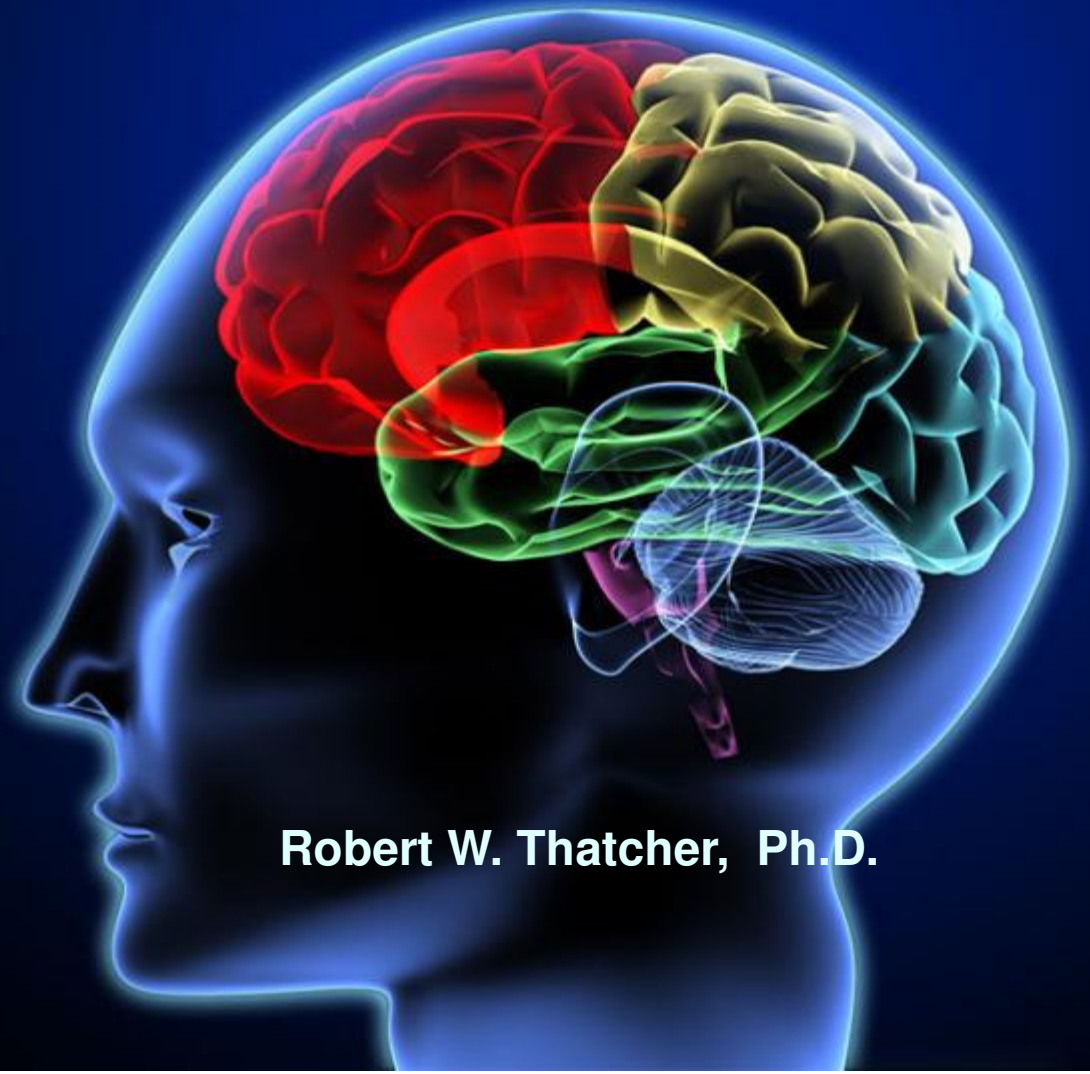
Introduction to Neurofeedback Using NeuroGuide

Seamless integration of qEEG
and Neurofeedback in NeuroGuide



Robert W. Thatcher, Ph.D.

What is Neurofeedback?

- Biofeedback is Operant Conditioning (or Reward Training) of Biometric Data
  - Examples:
    - Reducing Stress via Heart Rate or Blood Pressure Training
    - Achieving Calm by Galvanic Skin Response Conditioning
    - Controlling Pain by Changing Muscle Hypertension (EMG)

- Neurofeedback is Biofeedback of Information Contained in the Collection of Biometric Signals That Constitute the EEG, or Electroencephalogram

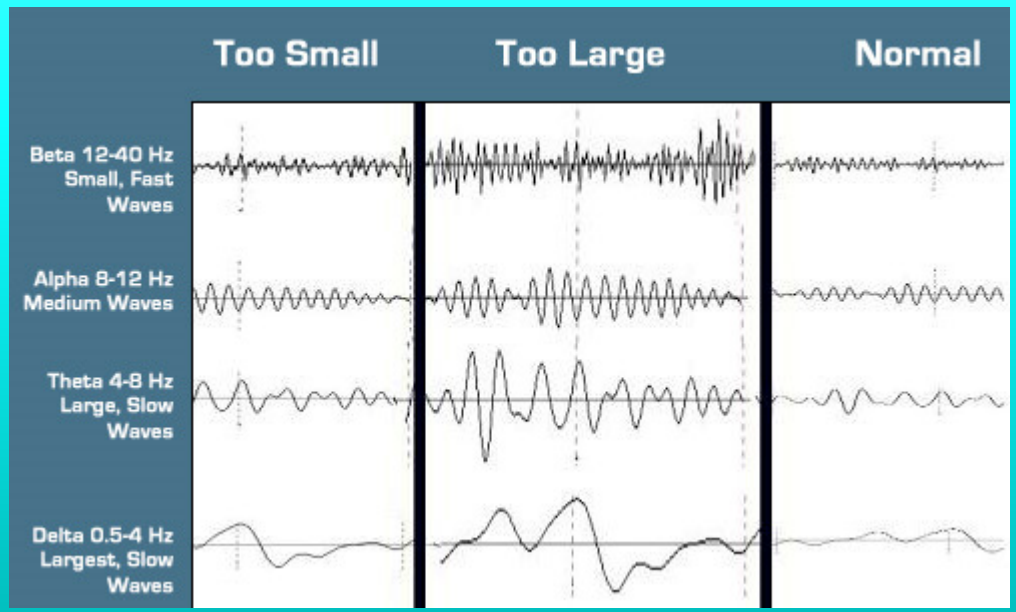
Why do Neurofeedback?

- Neurofeedback is used to treat behavioral health issues by training the patient to alter their brain function via altering aspects of their EEG

- Neurofeedback has been shown to be an effective treatment modality for affective disorders (anxiety, depression, PTSD), developmental disorders (AD/HD, LDs and ASDs), acquired brain injury (CVAs and TBIs), and many other conditions related to brain function (epilepsy, chronic pain, addiction, etc.)

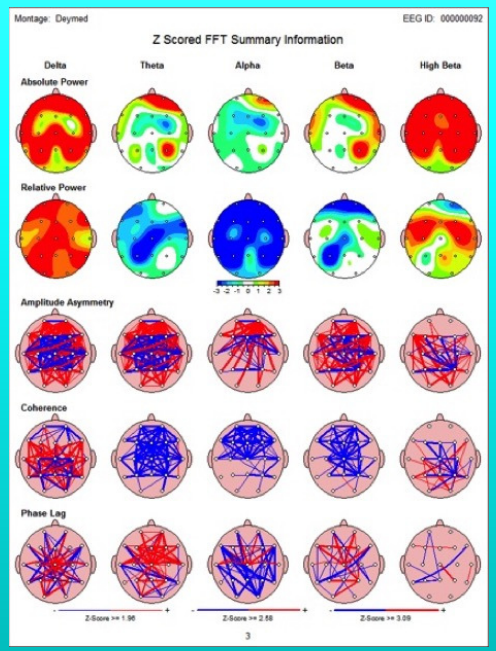
What is Neurofeedback?

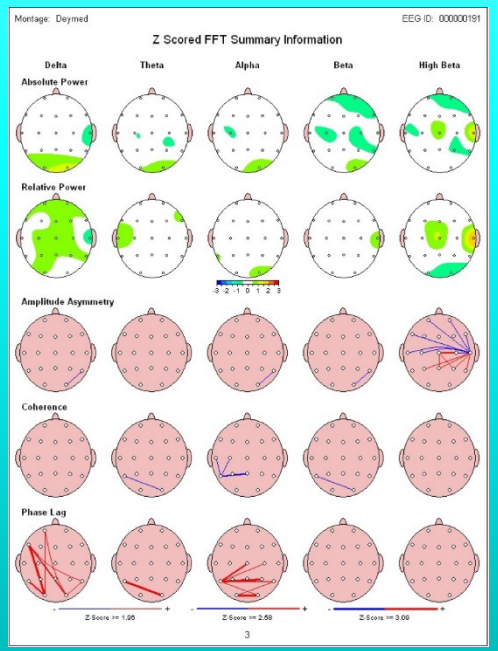
- Originally, Neurofeedback was done by training patients to alter aspects of their actual brainwave signals (“Raw” EEG):



What is Neurofeedback?

- Today, Neurofeedback more commonly refers to training patients to change aspects of their quantitative EEG (“qEEG”) brain maps that have been shown to be causally related to their symptoms

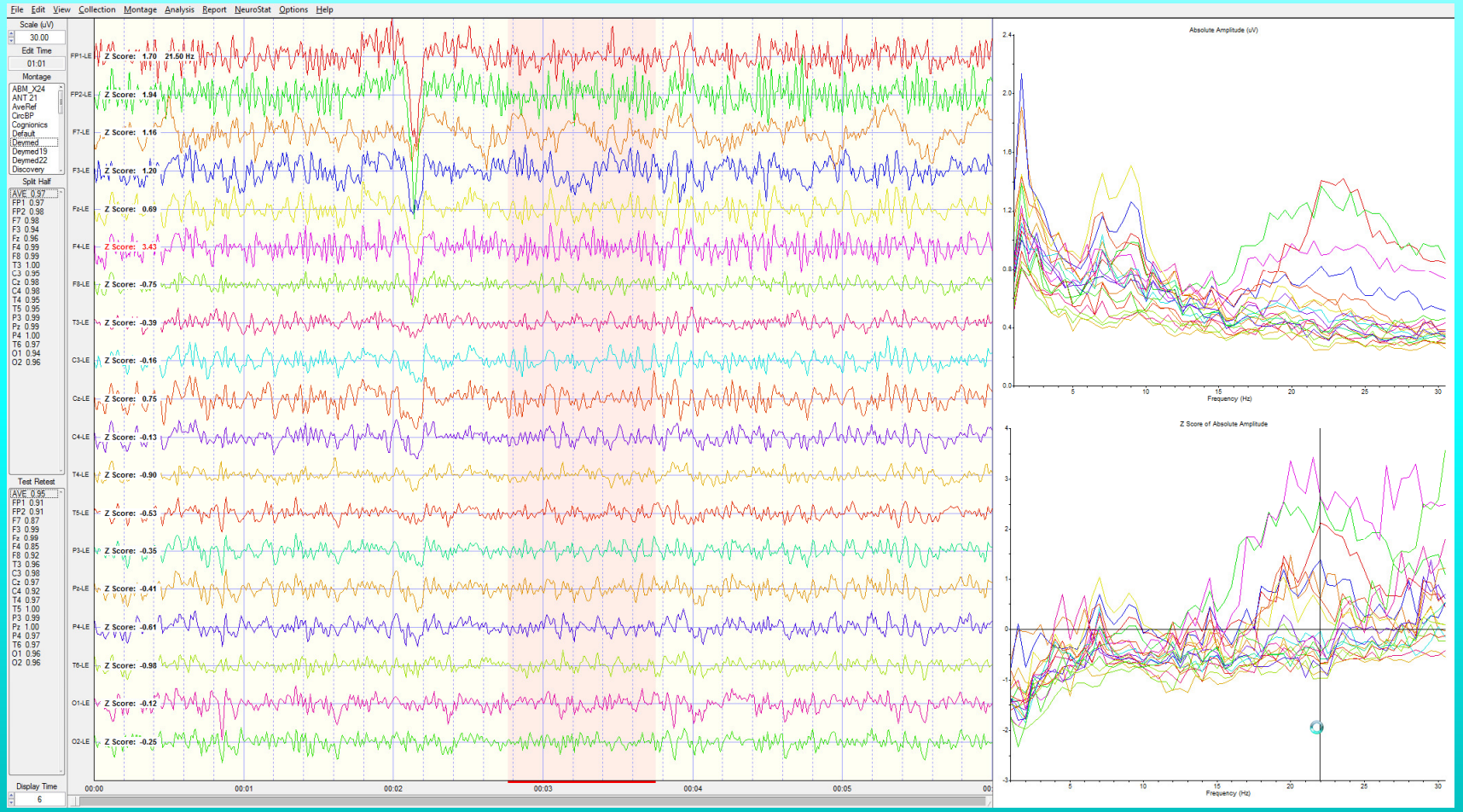




What is NeuroGuide?

- Neuroguide is:
  - An FDA Registered Database of Normative qEEG Values
  - A computer program that can compare the qEEG values of a given patient to the normative database and comparative produce brain maps
  - A system for collecting and recording (“acquiring”) EEG in real time
  - A set of tools for doing Neurofeedback on patients to help them retrain the brain functioning in order to address their behavioral health problems
  - A research tool for doing statistical analyses on groups of brain maps
  - Many other uses

What is NeuroGuide?



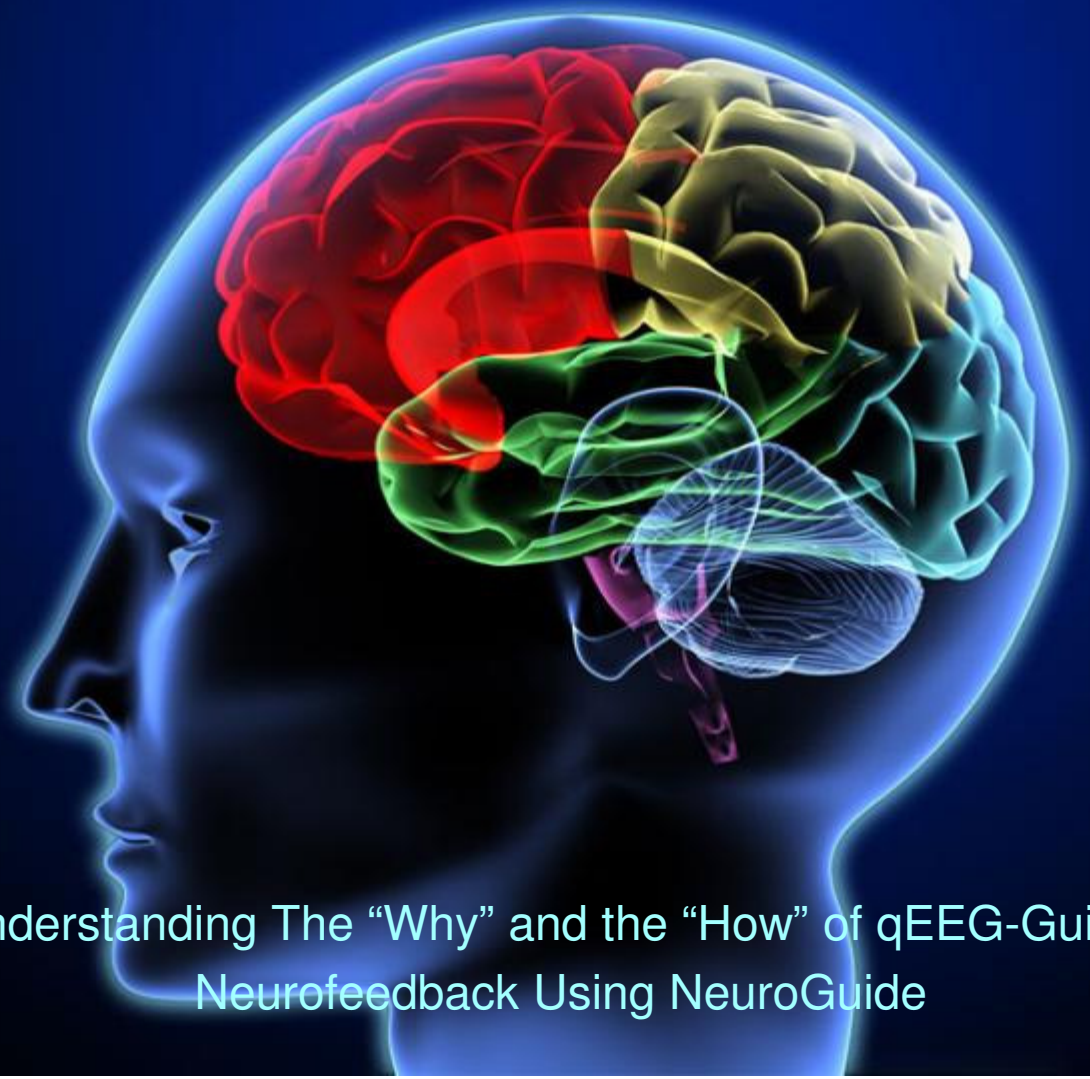
Why use NeuroGuide?

- NeuroGuide is the most advanced and scientifically validated system for analyzing brain function and doing neurofeedback:
  - Trains Only Z-scores of qEEG metrics, not absolute values
  - Symptom driven – doesn't "chase dysregulations"
  - Relies on full 19 channel EEG
  - Analyzes and rewards qEEG normalization using 3-D real time brain imaging (LORETA)
  - Based on the Node-Network Hypothesis of Cortical Functioning
  - Can train Surface Power, Connectivity, Current Sources (3-D) or a combination of these

Workshop Goals

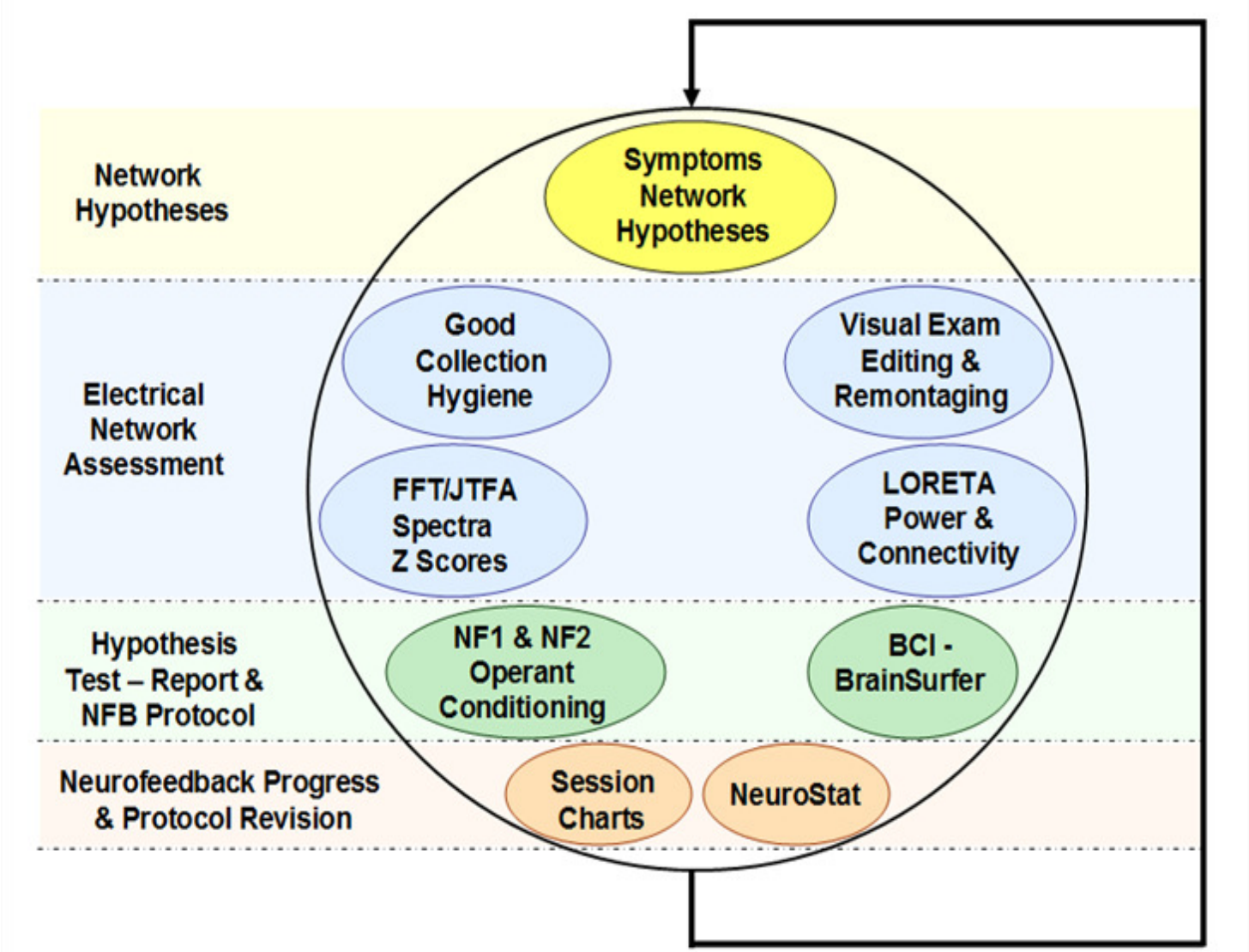
- To Learn and Understand a Comprehensive and Rational Approach to Analyzing and Changing Brain Function Using NeuroGuide
- To Teach Attendees How to Assess Patients, Acquire EEG an Automatic Clinical Report (ACR)
- To Learn How to Link Symptoms to Brain Dysregulations
- To Assess Symptoms By Functional Domain and Create Treatment Protocols Using NeuroLink
- To Learn How to Treat Patients Safely and Effectively as Quickly as Possible (one to two weekends) using Neuroguide and various EEG Collection Systems

Part I:
Some Theory and Background

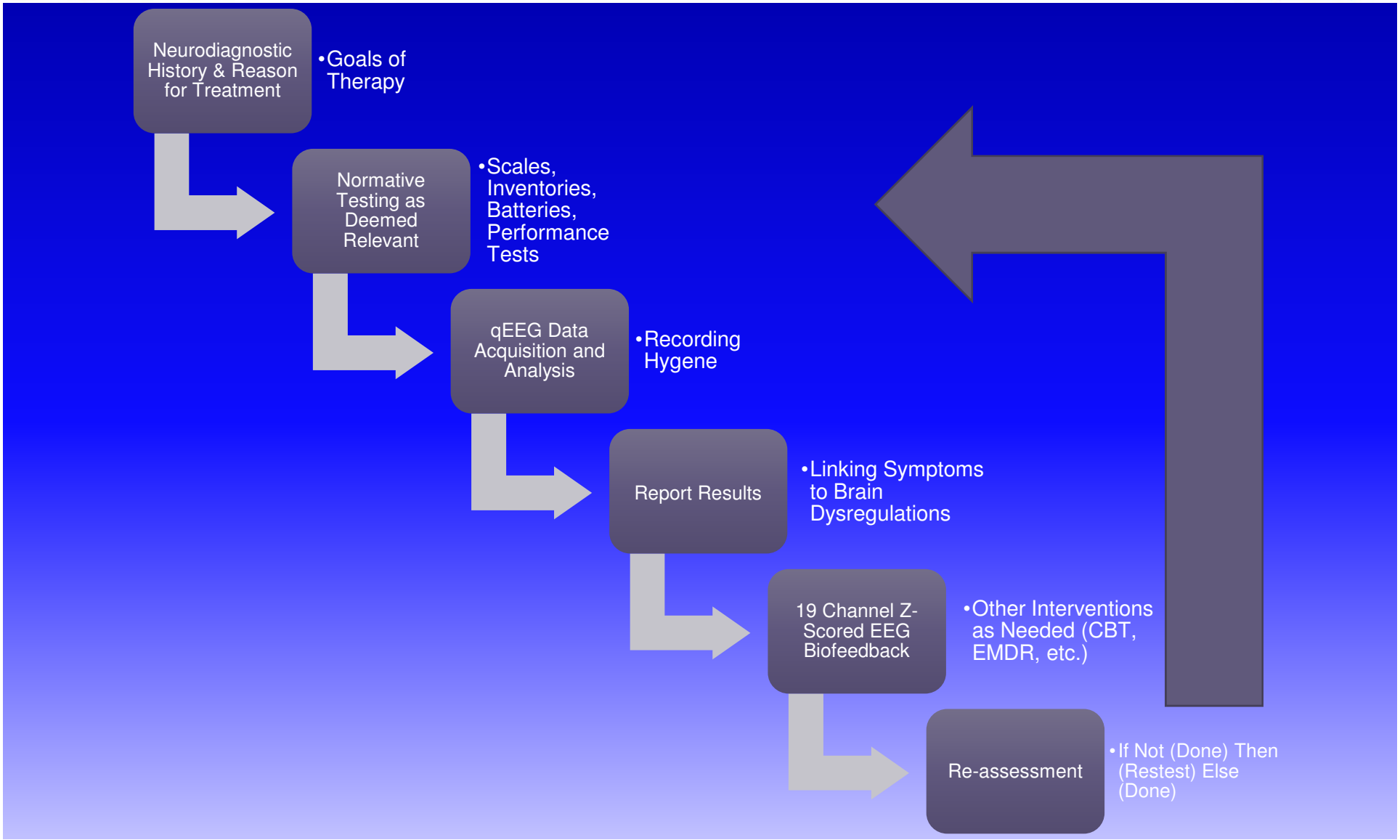


Understanding The “Why” and the “How” of qEEG-Guided Neurofeedback Using NeuroGuide

Linking The Patient's Symptoms to The Patient's Brain (LSB)



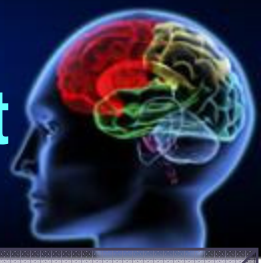
Essential Steps in Helping Patients with Neurological/Psychological Problems



History and reason for Treatment

- Structured Intake Interview
  - What Brings You Here?
    - Symptom(s) h/x, Onset, Duration, Severity, Previous d/x, etc.
  - Medical History
    - Guided Questions re: Developmental h/x, Medical Issues, Surgeries, Physical/Psych. Trauma, TBIs, Seizures, R/Xs, Other
  - Biopsychosocial Info.
  - Family History and Living Situation
  - Handedness, Languages
  - *** Goals of Therapy ***

Normative Testing as Deemed Relevant



Single Symptom Inventories / Behavior Scales	Comprehensive Profile Inventories (Self and Others)	Performance-Based Screening Batteries	Neuropsychological Performance Tests
• BDI-II • BAI • CB-OCD • MASC • Etc.	• CBRS • PAI/MMPI • TSI • BPAD, • NeuroLink*	• CNS-VS • NeuroTrax • NEPSY-II • Others	• CPT-3-CATA • IVA-TOVA • WISC/WAIS/Raven's Matrices • WMS-CVLT-RCFT • WASI/WJ-III

Report Results and Linking Symptoms to Brain Dysregulations (LSB)

