low amplitude of alpha and high amplitude of theta. Both indicate depressive symptoms with probability of mood swings.



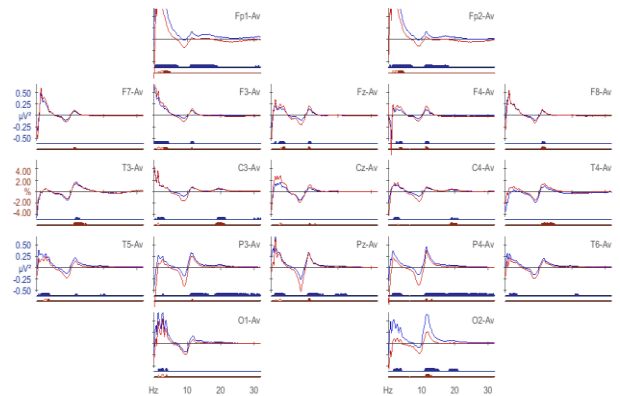
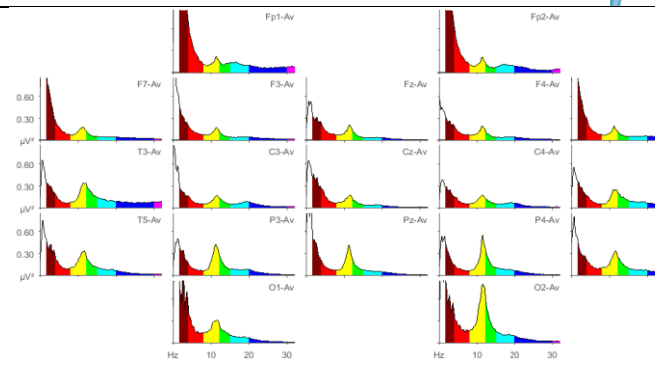


### Spectral Data (VCPT)



**Description:** This graph shows how Anon Ymized's brain functions when we asked him to look at pictures and click a button for 21 minutes, when he saw 2 animals.

**Findings:** High amplitude of theta in frontal regions. Low amplitude of Alpha in left occipital.

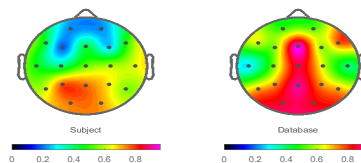


### Theta-Beta Ratio

**Description:**

The Theta/Beta ratio gives an index as to the quality of an individual's ability to pay attention. Important for understanding probability of ADHD.

**Findings:** Increased activation at PZ during eyes closed and during a task.

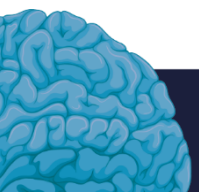
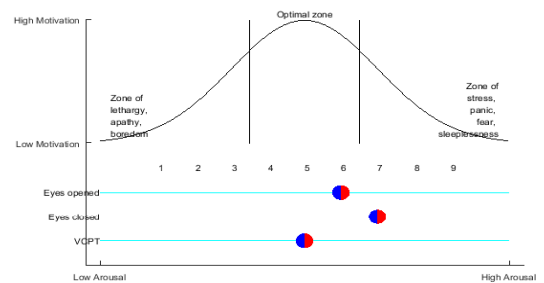


Version	v01	v01	v01
Eyes open	<u>Fz</u>	<u>Cz</u>	<u>Pz</u>
Subject (Stanine)	-0.01 (12.3%   3)	0.09 (11%   3)	0.28 (49.7%   5)
Eyes closed	<u>Fz</u>	<u>Cz</u>	<u>Pz</u>
subject (Stanine)	0.34 (31.3%   4)	0.56 (39.9%   4)	0.94 (84.2%   7)
VCPT	<u>Fz</u>	<u>Cz</u>	<u>Pz</u>
Subject (Stanine)	0.21 (28.5%   4)	0.12 (13.7%   3)	0.46 (66.9%   6)

### Arousal in relationship to focusing.

**Description:** Shows how well the left and right brain are working together.

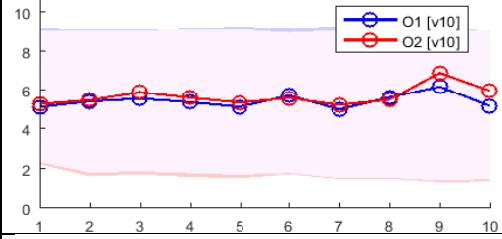
**Findings:** Normal arousal except in eyes closed condition. During eyes opened, balanced values. During eyes closed, increased arousal. Indicating no relaxation is taking place and/or there are possibly poor sleep habits, feelings of insecurities





**Left brain/Right Brain Synchronization**

Left and right brain are synchronized.

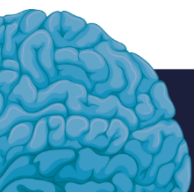
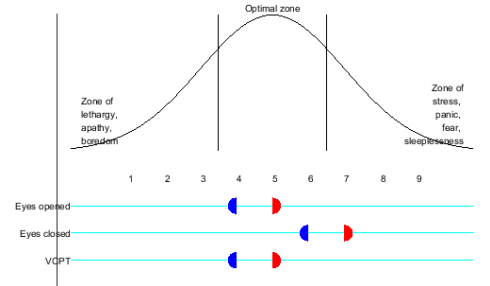


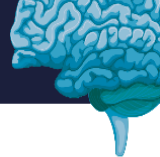
**Central Sensory Index (CSI)**

**Description:** Reflects the organization and functioning of the somatosensory areas. Providing clues into brain processing.

See appendix for more details.

**Findings:** Left hemisphere is in normal range when eyes are open, closed and performing tasks. Right hemisphere is highly aroused when eyes are closed.





### Event Related Potentials (ERPs)

This section looks at how the brain processes information when presented with a stimuli or task.

**Input Areas:** The brain first receives information from the environment as input (via Visual then auditory, then balances information between left and right brain regions). Donta’s results significantly indicate deviation from his peers in the same age and gender with normal brain function. Long lasting high amplitude in Auditory.

**Memory Areas:** Once the inputs are perceived, the left and right memory areas of the brain become activated, because they want to compare the new information with the past information that we have in our memory to facilitate the processing of the information. Donta’s results in the *left memory* area significantly deviates from his peers in the same age and gender with normal brain function.

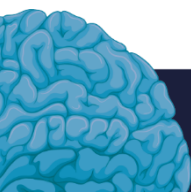
**Executive Function:** After inputting the information and comparing it against past information, the higher level of the brain is activated via the executive function in different parts of the brain. When Donta’s brain attempts to engage, there is a significantly difference in his brain’s ability to engage from that of his peers in the same age and gender. There are no significant differences in Inhibition/suppression, monitoring, working memory and slow wave activity from that of his peers with normal brain function.

Category	Region	Deviation?
Input Areas	Visual Input	Yes
	Auditory Novelty	Yes
	Left Association Areas	Yes
	Right Association Areas	Yes
Memory	Left Memory Area	Yes
	Right Memory Area	No
Executive Function	Engagement	Yes
	Inhibition/Suppression	No
	Monitoring	No
	Working Memory	No
	Slow Wave Activity	No

See pages 39-41 for more details and graphs on event related potentials (ERPs) results.

#### Overall QEEG/ERP Findings

- Due to the low amplitude of Alpha and spread Theta rhythms (EC), besides the low amplitude of late ERP components (P3b) early potentials (P4), the probability of depressive symptoms besides symptoms of mood swings need to be considered.
- High amplitude of frontocentral Beta, and high amplitude of early ERP components show the probability of obsessions/ruminations which lead to mental fatigue and loosing concentration or inhibition.
- Consider high amplitude of Alpha (C3/EO)





## TREATMENT RECOMMENDATION

### Neurofeedback Protocol (Othmer's Method)

EEG protocol (Othmer's Method)

#### Eyes Open Condition

- TBD after neuropsychological evaluation

Infra Low Frequency protocol (Othmer's Method)

#### Eyes Open Condition

- T4P4 for attachment issues, PTSD, physical calming, feeling safe, social anxiety
- T4FP2 for emotional calming, fear, anger, paranoia
- T4O2 for deeper emotional calming
- T3T4 for stability in both brain regions, anxiety, stress, anxiety, motivation, sleep issues, TBI
- T3FP1 when appropriate for mental calming, focus concentration (Helpful for GAD1 mutation)
- C3F3 at 16.5 Hz for severe depression
- T3F3 for motivation
- FZCZ for cognition

### Synchronization (Othmer's Method)

Synchronization protocol can be suggested but should be applied based on the individual response

- O1-O2 – 10 Hz

### Alpha/theta protocol

- Alpha-Theta protocol recommendation for social anxiety, trauma, fears and phobias. Typically, after 20 sessions of awake state training.

### DCS stimulation

- TBD

### Biofeedback training (HRV) is recommended

- TBD

### Default Network Training (DNT)

- Consider after substantial Infra-Low training

These suggestions are given in accordance with QEEG results and offered as a starting point for Neurofeedback training. Individual client responses will vary. The specific frequencies, montages, and the sequencing of sessions will likely require modification based on clinical response.

Suggestions may be implemented differently depending on instrumentation and symptoms monitored in and out of session.



The background of the page is a teal color with a white network diagram consisting of interconnected nodes and lines. The diagram is centered in the upper and lower portions of the page. A dark blue, wavy pattern is visible in the middle section, behind the text.

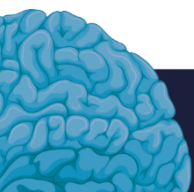
# APPENDICES

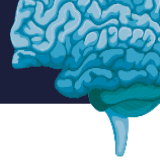
More Detailed Technical Information



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## I. Appendix A: Introduction

**Important notice:** qEEG and evoked potential assessment do not replace a medical-clinical checkup. They solely serve to generate comparable physiological data in different cognitive states. No neurologic diagnostic statement will be made. A neurologic assessment must be done by a licensed Neurologist.

**Procedure:** EEG recording was computed according to the 10-20 placement using 19 scalp electrode caps. Brain electrical activity was digitally recorded on a NeuroAmp x23 System, using a linked ears reference montage. Impedances of less than 5k Ohms were achieved at all sites before recordings were initiated and kept >5k Ohms at all times during recording. The signal was digitally processed by a quantitative topographic analysis system (ERPrec software), band passed from 1-50Hz, and saved on a local disc.

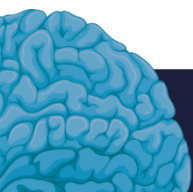
The client was seated 1.5m in front of a display monitor. The EEG was recorded in relaxed condition with eyes closed (EC) and eyes opened (EO) for 10 Minutes each and saved. After a short break, a visual or auditory continuous performance task (ACPT/VCPT) was presented on the monitor and performed during recording (task condition). The data was saved separately.

The digitized data is run through an artifact program where eye blinks, movement and other artifacts are identified and removed. The data is then additionally manually processed for artifacts and important transients are marked.

Corrected digital recording of the client is run through a mathematical program called Fourier-Transformation. This procedure analyzes the recorded brain waves and expresses the recordings as a mathematical function - time as a function of frequency - known as its frequency spectrum. To evaluate the data there are diverse descriptive and statistical repetitions which are performed to provide a spectral analysis, topometric analysis, covariance analysis, and comparisons between the states of data acquisition. The data collected is compared and evaluated against a known FDA approved data base.

This report aims to present the results and conclusion of this analysis. Also, therapeutic recommendations are given, according to dysfunction and cortical organization of the client's brain. Presented results are to be handled with caution, as they represent a momentary picture of a whole complex system.

The graphs represent an approximation of the source generator in the cortex calculated through mathematical procedures. Hence the calculated localization can differ from the real source. Therefore, expert knowledge based on functional neuronal models should ultimately determine the clinical relevance of these findings.





## II. APPENDIX B: Questionnaires

### 1. Questionnaire: Personal and clinical data

#### General information

- Name (family name, given name) or code: **WESLEY DONTA**
- Date of birth (Day. Month. Year): **24.6.1989**
- Gender (M-male, F-female): **M**
- Handed (L- left, R – right, ambidextrous): **R**
- Reason of having QEEG/ERP assessment: **Depression**
- Medication taken now: **none**

#### Pre- and post-natal history

- Birth trauma and/or hypoxia: **NA**
- Early development, such as started to talk/walk too late: **NA**
- Head trauma (with loss of consciousness): **NA**
- Poor grades in school, poor performance at work: **Sometimes**

#### General Brain Regulation

- Often having headaches and/or migraines: **none**
- Feels weak and passive during daytime: **No**
- Sleep-related difficulties: **Yes, restless sometimes**
- Abuses alcohol or drugs: **Sometimes**
- Has history of seizures: **No**

#### Sensory system

- Perceptual difficulties in vision, hearing, touch...such as dyslexia, paresis, neglect...: **No**
- Difficulties in social interaction and communication, autistic spectrum: **No**

#### Motor system

- Motor-related difficulties, such as fine motor, tremor, rigidity, apraxia...: **No**

#### Executive system

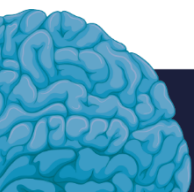
- Attention difficulties: **No**
- Impulsiveness: **Sometimes**
- Difficulties in correcting behavior: **Sometimes**
- Psychosis (hallucinations, delusions...): **No**

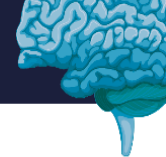
#### Affective system

- Occupied by mostly positive thoughts, manic: **No**
- Occupied by mostly negative emotions, depressed: **yes**
- Anxious: **Sometimes**

#### Memory system

- Poor memory for recent events: **No**
- Other forms of memory deficit: **No**

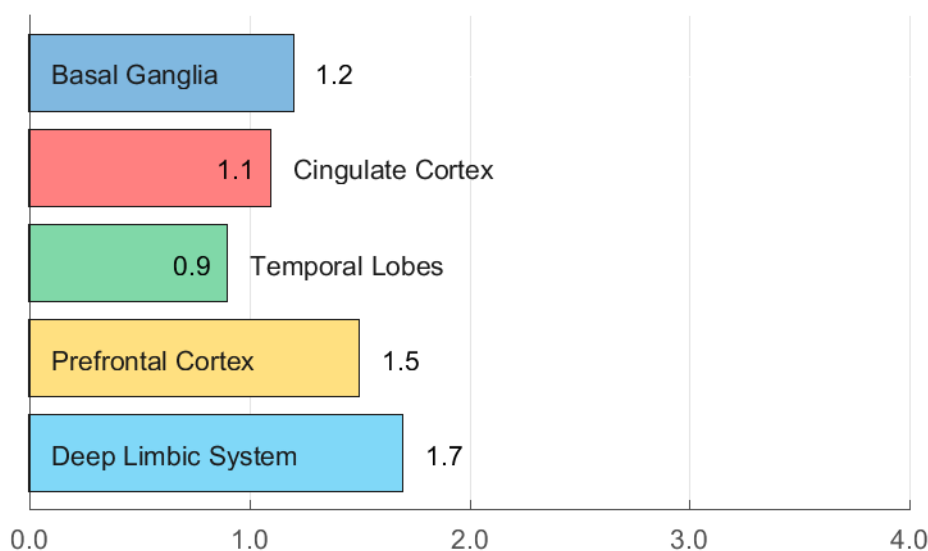




## 2. Questionnaire: Symptoms and Cortical Networks (Amen)

The relations between answers to the questions of the everyday functioning questionnaire and different brain structures have been researched. The figure below shows the weight of stressors on each structure. As answering styles are highly variable between individuals, it cannot be stated if the stressor is significantly impairing everyday functioning or not. Nonetheless it is interesting to observe the differences between various structures.

### Graphic summary:

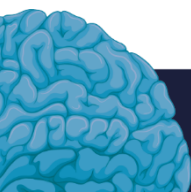


The answers do not show any significant values regarding basal ganglia, cingulate cortex and temporal lobes. The prefrontal cortex and deep limbic system show a (slightly) high level of strain. The self-rated distress is quite high and therefore clinically relevant.

- The attentional, emotional and executive system's networks achieve a special significance in the prefrontal cortex. The prefrontal cortex is the conductor of the brain, determining functions like planning, direction and control of actions. The prefrontal cortex receives information from all sensory modalities and deep limbic structures.
- The limbic system is responsible for emotional energy and related functions. In this questionnaire items enquiring about energy level or helplessness are related to this system. Attentional problems may arise indirectly because of high distractibility caused by emotional issues.

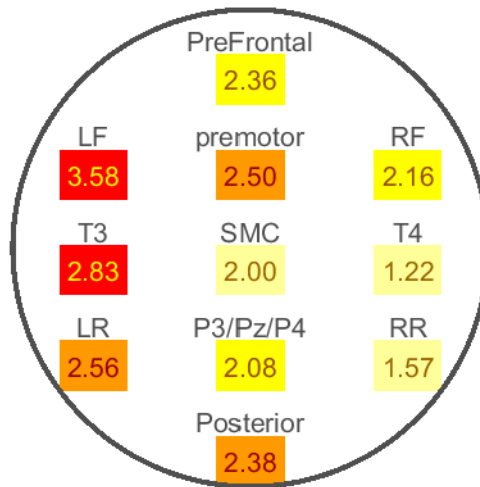
*Symptoms rated 'frequently' (3) and 'very frequently' (4):*

- No distinctive behaviors.





### 3. Questionnaire van Deusen



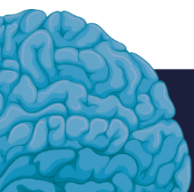
#### Summary of results:

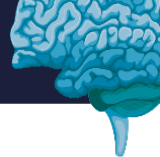
- Functions that have been allocated to the left hemisphere are strongly affected.
- Left frontal functions (increased self-blame or feeling of unhappiness) are strongly affected.
- Functions of the left medial temporal lobe (difficulties with information processing e.g. reading or orthography) are strongly affected.
- Both functions of the left parietal cortex and left superior temporal lobe (reading, orthography, logic-constructive processing) are strongly affected.

#### Symptom intensity rating:

*Symptoms rated 'frequently' (6) and 'very frequently' (7):*

- Not afraid when others would be (6)





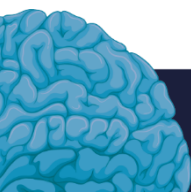
4. ADHD-Questionnaire

Type	Question	Score
Type 1	<b>Combined ADHD-Type</b> → <i>Questions on Attention &amp; Hyperactivity</i> Meets criteria for <i>Inattentiveness</i> questions as well as <i>Hyperactivity/ Impulsivity</i> questions.	0
	<b>Inattentiveness Questions</b> → <i>Questions on Attention</i> 6 (5) or more ratings of 3 or 4 are required to diagnose this type; with more than 4 such ratings suggesting this type of ADD.	0
	<b>Hyperactivity-/Impulsivity Questions</b> → <i>Questions on Hyperactivity</i> 6 (5) or more ratings of 3 or 4 are required to diagnose this type; with more than 4 such ratings suggesting this type of ADD.	0
Type 2	<b>Inattentive ADD</b> → <i>Questions on Attention</i> 6 (5) or more values of 3 or 4 are required to diagnose this type; with more than 4 such ratings suggesting this subtype of ADD; but not 6 or more such ratings for <i>Hyperactivity-/Impulsivity</i> questions.	0
Type 3	<b>Over focused ADD</b> → <i>Questions on Over Focusing</i> Meets criteria for <i>Inattentiveness</i> , as well as 6 or more such ratings in <i>Over Focusing</i> questions.	1
Type 4	<b>Emotion regulation Comorbidity</b> → <i>Questions on Emotion regulation</i> Meets criteria for <i>Inattentiveness</i> , as well as 12 or more such ratings in <i>Emotion regulation</i> questions.	5

Anon Ymized does not meet the cut-off (5 criteria) neither for inattention nor hyperactivity. This means that with a high probability the diagnosis of ADHD does not apply to Anon Ymized.