- What We're Here For:
- Assessment and NeuroLink
- Hypothesis Formation
  - EEG Collection and Recording
    - Wet vs. Dry, Cap vs. Free Sensors,
  - Recording Hygiene
    - Identifying and Eliminating Artifact: The Earlier, The Better
  - Generating The Analysis
    - Running Custom Analyses vs. Using the ACR

Report Results and Linking Symptoms to Brain Dysregulations

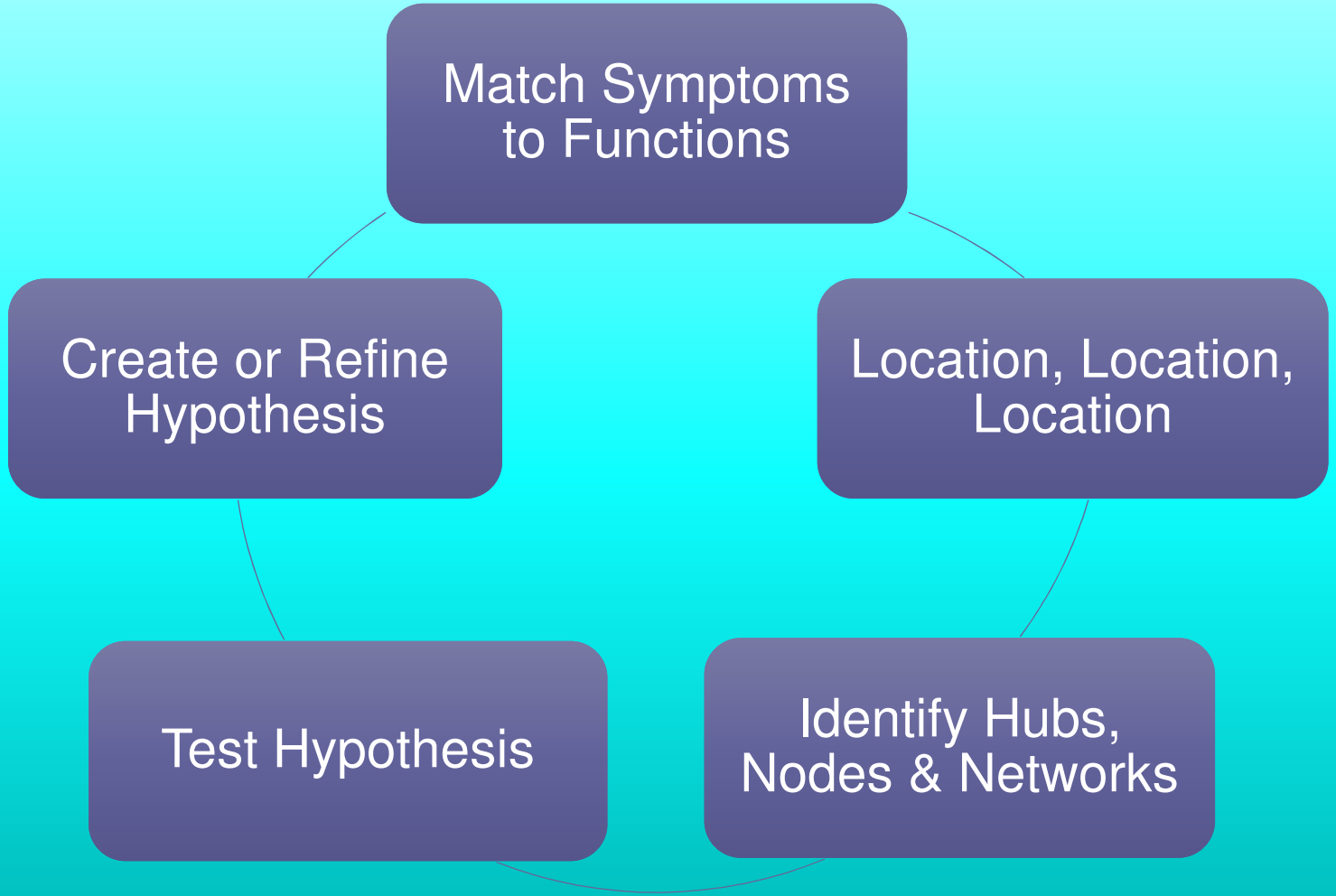
Presenting Complaints

Hypotheses: Linking Symptoms to Brain

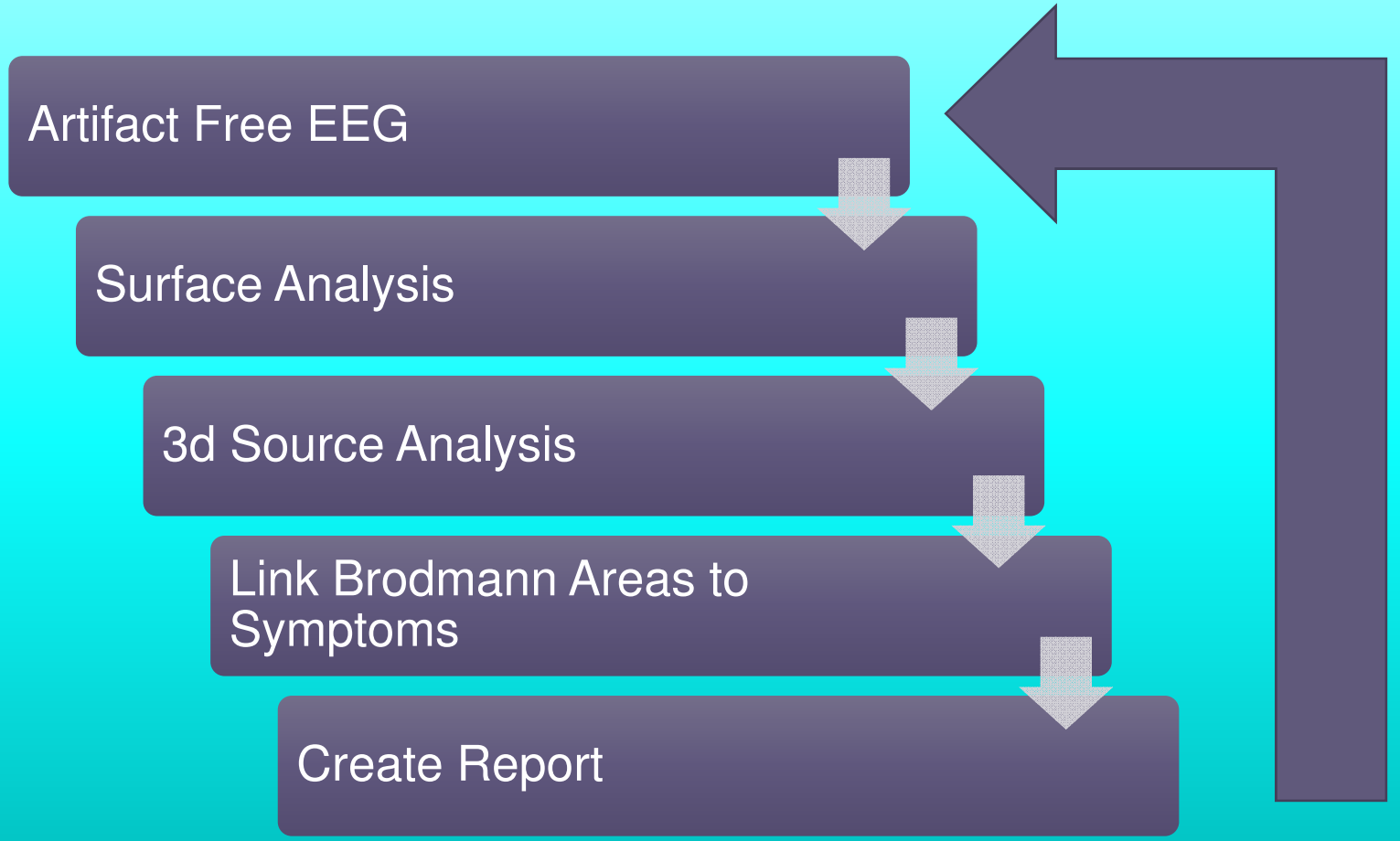
Assessment Results

Automatic Clin Report

Linking Symptoms to Brain



Analyses, Hypothesis Testing and Report Creation



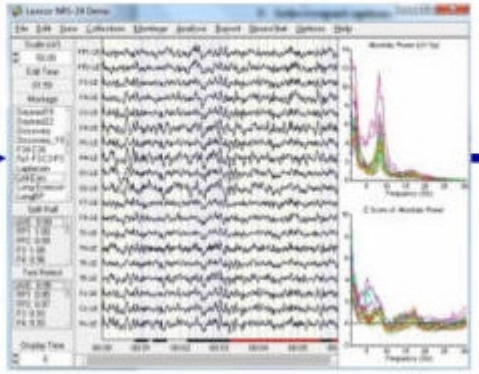
Analyses, Hypothesis Testing and Report Creation

- Clinical Evaluation
- Hypothesis Formation
- Visual Examination
- Artifact Rejection
- Linked Ears
- Laplacian
- LORETA

→ Clinic Report

Automatic Clinical Report Writer (ACR)

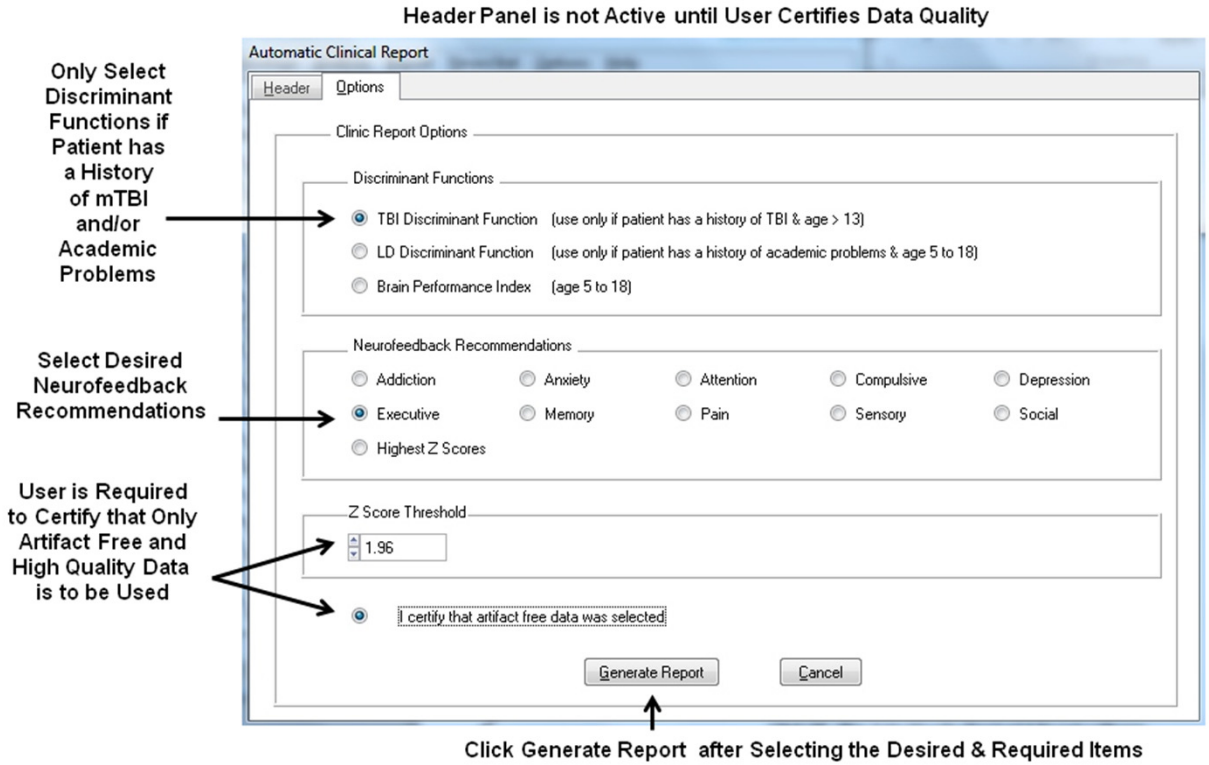
Record → **Edit** → **Automatic Report**



- No Delays with Minimal Expense for a Professional Quality In-House QEEG Clinical Report
- Less than One Minute to Produce a Professional QEEG Clinical Report, in Microsoft Word format
- ACR Provides: Empowerment, Simplicity, Accuracy & Efficiency!
- Get Valid Normative Database Comparisons using without Depending on Internet Q-EEG Report Services!
- Get Relevant Content and Displays, plus Helpful NFB Recommendations in Less than a Minute.
- Increased Productivity by at Least 10 Fold, e.g. Ten Reports in an Hour!

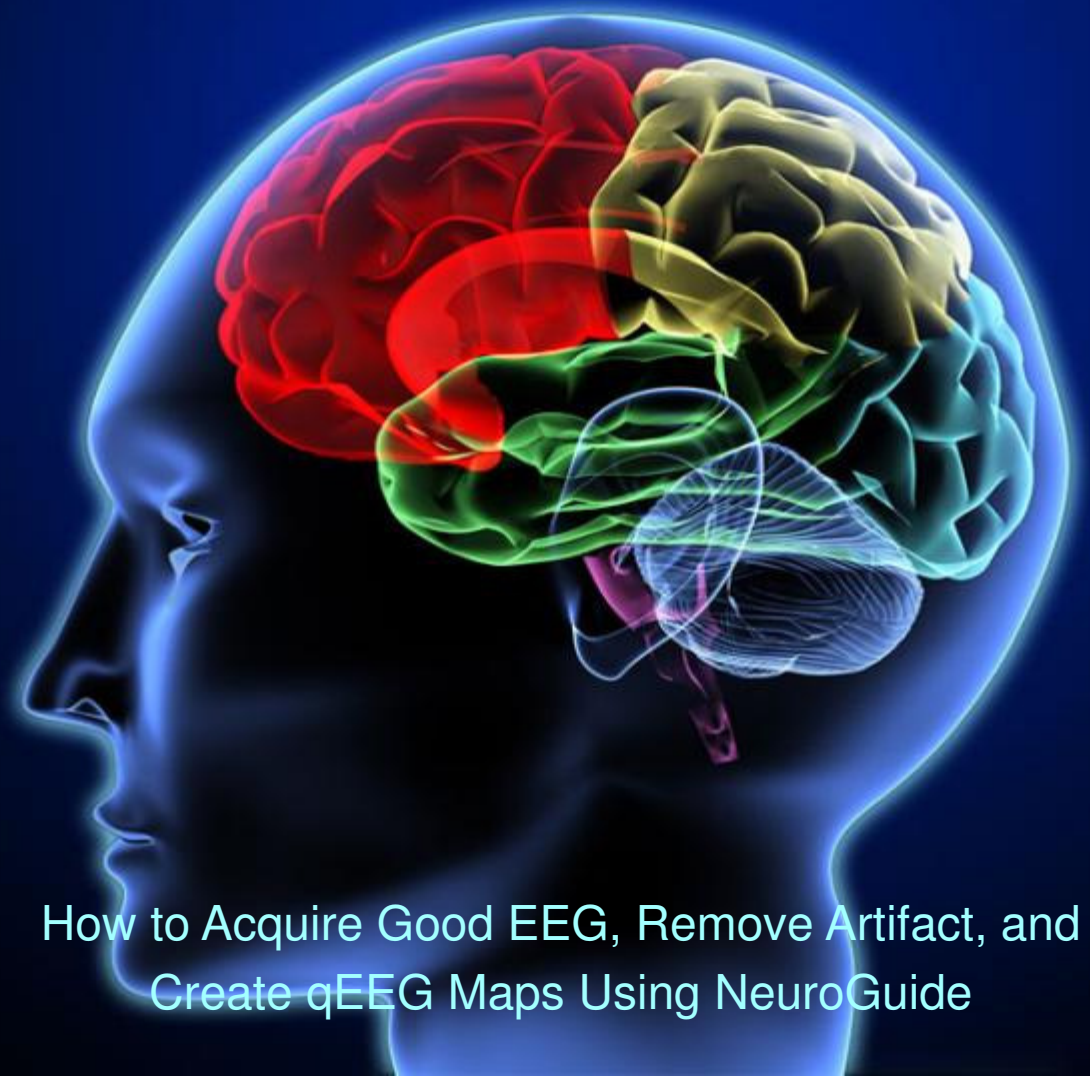
NeuroLink to a Clinical Report and Neurofeedback Protocol

ACR Options Panel



Network Linked to Symptoms → List of Networks appears – user selects the network, the significant surface & LORETA Z scores from the analysis are sorted and matched to the surface and Brodmann areas in the Neuroguide symptom check list and then printed in the report – if none then no NFB recommendations are produced with a statement – No Matches Present

Part II:
EEG Acquisition and Analysis

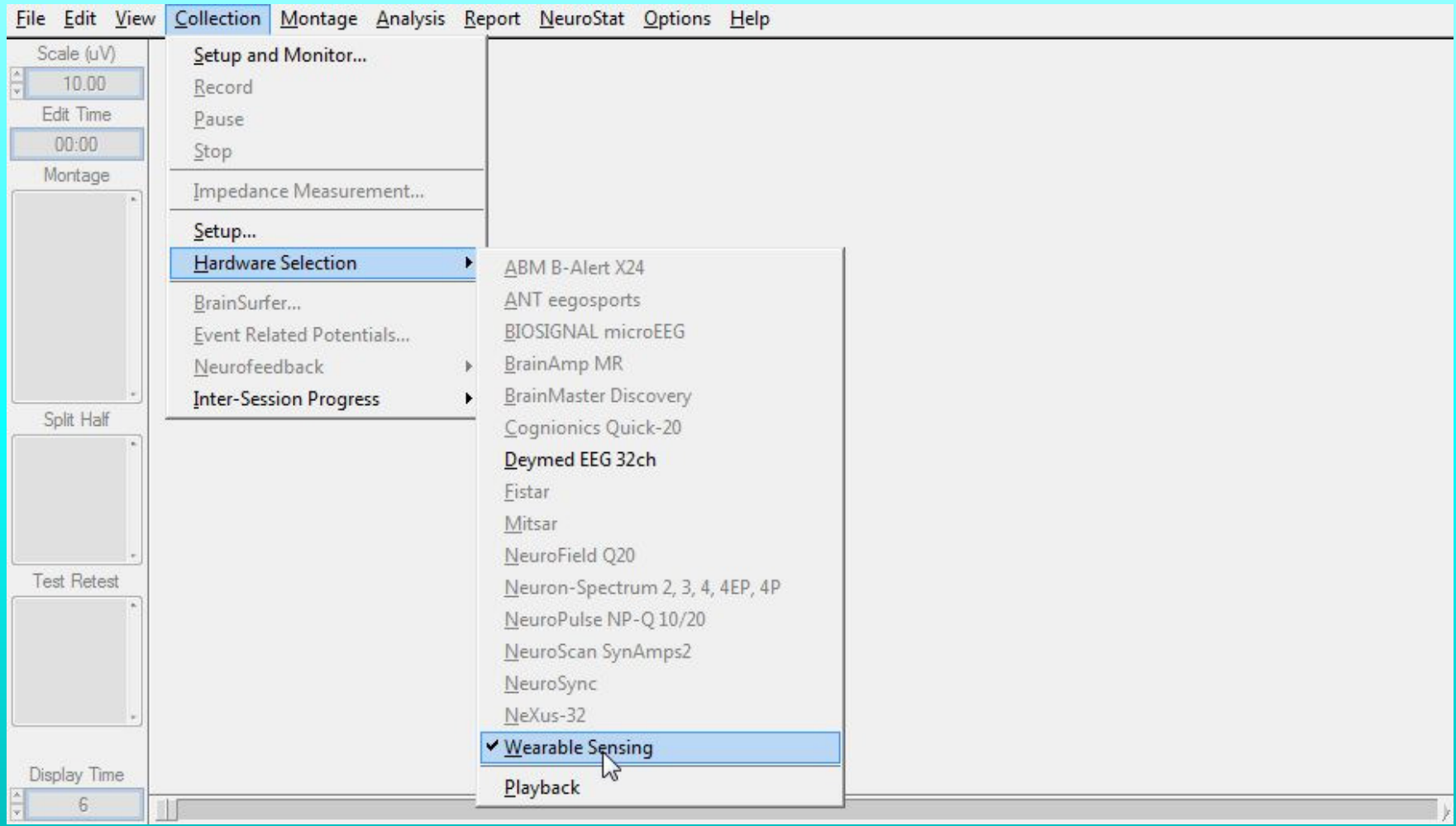


How to Acquire Good EEG, Remove Artifact, and
Create qEEG Maps Using NeuroGuide

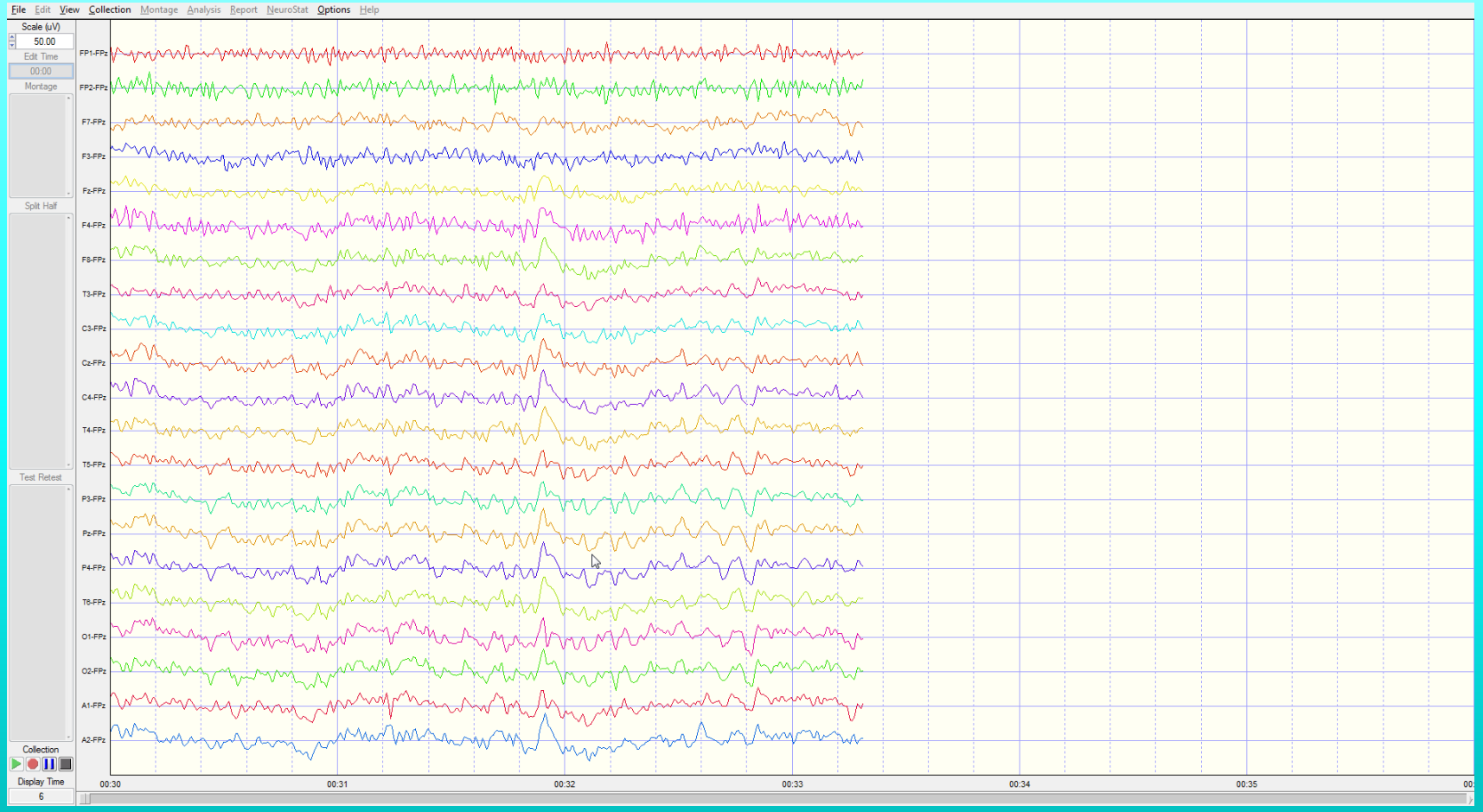
Demo for qEEG Data Acquisition, Artifacting and Report Creation

- We will:
  - Request a Volunteer to Have their EEG Recorded
  - Use NeuroGuide with a Wireless Dry Electrode System to Acquire Raw EEG
  - Use NeuroGuide to Remove Artifact and Select Brain-based EEG for Analysis
  - Use the Automated Cinical Report Generator to Create a qEEG Report

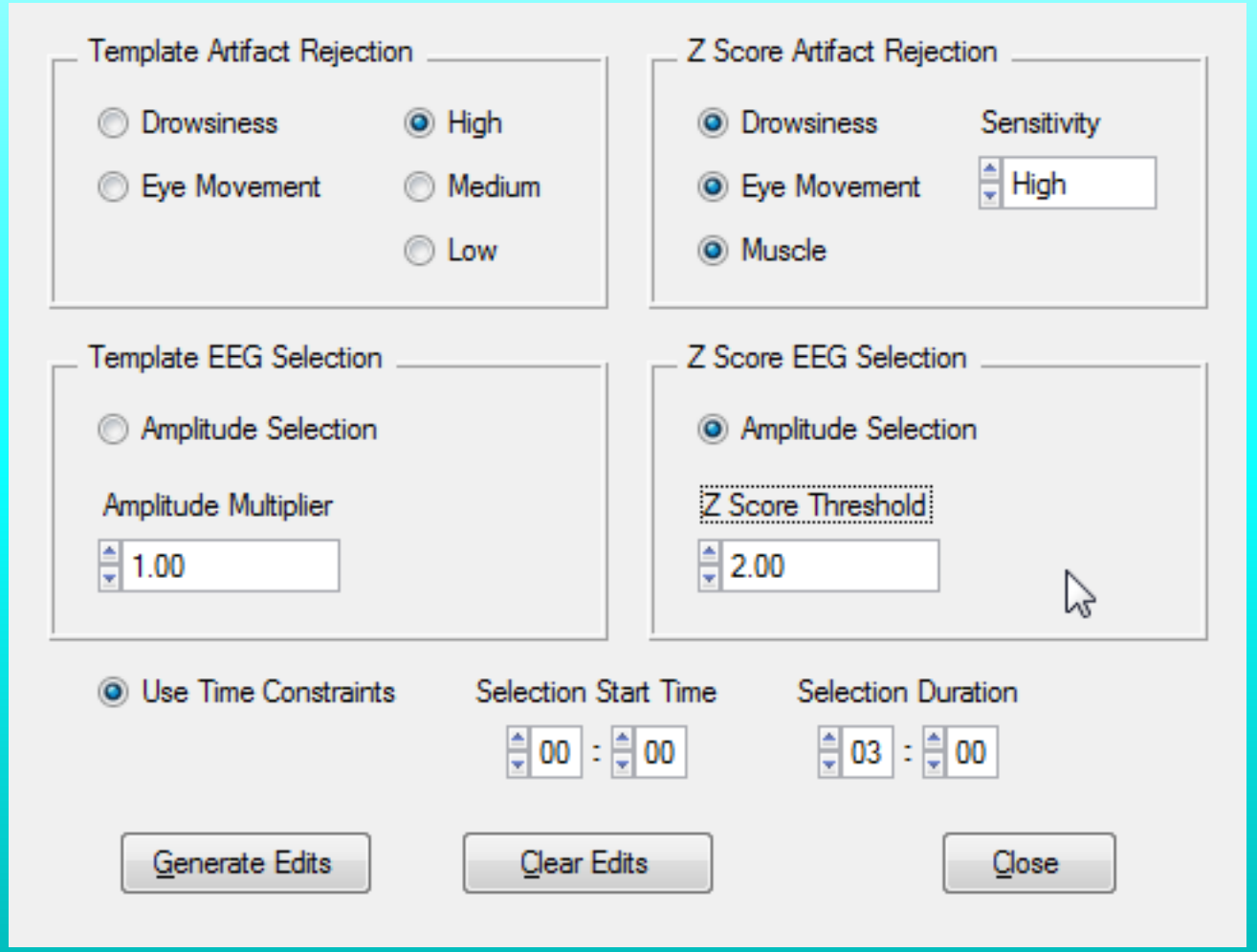
Demo for qEEG Data Acquisition, Artifacting and Report Creation