Summary of high and very high rated behaviors ( ● Attention, ● Hyperactivity/Impulsivity, ● Emotion regulation und ● Over Focusing):

- has periods of withdrawal and in this episode shows no emotion (3)
- has a family history of violence or tantrums (3)
- has often or recurrent mood swings (3)
- has periods of irrational, stupid or unreasonable behavior (3)
- has periods of increased impulsivity (3)
- has a strong tendency to fall into negative thoughts, has the same thoughts repetitively (3)



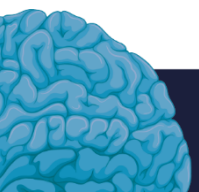


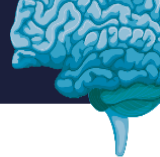
## 5. Depression questions BDI-II

BDI-II (Beck Depression Inventory) is a clinical questionnaire measuring severity of depression. The final score for this questionnaire is 21 - moderate depression.

List of all affected items:

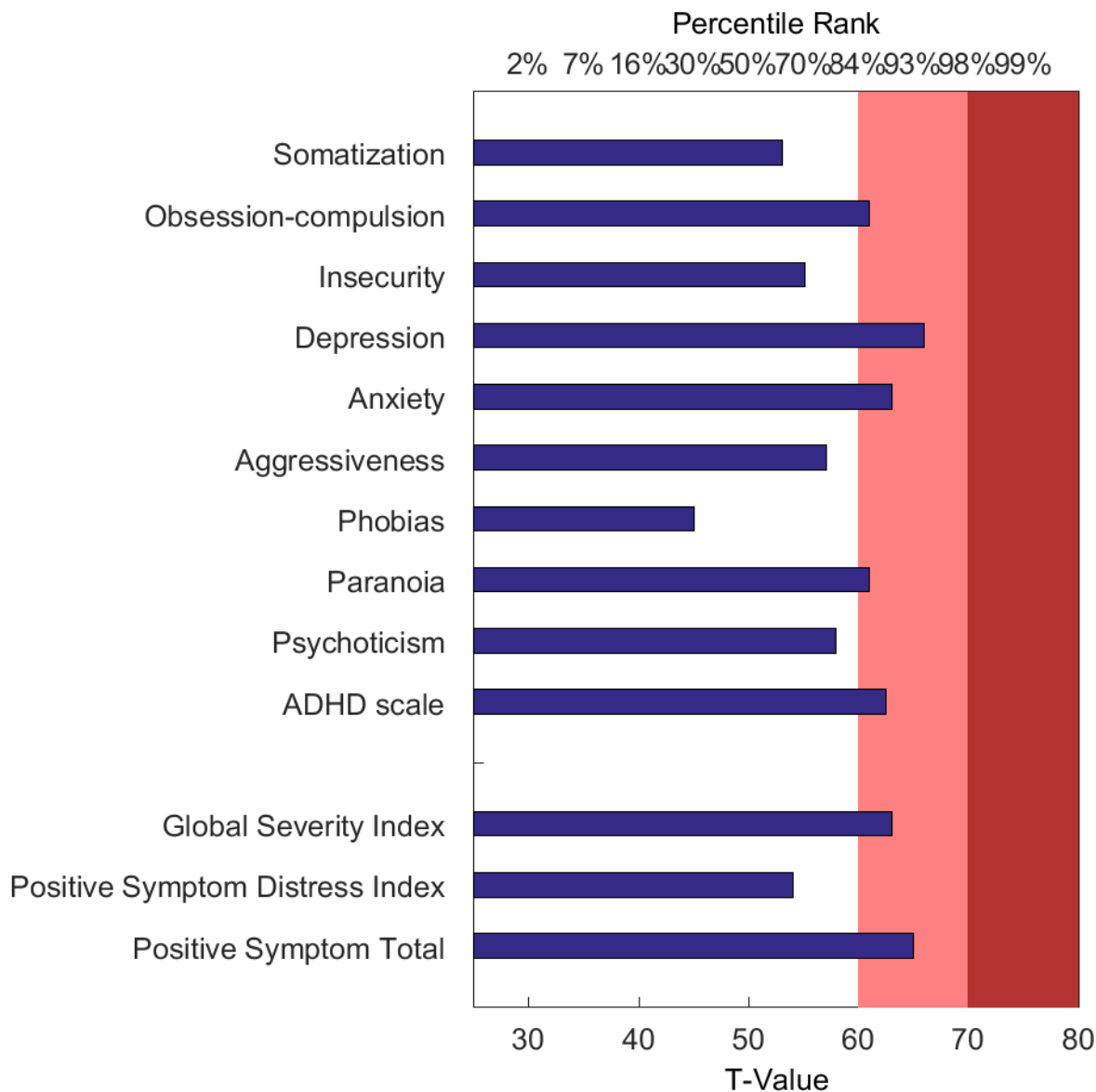
- Sadness - *I feel sad much of the time.*
- Pessimism - *I feel my future is hopeless and will only get worse.*
- Past Failure - *I feel I am a total failure as a person.*
- Guilty Feelings - *I feel guilty over many things I have done or should have done.*
- Self-Dislike - *I dislike myself.*
- Self-Criticalness - *I criticize myself for all of my faults.*
- Suicidal Thoughts or Wishes - *I have thoughts of killing myself, but I would not carry them out.*
- Loss of Interest - *I am less interested in other people or things than before.*
- Worthlessness - *I feel more worthless as compared to other people.*
- Changes in Sleeping Pattern - *I sleep somewhat more than usual.*
- Loss of Interest in Sex - *I have lost interest in sex completely.*





### 6. SCL90 - Fragebogen

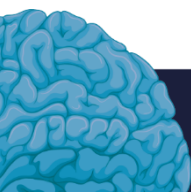
SCL-90®-S measures self-rated somatic and psychological problems during the last week. This rating scale is one of the most widely used self-rating scales to register psychological strain.

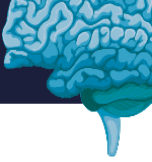


Summary of Symptom Checklist-90 by Derogatis, Eich, Gamma: The scales Depression, Anxiety and ADHD scale are within the abnormal range.

The following Scales are statistically significant:

- The SCL90-Scale "Obsession-compulsion" is slightly statistically significant. People who score high in this scale suffer from recurring thoughts, word or ideas they can't get out of their mind, memory issues, agitation due to forgetfulness and inattentiveness, feeling that they have difficulties to start anything, a need of doing everything in a slow and retarded manner to ensure that everything is done well and then the compulsion to check and double check everything they do; difficulties to make decisions, an empty head, attention problems or compulsions to repeat actions like touching, counting or washing.

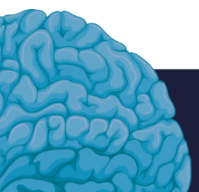


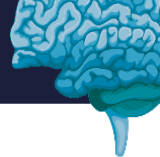


- The SCL90-Scale "Depression" is slightly statistically significant. People with overly high values suffer from decrease in their interest or pleasure in sex, loss of energy or slowing down of their movements or thoughts; they have suicidal thoughts, cry easily, are afraid of being caught, self-reproach, feelings of loneliness, melancholy, worries, lack of interest, despair about the future, that everything is exhausting or feeling of being worthless.
- The SCL90-Scale "Anxiety" is slightly statistically significant. People with high scores in this scale suffer from nervousness or inner trembling, shaking, sudden fright without good reason, fear, heart beats or heart racing, feeling tense or excited, panic attacks, extreme restlessness that enables them to sit still, constant feeling that something bad will happen or horrible thoughts and visions.
- The SCL90-Scale "Paranoia" is slightly statistically significant. People with high scores in this scale feel that others are responsible for the own disgrace or problems; they are suspicious and do not trust others; they feel that no one acknowledges their achievements and that others would just take advantage of them.
- The ADHD-Scale is slightly statistically significant. People with high scores in this ADHD scale show noticeable problems related to impulse control and regulation. According to the included items, problems such as nervousness without inner trembling, irritability towards emotionally loaded questions, emotional releases or feelings of restlessness or tension. Sometimes they are unable to start tasks due to internal blockade. Some people with this profile frequently engage in conflicts with others which is perceived as distressing.
- The SCL90-Scale "Global Severity Index" is slightly statistically significant. The GSI (Global Severity Index) measures overall psychological distress level.
- The SCL90-Scale "Positive Symptom Total" is slightly statistically significant. The PST (Positive Symptom Total) informs about the number of self-reported symptoms that cause distress.

#### Questions not answered:

- Unwanted thoughts, words, or ideas that won't leave your mind **[no answer selected!]**
- The idea that someone else can control your thoughts **[no answer selected!]**





### III. APPENDIX C: Neuropsychological Measures:

#### 1. Performance

Performance was recorded during the visual continuous performance task (VCPT). The measures can be interpreted regarding impulsivity (commission errors), attention (omission errors, missed trials), reaction times (msec) and variability of reaction times.

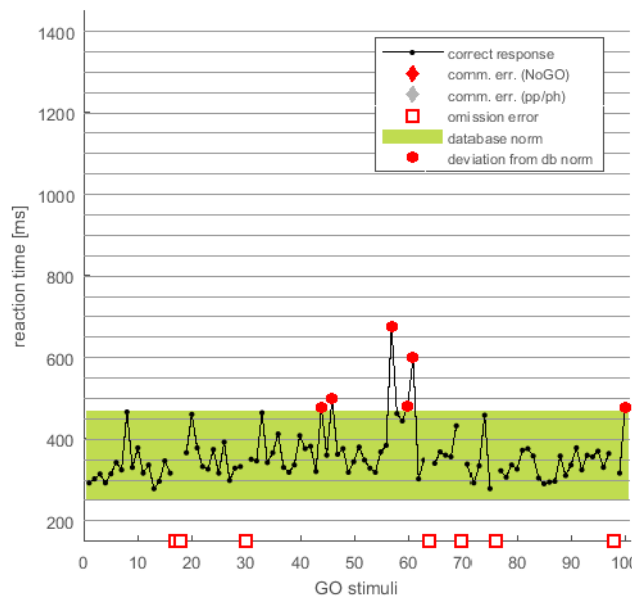
#### VCPT:

Group name	Correct	Omission	Commission	RT	VR(RT)
a-a GO	93.0 %	7 (0.139)	0	361 (0.995)	6.8 (0.661)
a-p NoGO	100.0 %	0	0 (0.516)	-	-

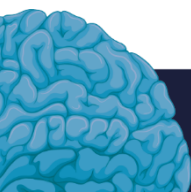
Number of processed trials: **396** (a-a GO: **100**, a-p NoGO: **100**, p-p: **98**, p-h: **98**)

Overview: The values of Anon Ymized are within the norm with respect to Impulsivity, Reaction time and Response consistency, and just sufficient with respect to Attention (but not statistically significant).

Figure 1: below, reaction times are presented over time. Red dots represent reaction times below or above database (DB) norm levels. Black dots represent correct responses, red squares omission errors (inattentiveness) and red crosses commission errors (impulsivity).



The analysis of Anon Ymized's reaction times compared to peers (green area) show a good consistency in reaction time.



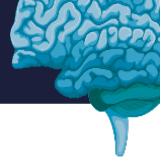
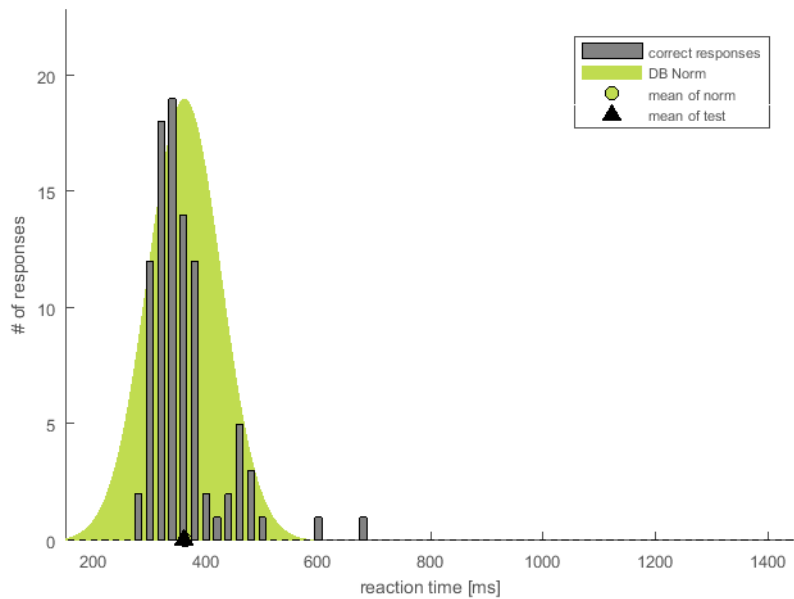
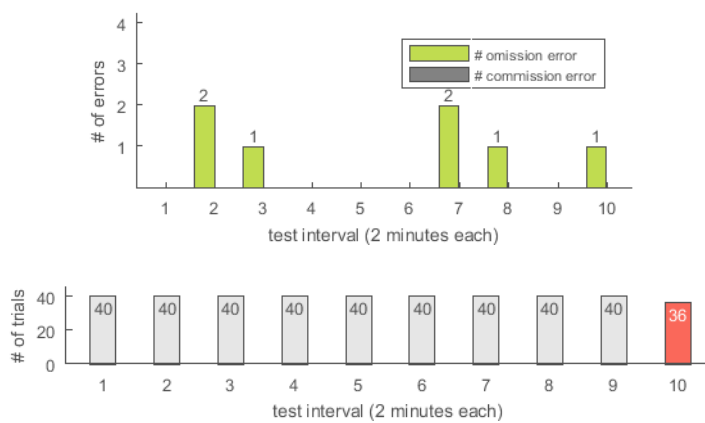


Figure 2: below, reaction times are represented as a function of occurrence. The distribution of grey bars indicates how stable the reaction times were (variability of reaction times). Wide distributions show unstable performance, while narrow distributions can be interpreted as stable performance. The green area indicates the database norm.

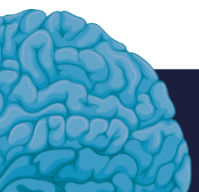


The average reaction time of Anon Ymized (black triangle) is similar to his peers (green dot).

Figure 3: below, the distribution of errors over time (intervals of 2 min) is illustrated. More errors towards the end of the task indicate growing fatigue in the course of performance.



There are 7 errors throughout the entire test.





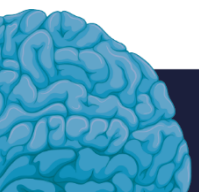
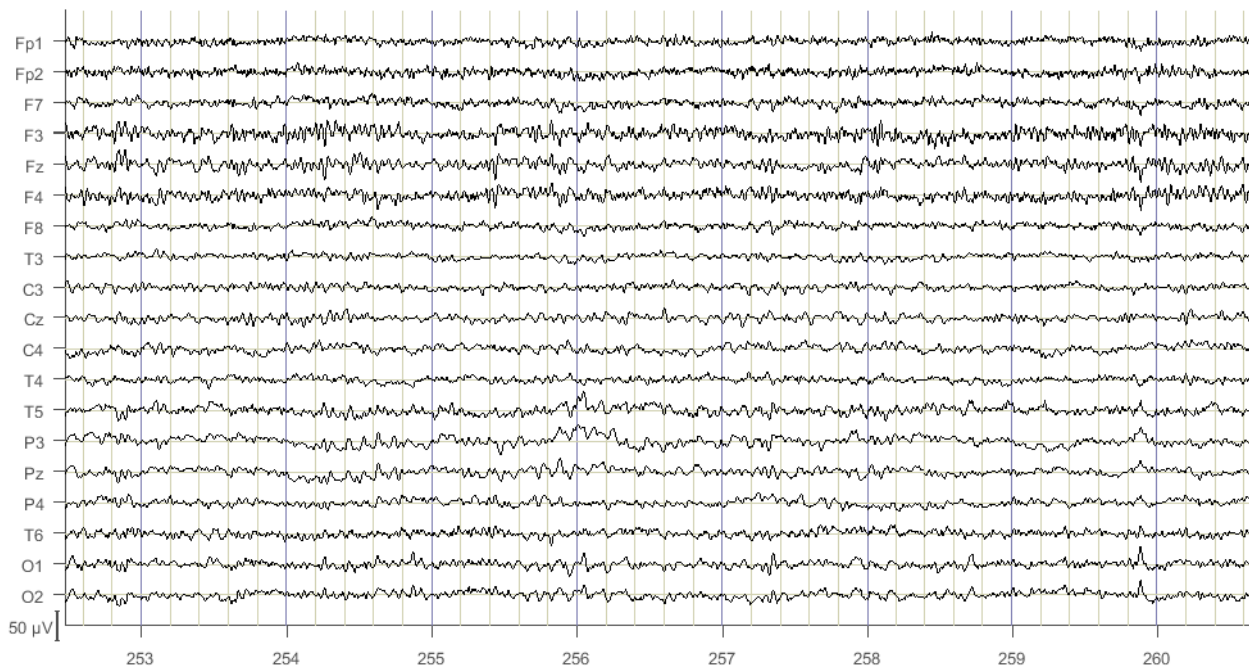
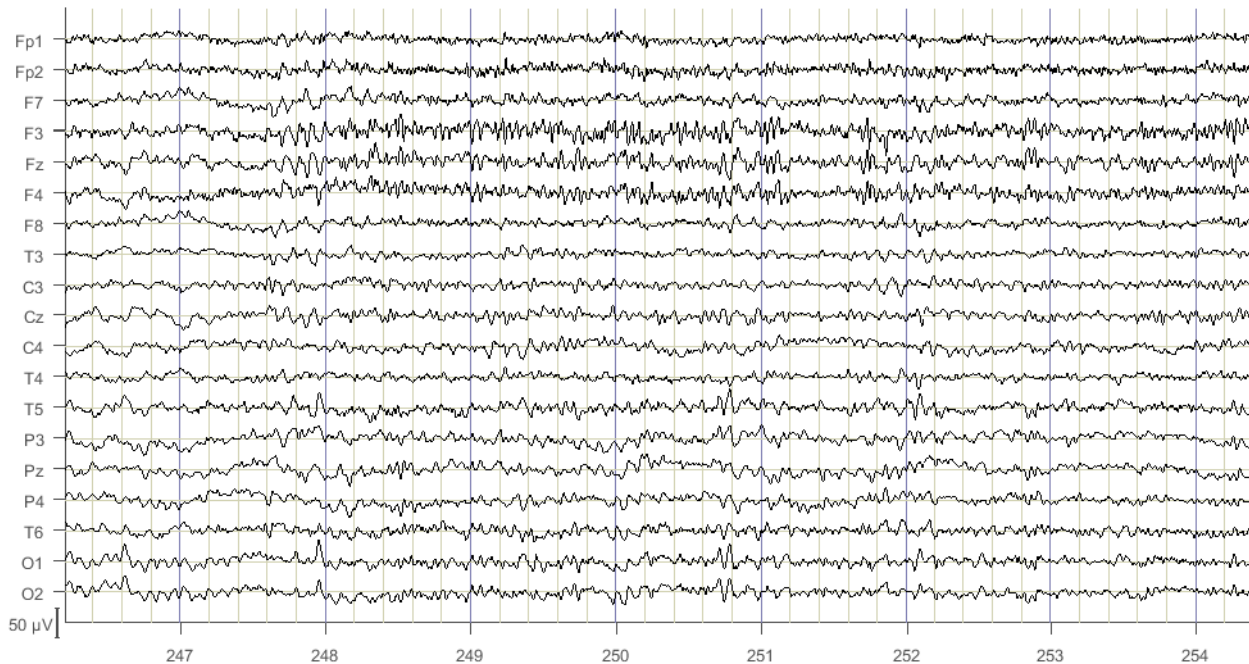
#### IV. APPENDIX D: Evidence-based investigation by measuring neurophysiological brain functions (functional neurophysiology, biomarkers):

##### 1. Spontaneous EEG

EEG was recorded during relaxation with closed eyes (6 minutes) and opened eyes (6 minutes). From this recording, spectral data was calculated and compared with database population. Database comparison was calculated with weighted montage.

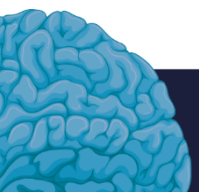
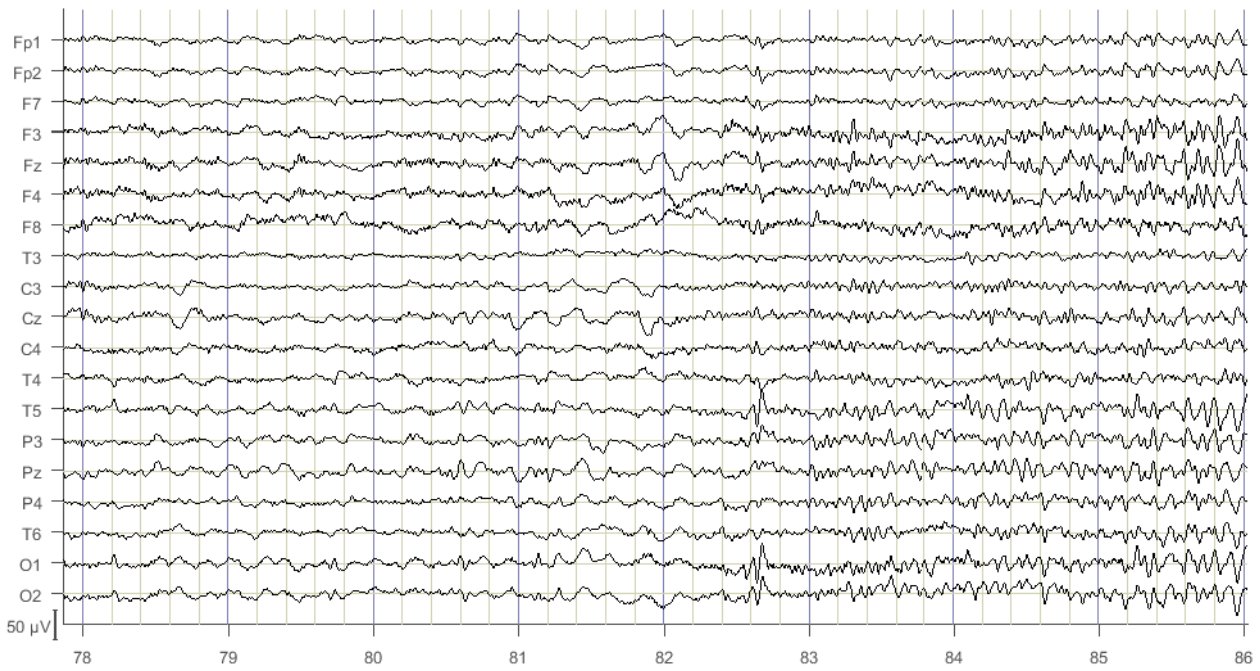
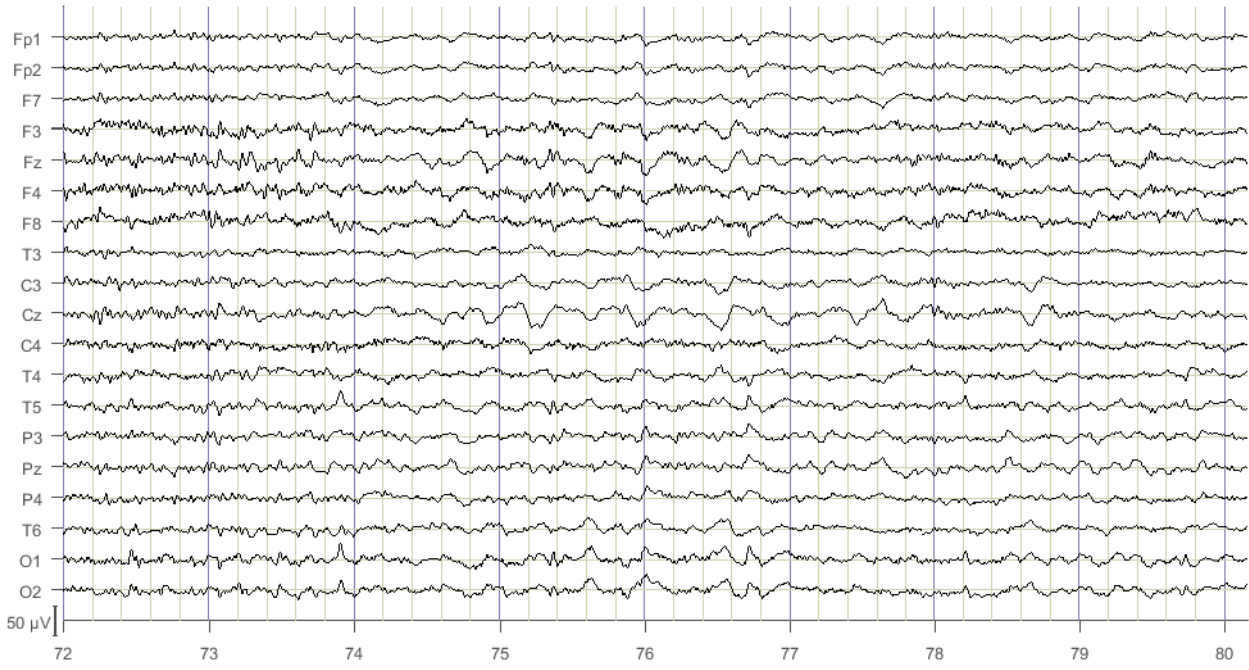
##### Fragment:

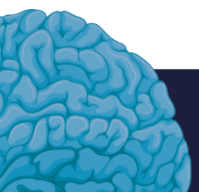
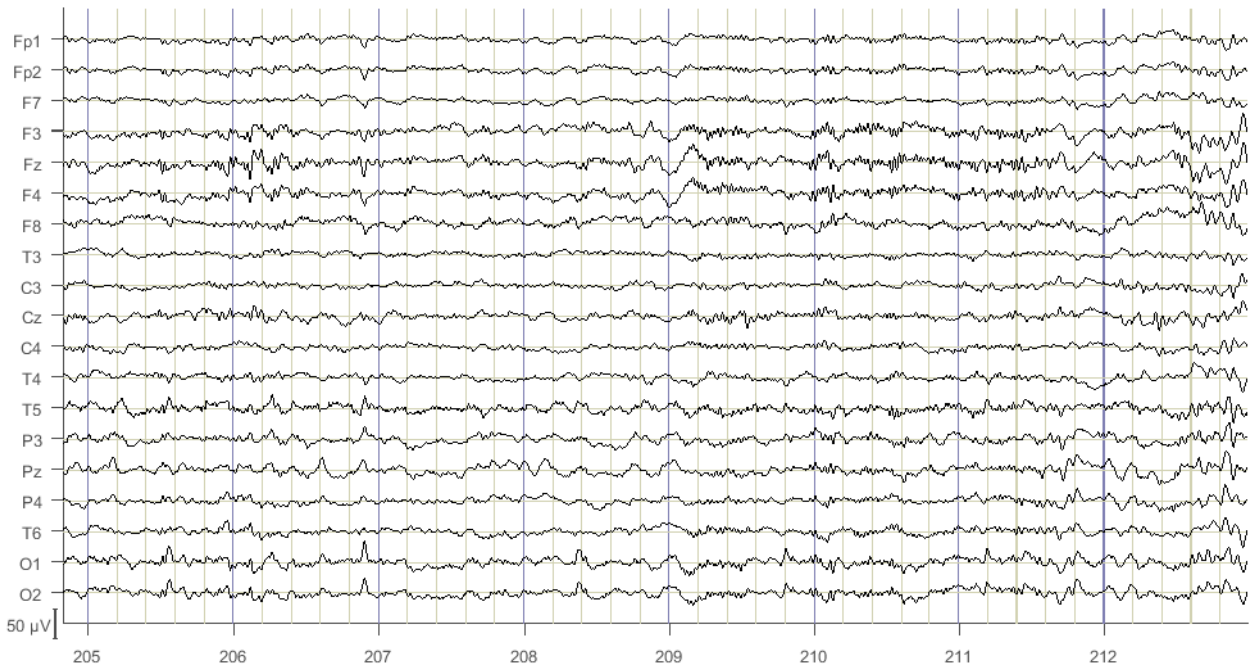
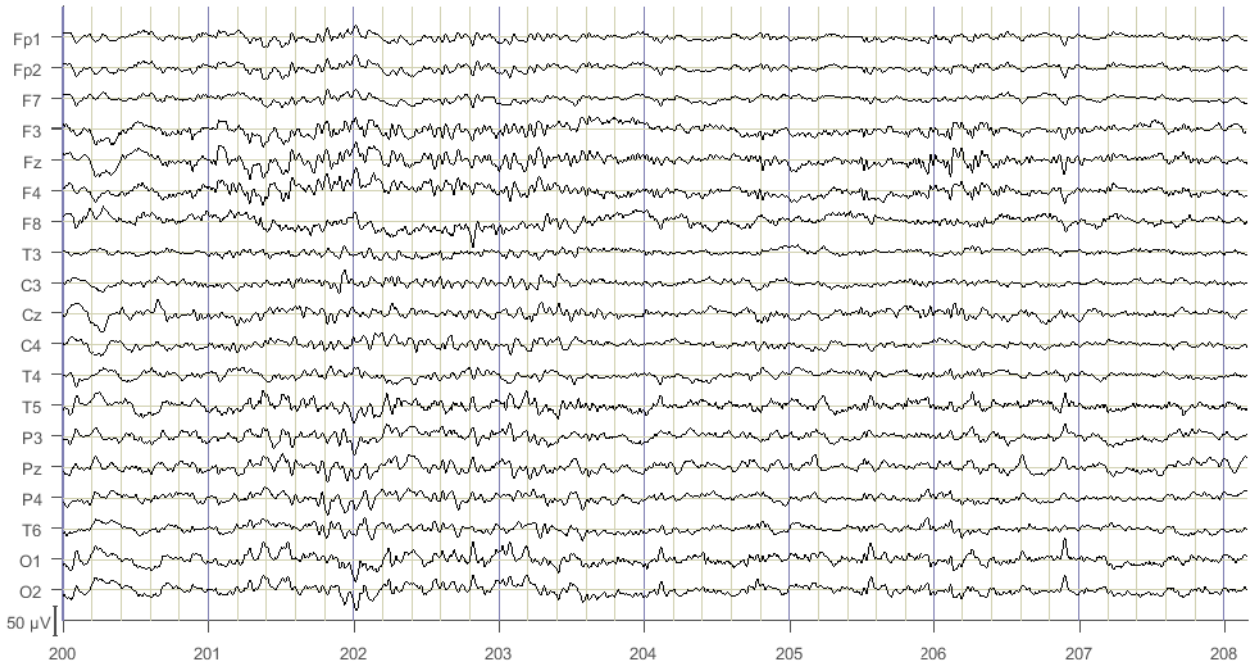
Eyes opened





Eyes closed







## 2. Spike Detection

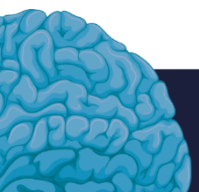
Spikes are sharp transient waves representing interictal epileptiform activity in the brain. The spike detection procedure uses morphological filtering of EEG signals in order to detect such transient activity and separate it from normal background waves.

### Eyes Closed

No significant events were detected.

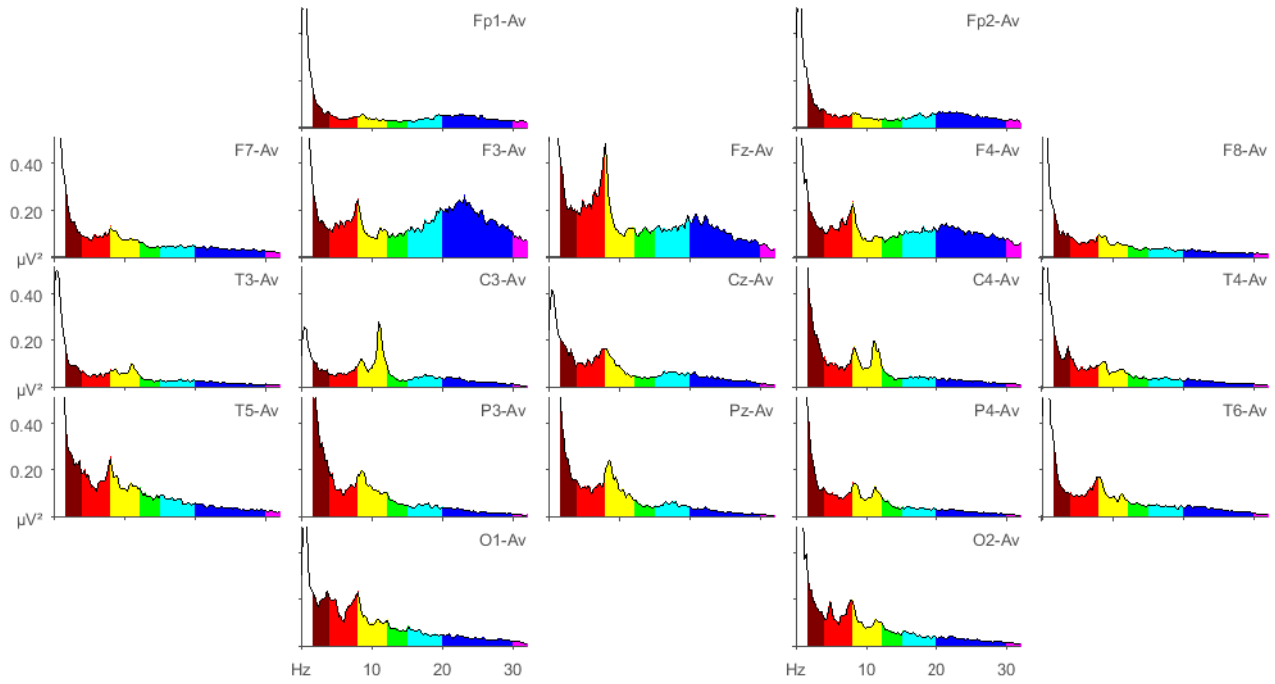
### Eyes Opened

No significant events were detected.

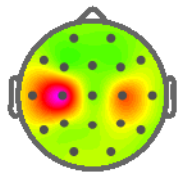
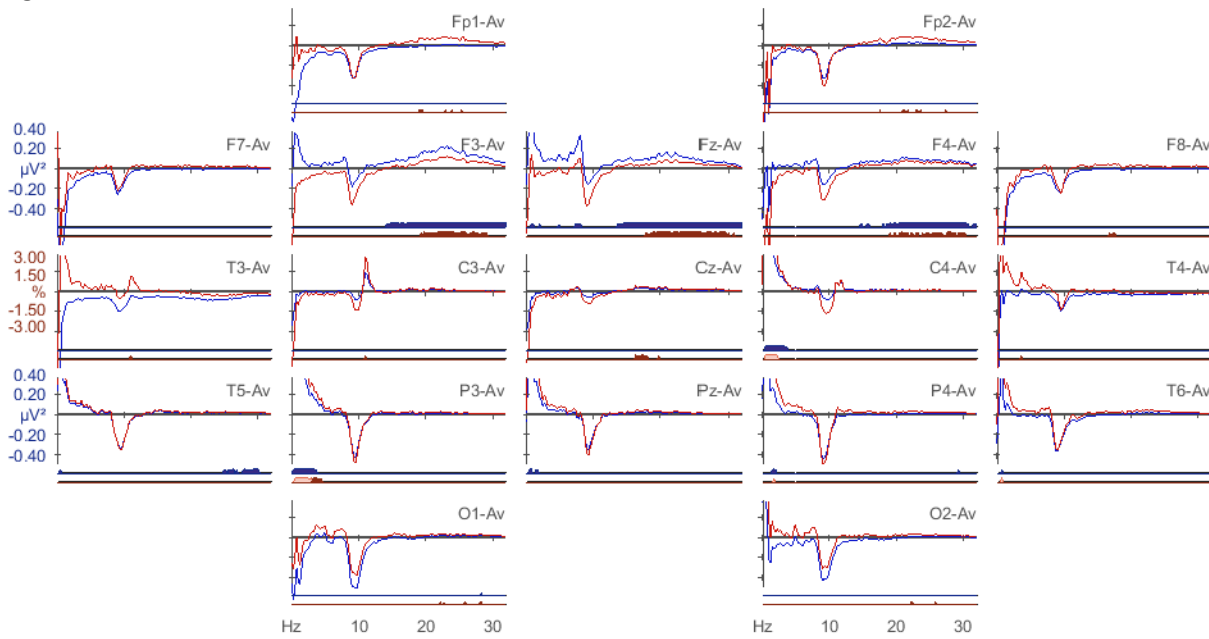




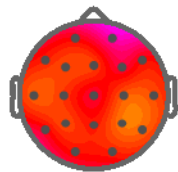
Spectral data: eyes opened (5:28)



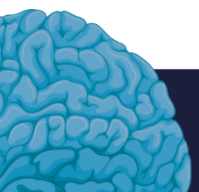
comparison with reference data: Difference (blue: absolute, red: relative). Bars on the bottom line indicate significant deviations from norm.