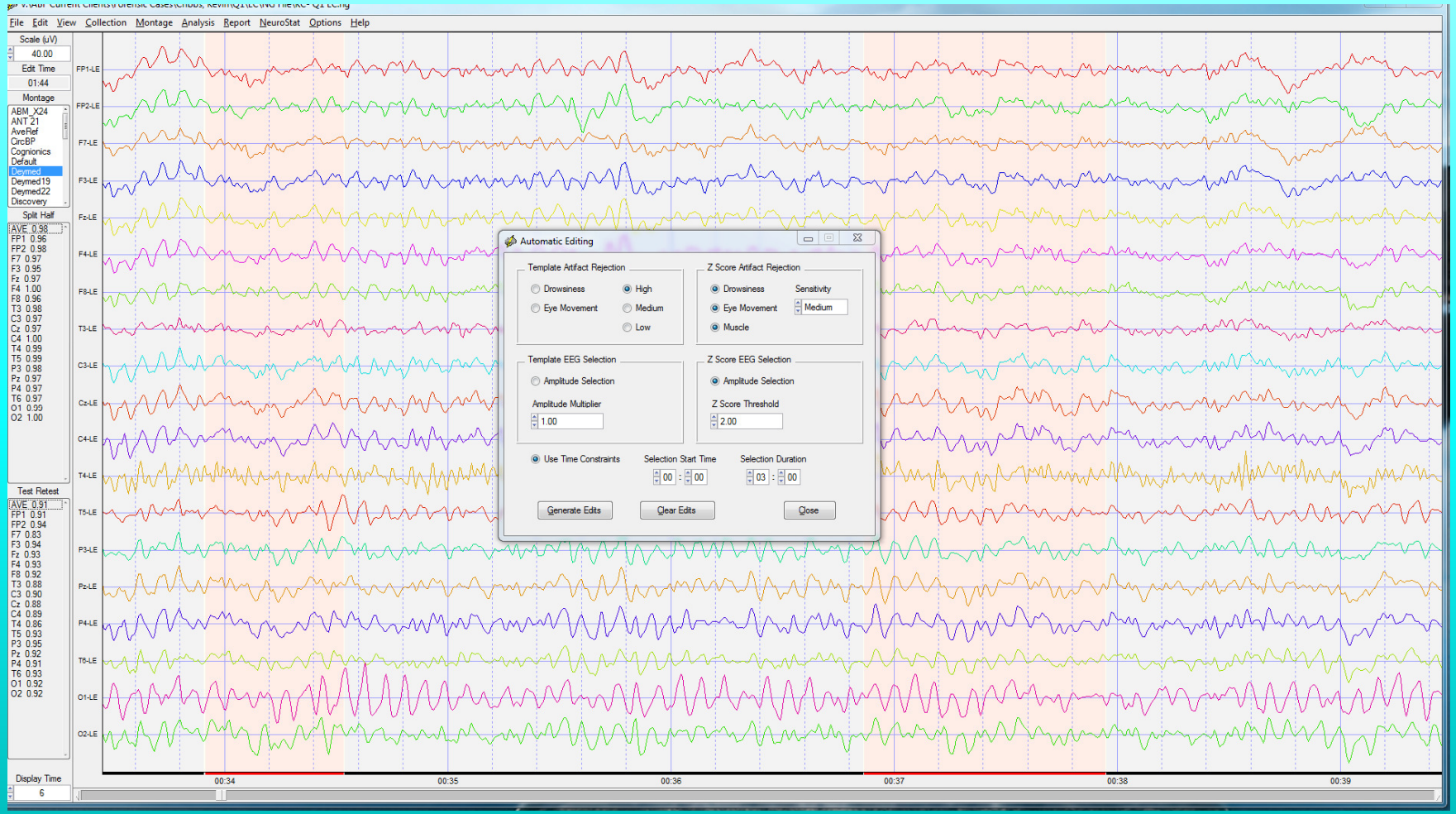
Demo for qEEG Data Acquisition, Artifacting and Report Creation



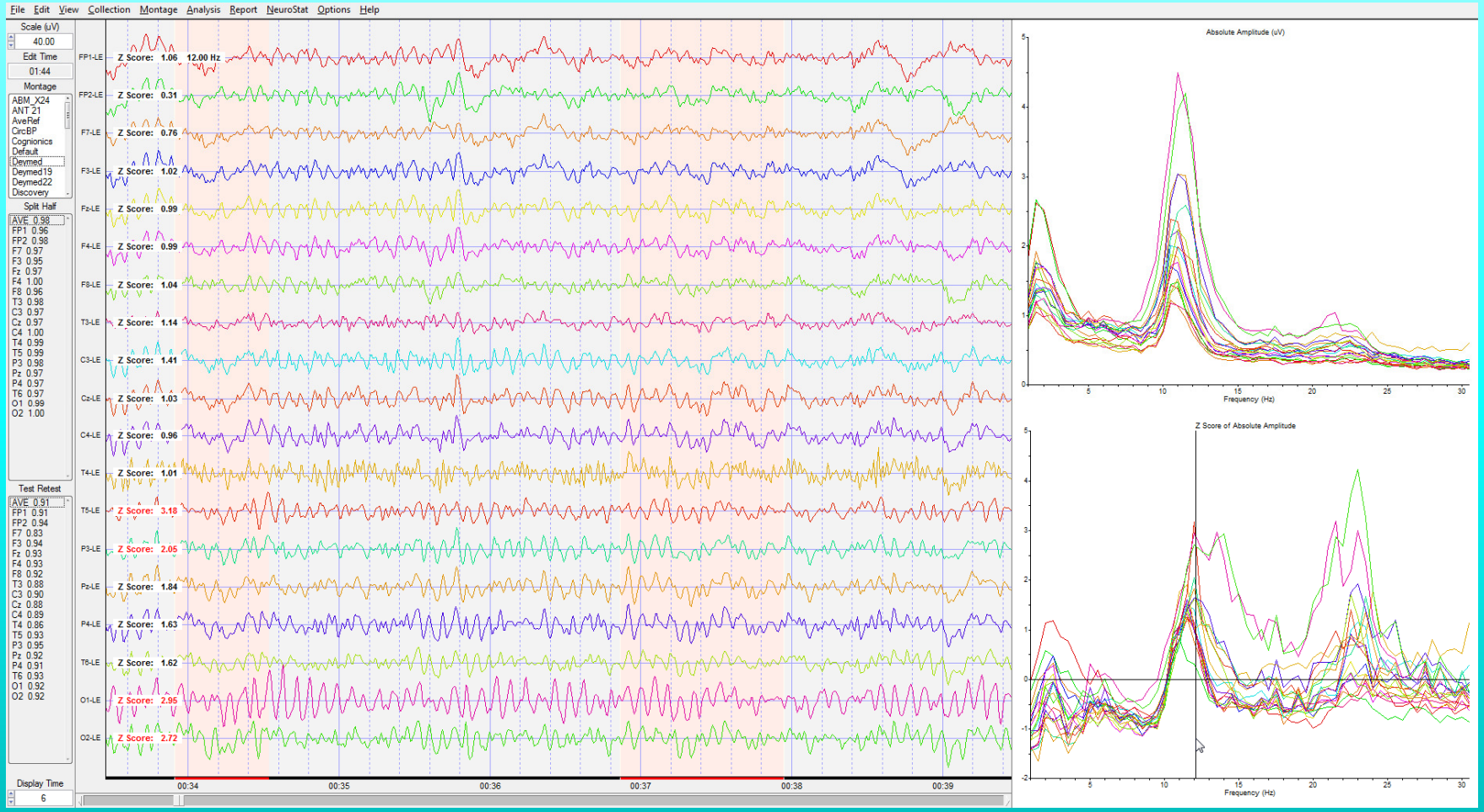
Demo for qEEG Data Acquisition, Artifacting and Report Creation



Demo for qEEG Data Acquisition, Artifacting and Report Creation



Demo for qEEG Data Acquisition, Artifacting and Report Creation



Automatic Clinical Report Writer Header Page

Header | Options

Company Info: ABF Behavioral Health

Company Name: ABF Behavioral Health

Address Line 1: 10840 Sheldon Road

Address Line 2: Suite B

City: Tampa State: FL

Zip Code: 33626 Country: USA

Phone: 813.235.4270 Fax: 813.

Email:

Save Company Info

No Company Logo in Report

Manual Signature

Clinician Name (e.g. John Doe)
William A. Lambos

Title (e.g. Ph.D., QEEG-D, BCIA, ECNS)
Ph.D., BCN

Reset

Exit Next

Automatic Clinical Report Writer Options page

Header | Options

Clinic Report Options

Discriminant Functions

- (•) TBI Discriminant Function (use only if patient has a history of TBI & age > 13)
- ( ) LD Discriminant Function (use only if patient has a history of academic problems & age 5 to 18)
- ( ) Brain Performance Index (age 5 to 18)

Neurofeedback Recommendations

( ) Addiction	( ) Anxiety	( ) Attention	(•) Compulsive	( ) Depression
(•) Executive	( ) Memory	( ) Pain	( ) Sensory	(•) Social
( ) Highest Z Scores				

Z Score Threshold

1.96

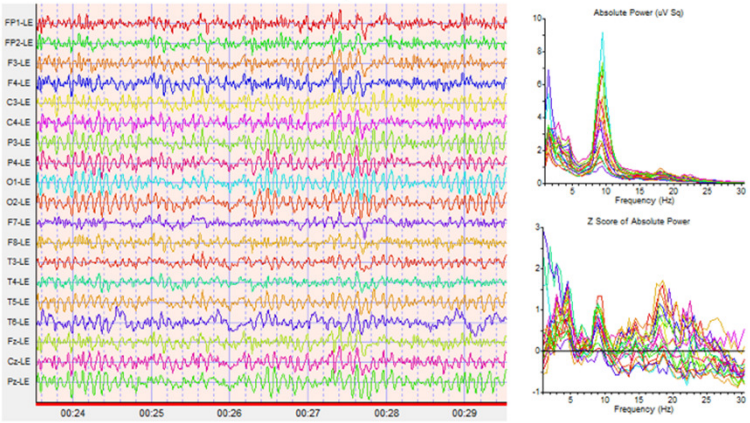
(•) I certify that artifact free data was selected

[Generate Report] [Cancel]

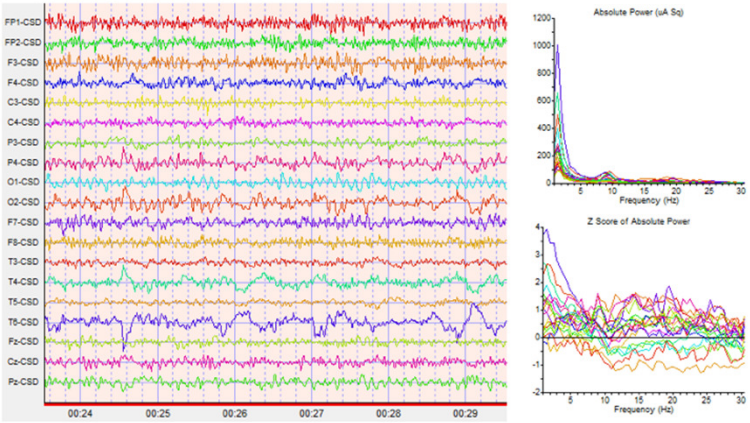
Automatic Clinical Report Writer Output Page

Conventional EEG Samples and Quantitative EEG Analyses

Example of Linked Ears EEG and Absolute Power - Eyes Closed Condition



Example of Laplacian EEG and Absolute Power - Eyes Closed Condition



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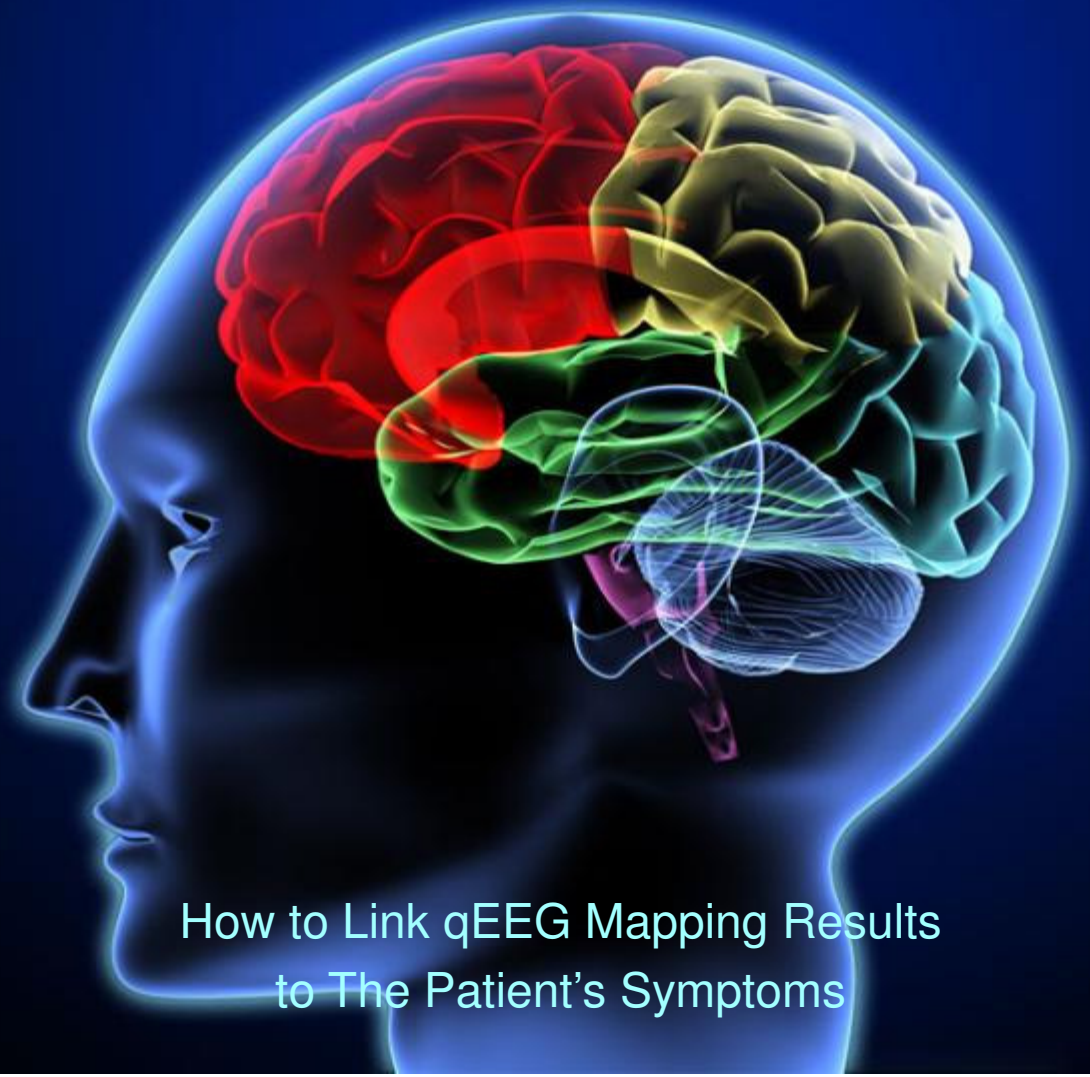
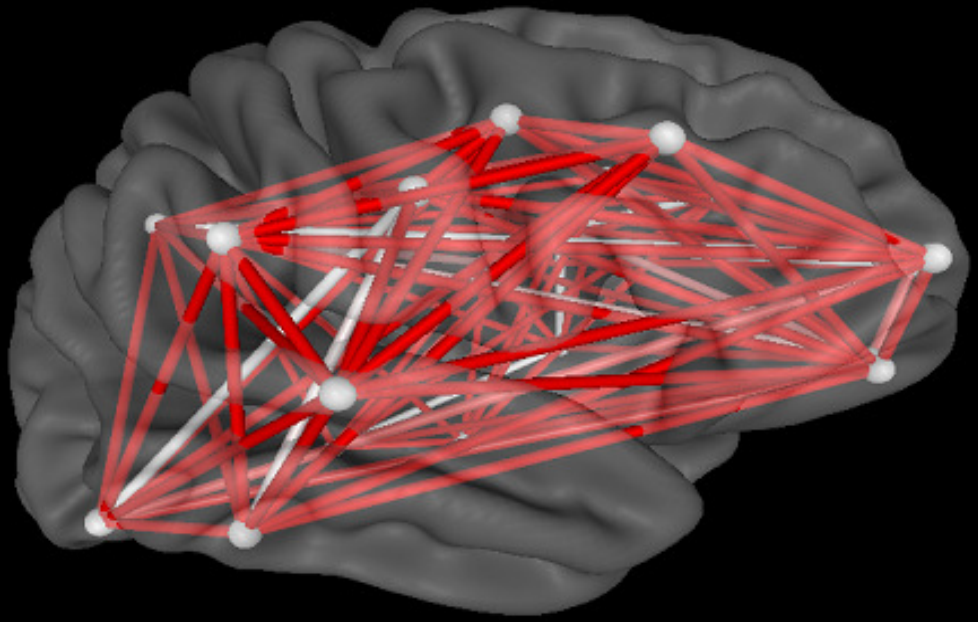
Part III:
Linking qEEG Results to Symptoms



How to Link qEEG Mapping Results
to The Patient's Symptoms

Testing To Relate Symptoms To Patient's Brain

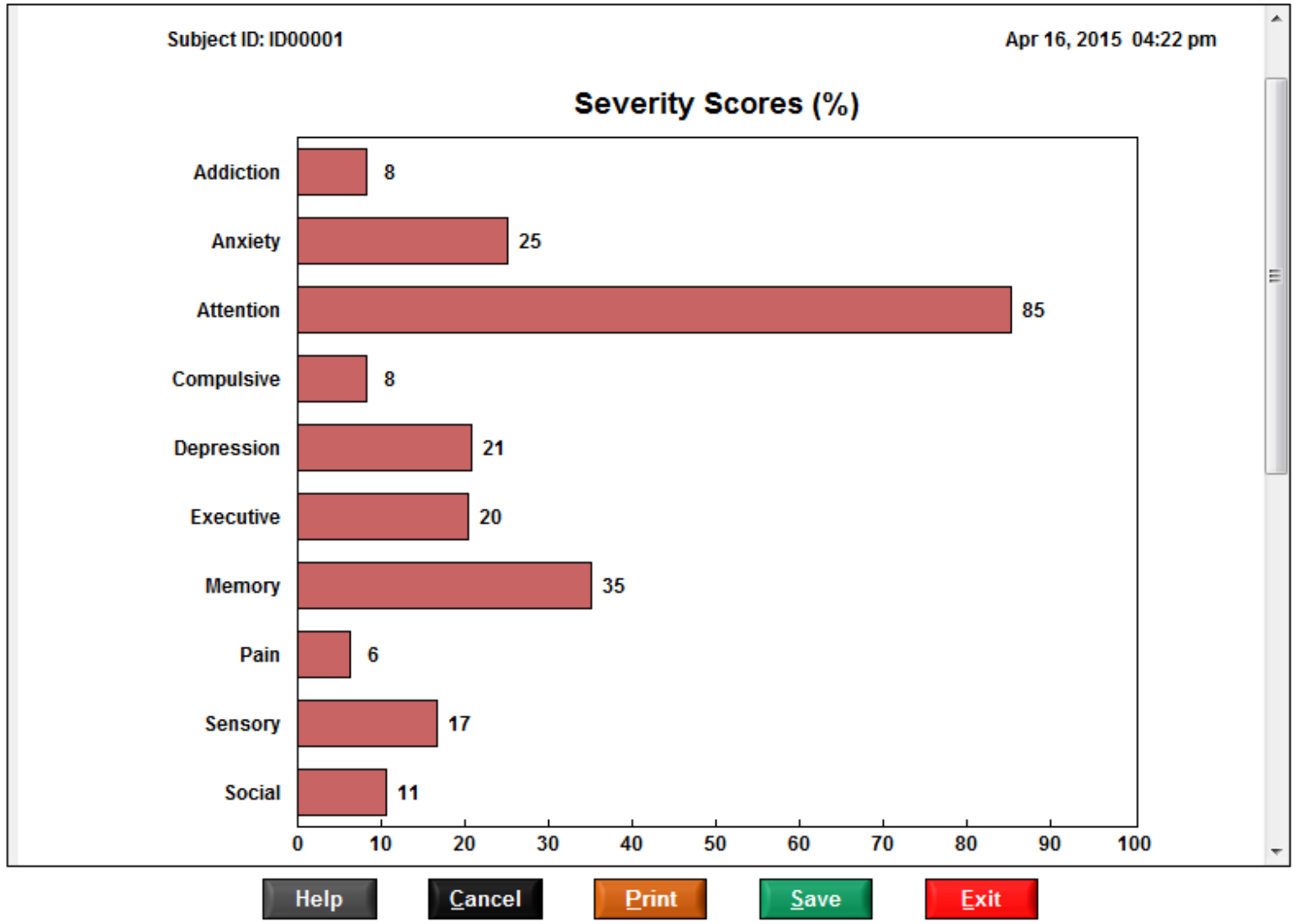
NeuroLink *by Applied Neuroscience, Inc.*



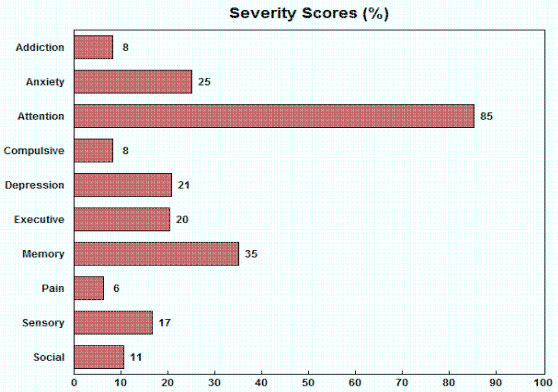
www.anineurolink.com

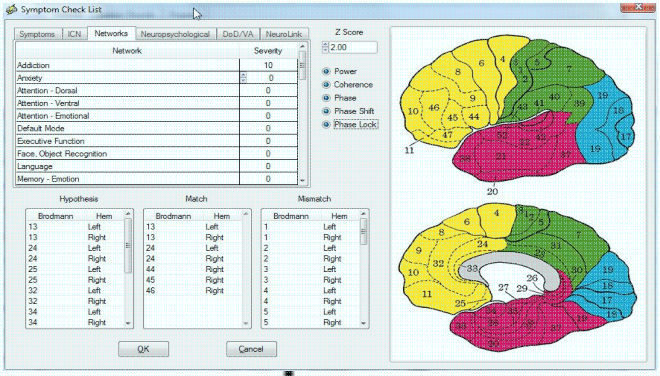
Press Any Key to Continue...

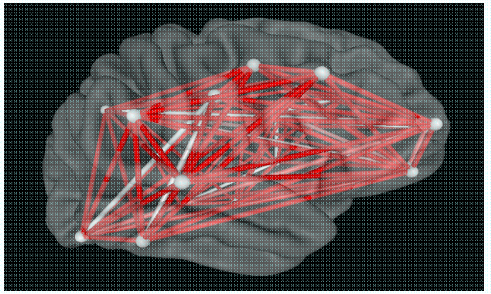
NeuroLink Severity Scores By Symptom Domain

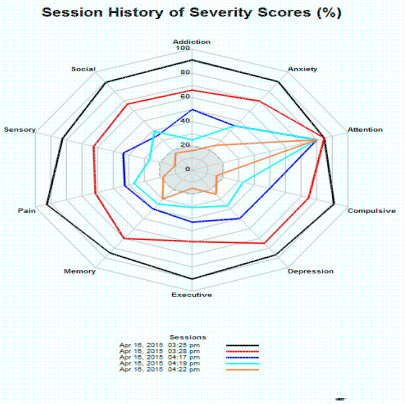


NeuroLink and NeuroGuide Integration: Linking Symtoms to the Brain





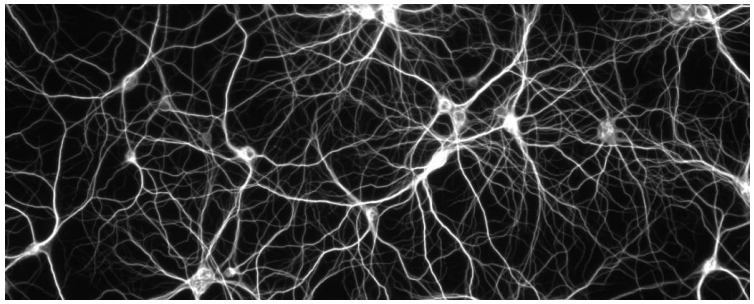




EEG Biofeedback

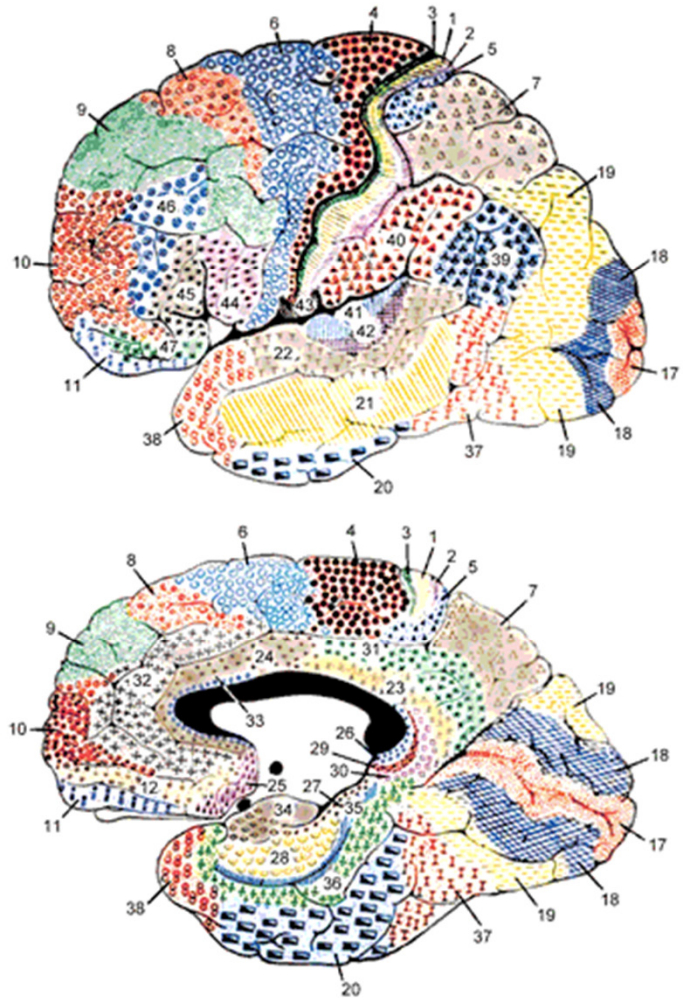
How Have We Learned About Brain Function?

- Open and Closed Head Wounds
  - Phinneus Gage, CVAs, TIAs, Birth Trauma, etc.
- Post-Mortem Histology Studies
  - Hippocrates, Galen, Ramon y Cajal, etc.
- Animal Ablation Research
  - Lashley, etc.
- Brain Imaging
  - Structural, Function, Axial, Proxy-based, Physiological

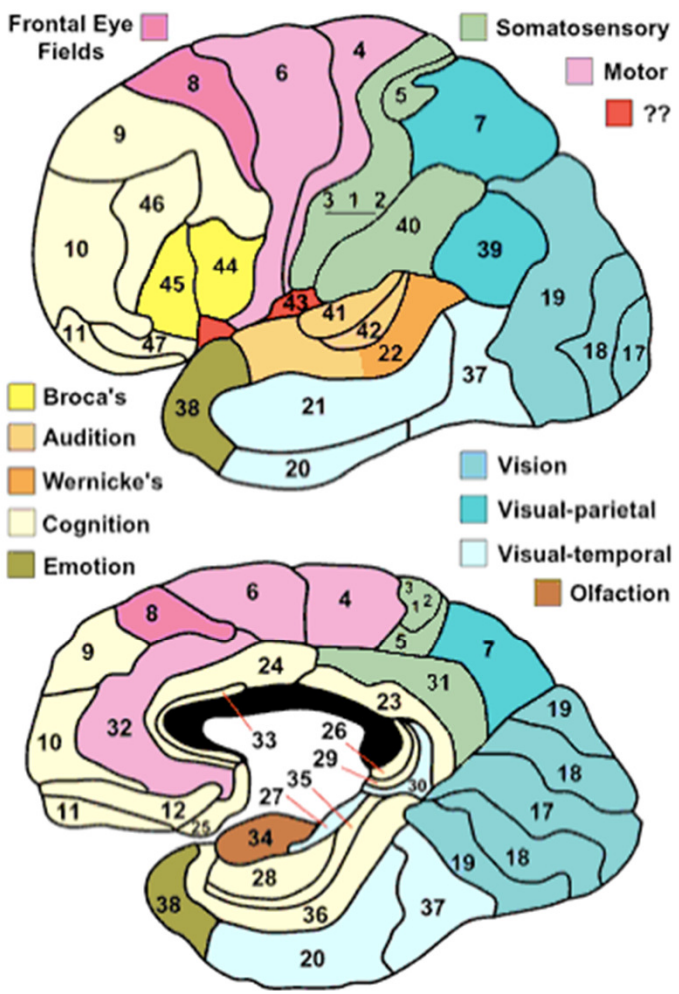


Brodmann Areas:
Cytoarchitecture ("Structure") of the Brain

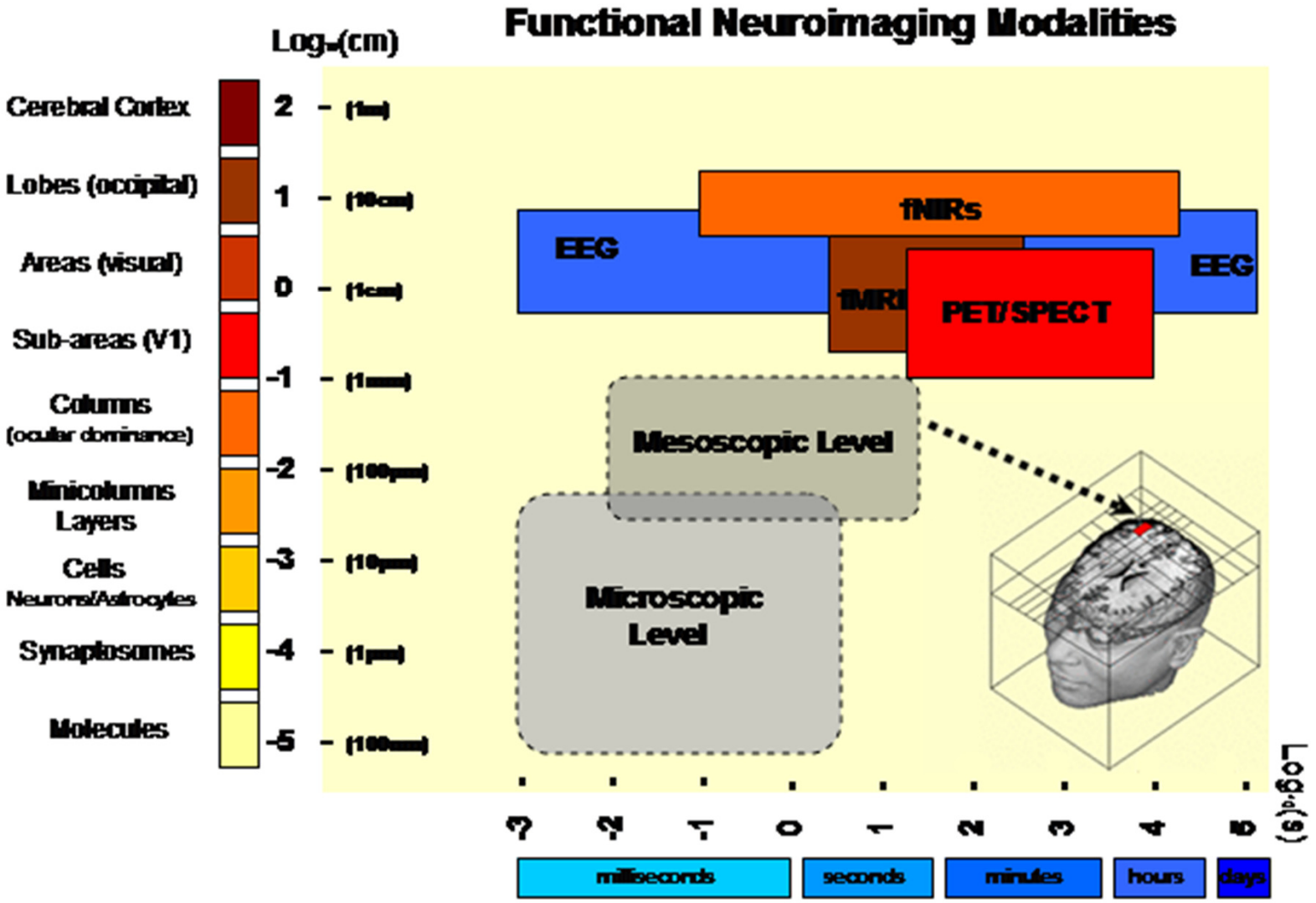
Original Brodmann Map - Colorized



Outlines - with Functional Attribution

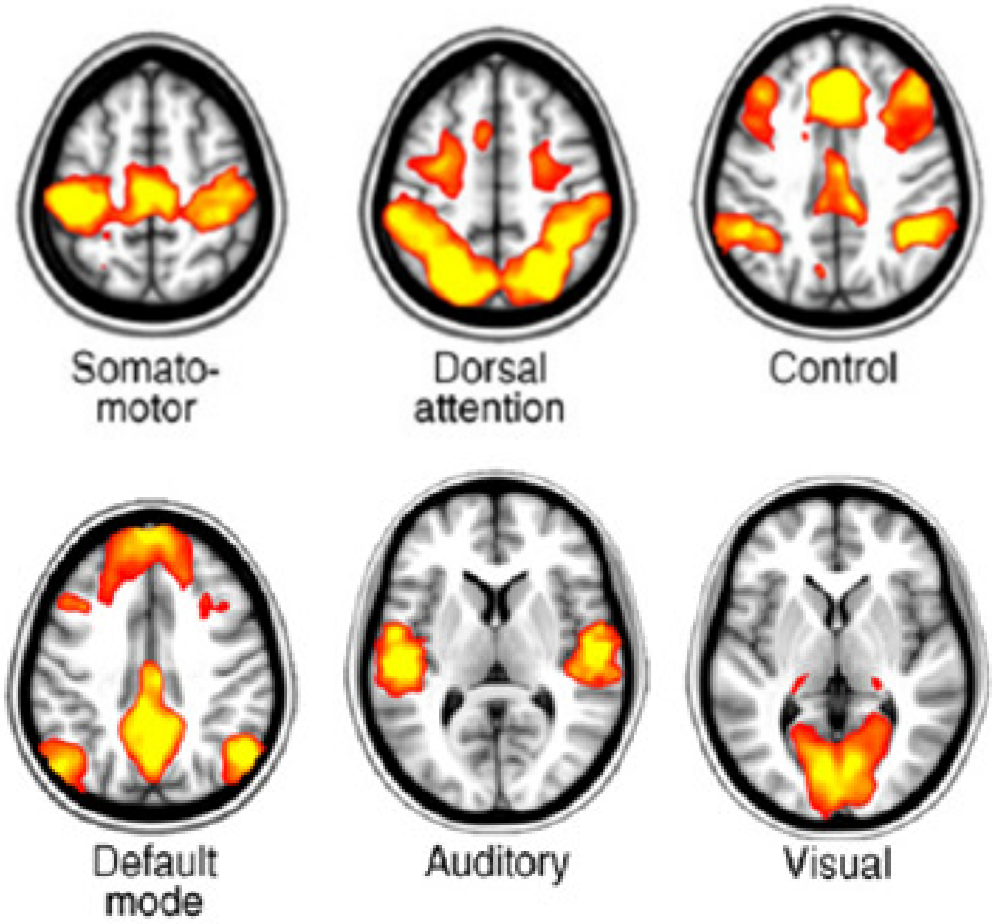


Functional Neuroimaging Modalities

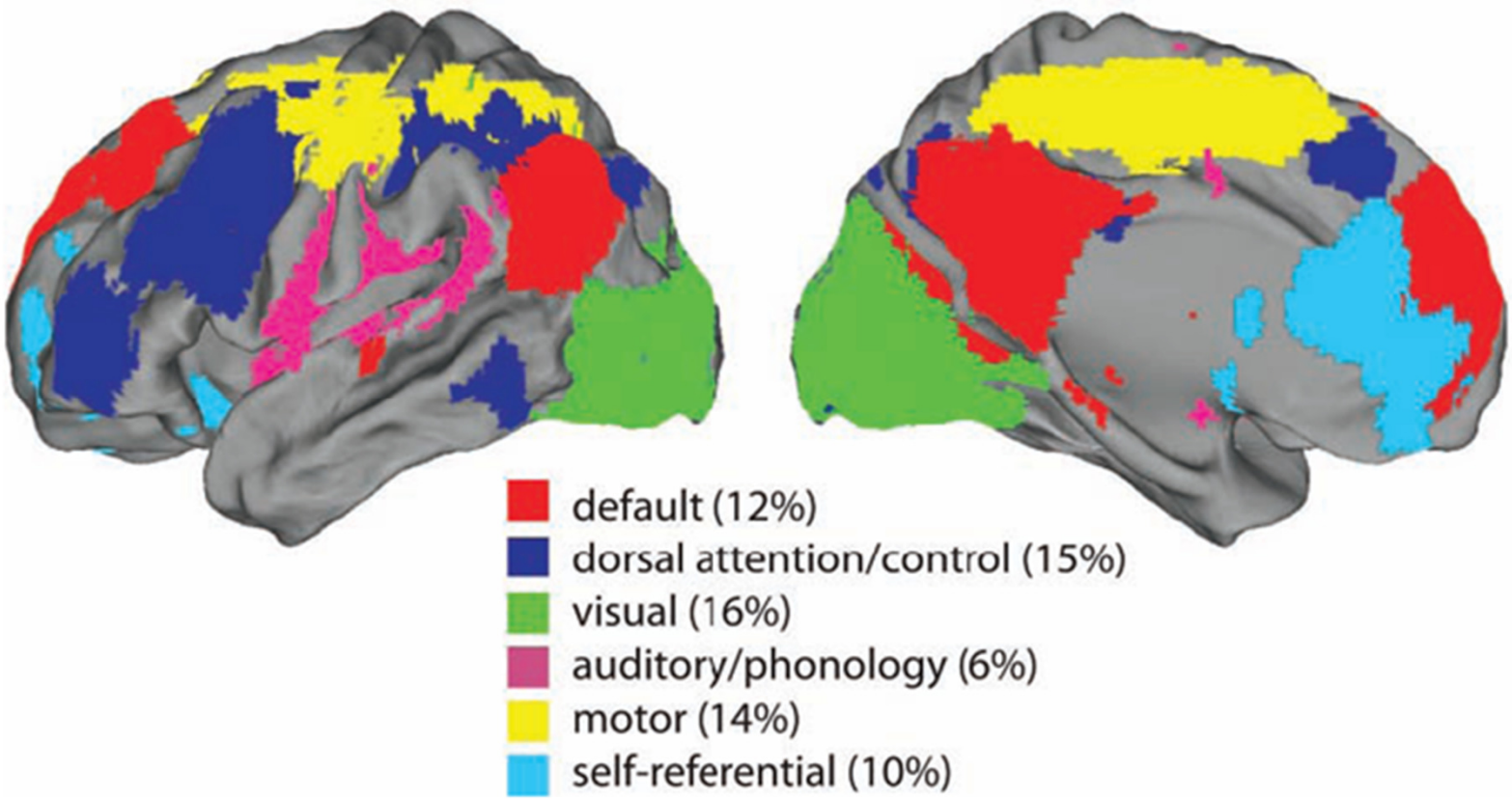


Traditional Domains of Neuropsychological Functioning and Assessment

Six Functional Modules as Measured by fMRI



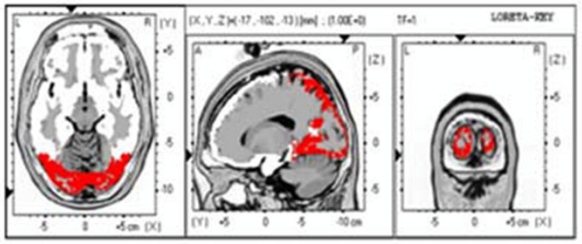
Six Functional Modules as Measured by PET/SPECT



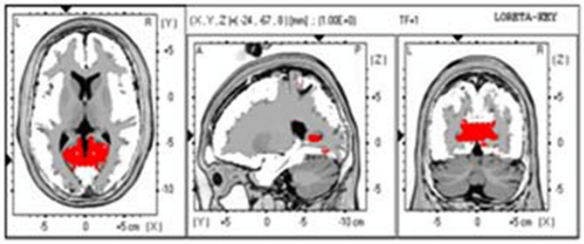
Six Functional Modules as Measured by qEEG LORETA

Hagmann et al. Modules

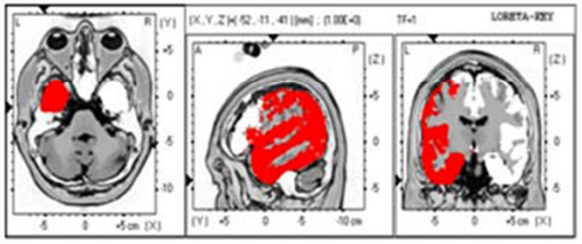
MOD 1



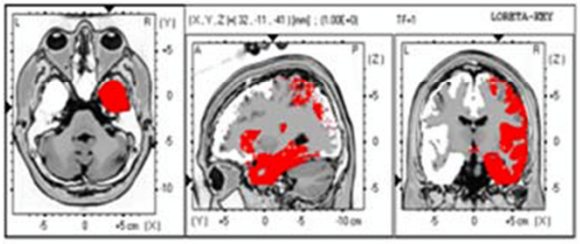
MOD 2



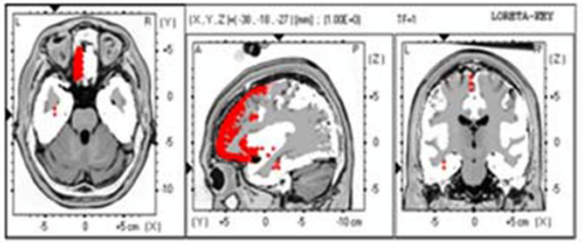
MOD 3



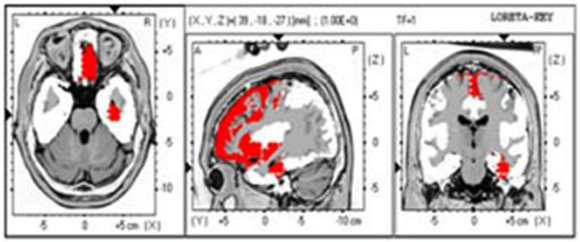
MOD 4



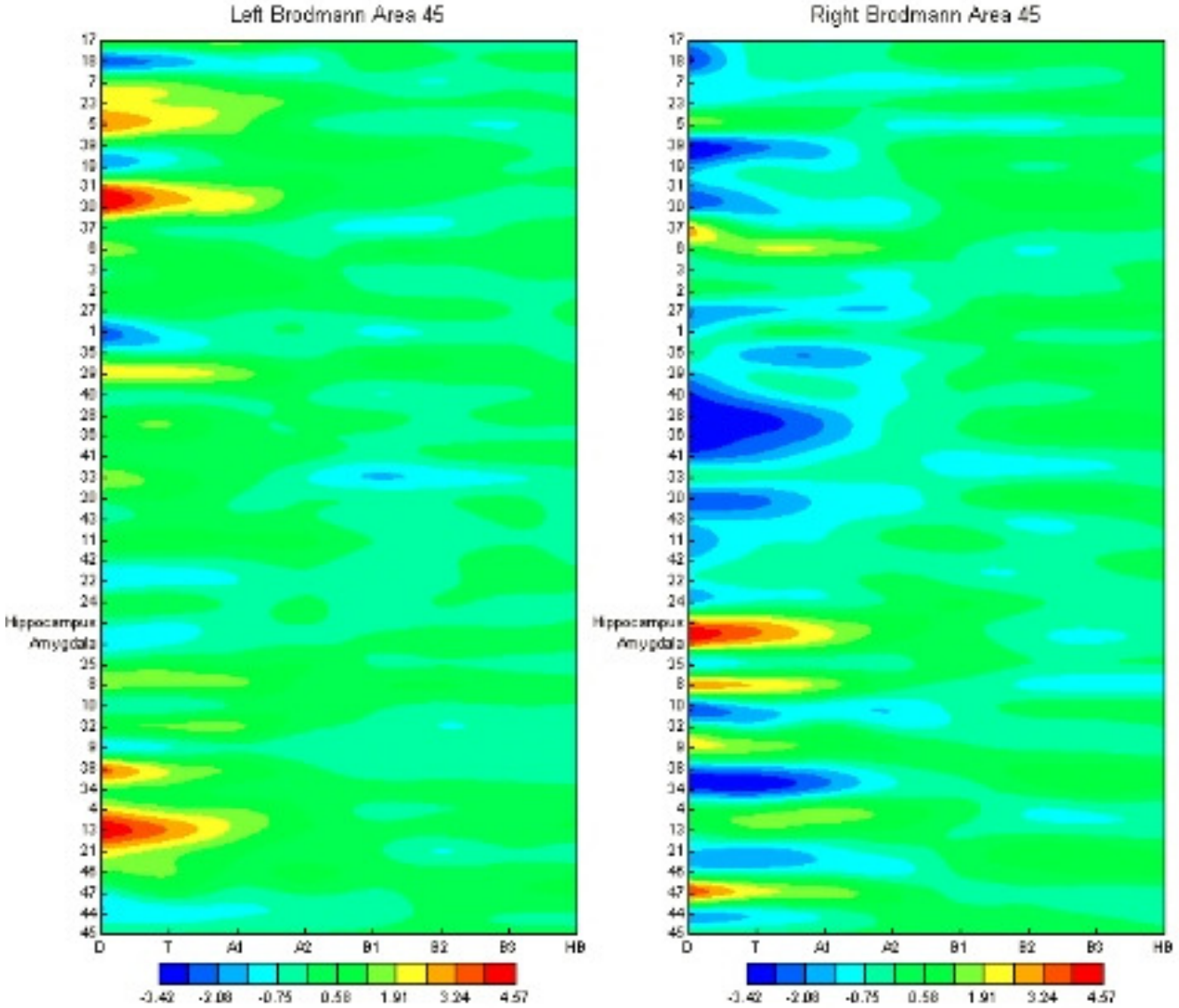
MOD 5



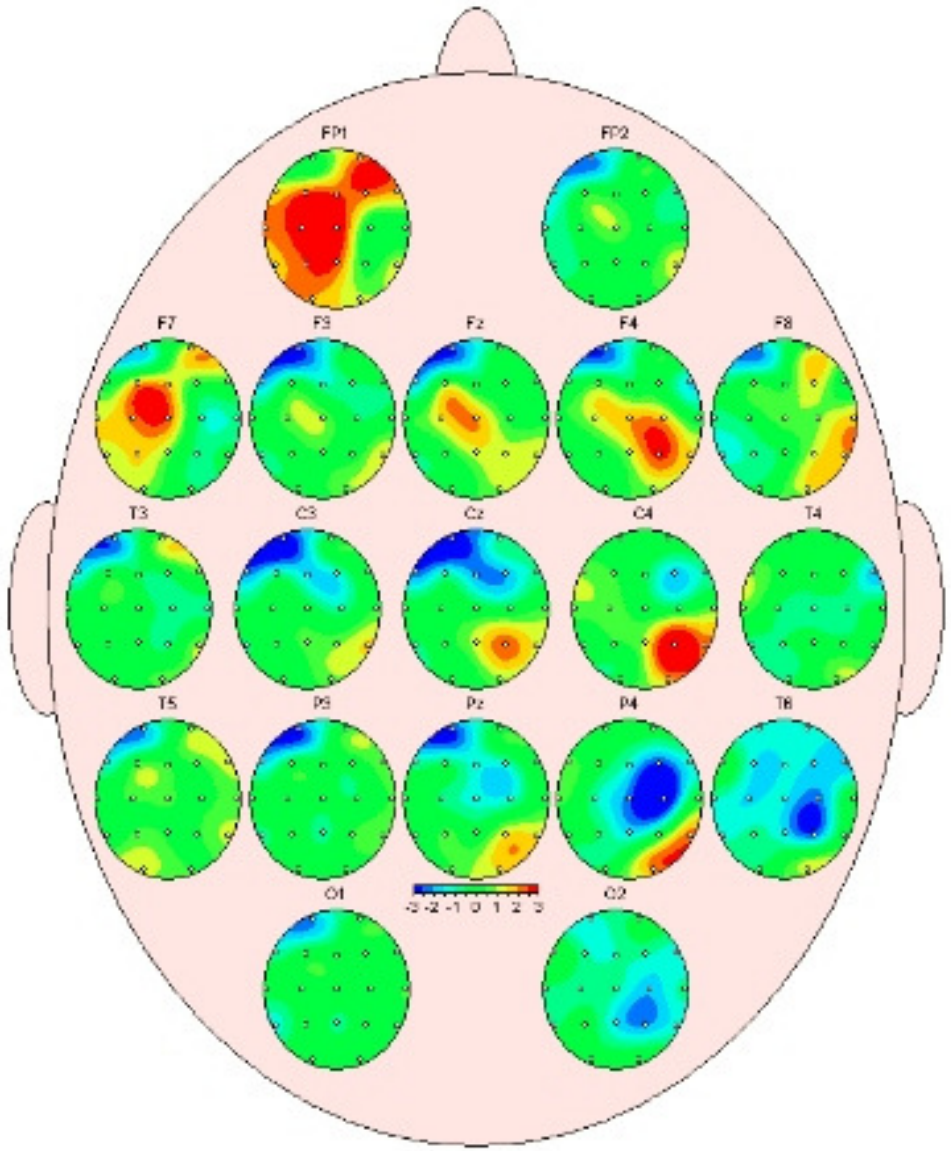
MOD 6



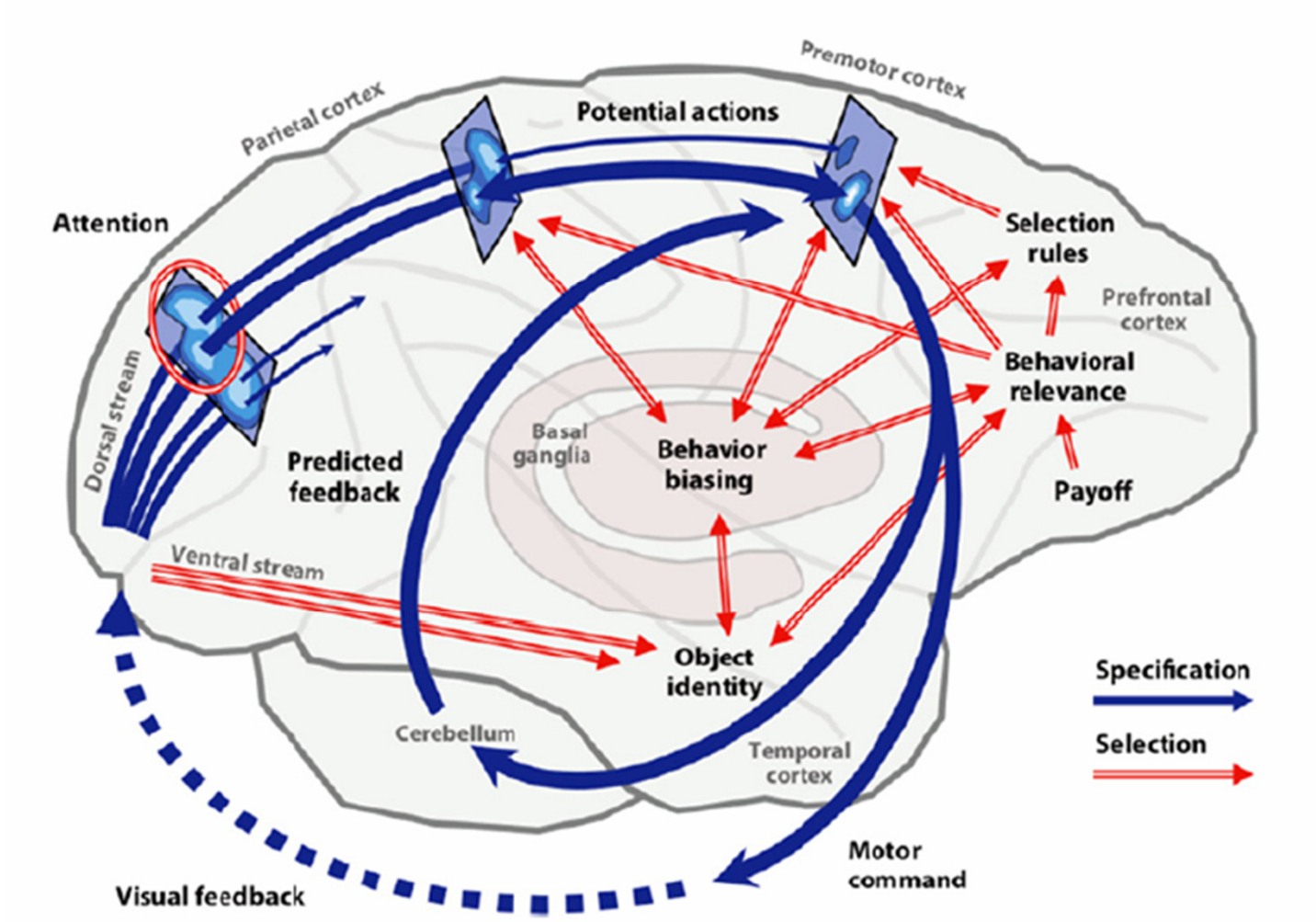
LORETA Effective Connectivity: Magnitude and Direction of Information Flow Between Brodmann Areas