% [10.99 Hz, z=2.08]  
-4 -2 0 2 4

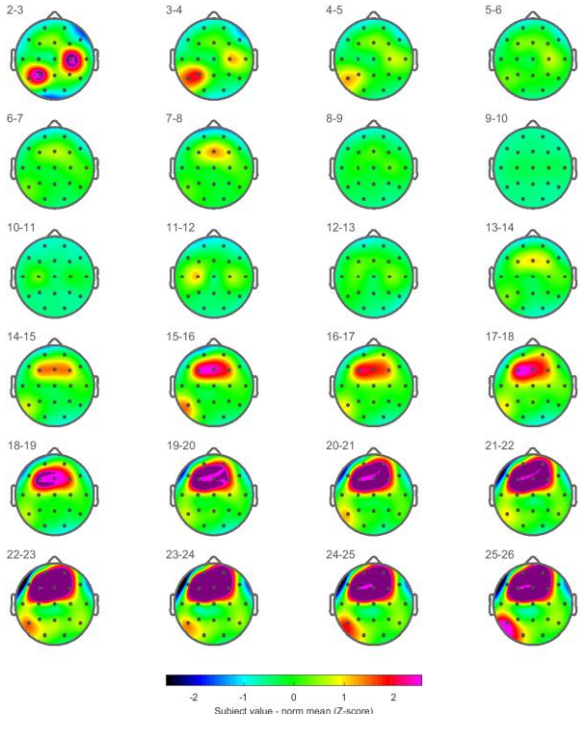


% [16.85 Hz, z=2.13]  
-1 0 1

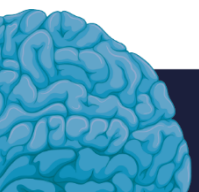
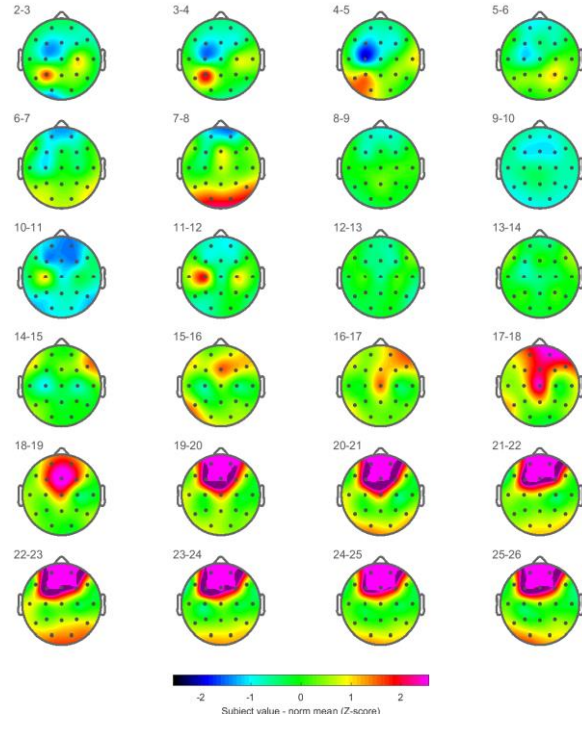




Database - Subject (absolute):

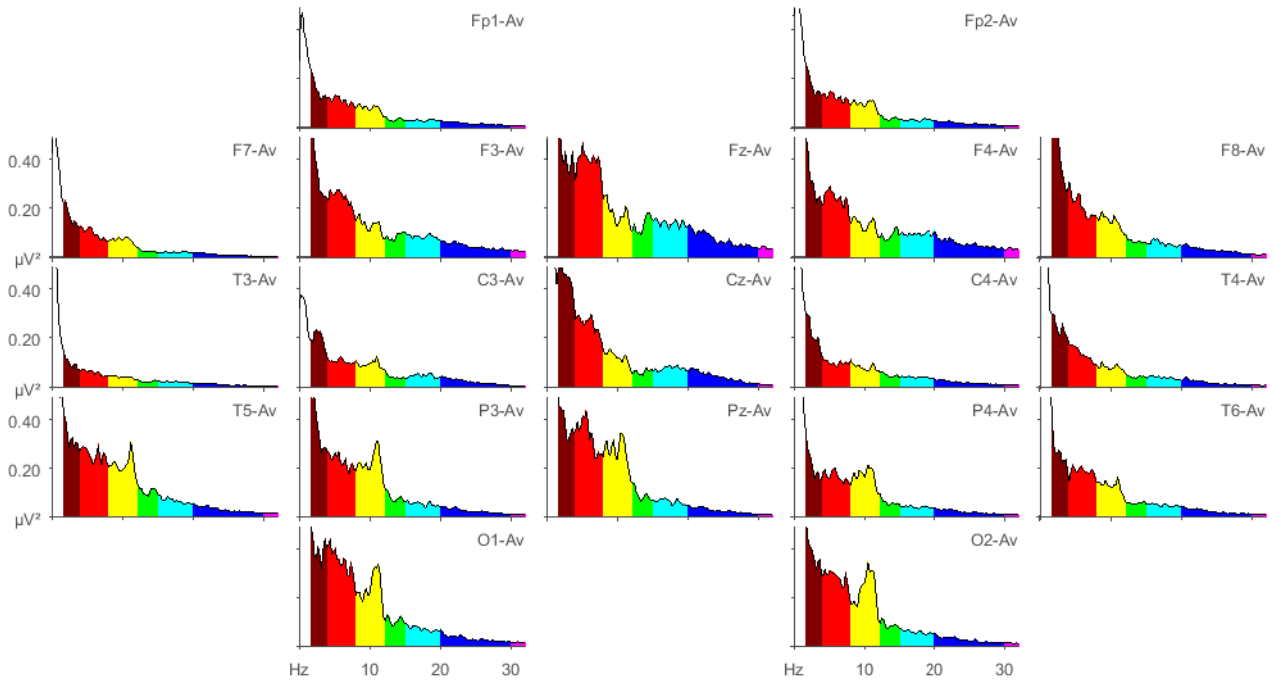


Database - Subject (relative):

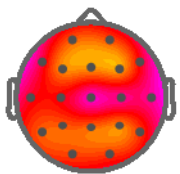
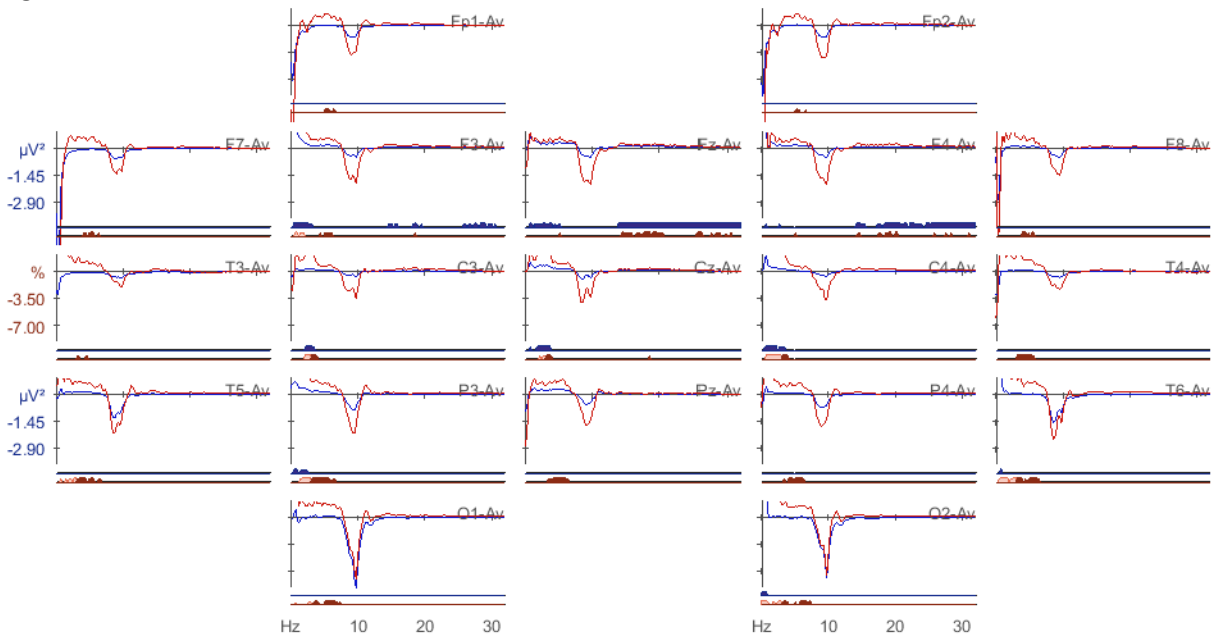




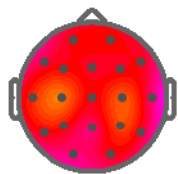
**Spectral data: eyes closed (5:24)**



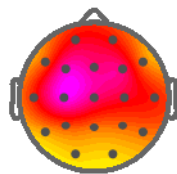
**comparison with reference data:** Difference (blue: absolute, red: relative). Bars on the bottom line indicate significant deviations from norm.



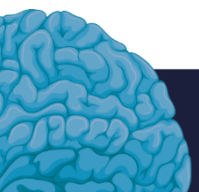
% [3.42 Hz, z=2.78]  
-2 0 2

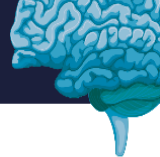


% [4.88 Hz, z=1.67]  
-2 0 2

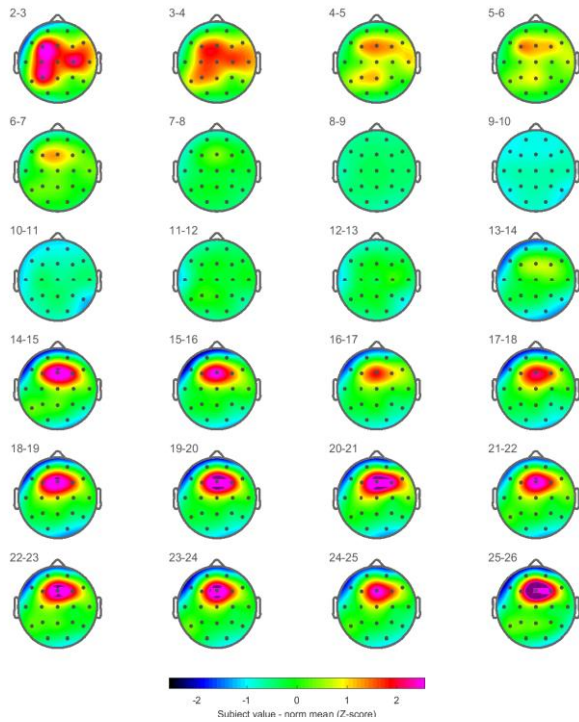


% [18.55 Hz, z=2.24]  
-0.5 0 0.5

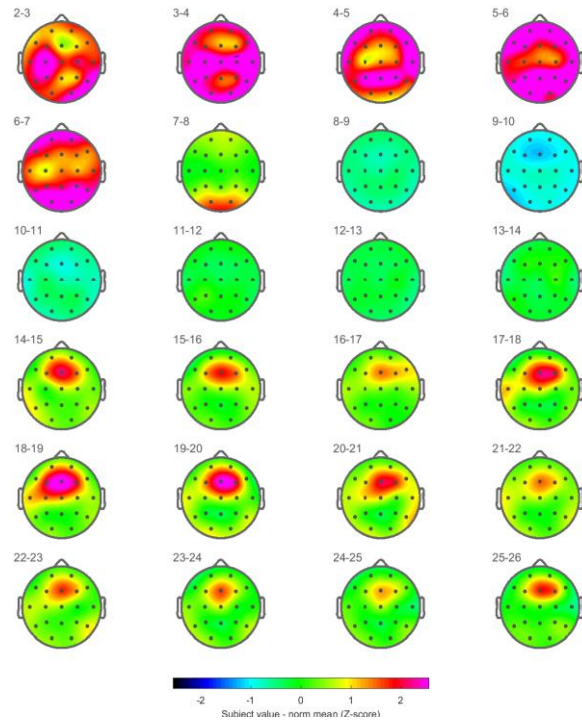




Database - Subject (absolute):

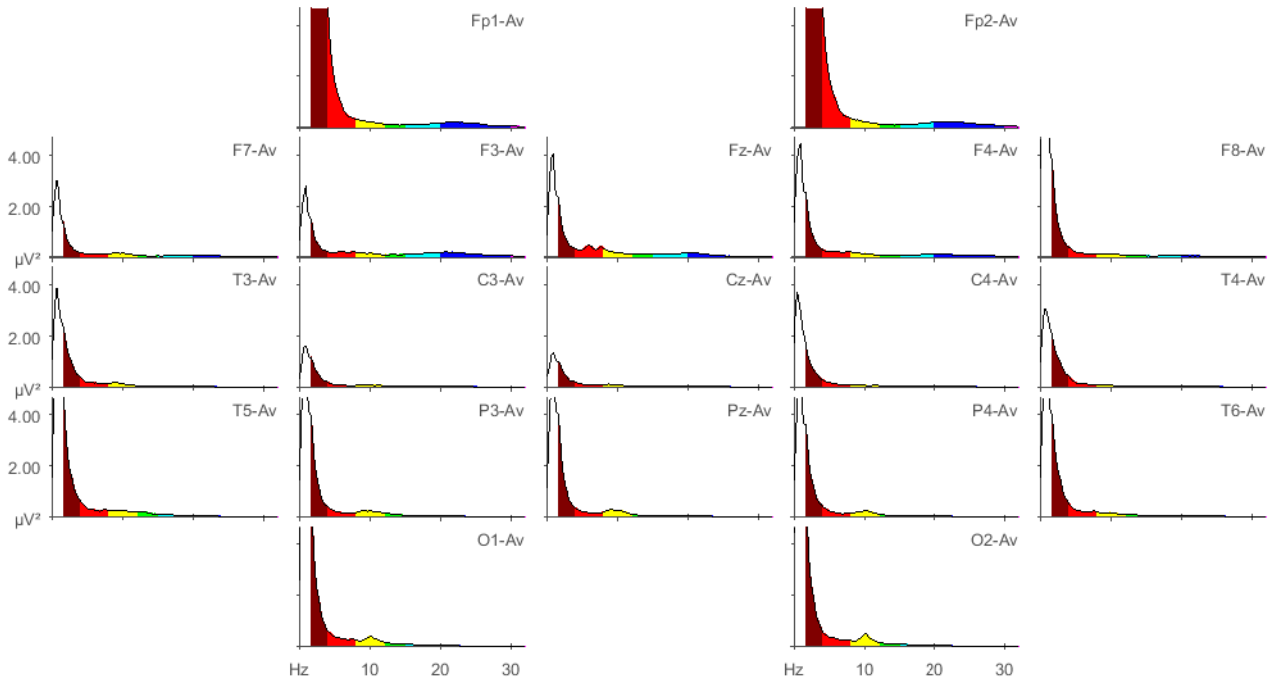


Database - Subject (relative):

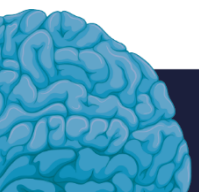
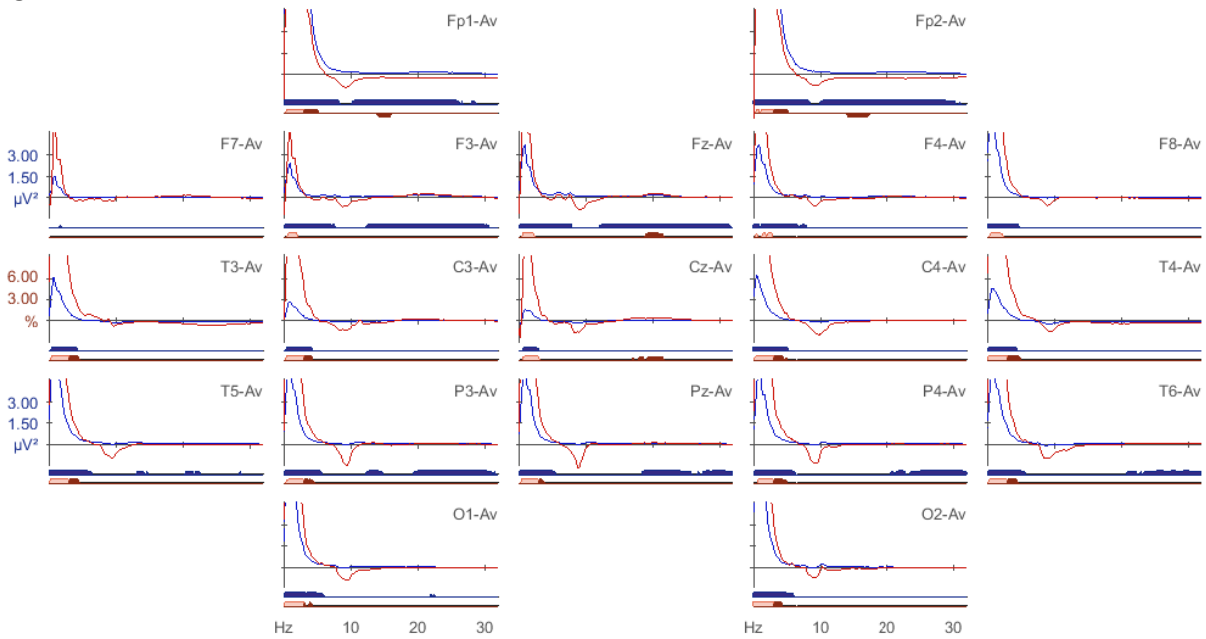




Spectral data: VCPT (20:47)

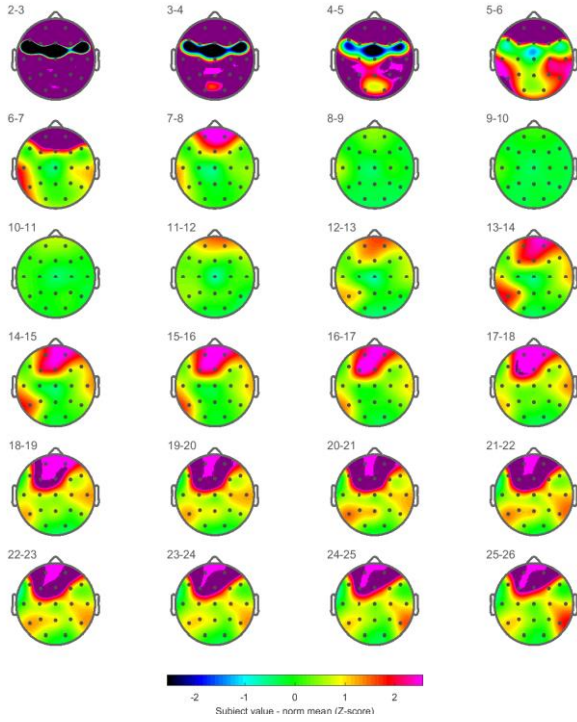


comparison with reference data: Difference (blue: absolute, red: relative). Bars on the bottom line indicate significant deviations from norm.

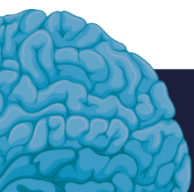
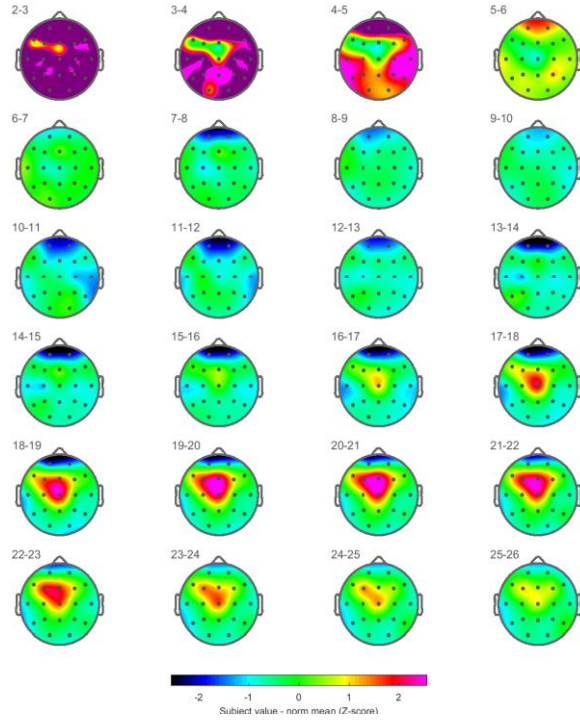




Database - Subject (absolute):

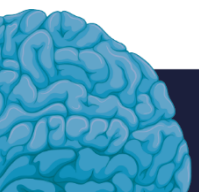


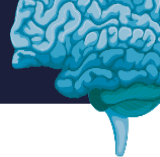
Database - Subject (relative):





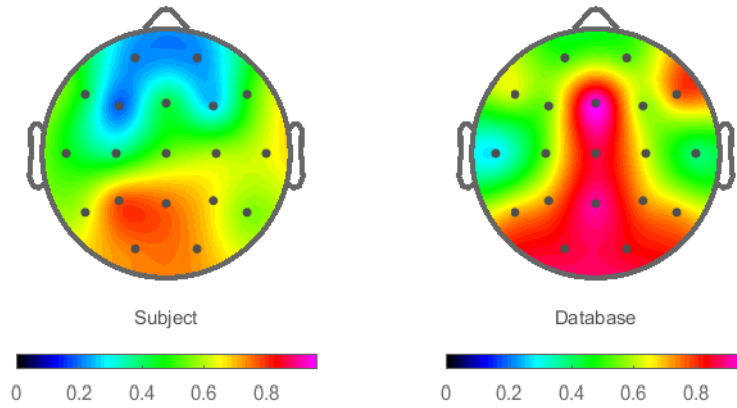
The graphs represent an approximation of the source generator in the cortex calculated through mathematical procedures. Hence the calculated localization can differ from the real source. Therefore, expert knowledge based on functional neuronal models should ultimately determine the clinical relevance of these findings.