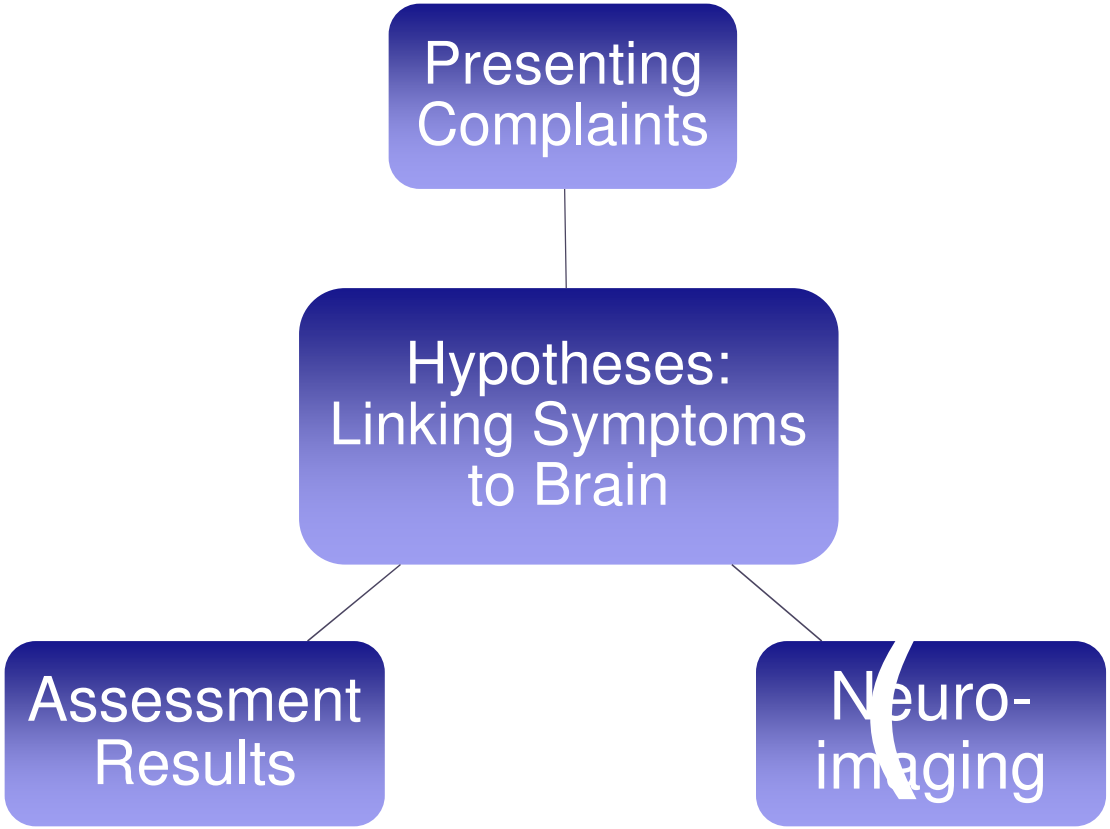
Information Flow in the Scalp Surface EEG



Information Flow:
The Node-Network Hypothesis of Brain Function

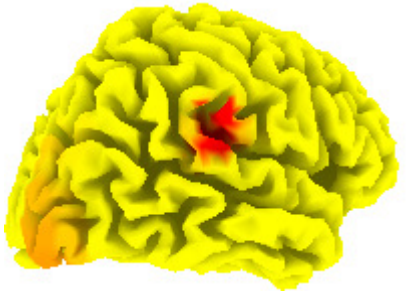


The Process of Neuropsychological Assessment

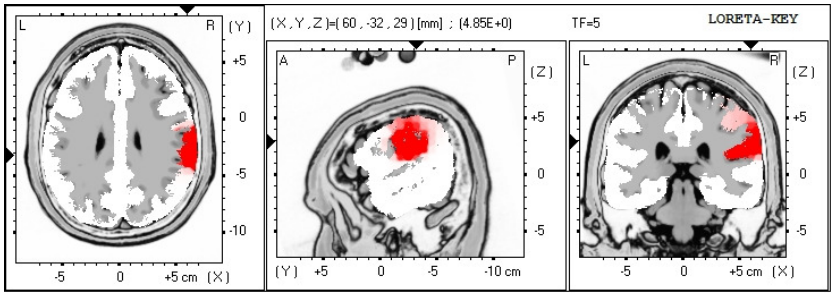


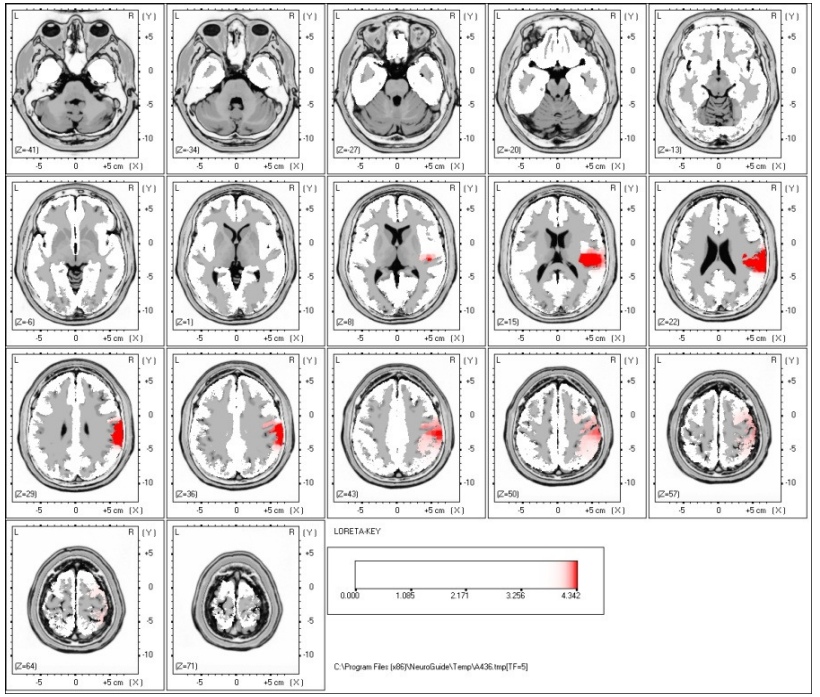
Electrical Neuroimaging & Cortical Source Localization

Cortical Surface Projection



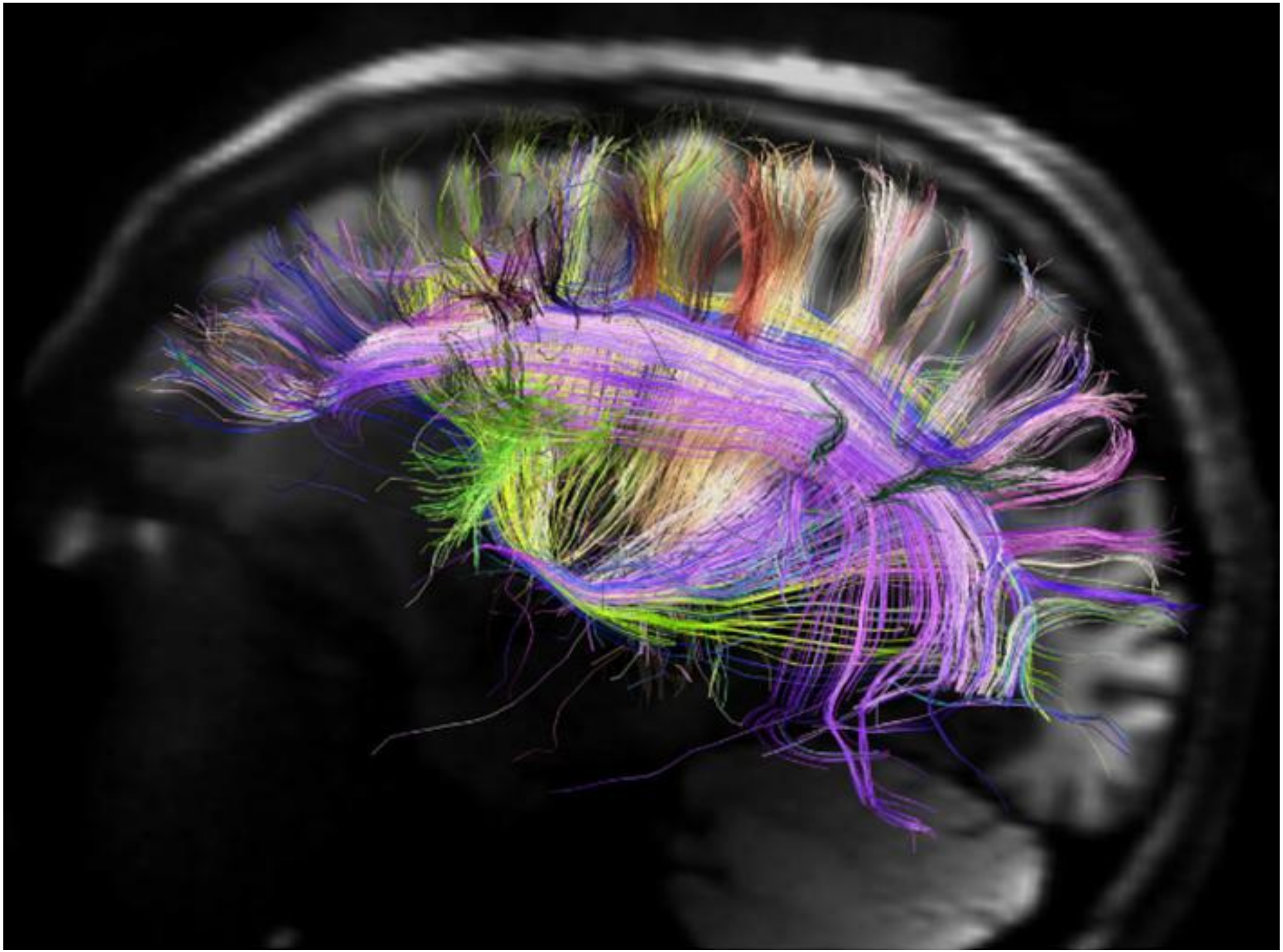
Horizontal, Sagital & Coronal Views of a Single Slice

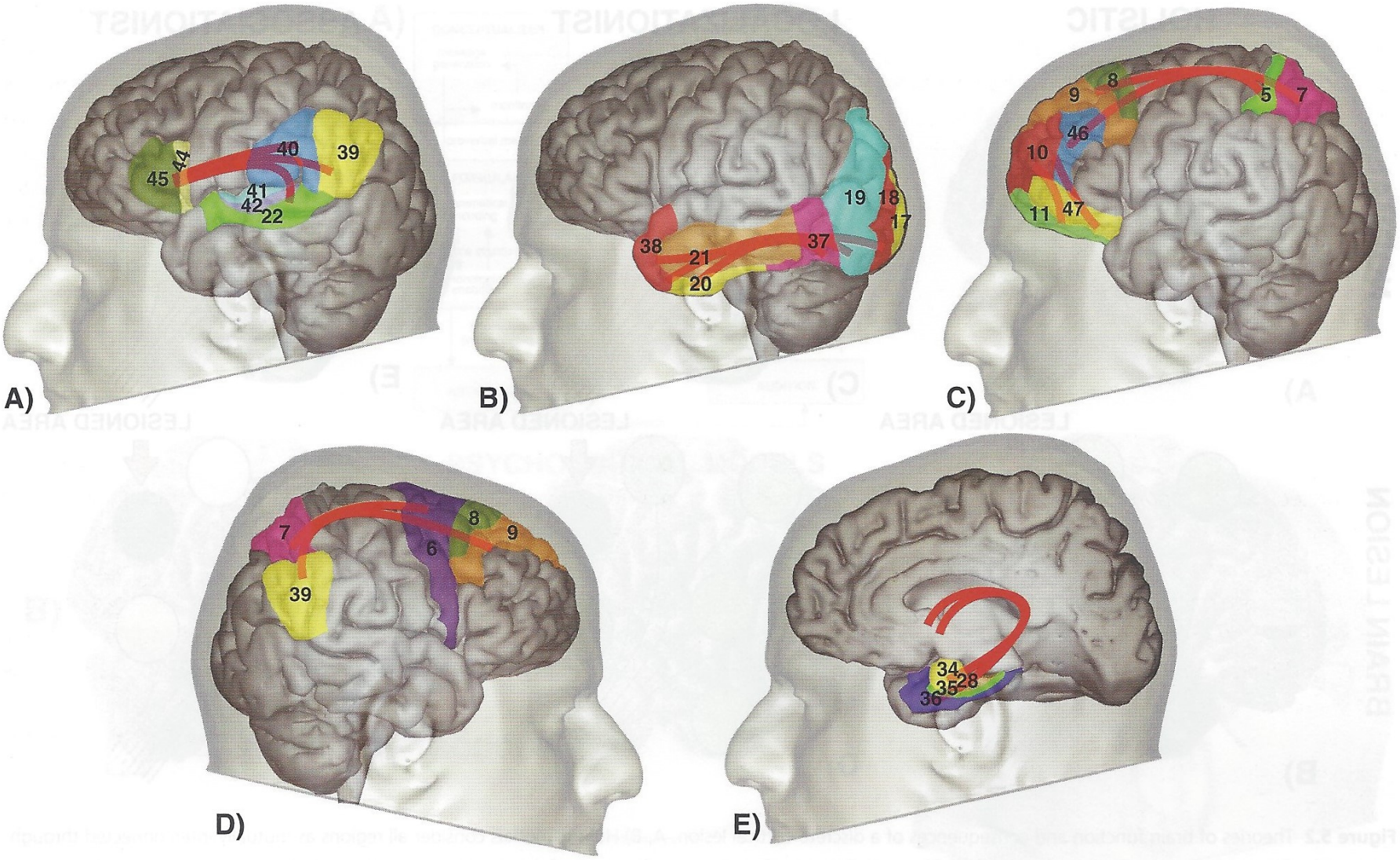




Electrical Neuroimaging – Assessment and Treatment

- **Treating the patient:**
  - **Preparing for 19-channel Z-scored Neurofeedback**
  - **Loading the Protocol**
  - **Choosing Surface vs. LORETA NFB**
  - **Train Symptoms or Networks?**
  - **NFB vs. BrainSurfer**
  - **Choosing Parameters:**
    - **Feedback Displays**
    - **Thresholds**
    - **Durations**
  - **Monitoring Progress**
    - **Within the Session**
    - **Between Sessions**
    - **Re-checking symptomatology with NeuroLink history**




A)
45
44
40
39
41
42
22
B)
38
21
20
37
19
18
17
C)
9
8
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D)
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39
E)
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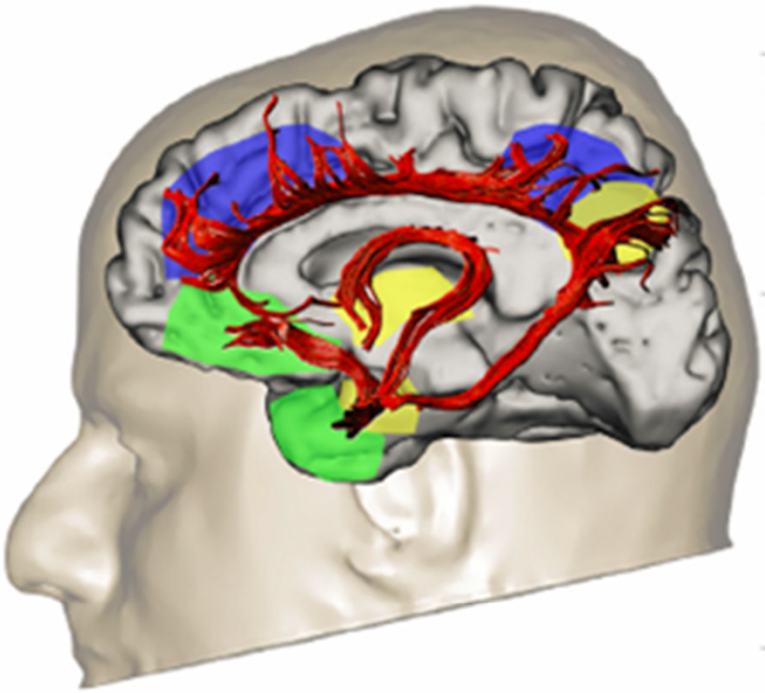
36



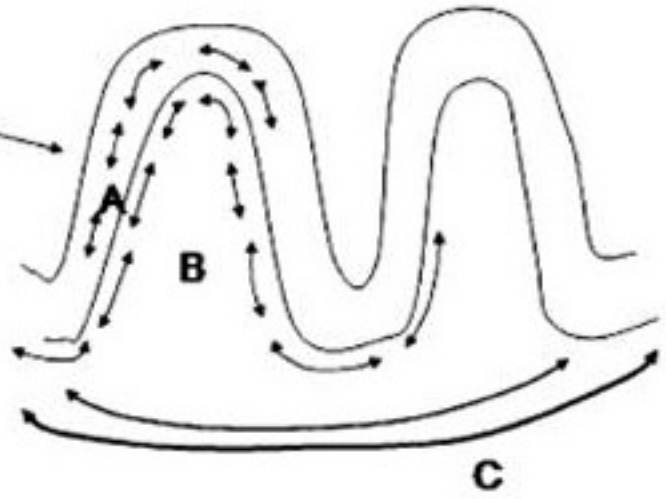
hippocampal-diencephalic and parahippocampal-retrosplenial network

temporal-amygdala-orbitofrontal network

medial 'default network'

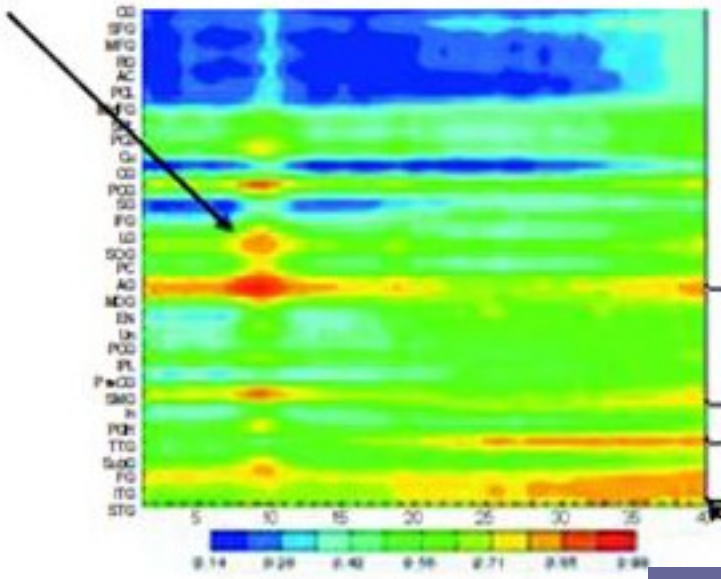
Network	Function	Disorder
Hippocampal-diencephalic and parahippocampal-retrosplenial	•memory •spatial orientation	•Amnesias •Korsakoff's syndrome •Mild Cognitive impairment •Alzheimer's disease (early) •Balint syndrome
Temporo-amydgala-orbitofrontal	•Behavioural inhibition •Memory for temporally complex visual information •Olfactory-gustatory-visceral functions •Multimodal sensory integration •Object-reward association learning •Outcome monitoring	•Alzheimer's Disease (advanced) •Semantic dementia •Klüver-Bucy syndrome •Temporal lobe epilepsy •Geschwind's syndromes •Psychopathy •Bipolar affective disorders
Dorsomedial default network	•Pain perception •Self-knowledge •Attention •Mentalizing •Empathy •Response selection and action monitoring •Autobiographical memory •Person perception	•Depression •Autism •Schizophrenia •Obsessive compulsive disorder •Mild Cognitive Impairmentt •Alzheimer's Disease (early) •Attention Deficit Hyperactivity Disorder •Anxiety