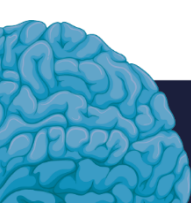


**Theta/Beta-Ratio**

The Theta/Beta ratio gives an index as to the quality of an individual's ability to pay attention. This ratio is negatively correlated with age, as it is expected to be larger in younger children, smaller in adulthood and rises again in later adulthood. This is measured in a GO/NOGO Test where it is expected that a higher ratio will produce more errors. This ratio has been demonstrated in the research of Monastra (Monastra et. al., 1999).



<b>Version</b>	v01	v01	v01
<b>Eyes open</b>	<b>Fz</b>	<b>Cz</b>	<b>Pz</b>
<b>Subject (Stanine)</b>	<b>-0.01 (12.3%   3)</b>	<b>0.09 (11%   3)</b>	<b>0.28 (49.7%   5)</b>
<b>Eyes closed</b>	<b>Fz</b>	<b>Cz</b>	<b>Pz</b>
<b>subject (Stanine)</b>	<b>0.34 (31.3%   4)</b>	<b>0.56 (39.9%   4)</b>	<b>0.94 (84.2%   7)</b>
<b>VCPT</b>	<b>Fz</b>	<b>Cz</b>	<b>Pz</b>
<b>Subject (Stanine)</b>	<b>0.21 (28.5%   4)</b>	<b>0.12 (13.7%   3)</b>	<b>0.46 (66.9%   6)</b>



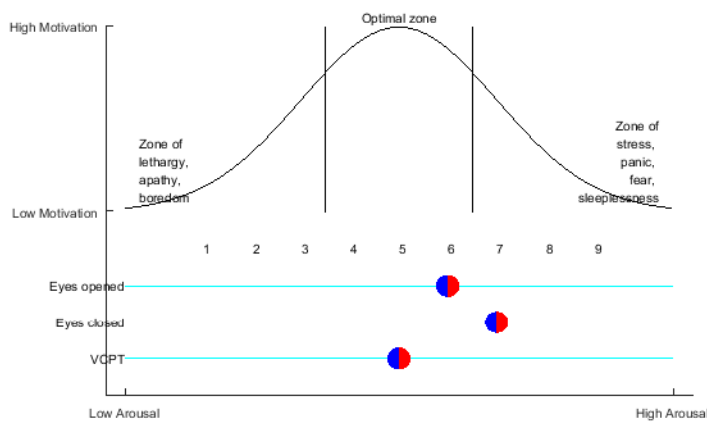


**Arousal**

This index represents the arousal caused by the vegetative nervous system. It is specifically the parietal and occipital branch projected from the insula to the respective regions. The index is calculated separately for each hemisphere. The patient’s index is set in bold; the arousal index of the age group is shown in parentheses. Scientific papers on this index are being prepared. Preliminary results show that this index hints at patient’s level of apathy, lethargy, unrest, and stress. The higher the value, the higher the inner unrest.

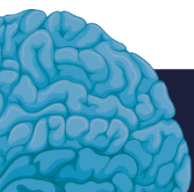
<b>Version</b>	v10	v10
<b>Eyes open</b>	<b>O1 relative Left hemisphere</b>	<b>O2 relative Right hemisphere</b>
<b>Subject (stanine)</b>	<b>6.03</b> (62.4%   6)	<b>6.18</b> (65.6%   6)
<b>Eyes closed</b>	<b>O1 relative Left hemisphere</b>	<b>O2 relative Right hemisphere</b>
<b>Subject (stanine)</b>	<b>4.74</b> (81.6%   7)	<b>5.00</b> (85.1%   7)
<b>VCPT</b>	<b>O1 relative Left hemisphere</b>	<b>O2 relative Right hemisphere</b>
<b>Subject (stanine)</b>	<b>5.46</b> (48.9%   5)	<b>5.72</b> (56.8%   5)

**Arousal in relationship to focusing**



**Figure 1: Arousal-Index of the left hemisphere (blue) and the right hemisphere (red) in eyes opened, eyes closed and VCPT.**

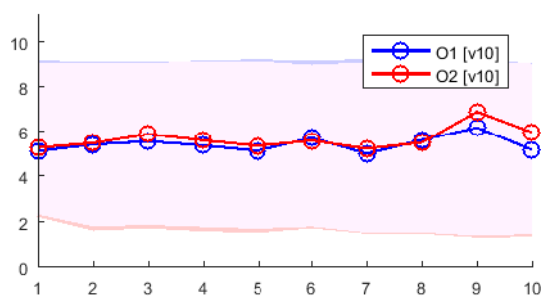
During eyes opened as well as during VCPT, the index shows balanced values for Anon Ymized. During eyes closed, the index is increased. This usually means that, during eyes closed, no relaxation takes place. Often, this indicates that the sleeping habits have to be examined separately.



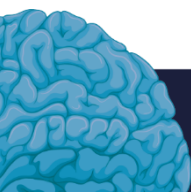


### Arousal modulation during VCPT

A VCPT recording lasts around 21 minutes. This data was split into 10 equally long epochs, with each epoch lasting for around 125 seconds. Arousal was measured for each epoch. Left hemisphere (O1) and right hemisphere (O2) were recorded separately.



For Anon Ymized, both hemispheres are synchronized.

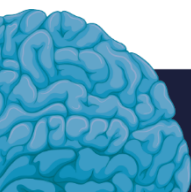
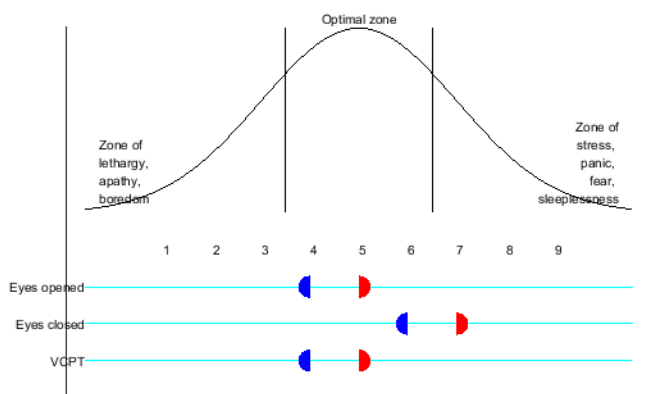


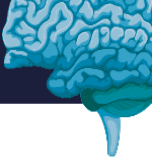


**Central-sensory Index (relative power, beta-gamma squared); CSI**

The central sensory index reflects the organization and functioning of the somatosensory areas. They receive information from many different systems: thalamic nuclei, basal ganglia, limbic system and cingulate system. Functionally, the CSI gives clues to the way of processing: low values are associated with increased introspection/introversion, high values with increased external orientation or extraversion. In children, the CSI provides important information regarding processing in a stimulus-intensive context. In adults, essential indications on the dimension anxiety/internal excitement can be obtained. The scientific publication is still pending.

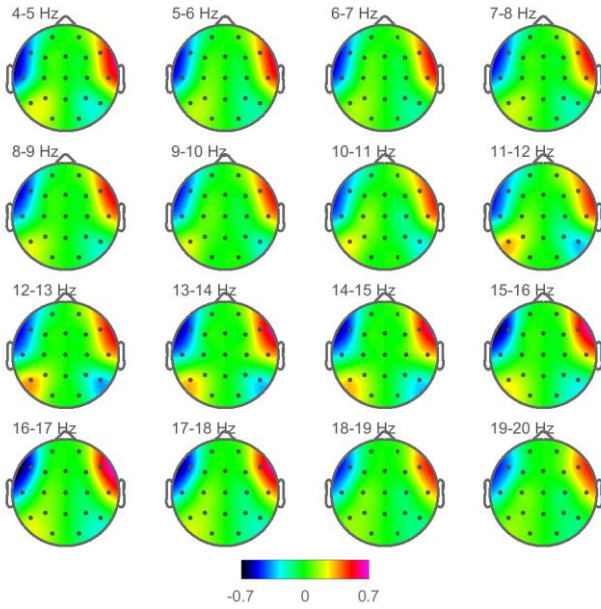
<b>Version</b>	v02	v02
<b>Eyes open</b>	<b>Left hemisphere</b>	<b>Right hemisphere</b>
<b>Subject (Stanine)</b>	<b>-8.01 (35.3%   4)</b>	<b>-6.73 (55.8%   5)</b>
<b>Eyes closed</b>	<b>Left hemisphere</b>	<b>Right hemisphere</b>
<b>Subject (Stanine)</b>	<b>-8.72 (61.8%   6)</b>	<b>-7.23 (79.6%   7)</b>
<b>During VCPT</b>	<b>Left hemisphere</b>	<b>Right hemisphere</b>
<b>Subject (Stanine)</b>	<b>-7.31 (40%   4)</b>	<b>-6.36 (55.4%   5)</b>



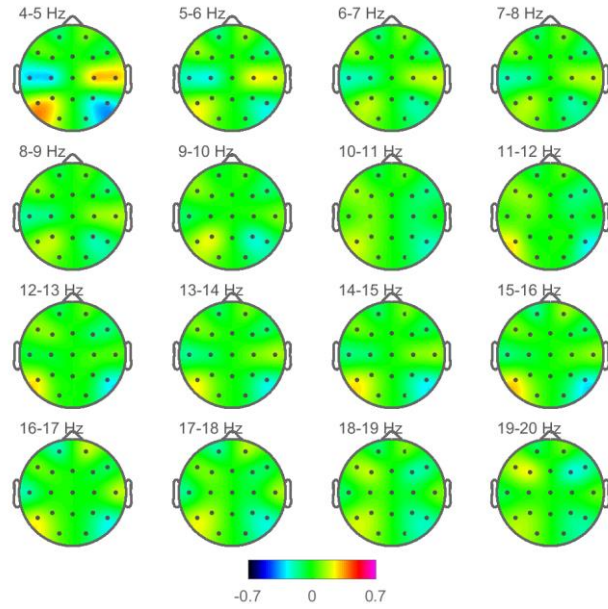


### Asymmetry

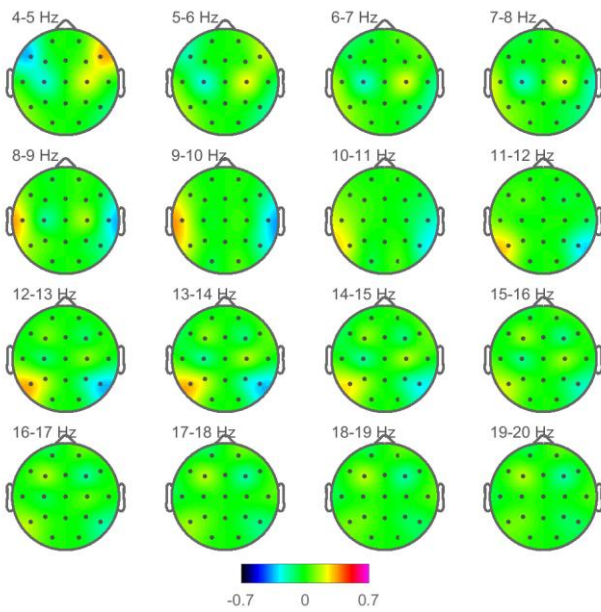
Asymmetry eyes closed:



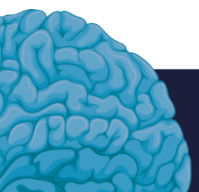
Asymmetry eyes open:



Asymmetry VCPT:



Without significant findings

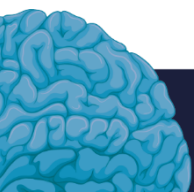
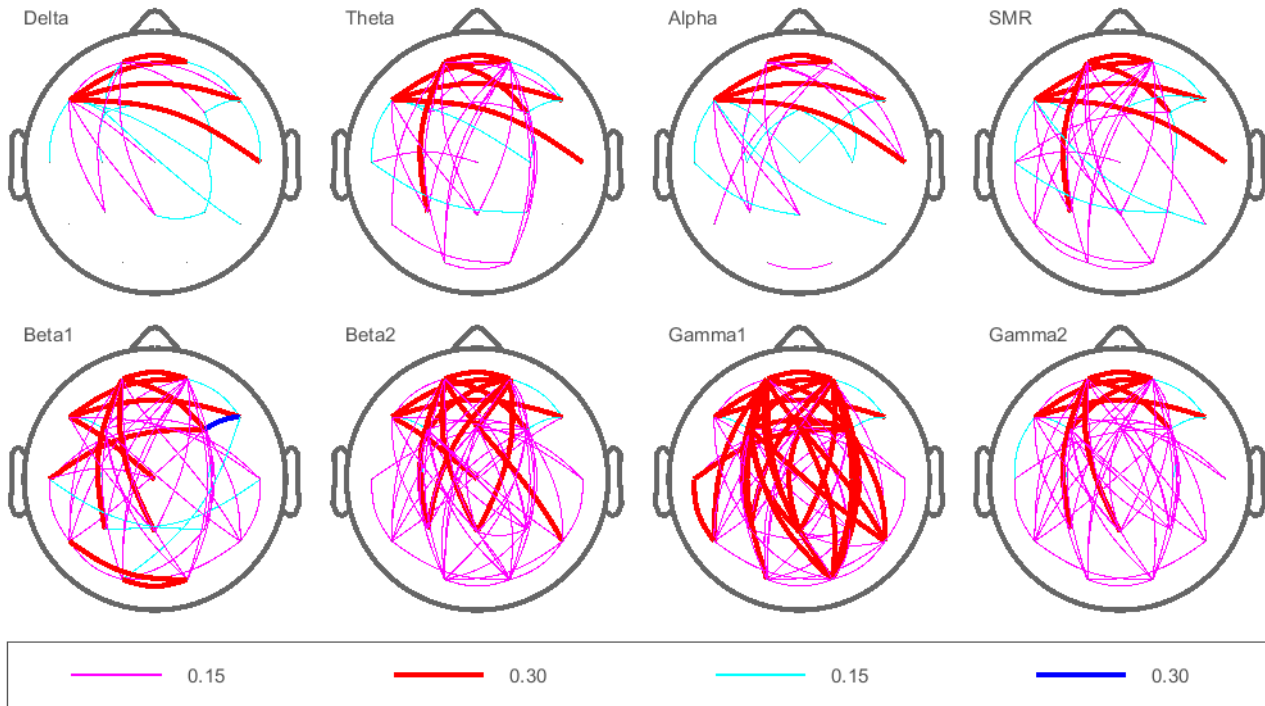


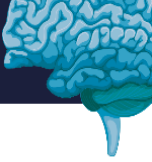


### Coherence

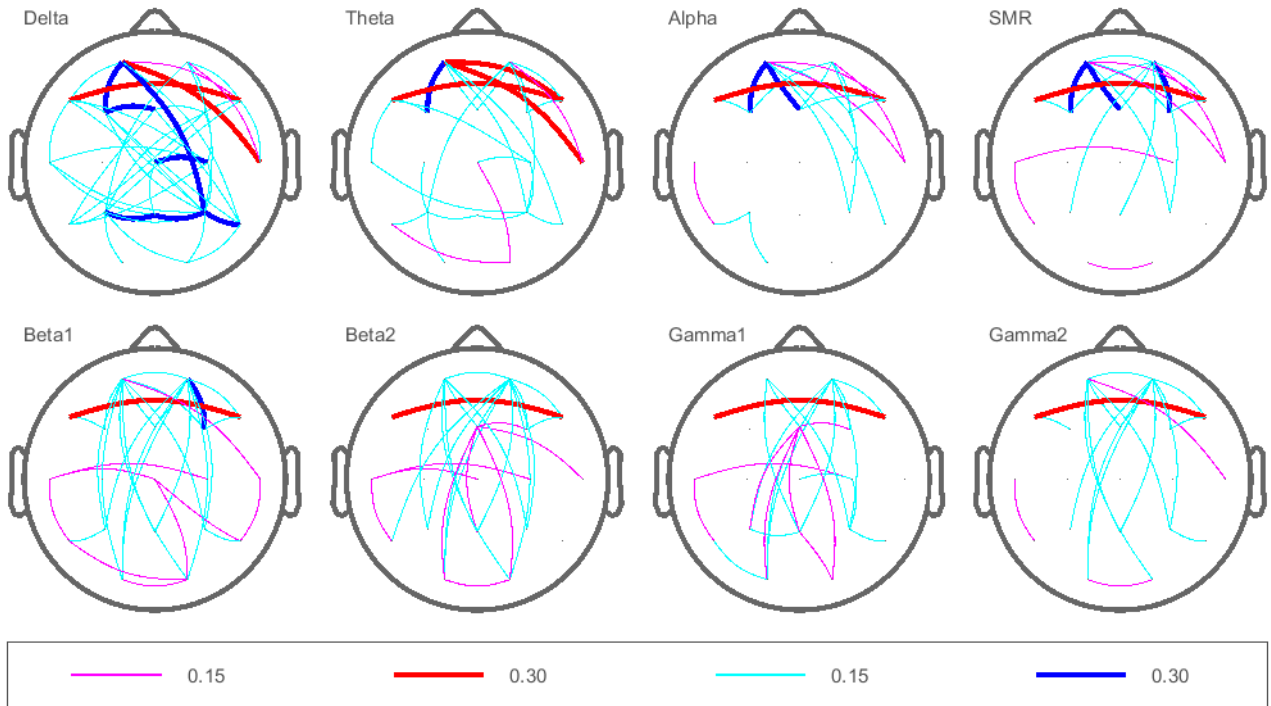
The coherence analysis is a measure of the relationship of various structures in the cortex. The coherence analysis provides a ratio of the correlation of a specific frequency range. Violet and red lines represent excessive positive correlations, light blue and dark blue lines represent excessive negative correlations. Excessive positive correlations suggest that there is over-communication between the sites. Excessive negative correlations suggest that there is a lack of communication between the sites.