Braitenberg's Cortico-Cortical Connection Model



Vertical Features = Frequency Multiplexing to Multiple ROIs

Horizontal Features = Cortico-Cortical Fiber System Across Frequency

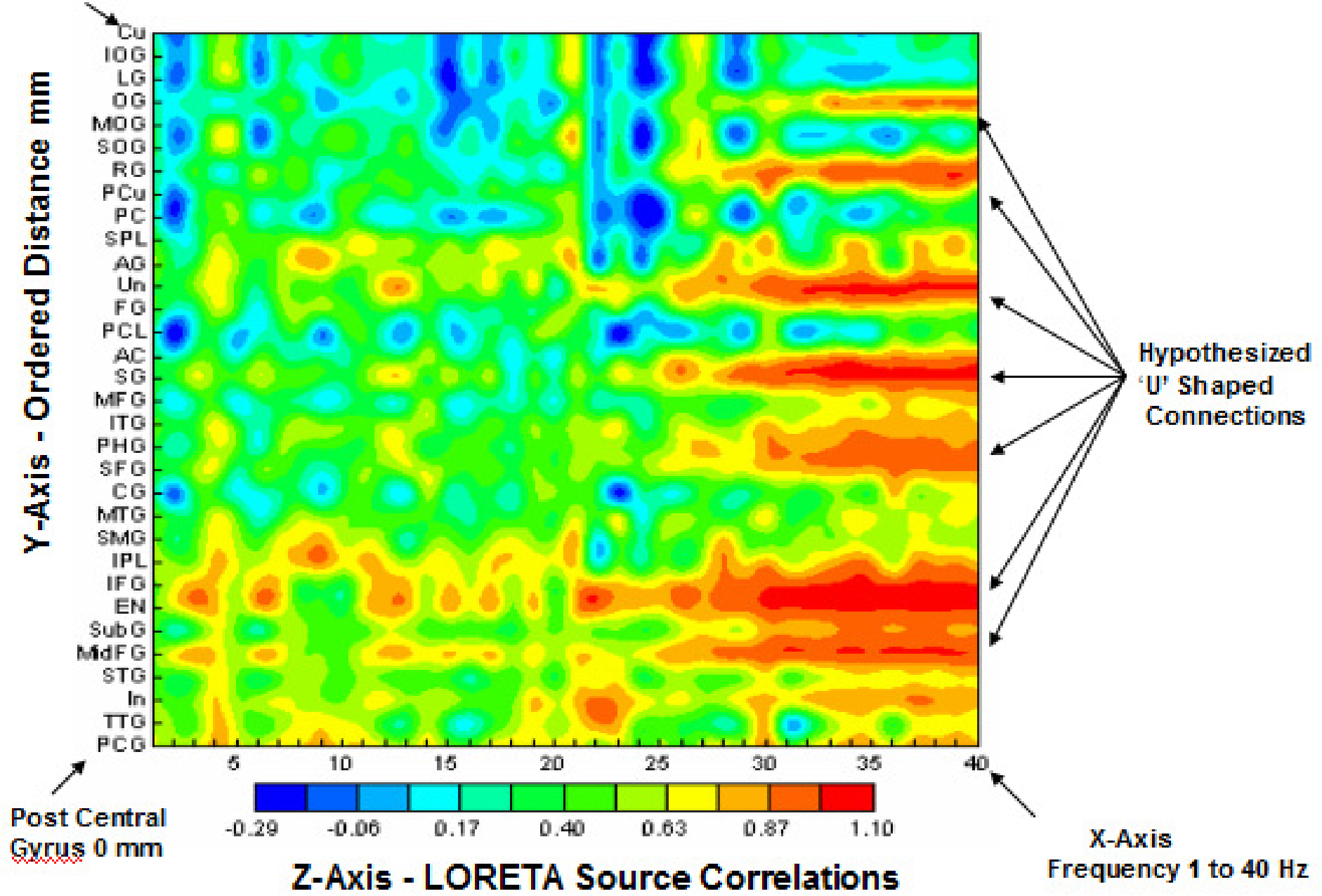


Long Distance Connections - **C**

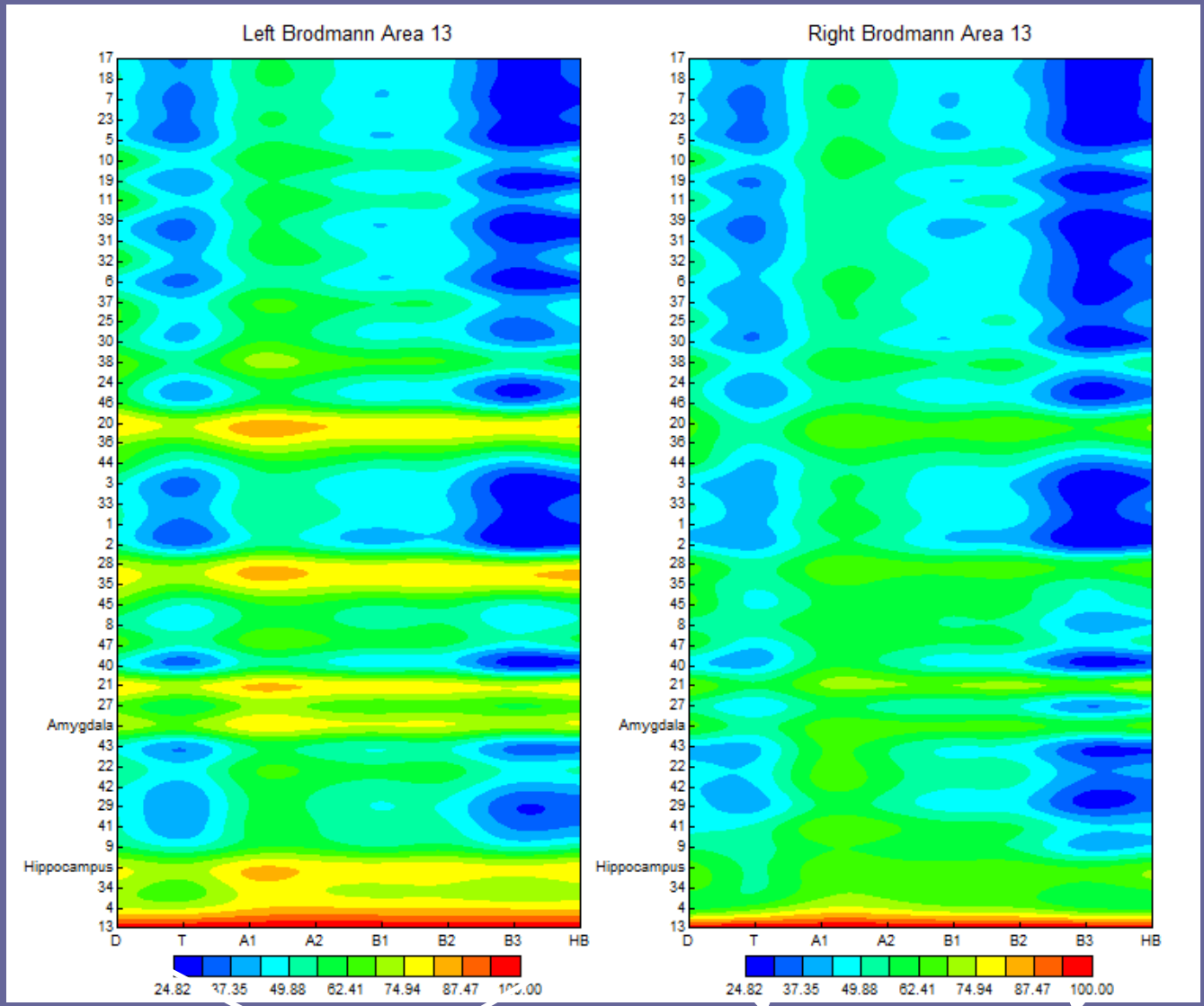
'U' Shaped Fibers - **B**

Intra-Cortical Connections - **A**

Spatial Heterogeneity of Source Correlations



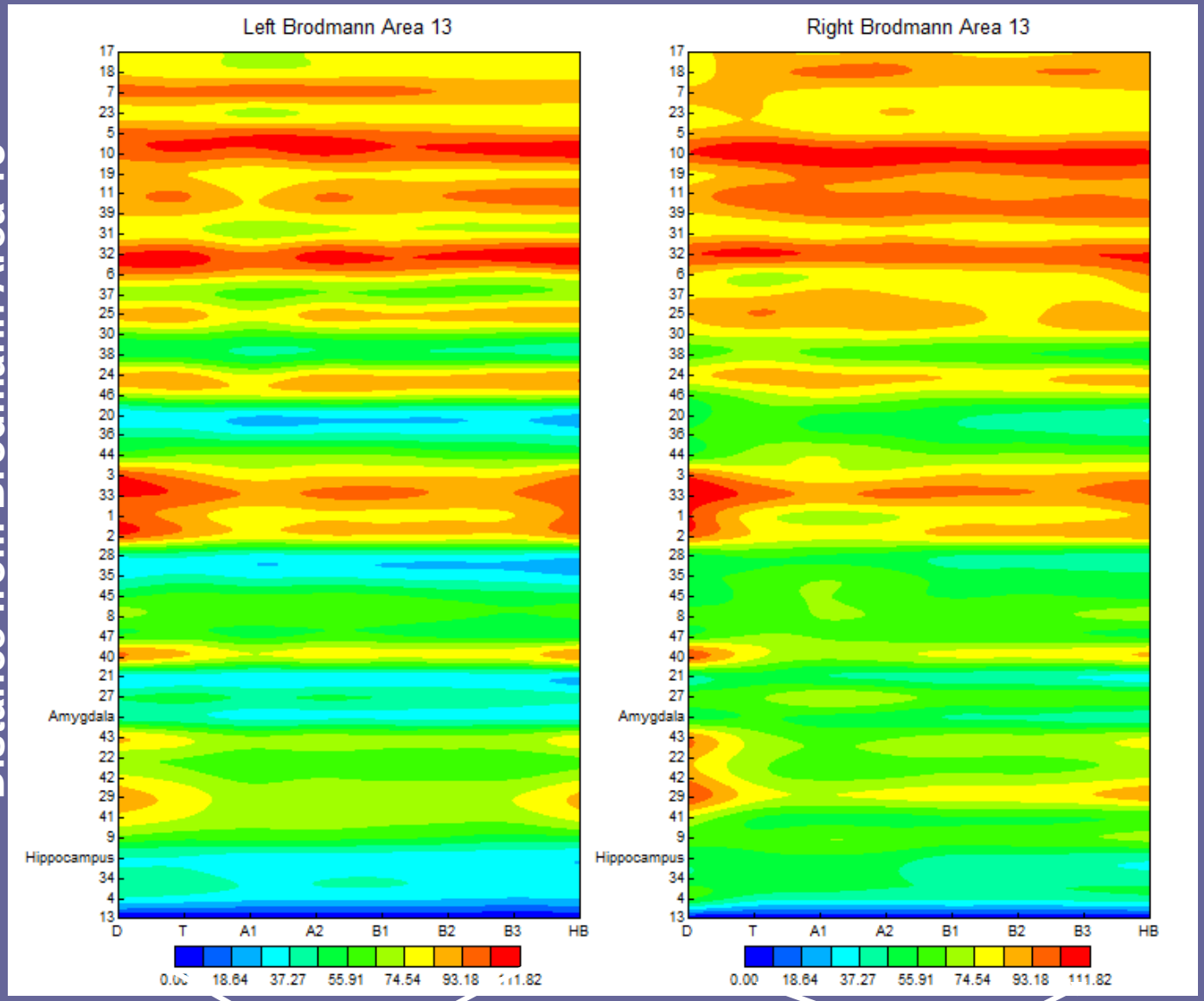
LORETA Coherence



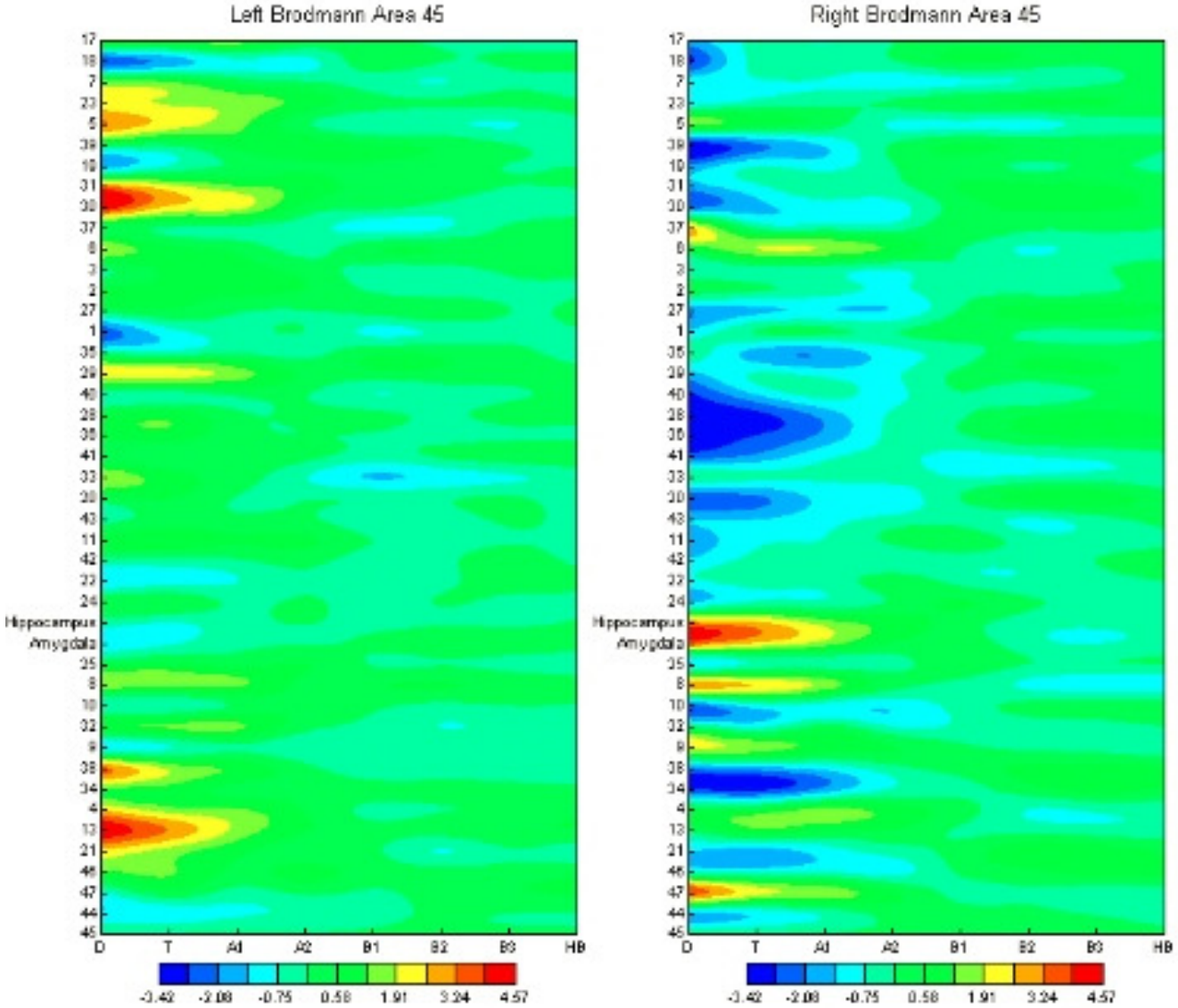
Frequency Bands (Delta to Hi-Beta)

Coherence Values (Low-to-High)

LORETA Absolute Phase

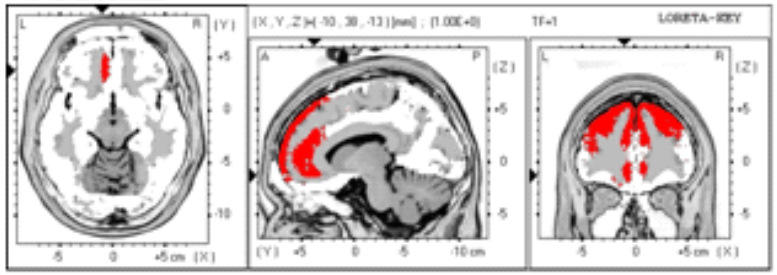


LORETA Magnitude and Direction of Information Flow

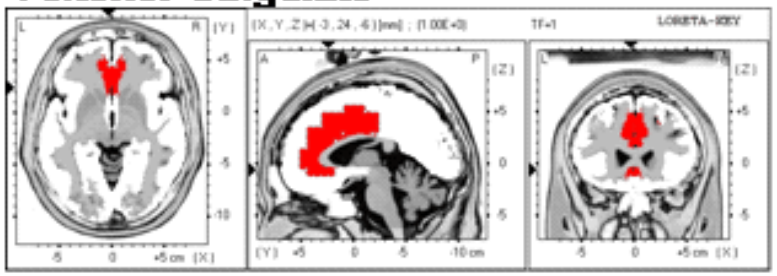


Loreta Default Brain Network

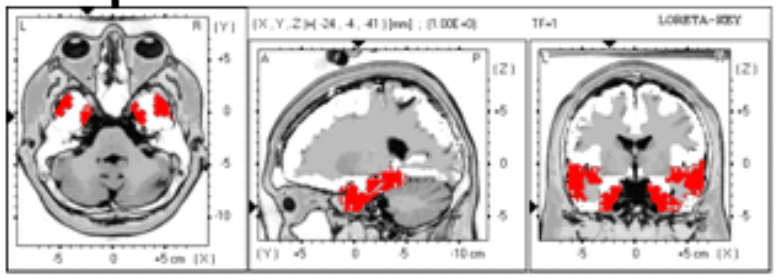
Frontal



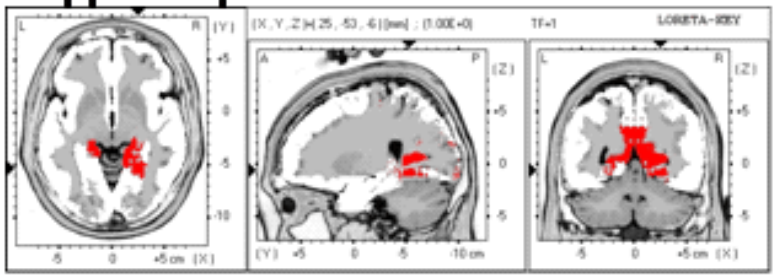
Anterior Cingulate



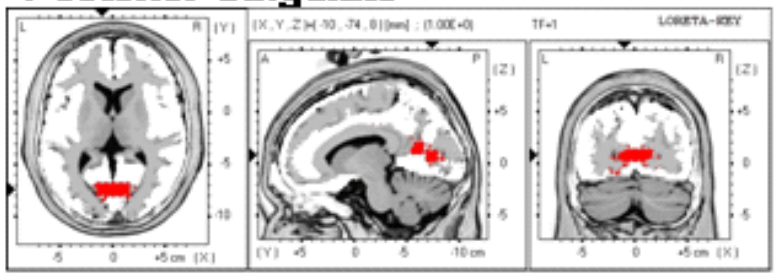
Temporal



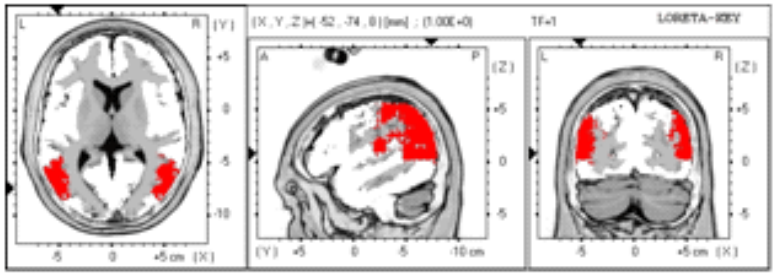
Hippocampus



Posterior Cingulate



Parietal



Some Relevant Items and Questions

- **Loops in the Brain and Why Homeostasis and Equilibrium are Critical for Brain Function**
- **The EEG is Produced Exclusively by Summated Synaptic Potentials**
- **How does EEG Biofeedback Change the EEG?**
- **How does EEG Biofeedback Change Synaptic Potentials?**
- **What are the Mechanisms of Modification of Synapses by Operant Conditioning of EEG at the Molecular Level? (nu. Accumbens & Reinforcement**

Essentials of Operant Conditioning

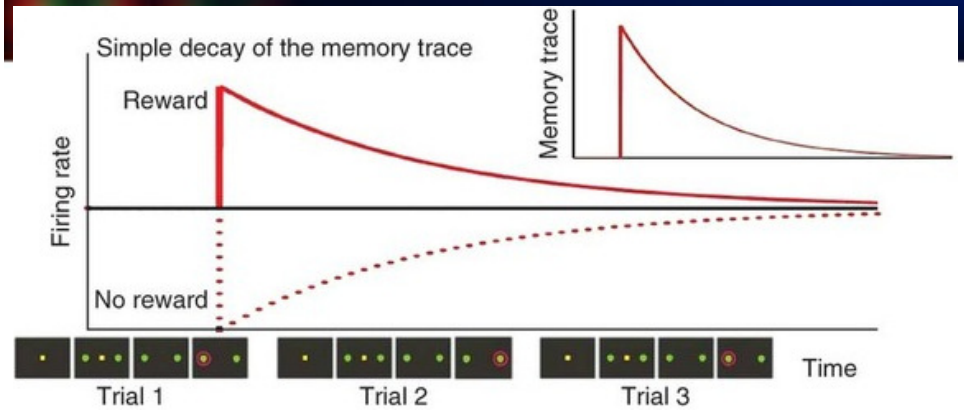
1. There must be a ‘real’ and ‘valid’ neural event to be reinforced

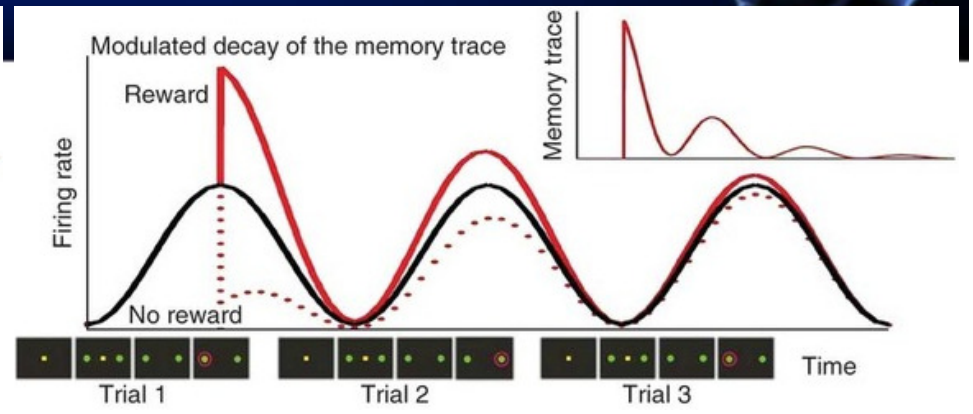
2. The ‘Reinforcement’ must be distinct and clear

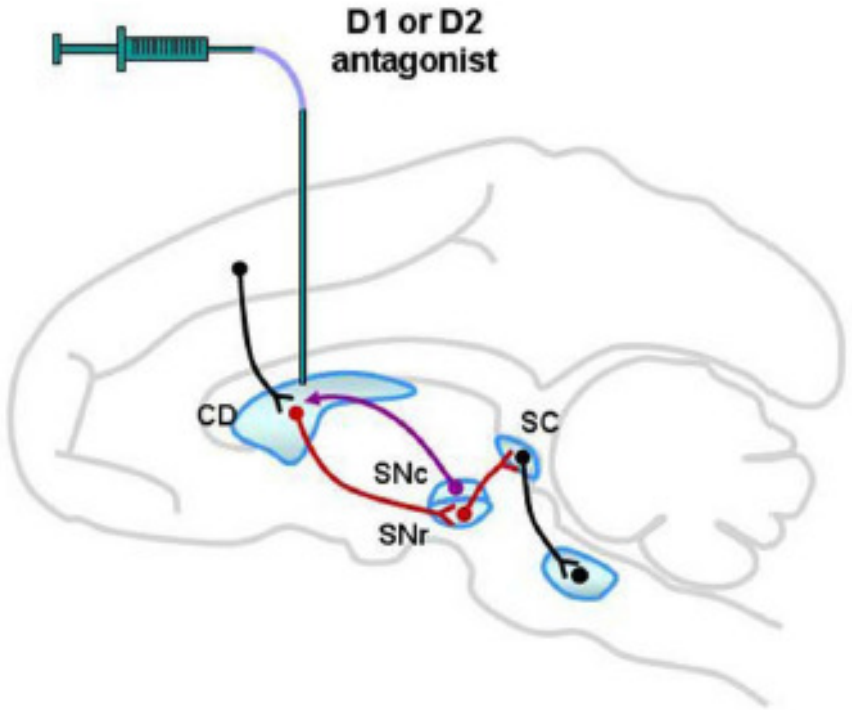
3. The interval of time between the spontaneous ‘emitted event’ and the ‘reinforcement’ can not be too short, approximately < 250 msec? or too long approximately > 20 sec

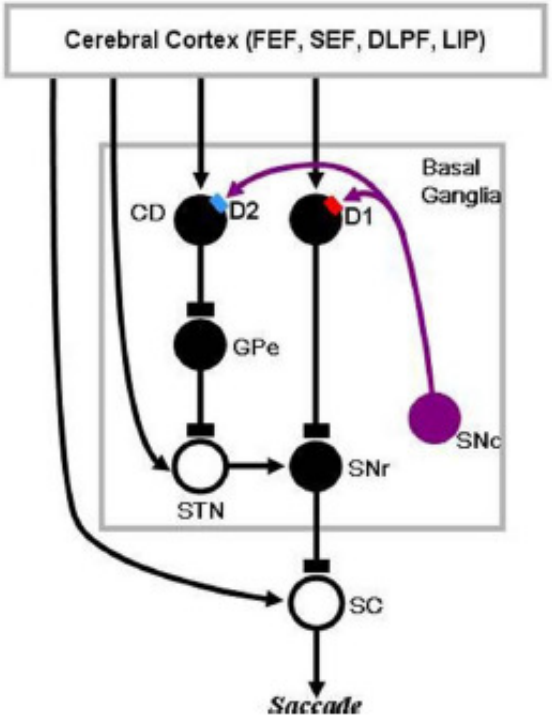
4. The Schedule of Reinforcement is Important with two General Types ‘Continuous’ vs ‘Partial’ Reinforcement - Continuous is good at the beginning but not as resistant to extinction as is Partial Reinforcement

EEG Neurofeedback



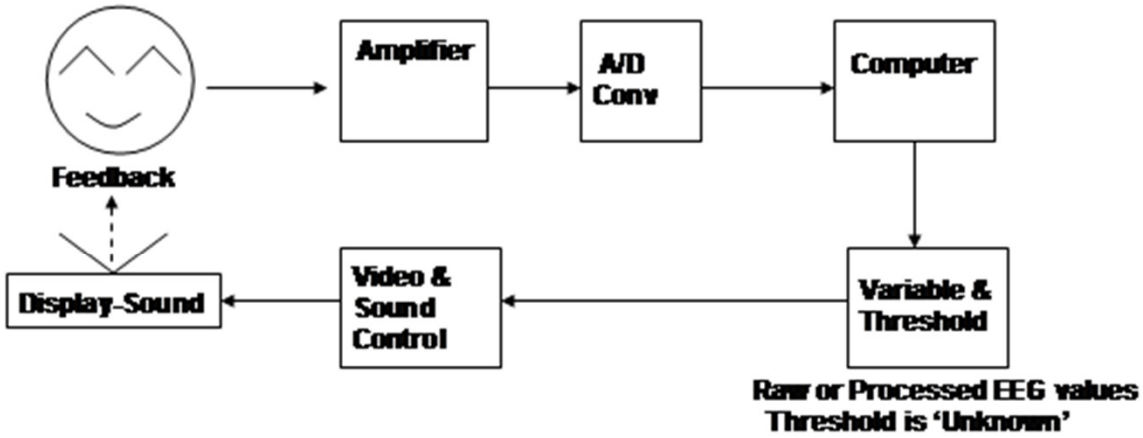






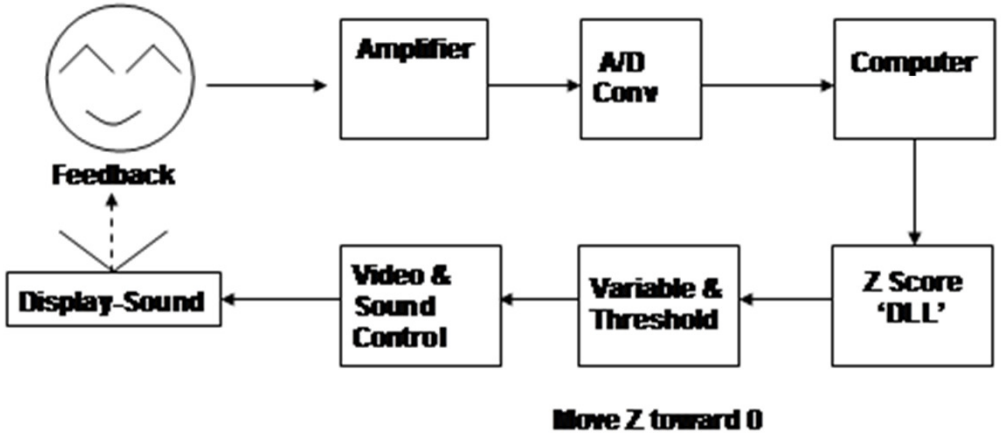
Z Score NFB – Simplicity, Accuracy & Standardization