Coherence in eyes closed condition:

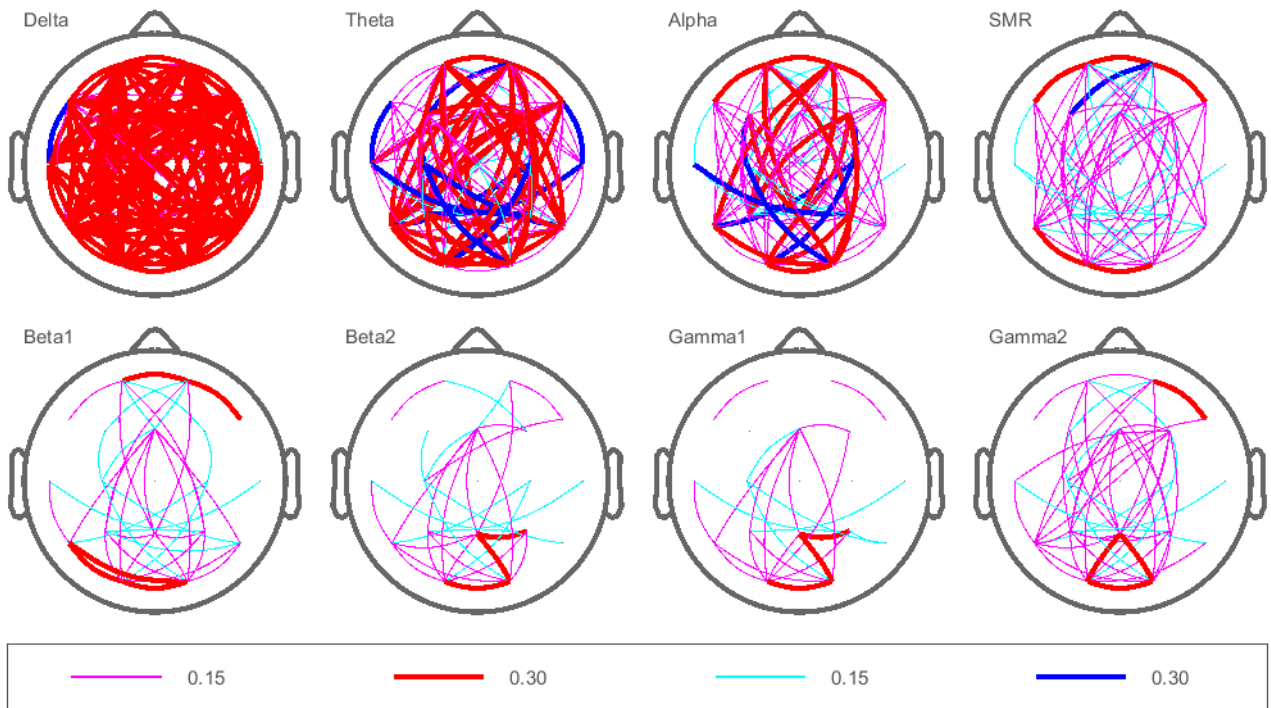




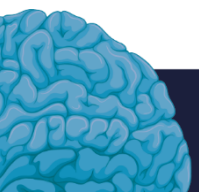
Coherence in eyes open condition:

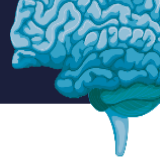


Coherence in VCPT condition:



Without significant findings





### 3. Evoked Potentials (in continuous performance task)

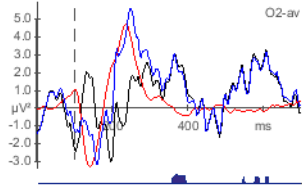
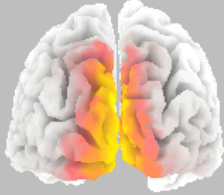
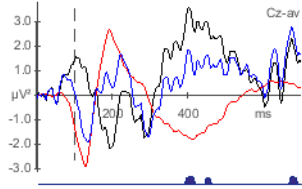
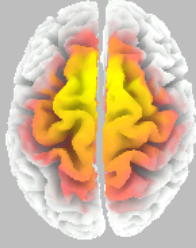
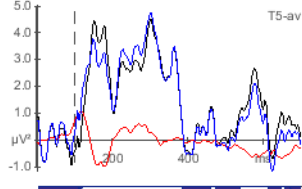
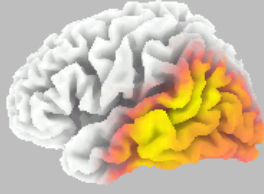
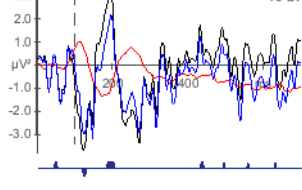
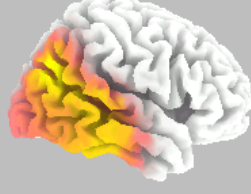
The images of the evoked potentials are relevant to information processing in different regions of the brain during the presentation of simple stimuli. In the various potentials, only specific neuronal groups and networks are involved.

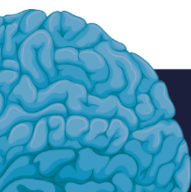
Only 42 trials will enter data calculation. To achieve robust results at least 50 trials are required, therefore the data should be interpreted with caution.

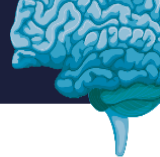
Comparison of the components with database:

Input areas:

blue: client/red: database/black: difference (significance)

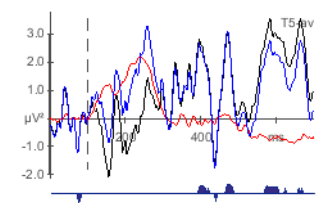
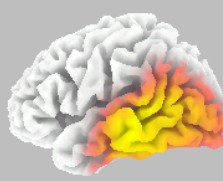
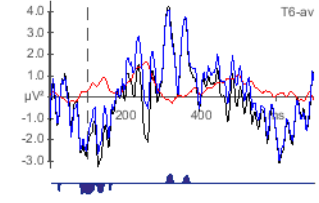
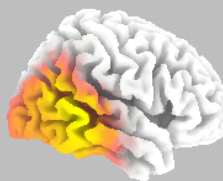
<p>P1N1 Visual Input</p> 	<p><i>Brodmann area 19 Cuneus Occipital Lobe</i></p> <p><i>Best Match at 5mm Brodmann area 18 Cuneus Occipital Lobe</i></p>	
<p>N1P2 Auditory Novelty</p> 	<p><i>Brodmann area 6 Superior Frontal Gyrus Frontal Lobe</i></p> <p><i>Best Match at 17mm Brodmann area 8 Superior Frontal Gyrus Frontal Lobe</i></p>	
<p>P1N1 vTL left Association areas</p> 	<p><i>Brodmann area 22 Superior Temporal Gyrus Temporal Lobe</i></p> <p><i>Best Match at 7mm Brodmann area 40 Supremargial Gyrus Temporal Lobe</i></p>	
<p>P1N1 vTR right Association areas</p> 	<p><i>Brodmann area 39 Angular Gyrus Parietal Lobe</i></p> <p><i>Best Match at 9mm Brodmann area 40 Inferior Parietal Lobule Parietal Lobe</i></p>	





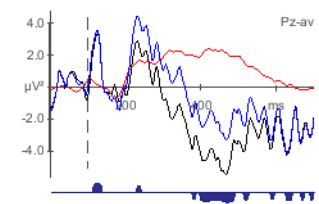
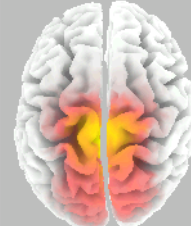
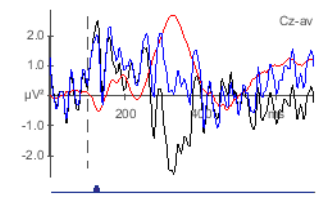
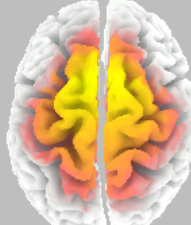
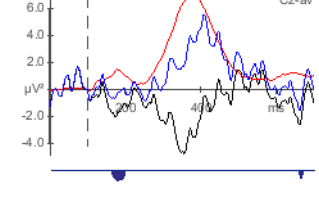
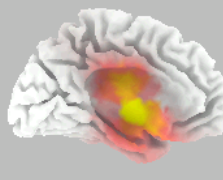
**Memory areas:**

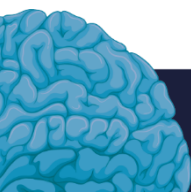
blue: client/red: database/black: difference (significance)

<p>V com TL left Memory areas</p> 	<p><i>Brodmann area 21 Middle Temporal Gyrus Temporal Lobe</i></p> <p><i>Best Match at 7mm Brodmann area 22 Middle Temporal Gyrus Temporal Lobe</i></p>	
<p>V com TR right Memory areas</p> 	<p><i>Brodmann area 21 Middle Temporal Gyrus Temporal Lobe</i></p> <p><i>Best Match at 5mm Middle Temporal Gyrus Temporal Lobe</i></p>	

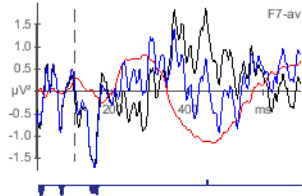
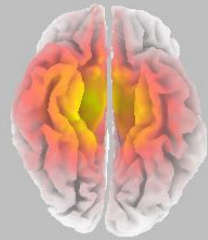
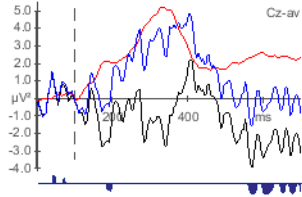
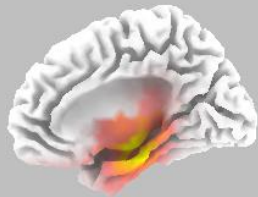
**Executive function areas:**

blue: client/red: database/black: difference (significance)

<p>P3b Engagement</p> 	<p><i>Brodmann area 6 Medial Frontal Gyrus Frontal Lobe</i></p> <p><i>Best Match at 5mm Brodmann area 5 Paracentral Lobule Frontal Lobe</i></p>	
<p>P3a Inhibition/Suppression</p> 	<p><i>Brodmann area 6 Superior Frontal Gyrus Frontal Lobe</i></p> <p><i>Best Match at 17mm Brodmann area 8 Superior Frontal Gyrus Frontal Lobe</i></p>	
<p>P4 monCC Monitoring</p> 	<p><i>Brodmann area 25 Anterior Cingulate Limbic Lobe</i></p> <p><i>Best Match at 15mm Brodmann area 34 Subcallosal Gyrus Frontal Lobe</i></p>	





<p>P4wmF</p> <p>Working Memory</p> 	<p><i>Brodmann area 34</i> <i>Parahippocampus Gyrus</i> <i>Limbic Lobe</i></p> <p><i>Best Match at 5 mm</i> <i>Brodmann area 28</i> <i>Parahippocampal Gyrus</i> <i>Limbic Lobe</i></p>	
<p>SW PHC</p> <p>Slow Wave Activity</p> <p>This component reflects a part of limbic system activity</p> 	<p><i>Brodmann area 28</i> <i>Parahippocampal Gyrus</i> <i>Limbic Lobe</i></p> <p><i>Best Match at 5 mm</i> <i>Brodmann area 34</i> <i>Parahippocampal Gyrus</i> <i>Limbic Lobe</i></p>	

**Shown are various deviations from the norm:**

**P1N1 - Visual Input:**

*Mid potentials:* High amplitude (negative & positive)

*Late potentials:* Long-lasting high amplitude

**N1P2 - Auditory Novelty:**

*Mid potentials:* High amplitude (negative & positive)

*Late potentials:* Long-lasting high amplitude

**P1N1 vTL - left Association areas:**

*Early potentials:* Low amplitude (negative & positive)

*Mid potentials:* High amplitude (negative & positive)

*Late potentials:* Reactivation

**P1N1 vTR - right Association areas:**

*Late potentials:* Reactivation

**V com TL - left Memory areas:**

*Early potentials:* Low amplitude (negative & positive)

*Late potentials:* Long-lasting high amplitude, Reactivation

**P3b - Engagement:**

*Early potentials:* High amplitude (negative & positive)

*Mid potentials:* High amplitude (negative & positive)

*Late potentials:* Long-lasting negativity

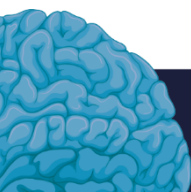
**P3a - Inhibition/Suppression:**

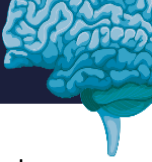
*Early potentials:* High amplitude (negative & positive)

**P4 monCC - Monitoring:**

*Early potentials:* Low amplitude (negative & positive)

**P1N1 - Visual input**





The activation of primary visual areas informs about the quality of picture decoding into neurophysiological signals.

#### *Mid potentials*

Amplitudes provides information about processing intensity. High positive or negative amplitudes indicate high intensity during information processing. The high intensity may be triggered by emotional drive, which usually leads to a kind of hypersensitivity.

#### *Late potentials*

Long-lasting high amplitude indicates that visual decoding is inaccurate.

#### **N1P2 - Aud. Novelty**

The Novelty stimulus is a good indicator of reactions towards unexpected auditory stimuli. During the task this stimulus is presented in 100 trials together with the picture of a person, but no behavioural reaction is required.

#### *Mid potentials*

High amplitudes indicate that the brain reacts too strongly to the sound. This is often observed in people with hypersensitivity.

#### *Late potentials*

Long lasting high amplitudes indicate that Anon Ymized's cortical activation does not decrease at the end. Functionally there is a relation to high amplitudes in the mid potentials. It can be assumed that the same generators produce the effects.

#### **P1N1 vTL - Left association areas**

The association areas in left superior temporal cortex and left parietal cortex receive input from the occipital cortex and other secondary sensory areas. Here information is integrated and processed with the influence of frontal control functions. This association process is defined through complex mechanisms with the goal of generating concepts that can be recognized in the future. This construction process is highly individual and is influenced by many factors including genes, biology and learning processes. According to the lateralized functions that have been attributed to the left hemisphere, in these association areas mostly detail recognition and analytic processes are promoted. **The left hemisphere is particularly relevant in speech, reading, writing and detailed calculation. Furthermore the left hemisphere is involved in speech comprehension by enabling detailed listening.**

#### *Early potentials*

The activity of left **early** potentials is related to sensory processing functions that are not under cognitive control and probably are triggered by excitatory mechanisms of sensory registration.

In Anon Ymized, low amplitudes in early potentials of left association processes are observed. This leads to inadequate activation. In other words, left association processes are being overridden. This generally leads to decreased detail-oriented information processing.

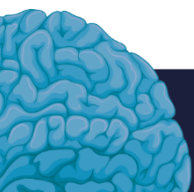
#### *Mid potentials*

Mid potentials of the association areas relate to sensory-cognitive processing functions; the main goal of these is sustaining the information processing. By maintaining the energy in association areas, the mid potentials are formed, which is why these are associated with attention processes.

High amplitudes in mid potentials of left association areas indicate that sensory-cognitive functions of the aforementioned skills proceed intensely. This leads in Anon Ymized to intense detail-oriented processing, which is usually associated with excessive monitoring. The result is often exhaustion.

#### *Late potentials*

Late potentials of association processes are related to control of constructive processes and are affected by emotional factors like security or insecurity. Emotional regulation is in this way essential for the outcome of constructive processes.





In Anon Ymized, a reactivation of left association areas is observed. This is associated with high activation of left-sided monitoring processes which is usually associated with slow processing in everyday life.

### **P1N1 vTR - Right association areas**

The association areas in right superior temporal cortex and right parietal cortex receive input from the occipital cortex and other secondary sensory areas. Here information is integrated and processed with the influence of frontal control functions. This association process is defined through complex mechanisms with the goal of generating concepts that can be recognized in the future. This construction process is highly individual and is influenced by many factors including genes, biology and learning processes. According to the lateralized functions that have been attributed to the right hemisphere, in these association areas mostly synthesis and holistic orientation are promoted. **The right hemisphere is particularly relevant in spatial recognition and orientation, recognition of emotional content and patterns, tactile-kinesthetic processing, musical experience and cultural techniques, as it is involved in estimation of time and space.**

#### *Late potentials*

Late potentials of association processes are related to control of constructive processes and are affected by emotional factors like security or insecurity. Emotional regulation is in this way essential for the outcome of constructive processes.

In Anon Ymized, a reactivation of right association areas is observed. This is associated with high activation of right-sided monitoring processes which is usually associated with slow and intensive emotional processing in everyday life.

### **V com TL - Left memory areas**

The memory areas in left superior temporal cortex and left parietal cortex store information from association areas. These processes are influenced by frontal control functions. The process that happens in memory areas is partially identical to what happens in association areas, namely comparison operations that aim at recognizing percepts. The process of recognition is influenced by time and content. Understanding and learning is possible because of memory retrieval. According to brain lateralization research, the functions that are attributed to the left hemisphere in terms of memory are involved in the following skills: **Speech, reading, writing and detail-oriented calculation. The left hemisphere is also relevant for speech comprehension and detail-oriented listening.**

#### *Early potentials*

The activity of left **early** potentials is related to sensory processing functions that are not under cognitive control and probably are triggered by excitatory mechanisms of sensory registration.

In Anon Ymized, low amplitudes in early potentials of left comparison processes are observed. This leads to inadequate activation. In other words, left comparison processes are being overridden. This generally leads to decreased detail-oriented information processing.

#### *Late potentials*

Late potentials of comparison operations are related to control of one's own performance and are affected by emotional factors like security or insecurity. Emotional regulation is in this way essential for the outcome of retrieval processes.

In Anon Ymized, long lasting high amplitudes in late potentials of left-sided comparison operations are observed. This is associated with high activation of left-sided monitoring processes which is usually associated with a high degree of control and meticulous behaviour in everyday life. This leads to exhaustion over time.

In Anon Ymized, a reactivation of left memory areas is observed. This is associated with high activation of left-sided monitoring processes which is usually associated with slow processing in everyday life.

### **P3b - Activation operation**

**Executive functions/activation:** There are two kinds of activation that are regulated by the Reticular formation: tonic and phasic activation. The tonic system of the reticular formation regulates through the hypothalamus the





excretion of (nor-)adrenalin and serotonin neurotransmitters, what leads to long lasting tonic activation and modulation of cortical activity, e.g. influencing the day-night cycle.

The centre of the phasic system is located in the medial thalamus and is responsible for short-term activation of singular parts of the cortex, what is basically the activity we are measuring. Reticular structures are thin layers that cover the thalamic nuclei of sensory organs that send projections to the cortex. Non-specific reticular structures are activated here through convergent sensory pathways. The thalamus works as a switchboard of information and has a less general effect upon the cortex compared to the reticular formation; instead the thalamus exerts a selective effect upon specific cortical areas, being able to concurrently activate some areas and shielding others.

The activation operation is relevant as it enables goal-oriented performance. Hereby the cortex is optimally activated in order to achieve the desired goals. We differentiate among early, mid and late phases of activation.

#### *Early potentials*

Early potentials of the activation operation are related to sensory processing functions that are not under cognitive control. Activation at this stage probably occurs mainly through phasic excitation of the reticular activation system, which influences sensory processes.

High amplitudes of early potential in the activation operation are related to intense activation of sensory input channels. Not solely visual and auditive sensory impulses but also somatosensory impulses must be taken into account, as these are controlled by the amygdala and hereby produced by limbic energy.

#### *Mid potentials*

Mid potentials of the activation operation relate to sensory-cognitive processing functions, which aim at achieving specific goals. Maintaining the level of energy for other functions (perception, memory, monitoring) is the basic element of mid potentials of the activation operation.