Difference Between Standard Neurofeedback vs Z Score Neurofeedback



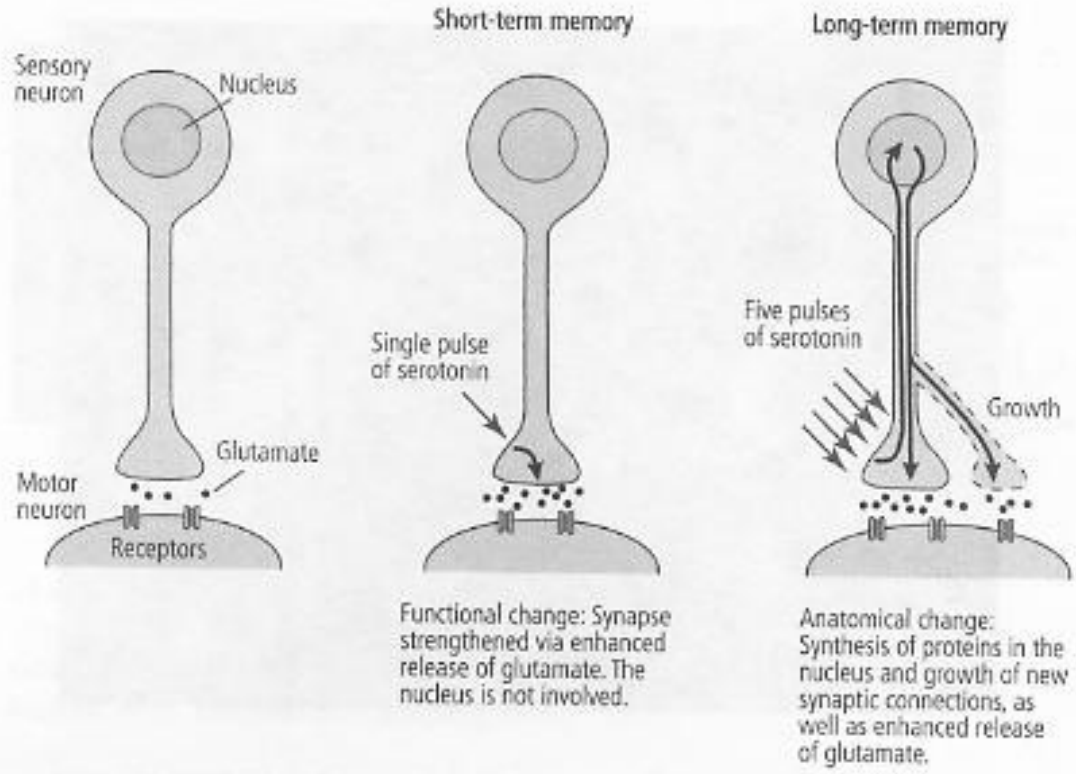
Standard EEG Neurofeedback

1- Apples & Oranges
2- Arbitrary Threshold
3- No reference to Guide NF

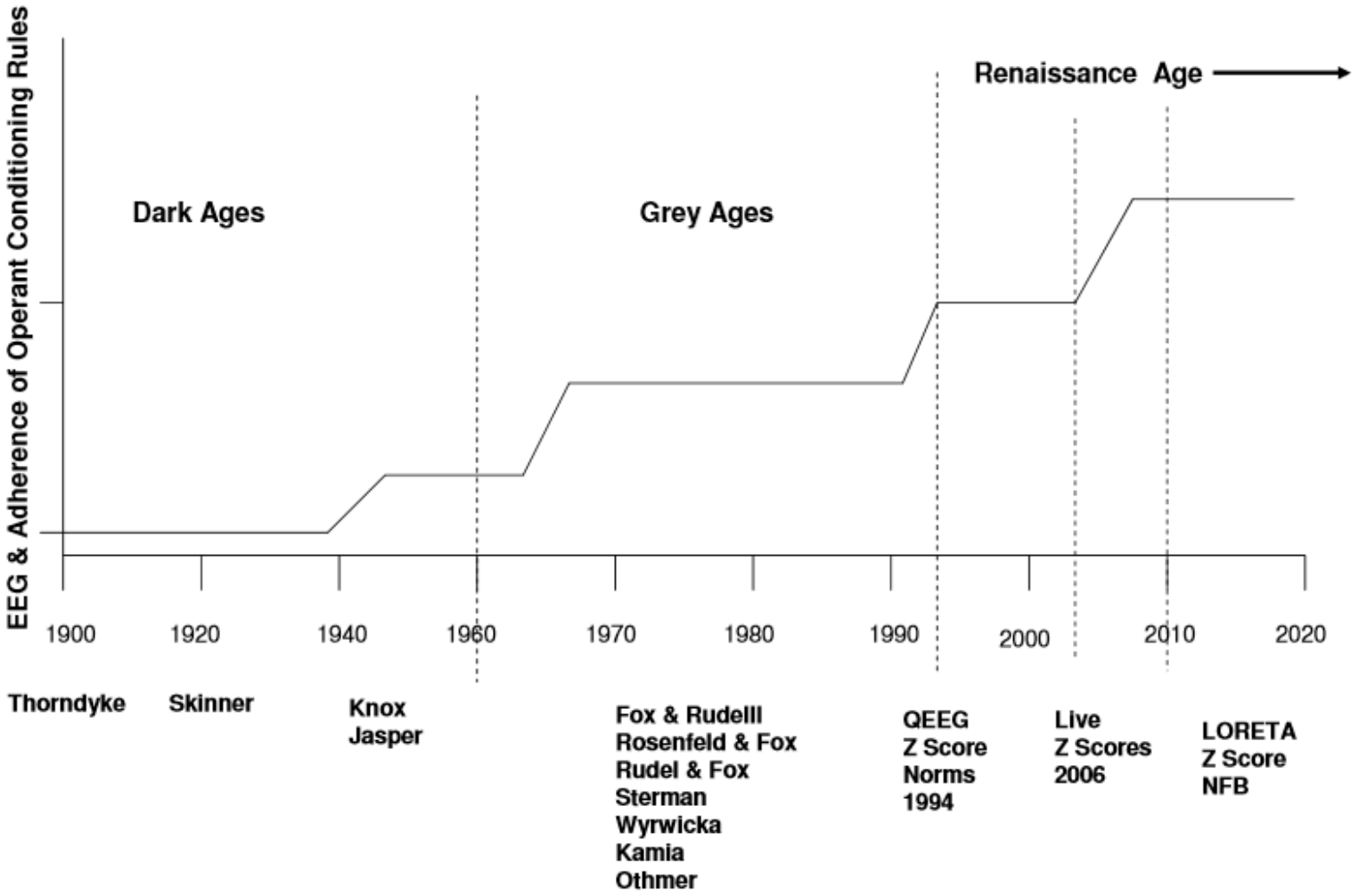


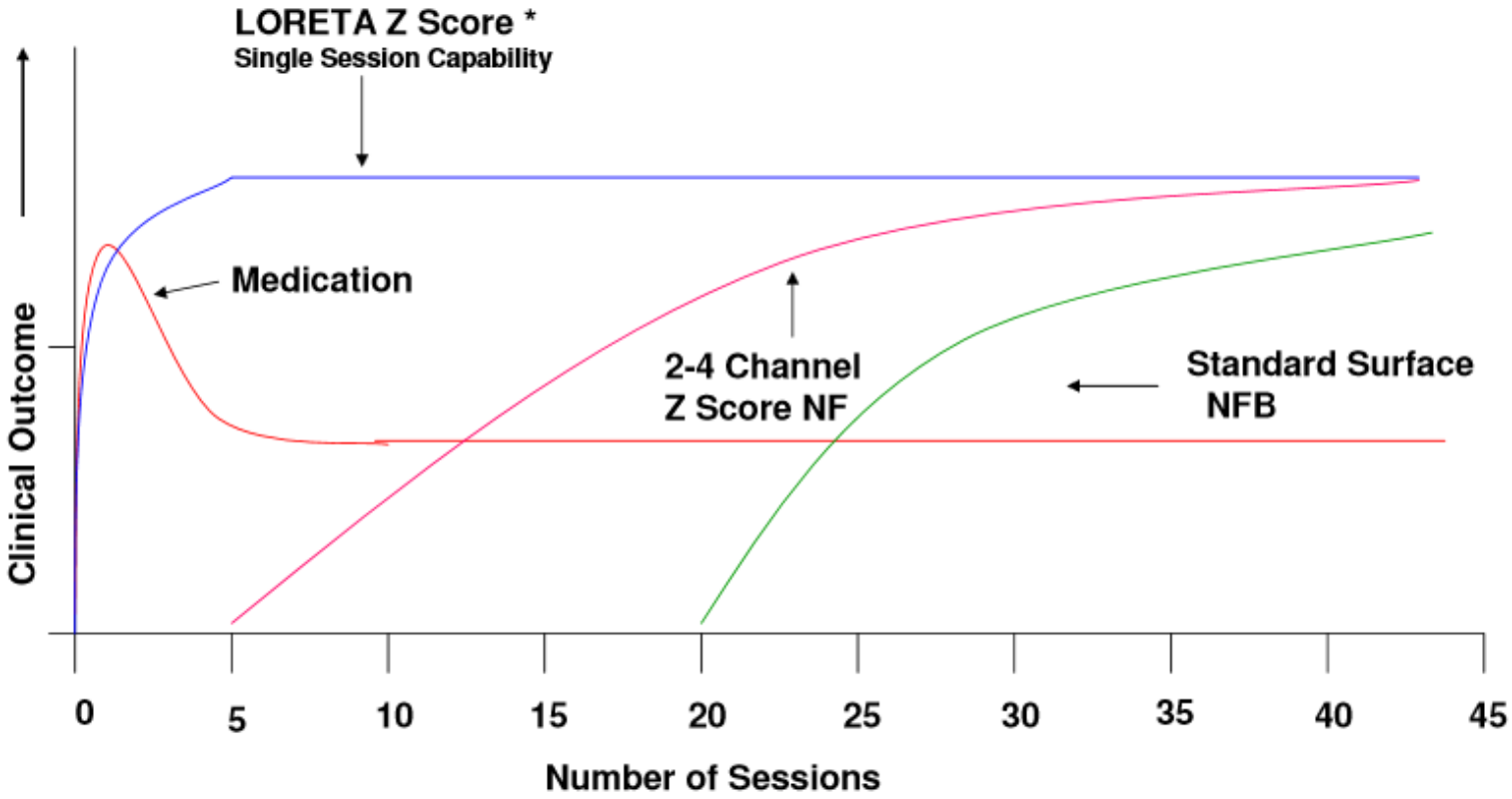
Real-Time or "Live" Z Score Neurofeedback

1- Metric, i.e., a 'Z' Score
2- Threshold toward '0'
3- Instantaneous Comparison to a normative database



18-4 Changes underlying short- and long-term memory in a single sensory and motor neuron.

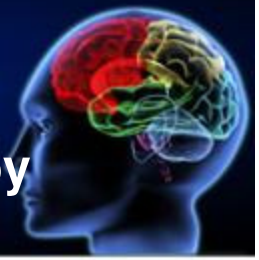

EEG & Adherence of Operant Conditioning Rules
Renaissance Age
Dark Ages
Grey Ages
1900
1920
1940
1960
1970
1980
1990
2000
2010
2020
Thorndyke
Skinner
Knox
Jasper
Fox & RudellI
Rosenfeld & Fox
Rudel & Fox
Sterman
Wyrwicka
Kamia
Othmer
QEEG
Z Score
Norms
1994
Live
Z Scores
2006
LORETA
Z Score
NFB

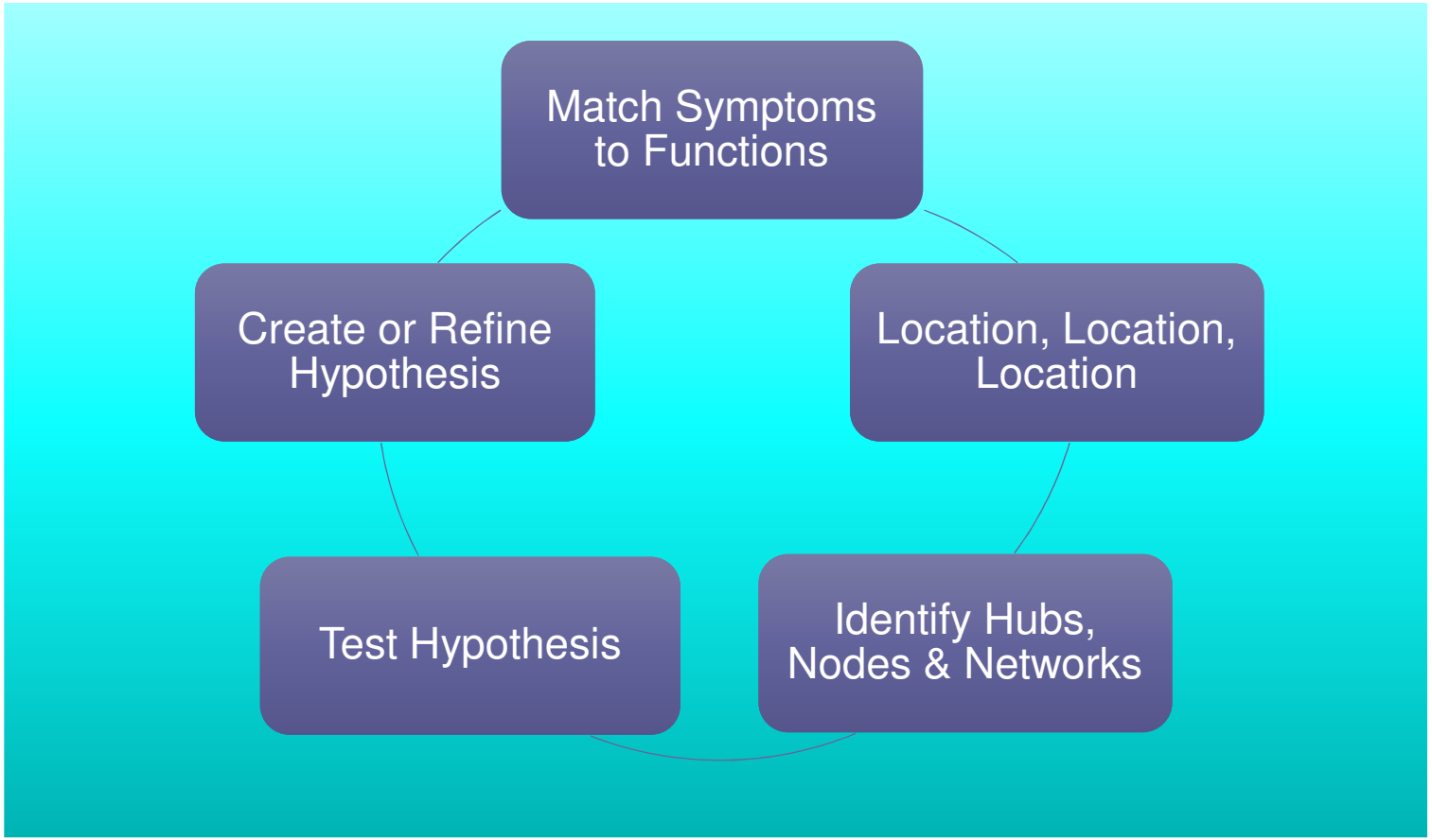


* Combine with Neurofield in cases to reset or "unstick" the brain

Seamless QEEG and Neurofeedback

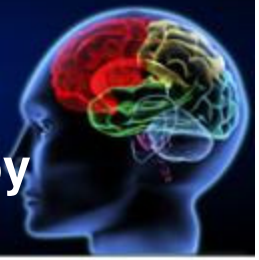
Approximately 50 – 60 minutes for a Single Session in Three Steps from Clinical Interview to QEEG to Neurotherapy

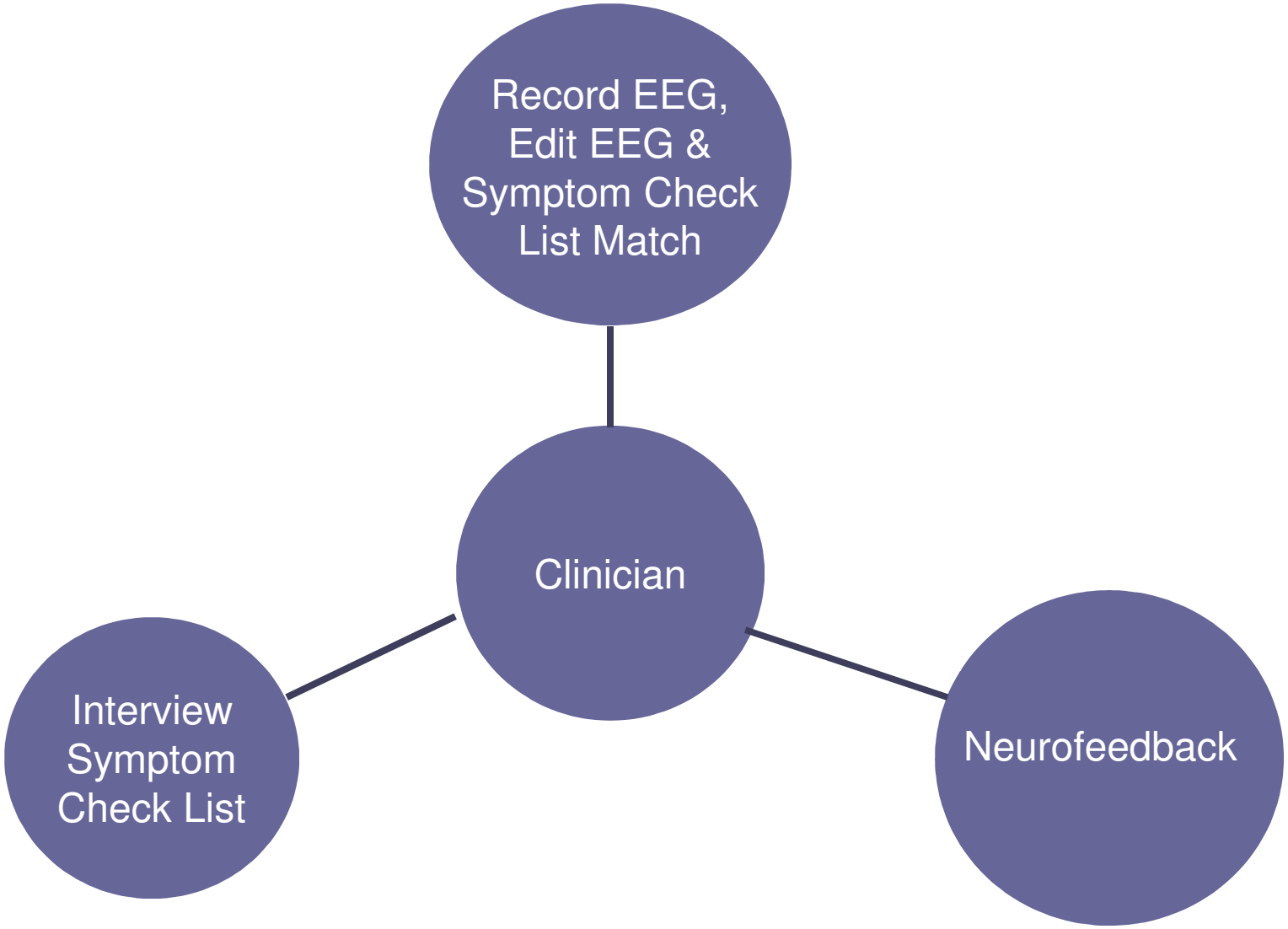




Seamless QEEG and Neurofeedback

Approximately 50 – 60 minutes for a Single Session in Three Steps from Clinical Interview to QEEG to Neurotherapy





Select a Network or Symptoms, Frequency and Metric

Symptoms | ICN | Networks | Neuropsychological | DoD/VA

Network	Severity
Addiction	0
Anxiety	0
Attention - Dorsal	0
Attention - Ventral	0
Attention - Emotional	0
Default Mode	0
Executive Function	0
Face, Object Recognition	0
Language	0
Memory - Emotion	0
Mirror Neuron	0
Mood	0
Pain	0
Pleasure	0
Salience	0
Schizophrenia	0
Working Memory	0
DTI - Frontal Limbic	0
DTI - Frontal Occipital	0
DTI - Frontal Parietal	0
DTI - Frontal Temporal	0
DTI - Local Frontal	0
DTI - Local Limbic	0
DTI - Local Occipital	0
DTI - Local Parietal	0
DTI - Local Temporal	0
Hagmann Module 1 (Vision)	0
Hagmann Module 2 (Attention, Working Memory)	0
Hagmann Module 3 (Auditory, Language, Memory)	0
Hagmann Module 4 (Auditory, Language, Memory)	0
Hagmann Module 5 (Executive, Sequential Planning)	0
Hagmann Module 6 (Executive, Social Skills)	0
Isocortex Hippocampocentric	0
Isocortex Olfactocentric	0
Mesocortex Hippocampocentric	0
Mesocortex Olfactocentric	0
Mesulam - Emotional Memory	0
Mesulam - Executive Function	0
Mesulam - Face/Object Indentification	0
Mesulam - Language	0
Mesulam - Spatial Attention	0

Symptoms | ICN | Networks | Neuropsychological | DoD/VA

Intrinsic Connectivity Network	Severity
ICN 1 (Limbic, Medial-Temporal, Emotion)	0
ICN 2 (Reward, Emotion)	0
ICN 4 (Language, Executive)	0
ICN 6 (Premotor, Supplemental Motor)	0
ICN 7 (Visual-Spatial Processing)	0
ICN 8, 17 (Primary Sensory Motor)	0
ICN 9 (Parietal)	0
ICN 10 (Picture Naming, Visual Tracking)	0
ICN 11, 12 (Visual System)	0
ICN 13 (Default Mode Network)	0
ICN 15 (Right Hemisphere, Attention, Reasoning, Memory)	0
ICN 16 (Auditory, Music)	0
ICN 18 (Left Hemisphere, Language)	0

Symptoms | ICN | Networks | Neuropsychological | DoD/VA

Neuropsychological Diagnosis	Severity
Agnosia of Action Apperceptive	0
Agnosia of Action Associative	0
Agnosia Auditory Apperceptive	0
Agnosia Auditory Associative	0
Agnosia Auditory Space	0
Agnosia Prosopagnosia (Face)	0
Agnosia Social Emotional	0
Agnosia Social of Action - Theory of Mind	0
Agnosia Somatosensory Autotopagnosia	0
Agnosia Somatosensory Finger	0

Symptoms | ICN | Networks | Neuropsychological | DoD/VA

Symptom / Complaint	Severity
Attention - Re-Experiences Intrusive Memories	0
Attention - Emotional Numbing	0
Attention - Distracting Pain	0
Attention - Difficulty Multi-Tasking	0
Attention - Worsens with Emotional Stress	0
Attention - Dissociative Episodes	0
Attention - Worsens With Withdrawl Symptoms	0
Chronic Pain - Neuropathic	0
Chronic Pain - Musculoskeletal	0
Chronic Pain - Diffuse Pain (Entire Body)	0

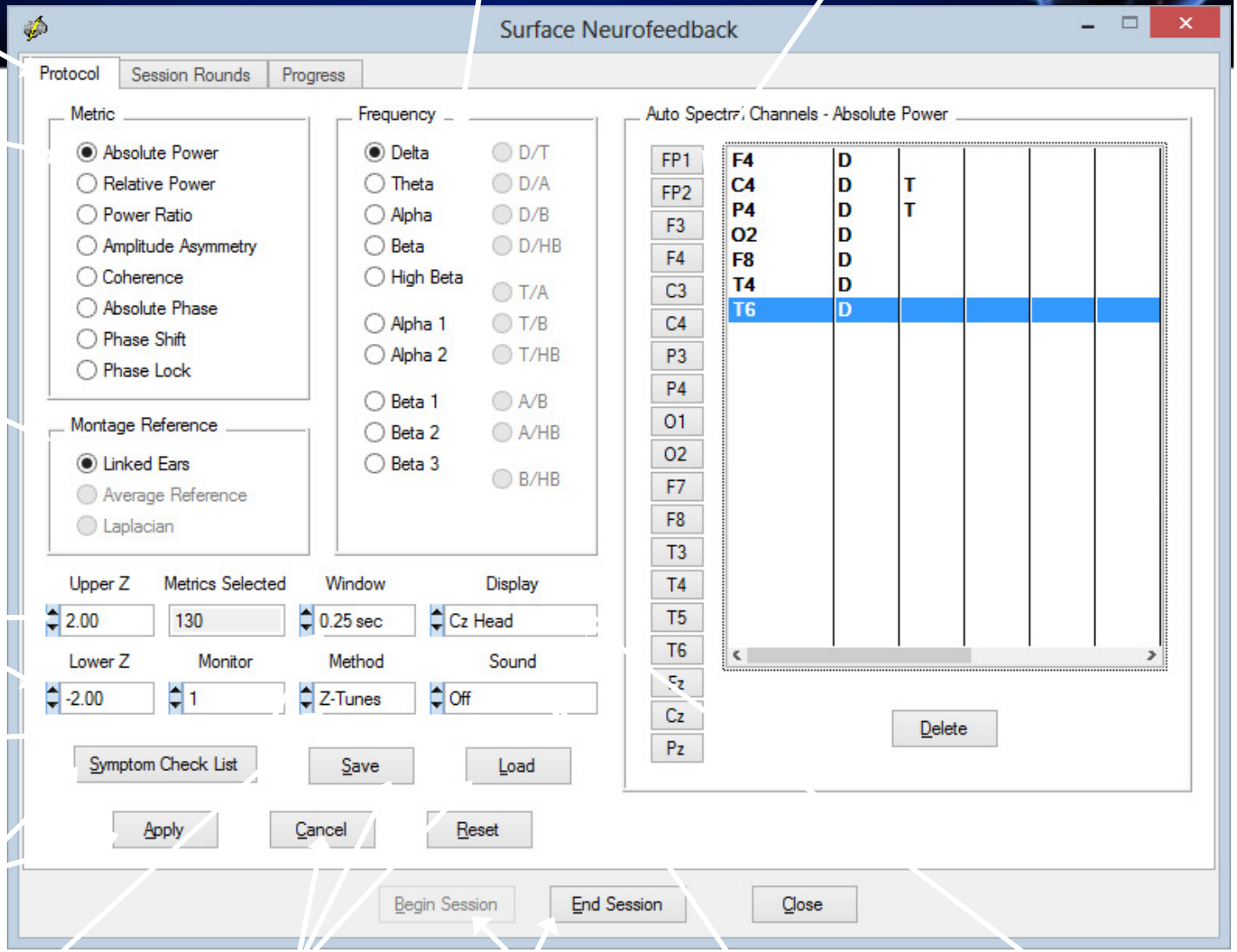
Symptoms | ICN | Networks | Neuropsychological | DoD/VA

Symptom / Complaint	Severity
Anosognosia - Denial of a Problem	0
Anxiety	0
Attention Deficits - Easily Distractible	0
Auditory Sequencing Problems	0
Balance Problems	0
Blurred Vision	0
Chronic Pain	0
Compulsive Behaviors and/or Thoughts	0
Concentration Problems	0
Decreased Tactile or Skin Sensitivity	0
Delusional	0
Depression (Sad & Blue)	0
Difficulty Comprehending Social Cues	0
Dyscalcula - Problems Calculating	0
Dyslexia - Letter Reversal	0
Executive Function Problems	0
Face Recognition Problems	0
Failure to Initiate Actions	0
Hyperactive and/or Agitation	0
Impulsive Behaviors	0
Insensitive to Others Emotional Expressions	0
Insensitive to Other's Feelings	0
Low Motivation	0
Low Threshold for Anger & Loss of Control	0
Migrane Headaches	0
Mood Swings	0
Multi-Tasking Problems	0
Obsessive Thoughts about Self	0
Obsessive Thoughts and/or Hyper Focused	0
Oppositional Defiant Conduct	0
Orientation in Space Problems	0
Perception of Letters Problems	0
Poor Judgement	0
Poor Skilled Motor Movements	0
Poor Social Skills	0
Receptive Language Problems	0
Recognizing Objects by Touch Problems	0
Self-Esteem Problems	0
Sequential Planning Problems	0
Short-Term Memory Problems	0
Slow Reader	0
Slowness of Thought - Easily Confused	0
Spatial Perception Problems	0
Speech Articulation Problems	0
Substance Abuse	0
Symptoms of Fibromyalgia	0
Word Finding Problems	0

Z Score Neurofeedback Panel

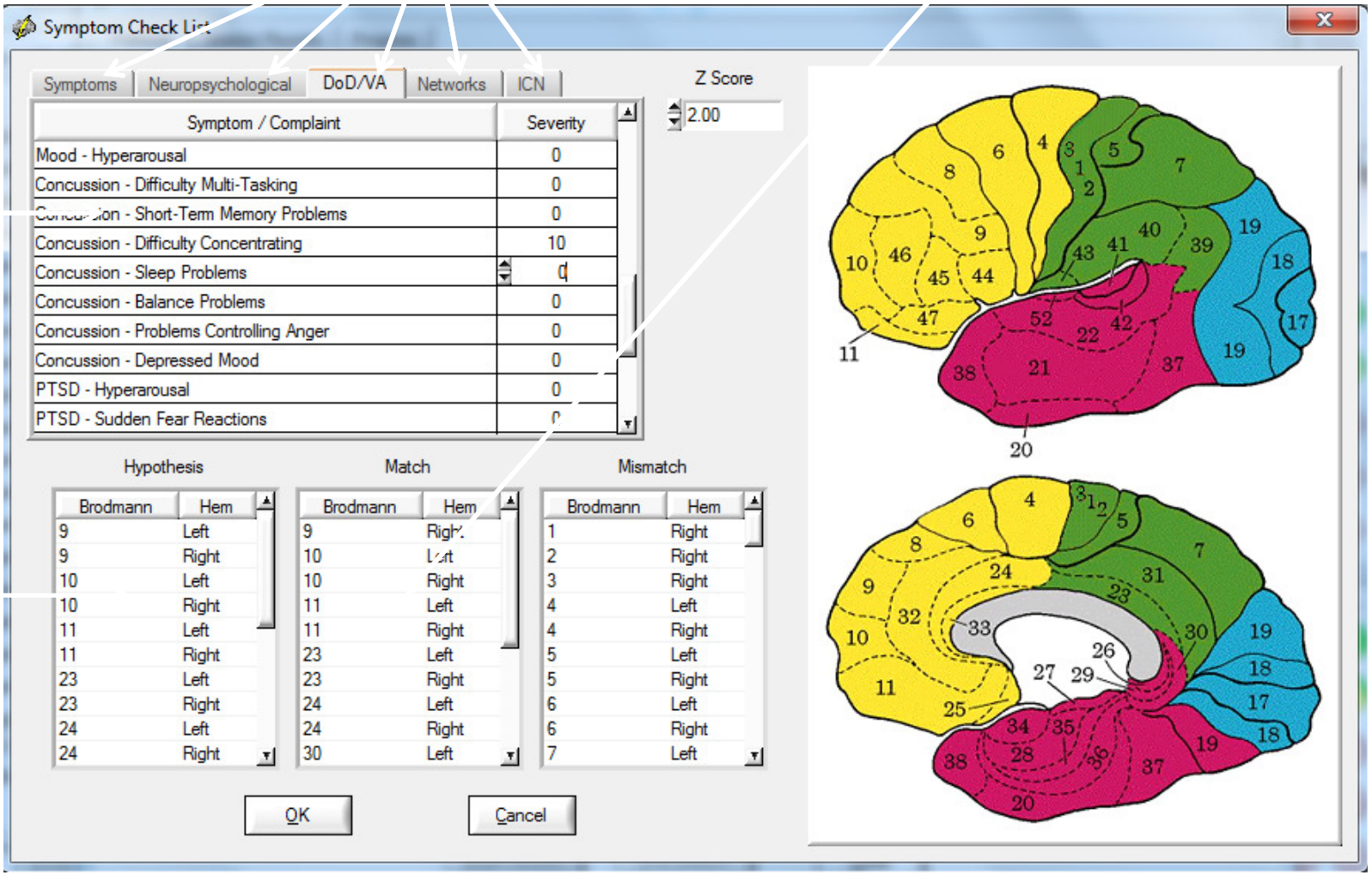
Select Protocol, Session Rounds or Progress Tabs