High amplitudes of mid potentials in the activation operation indicate a high energy expenditure to achieve goals. This often leads to fatigue in terms of achieving objectives.

#### *Late potentials*

Late potentials of activation operation contain both a phasic and a tonic part. The tonic activation is related to the general activation and readiness to respond of the cortex. Emotional regulation is also relevant to the activation of late potentials.

Long lasting negativity of the activation operation in late potentials is usually related to decreased level of inner involvement.

### **P3a - Inhibition/Suppression**

**Executive functions/inhibition/suppression/selection:** This function is highly relevant not only for motor and cognitive (perceptual) control, but also for emotional behaviour. Inhibition is a fundamental function of neuronal networks, which regulate the planning, execution and control of different processes. These functions are involved in all processes as inhibition (suppression) of processes represents a fundamental part of neurobiological networks. The **Inhibition** phenomenon works by influencing a neuron through an impulse that prevents the occurrence of an action potential, meaning that it impedes the firing of the neuron. Synaptic inhibition can occur be either pre- or postsynaptic inhibition. This inhibition function is localized in the fronto striatal loop (cortex-basal ganglia-thalamus-cortex).

#### *Early potentials*

Early potentials of inhibition/suppression are related to sensory processing functions that are not under cognitive control. The inhibition function of early potentials pertains mainly the monitoring of sensory assimilation and processing modalities.





High amplitudes in inhibition/suppression functions indicate that the control over sensory processes is dysfunctional. Often high amplitudes in primary input areas are observed. This leads to intense assimilation and processing of information.

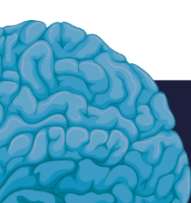
#### **p4 monCC - Conflict monitoring**

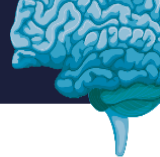
**Executive functions/Monitoring:** Like all executive functions, this function is essential for everyday functioning as it enables assessing one's performance and processes. The anterior cingulate cortex occupies about 2/3 of the medial surface in frontal lobes, located ventral, rostral and dorsal to the corpus callosum: a fibre tract that connects both hemispheres. The anterior cingulate cortex corresponds to the Brodmann areas 24, 25 and 32. In the context of executive functions the anterior cingulate cortex is involved in conflict solving between competing responses and arbitrary selection of action alternatives. Furthermore, this structure is involved in learning processes together with basal ganglia, assessing different action alternatives according to relevance. Within the anterior cingulate cortex two parts can be further differentiated: a rostral-ventral area that becomes activated in response to emotional conflicts, and a dorsal area that is more related to controlling cognitive functions. Even if this function is not entirely clear yet, it can be said that through this network a comparison operation takes place: by comparing one's actual behaviour (emotional, cognitive, behavioural performance) with the expected outcomes.

#### *Early potentials*

Early potentials of conflict monitoring influence preparatory functions of sensory assimilation. Hereby emotional constitution and strain exert an important impact on several sensory functions.

In Anon Ymized, low amplitudes in early potentials of conflict monitoring are observed. Low potentials occur in correlation with minor discharges of electric potentials indicating in this context that sensory input is marginally influenced by the limbic system. This means that no clear monitoring of different action alternatives takes place.





#### 4. Event related potentials - ERPs

Total number of trials: **396** (a-a GO: **100**, a-p NoGO: **100**, p-p: **98**, p-h: **98**, +: **200**, -: **196**)  
 Number of processed trials: **166** (a-a GO: **42**, a-p NoGO: **44**, p-p: **44**, p-h: **36**, +: **92**, -: **80**)

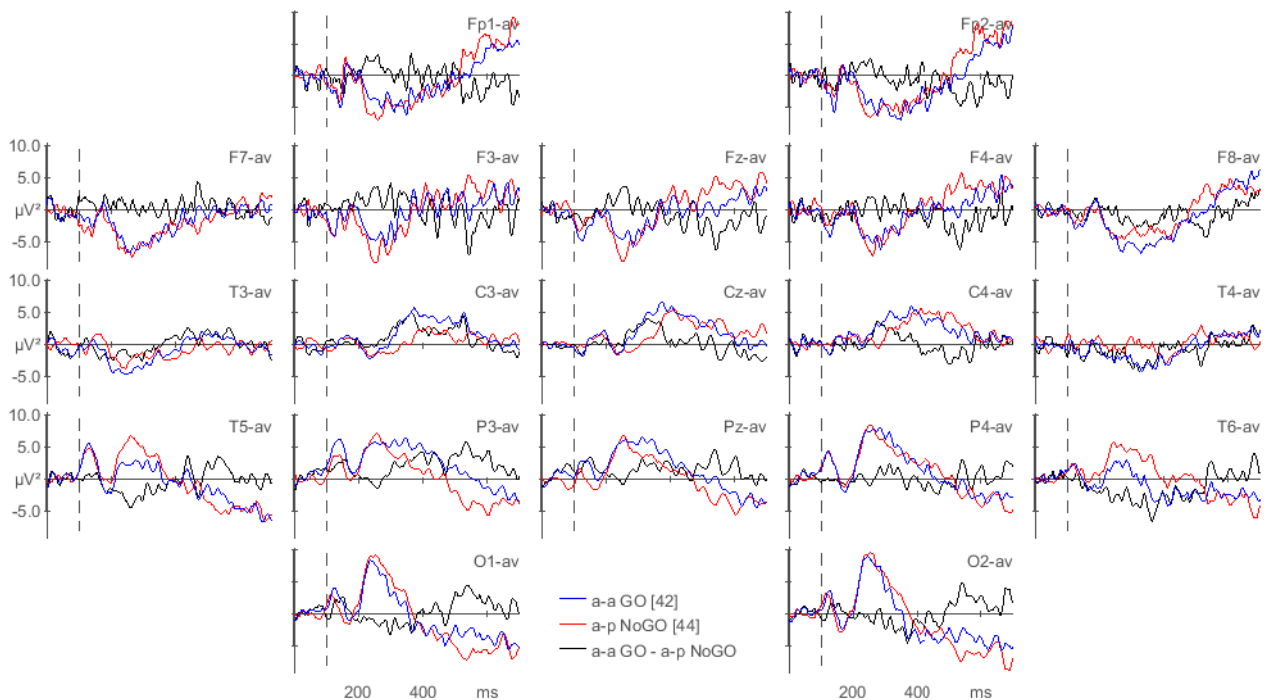
##### ERP Components

Comparison of the client's GO and NoGO ERPs computed for the second stimulus.

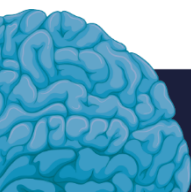
ERPs in the GO-NoGO task computed for GO, NoGO stimuli and ERP differences (GO- NoGO) are presented below.

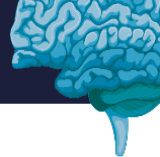
blue: GO/red: NoGO data/black: difference curve (GO-NoGO)

GO-NoGO:



Differences between GO-condition and NOGO-condition are observed in central cortex and superior temporal cortex. This indicates an ability to perceptually discriminate different situations.





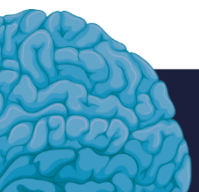
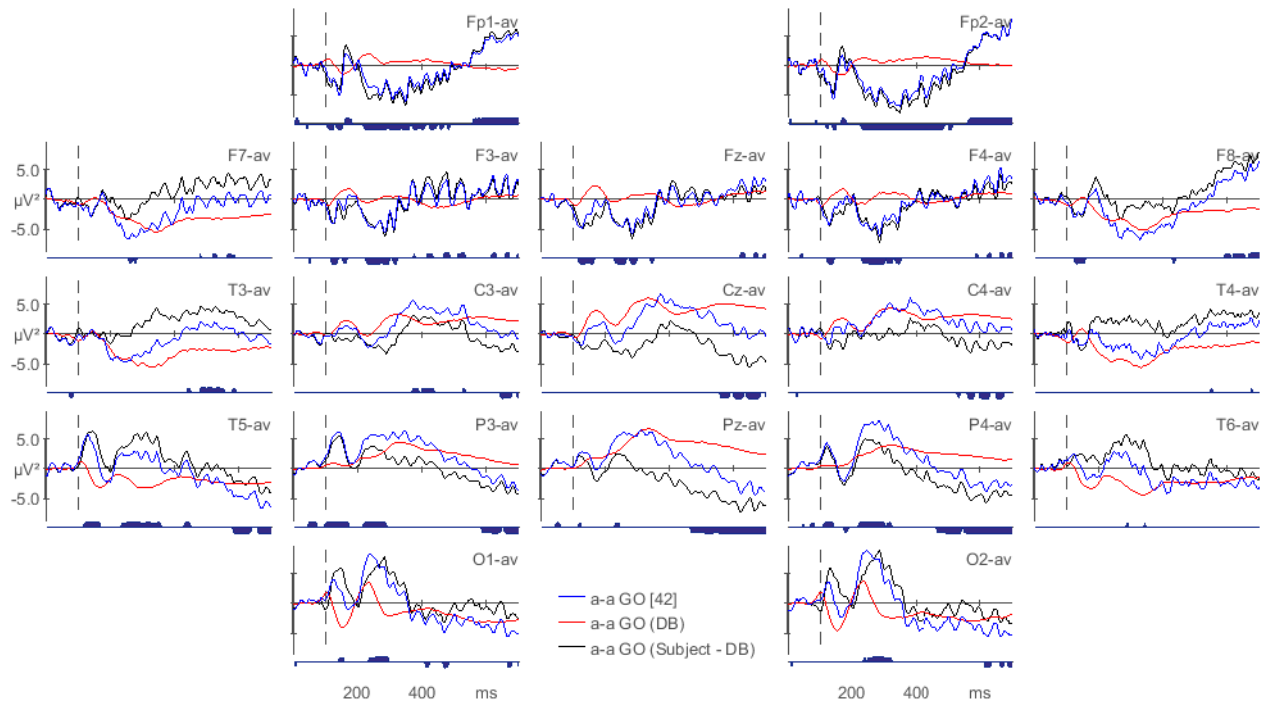
### Simple ERPs

Comparison with the normative ERPs computed for the second stimulus.

ERPs in the GO-NoGO task computed for GO, NoGO and Novelty (p-h) stimuli are presented on the next pages.

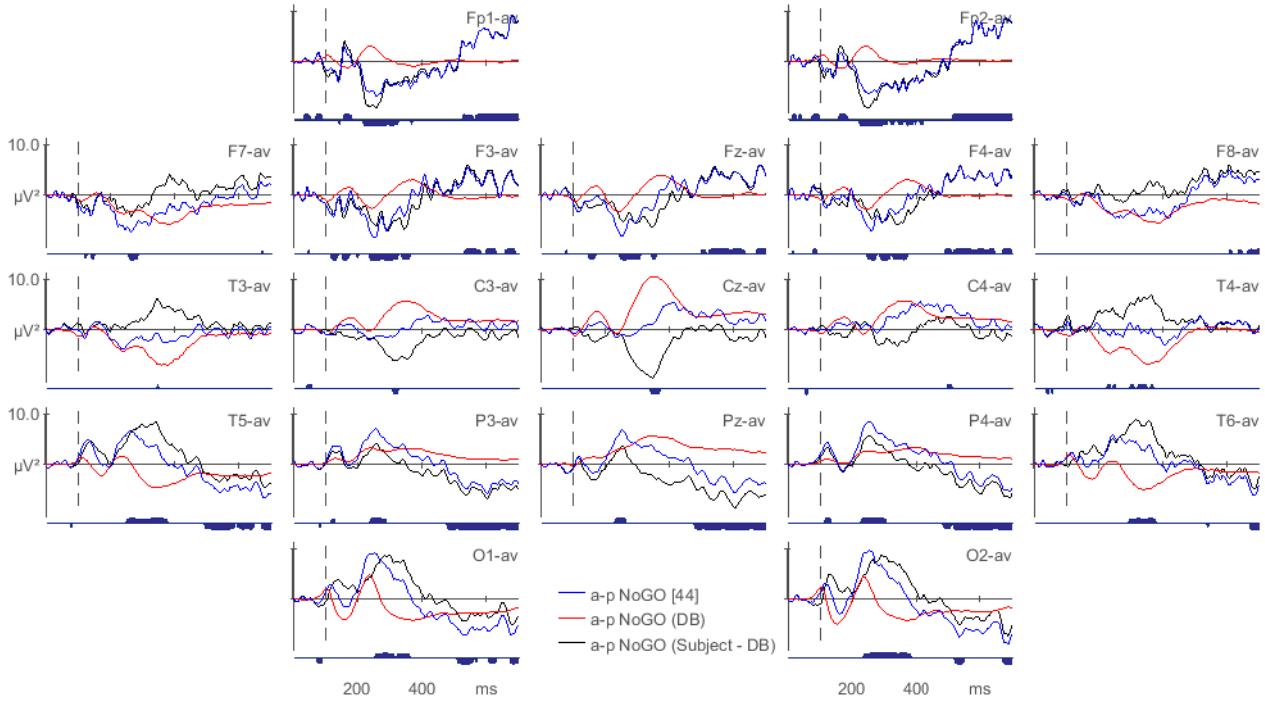
blue: subject/red: reference data/black: difference curve (significance)

GO condition:

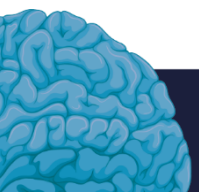
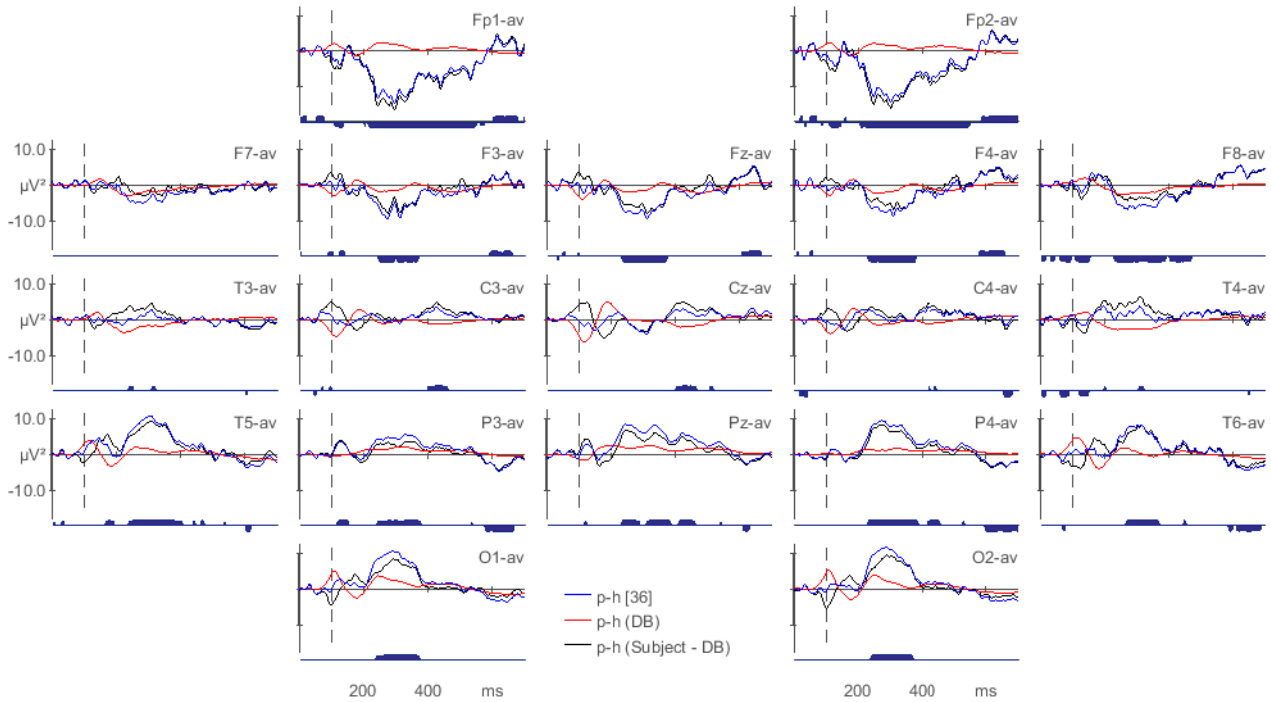


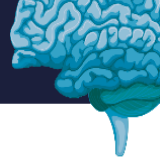


NoGO condition:



Novelty condition (p-h):





## 5. Diagnostic-Algorithms

According to the medical tradition, a diagnosis is to be made on the one hand by the reported suffering of the patients and, on the other hand, by evidence-based, objective diagnostic procedures. Focusing on neurophysiological characteristics implies that norms have been defined by a meticulous method according to scientifically recognized criteria and compared with patient groups. The patients included in the patient groups were all diagnosed by the usual criteria of the diagnostic and statistical manual (gold standard) as well as by experts. This allows a reliable definition of the patient group and its subtypes.

Psychopathology varies according to age and shows different characteristics depending on age group. Therefore, the patient groups must be divided into age groups. For each age group, the corresponding biomarkers are calculated and validated within the age group. This is done according to the following procedure: several hundred patients from several patient groups were subjected to standardized scientific examinations. This affects patient groups to attention disorders, learning disabilities, autism, depression, schizophrenia, obsessive-compulsive disorder, slight traumatic brain injury and stress disorders (patients after heart attack). For each of these patient groups, algorithms are developed for various age groups using complex statistical methods (big data, learning machines). For each individual patient, the probability of matching to the different patient groups can therefore be calculated using the algorithms. So far, there are algorithms for attention disorders as well as stress disturbances. Further algorithms follow 2017/2018.

Such an extended approach can provide support for diagnostics and statements regarding sensitivity and specificity. The probability of the diagnosis being accepted in percentages is calculated and output in the individual case. It is recommended that these markers be clinically validated in individual cases. However, the result of the algorithm comparison is not the clinical diagnosis!

It is clinically evident that diagnoses are a generalization and thus always an approximation to the actual, individually very different processes and circumstances of the individual humans. This is currently the best possible representation of a membership of a patient group. Our data, which are not yet used in clinical studies so far, help to better characterize the characteristics and to differentiate between the subtypes with consequences for prognosis and therapeutic measures, which is a step closer to the individual as a matter of fact. To this extent, it must also be emphasized once again that the information of the neurophysiological constellations represents a complementary mosaic piece of the findings which extends the previous diagnostics. It is also clear that the demarcation to other patient groups is necessary. This will be all the more possible, the more algorithms of other patient groups are present and the patient's affiliation to existing patient groups can be defined as precisely as possible. It is also clear that the quality of the algorithms is closely linked to patient numbers and patients in general. The higher the number of patients, the clearer the patient's diagnosis, the better the algorithms. Since the present algorithms are dynamic variables, they will be constantly updated over time.

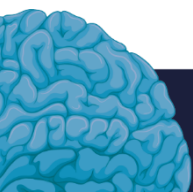
### A. ADHD-Diagnose-Index

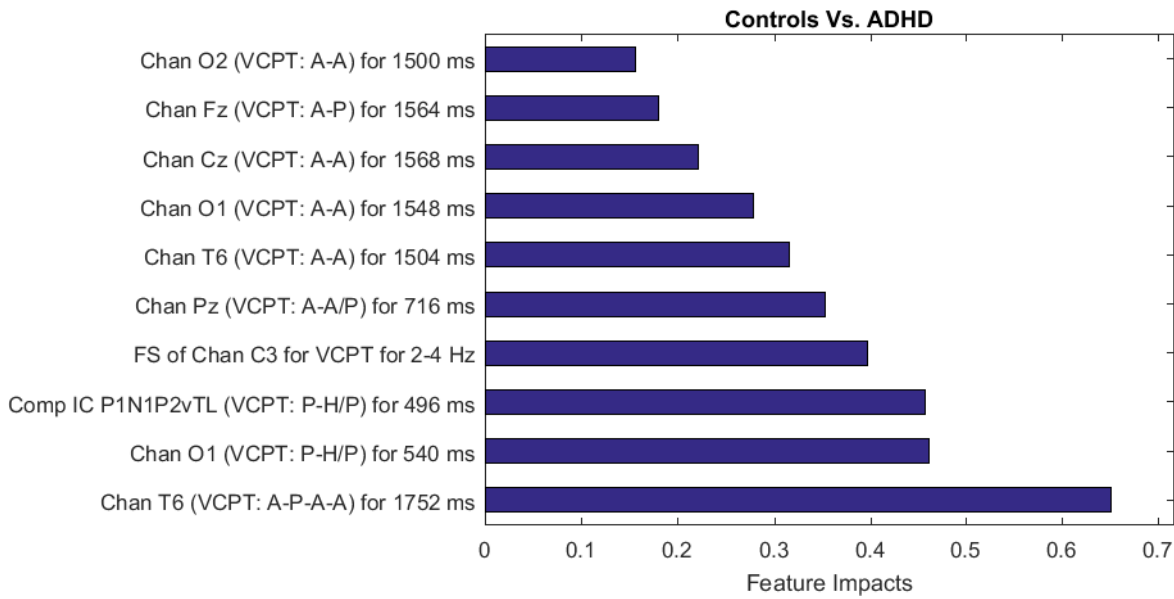
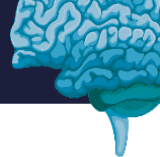
The ADHD algorithm or ADHD index was realized in the context of the CH-ADHS project on three different samples. The following algorithm was used: Regularized Logistic Regression#.

Anon Ymized belongs to the age group 18 - 67#.

For Anon Ymized the following probability of belonging to this group is shown:

ADHD: 88%

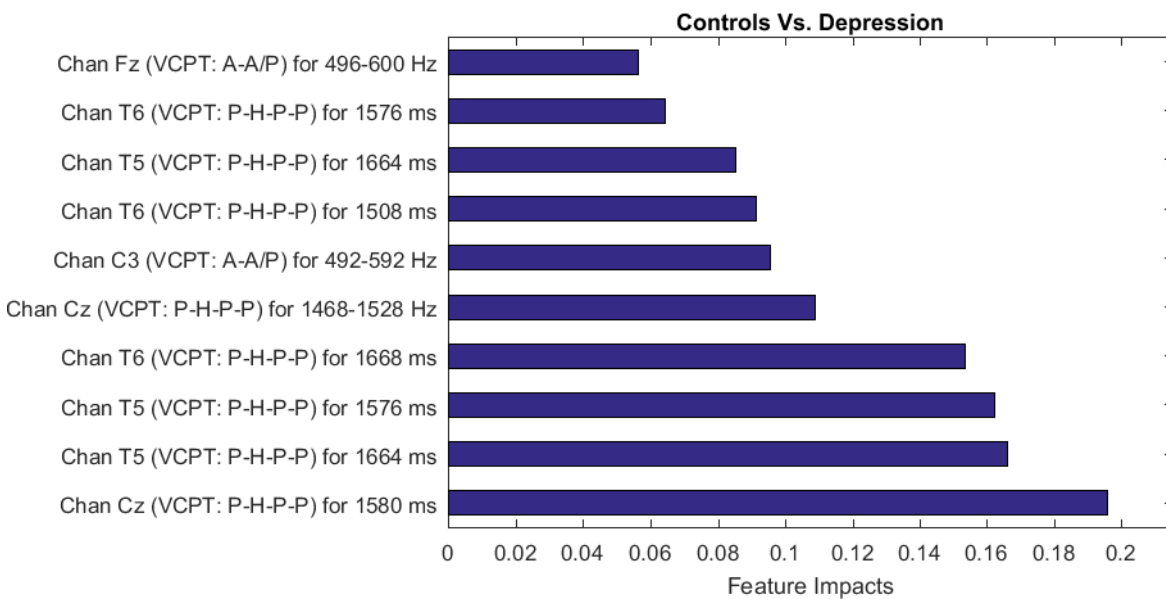




**B. Emotion regulation, including mood modulation.**

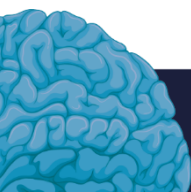
For Anon Ymized the following probability for the presence of deviance in Emotional regulation is calculated:  
 Depression: 69%

The following features are particularly significant:



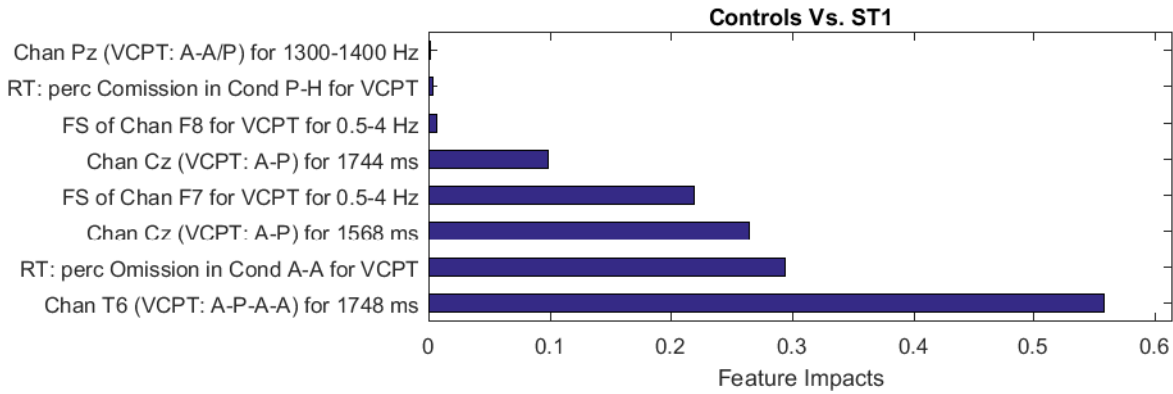
**Subtypes**

[description]

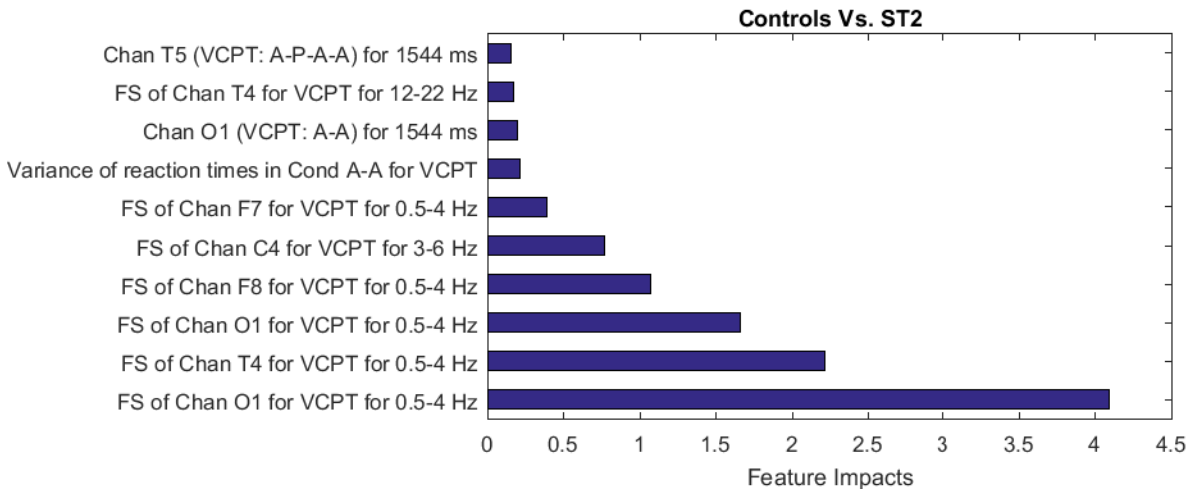




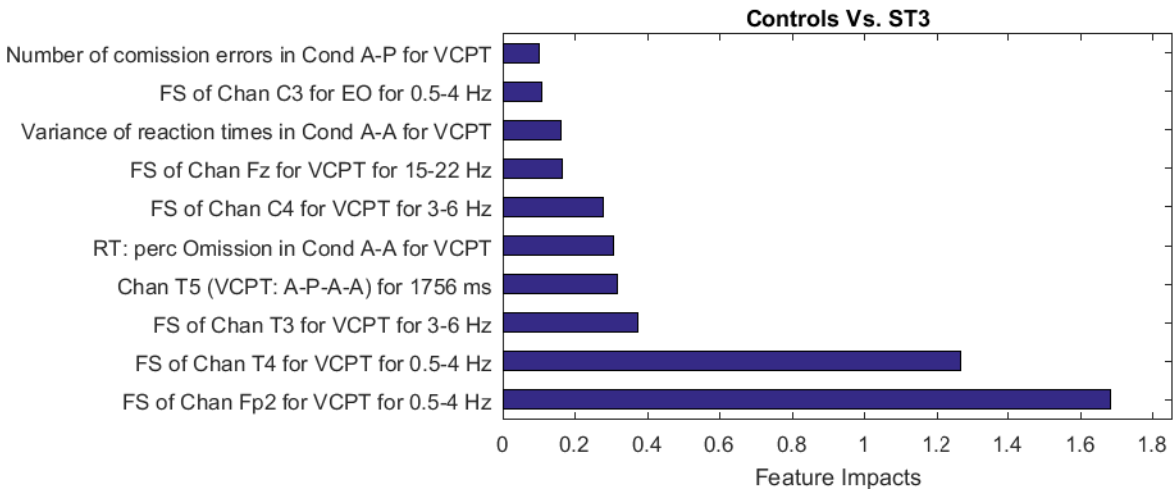
**ST1: 56%**



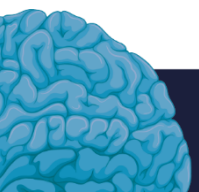
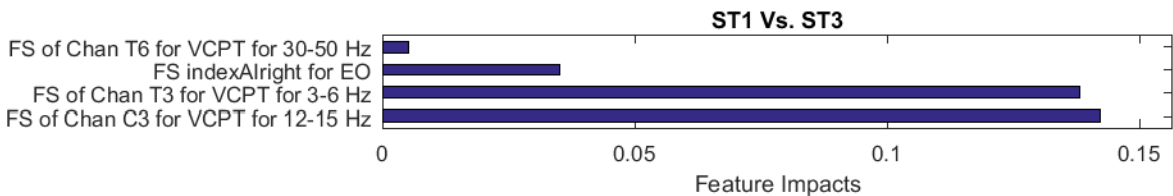
**ST2: 2%**

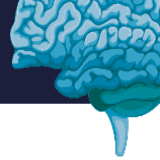


**ST3: 69%**



**ST3 (ST1vsST3): 48%**





## V. APPENDIX E: Recommendations

We would like to point out that the therapeutic approach must be holistic and include various aspects of life. This means that in addition to cognitive, behavioral, and emotional aspects, a person's physiology must also be considered. An all-inclusive change strategy is beyond the scope of this report. However, we believe that difficulties must be addressed in a multi-modal approach that takes into consideration a variety of aspects involved in the individual. The recommendations that follow seek to do that within the scope of the information provided by the results of this evaluation.

### 1. Medication

No medication recommendations. See primary care physician for further evaluation.

### 2. Everyday Life/Work

General statement: Our basic principle is that a high degree of neurobiological change is possible. Thanks to worldwide, intensive research in the field of neuroplasticity, we know that new neuronal connections can be formed in every area if the right information is given. Personalized interventions are listed which are based on research and rated highly as potential facilitators of change.

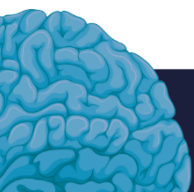
Daily Life: Anon Ymized will benefit from incorporating as much routine and structure into his/her day as he can. For example, routines can be instituted for waking in the AM, around meals, times for academics, pre-sleep routines, household chores, etc. It may take discipline to follow the routines initially, but once they become actual routines, life will become easier, better organized and more efficient. It will also put less strain on his/her brain.

Anon Ymized will do well to build in to his/her day opportunities and activities that calm his/hers mind and relax his body. This can include some of the techniques he/she may learn via biofeedback training, but also breaks for such things as meditation, progressive relaxation, calming visualizations, etc. Also, engaging in activities on a regular basis that can have a calming affect such as yoga, music, reading, etc. can be considered.

Sleep: It will be important to discuss and begin to implement good sleep hygiene practices such as establishing a bedtime routine that includes relaxing activities (warm shower, reading, etc.). More information can be found on the Sadar Psychological Services website (<https://sadarpsych.com/take-care-of-your-brain/sleep/>). Sleep is expected to improve with incorporating good sleep hygiene practices and biofeedback.

Diet: The following guidelines are offered for consideration. There is considerable science suggesting that a diet higher in protein (leaner meat, eggs, fish, and dairy products) and lower in simple carbohydrates (sugar, rice, pasta, potatoes, flour and bread) improves concentration and general brain function. Meals that are primarily simple carbohydrates (breakfast cereal, pastry, pasta, French fries, etc.) cause an initial rapid surge in blood sugar making the individual more hyperactive. Soon thereafter, there is a rapid fall in blood sugar leading to mental fatigue. Meals with more protein and complex carbohydrates (vegetables, fruits, and whole grains) keep blood sugar more stable, give steady energy and reduce chances of storing excess fat.

There is significant evidence that increasing Omega-3 oil benefits learning, helps stabilize mood and helps overall wellness. A good source of this is oily fish such as salmon and tuna, although there is significant controversy regarding mercury contamination of ocean raised, farm raised and even canned fish. An alternative is fish oil capsules and/or fish oil liquid supplements. These can be found in most health food sections and are not expensive. Our research review shows that fish oils produced in triglyceride form are the best source of Omega-3, when taken as recommended on the bottle. Vitamin D3 is also being recommended by the scientific community as being important for efficient brain functioning. For example, it is being recommended at the Amen Clinics in addition to Omega-3 fatty acids. It is important to have one's D3 level checked before beginning such supplementation.





Exercise: Our recommendation is to reach a point where you engage in moderate or greater physical activity/exercise for thirty minutes or more at least five days a week.

Drugs/Alcohol: Not reported to be an issue.

Electronic Screen Use: The general recommendation is to limit screen time to 2 hours a day.

### 3. Other Recommendations

Psychotherapy: Adolescents with this neurobiological constellation can develop issues with self- confidence, motivation, self- image, etc. If Anon Ymized seems to be struggling with anything like this, individual psychotherapy can be helpful.

Making several lifestyle changes can feel stressful if an individual is already experiencing over arousal and anxiety. Working with a therapist who can break down these changes into manageable pieces and encourage these efforts may be beneficial in the long term.

#### Biofeedback:

sEMG Biofeedback: sEMG is a measure of the electrical signals produced by the muscles during contraction. Excessive muscle tension is often an indication of over arousal of the central nervous system and can also fuel over activation. Excess muscle tension can contribute directly to numerous symptoms such as chronic headaches and muscle soreness. Given the muscle tension noted in the EEG recordings, several sessions of sEMG biofeedback may be useful to facilitate self-regulation training.

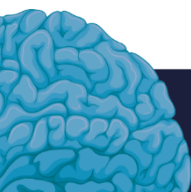
Heart Rate Variability (HRV) is a measure of the beat-to-beat variations in heart rate. HRV is an important indicator of both physiological resiliency and behavioral flexibility, reflecting the individual's capacity to adapt effectively to stress and environmental demands. It is a skill that can be learned and practiced to improve health, performance, and overall well-being. This technique, once learned and practiced, can give ANON YMIZED a way to regulate arousal. The more balance in the autonomic nervous system, the easier it is to concentrate and to control one's emotions and behaviors.

Neurofeedback: EEG Biofeedback (also called neurofeedback, neurotherapy, or neurobiofeedback) is a type of biofeedback that uses real-time measurements of brainwaves (EEG) to provide a signal that can be used by a person to receive feedback about brain activity, often with a goal of controlling and enhancing central nervous system activity.

During training, sensors are placed on the scalp and then connected to sensitive electronics and computer software that detect, amplify, and display specific brain activity. Resulting information is fed back to the trainee virtually instantaneously with the conceptual understanding that changes in the feedback signal indicate whether or not the trainee's brain activity is within the designated range.

Based on this feedback, changes in brain patterns occur and are associated with positive changes in physical, emotional, and cognitive states. Often the trainee is not consciously aware of the mechanisms by which such changes are accomplished although people routinely acquire a "felt sense" of these positive changes and often are able to access these states outside the feedback session. Generally, trainees do not experience adverse effects.

pirHEG (passive infrared Hemoencephalography): pirHEG involves wearing an infra-red sensor over one's forehead. This allows for the reading and the feeding back of the amount of blood flow occurring in the regions of the prefrontal and frontal lobes. Blood flow is an indication of the amount of metabolic activity. When the metabolic activity in the frontal and prefrontal areas increases, executive brain functioning occurs. Outcomes include improved attention, improved mental flexibility, improved emotional/behavioral control, improved planning, and





organization, etc. This type of training has been referred to as a type of neurofeedback as it impacts the functioning of the brain. Its' strength, relative to forms of EEG biofeedback, is its focus on frontal lobe functioning.

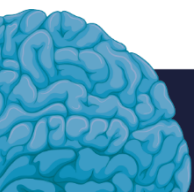
### Home Training Options:

Unyte is a computer software program that you control with your heart rate variability. The program - developed by a team of doctors and spiritual leaders - artfully combines state of the art technology with beautiful visuals, soothing sounds and effective meditation and breathing techniques to help you master your body's natural ability to counter the effects of stressful situations and live a happier, more balanced life. <https://unyte.com/>. There are also several apps available for smart phones which can be explored by searching: HRV telephone apps. Two of the better known are Inner Balance and Elite, but there are many others available. These options can be considered if ANON YMIZED seems to need ways to facilitate regular practice of the HRV breathing technique. This is something that needs to be practiced on a regular basis to enjoy the maximum benefits it has to offer.

All decisions regarding the implementation of these suggestions are the responsibility of the individual practitioner. I recognize the utility of ongoing consultation and welcome discussion of the clinical progress of individual patients, or related questions and suggestions.

### Summary of Recommendations

- Neurofeedback (Fz/Cz) and cognitive rehabilitation can be helpful.
- Biofeedback, relaxation, and Yoga can be helpful.
- Restricting alcohol or any other types of stimulants is strongly recommended.
- Sleep hygiene techniques should be considered.
- Psychotherapy can help Donta to feel more secure and control depressive/ anxious symptoms.



APPENDIX F

# QikTest Results

Continuous Performance Test (CPT)

The background of the page is a teal color with a white network diagram consisting of interconnected nodes and lines. A dark blue, brain-like pattern is visible in the center of the page, behind the text.

APPENDIX G

# Nutrigenomics

Genetic Test Results



APPENDIX H

# Neuropsychological Assessments