Select Frequency Bands for 1 to 19 Channels & Combinations of Channels for Cross-Spectra



Neuroimaging Neurofeedback Symptom Check List

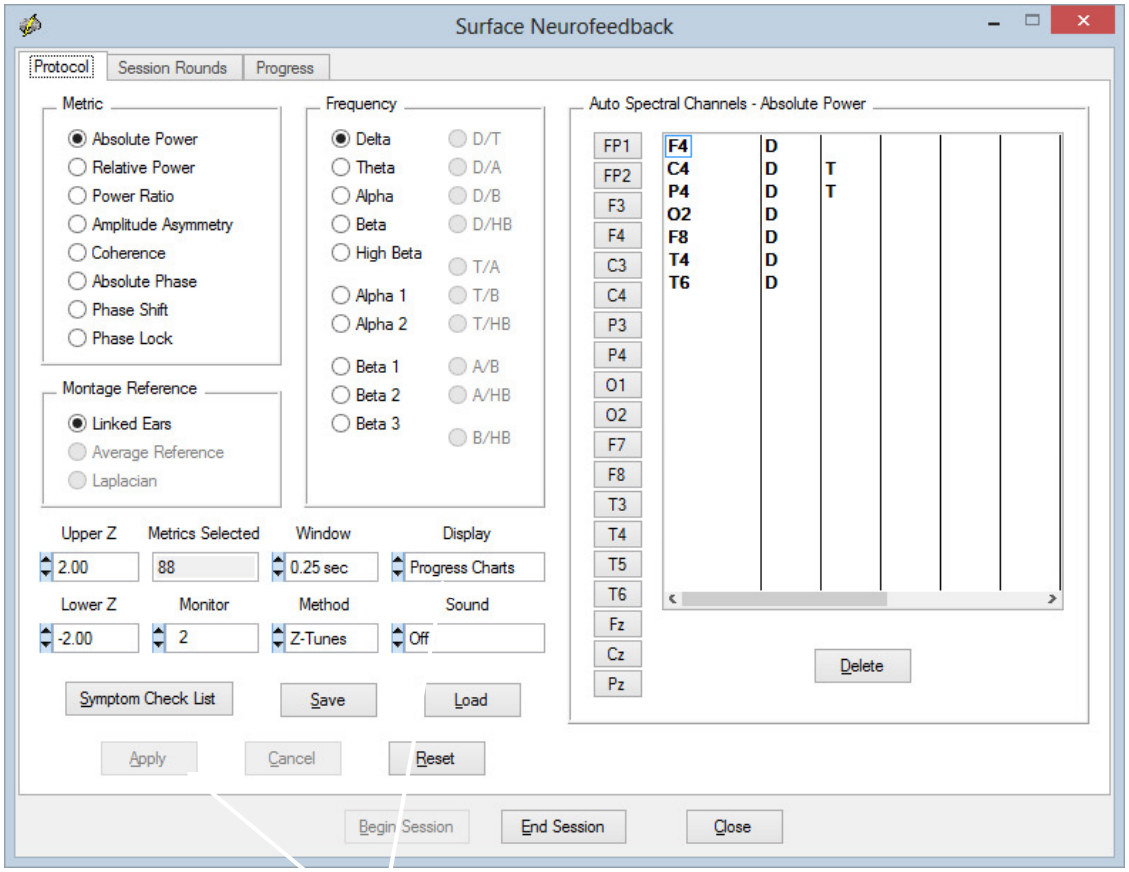
Click Symptoms or Neuropsychological Diagnoses **List of Matching**

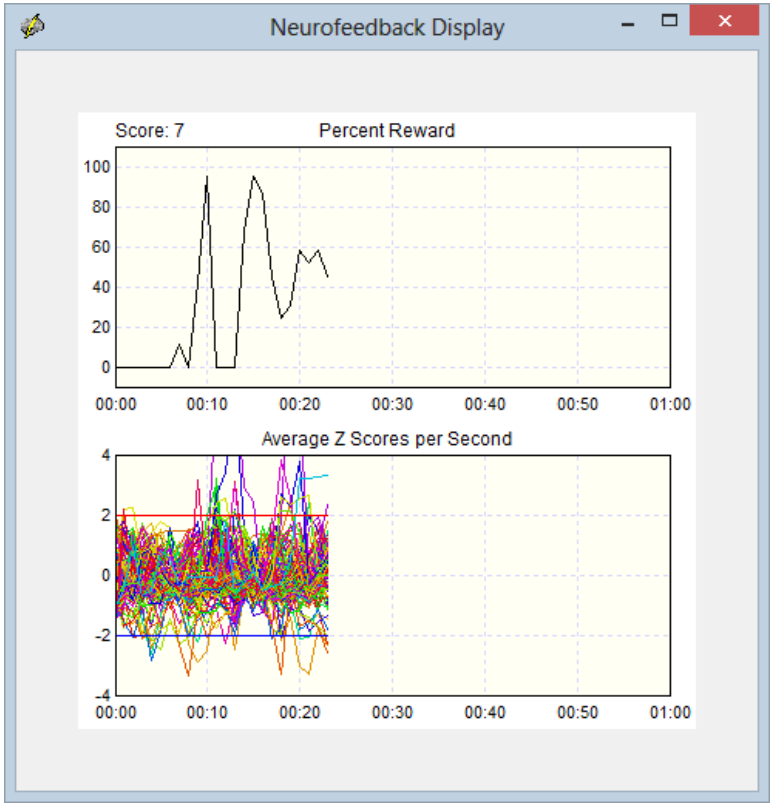


Use the Progress Chart as a Feedback Display

Neurofeedback Setup Panel

Move the Display to the Client's Monitor



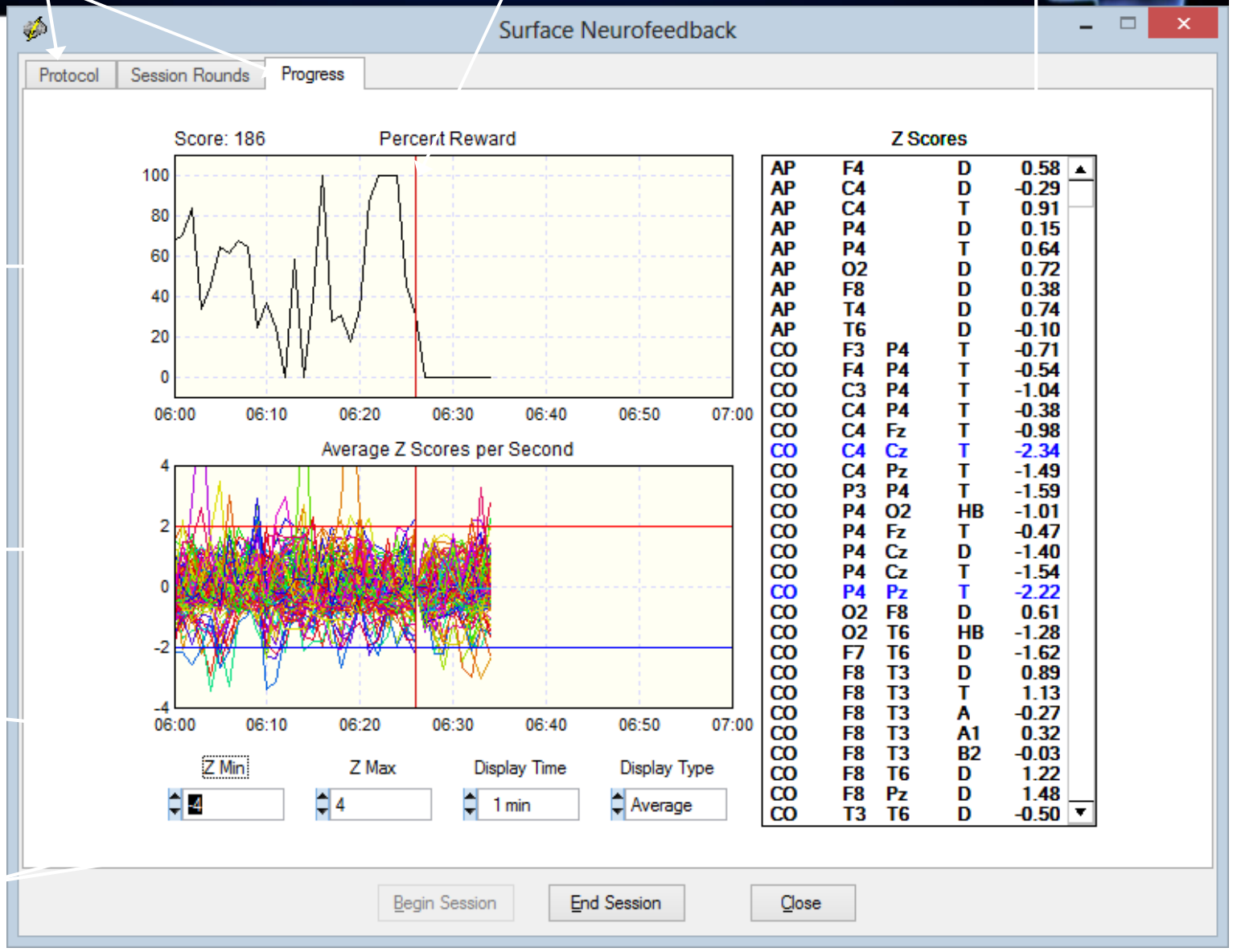


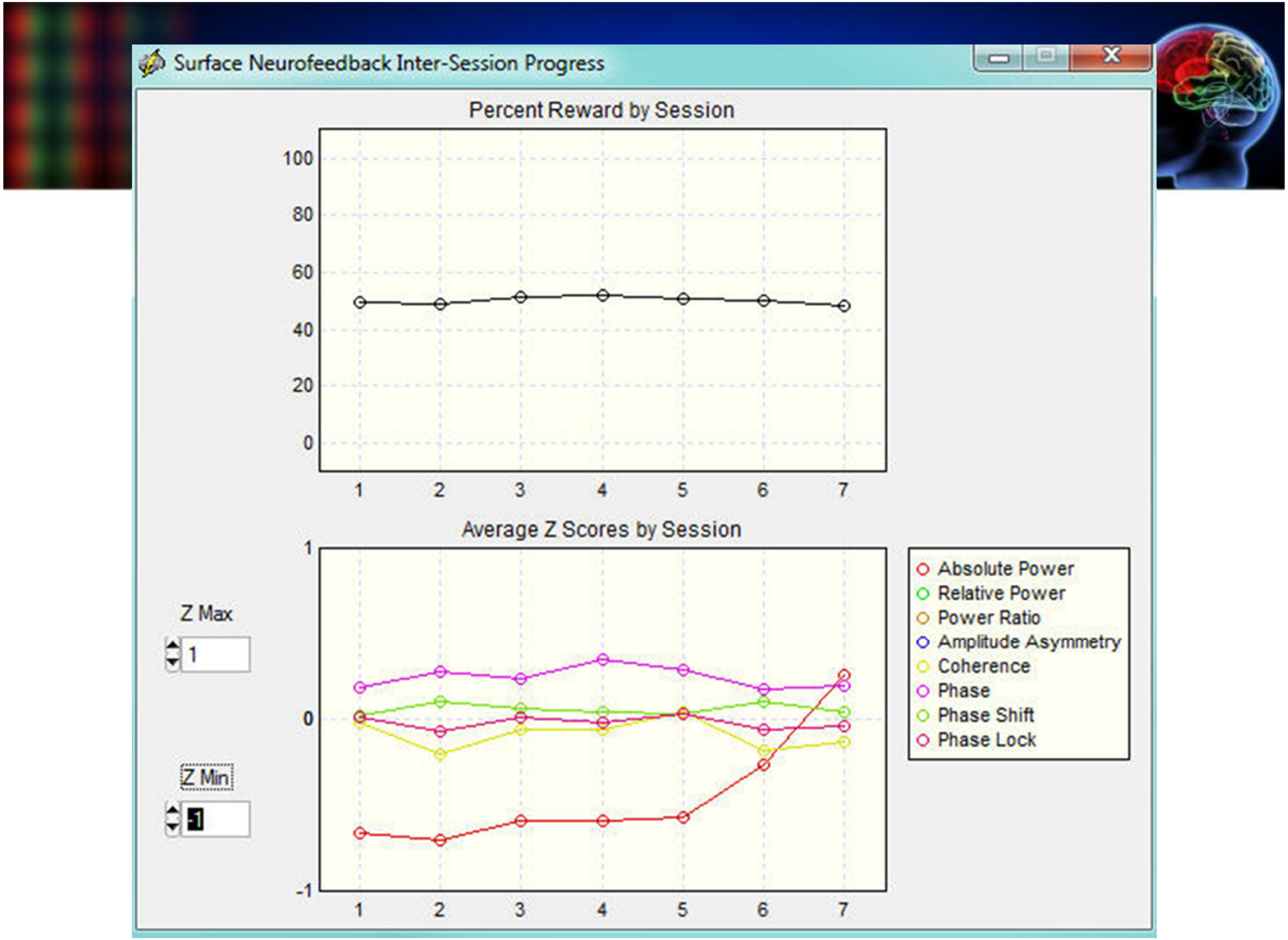
Progress Charts to be Monitored by the Clinician During Neurofeedback

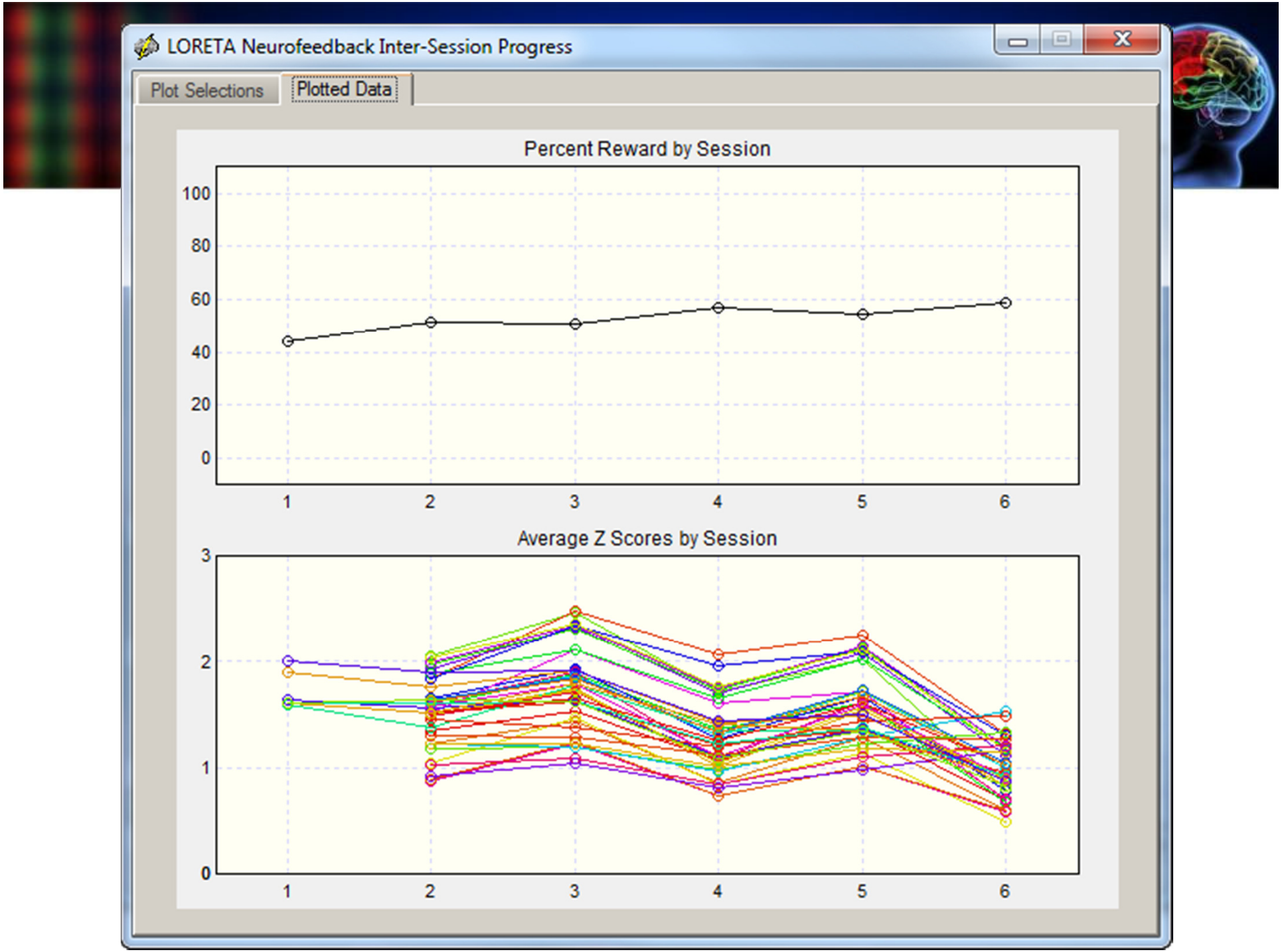
Toggle Back & Forth between Protocol Window & Progress Charts

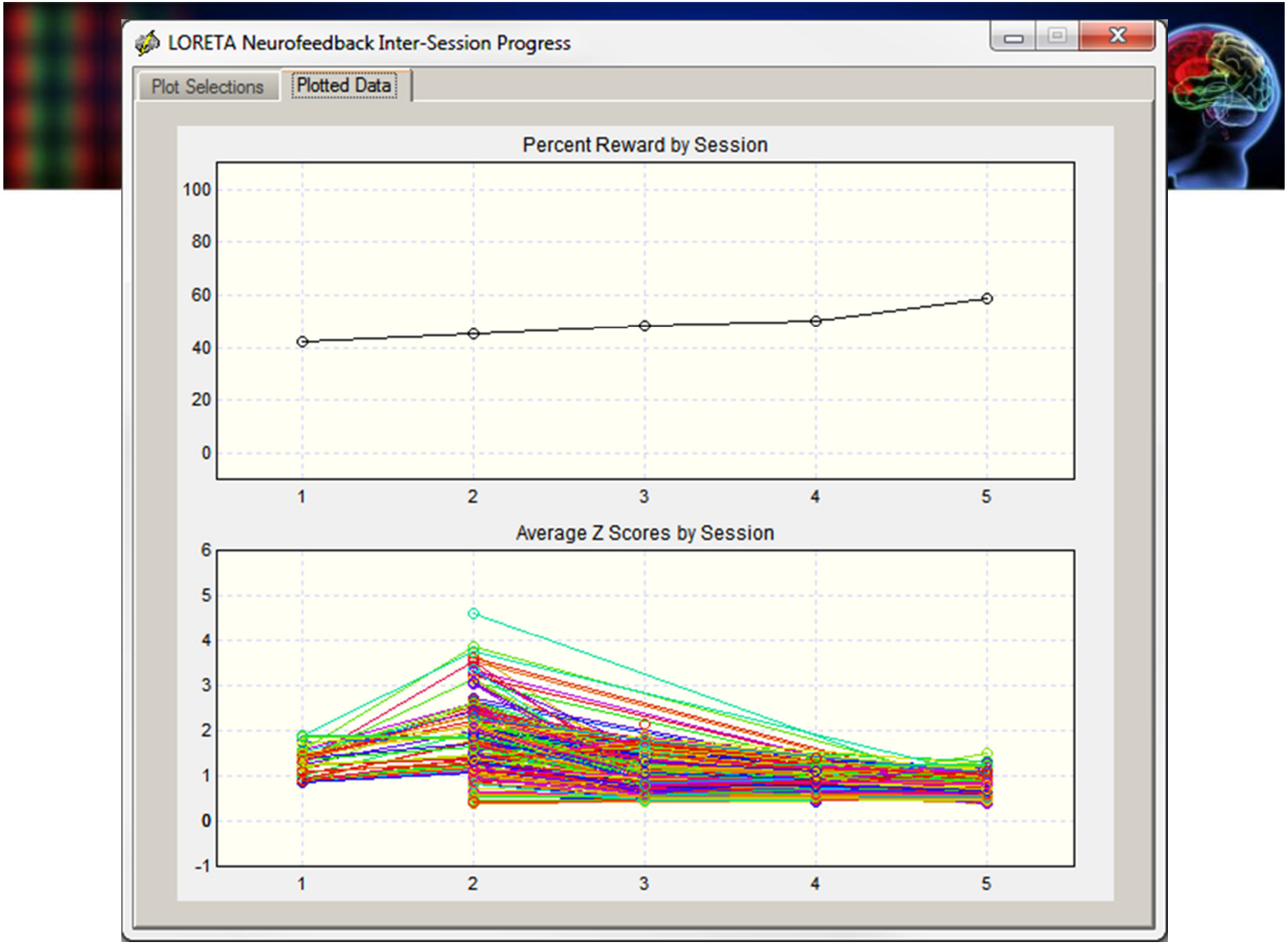
Red Mark Designates Settings Change

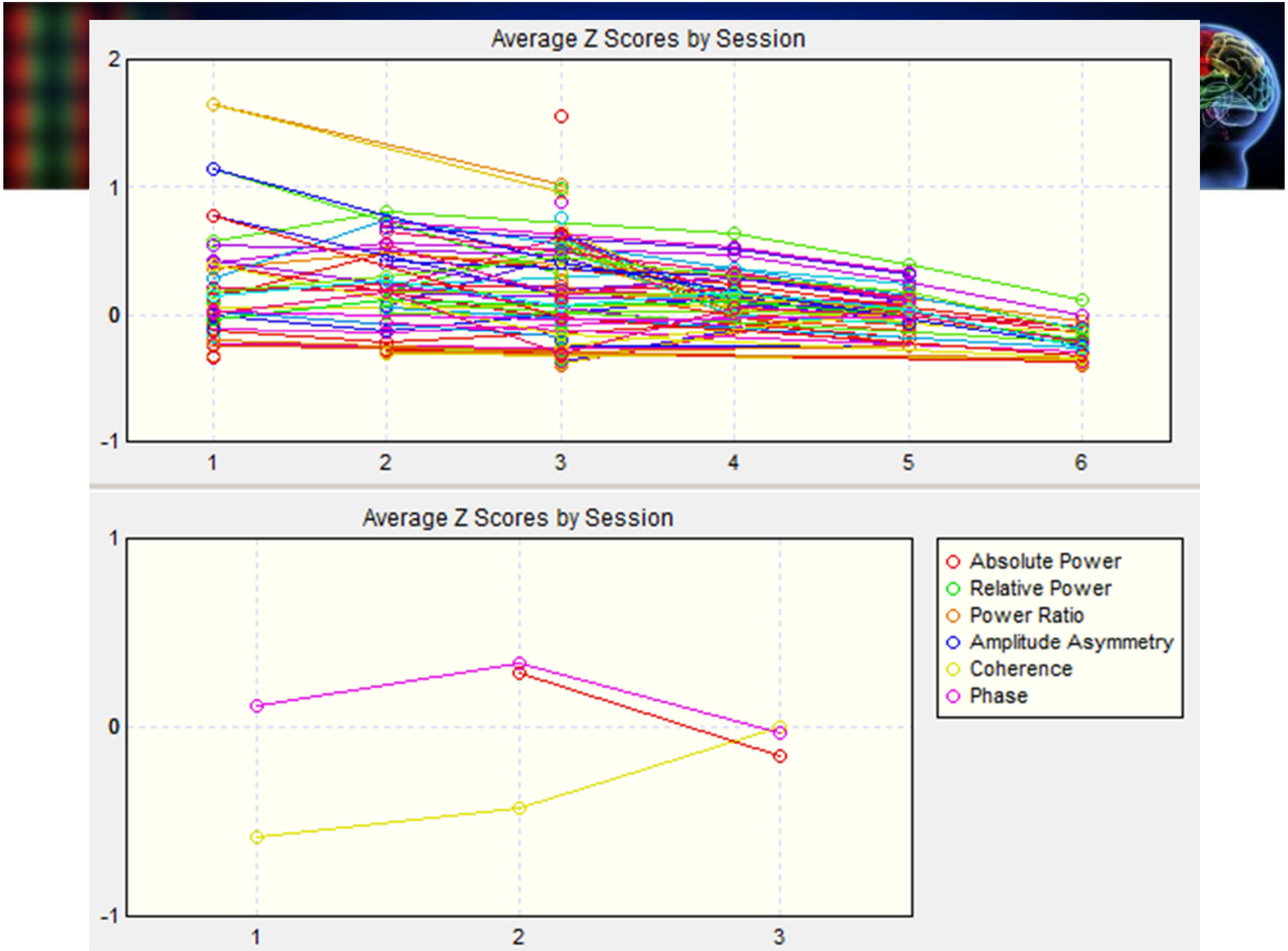
View Instantaneous Z Scores




Surface Neurofeedback Inter-Session Progress
Percent Reward by Session
100
80
60
40
20
0
1
2
3
4
5
6
7
Average Z Scores by Session
1
0
-1
1
2
3
4
5
6
7
Absolute Power
Relative Power
Power Ratio
Amplitude Asymmetry
Coherence
Phase
Phase Shift
Phase Lock
Z Max
1
Z Min
-1

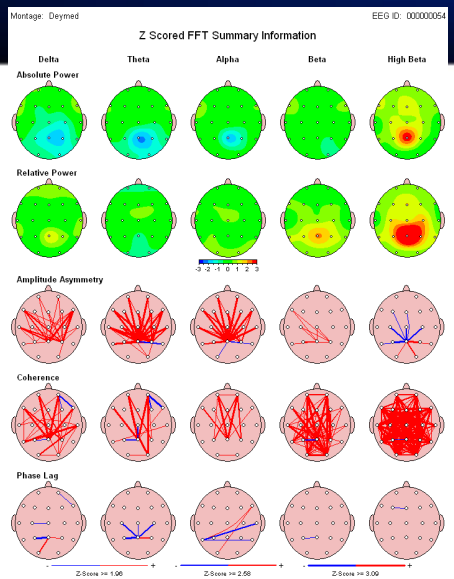

LORETA Neurofeedback Inter-Session Progress
Plot Selections
Plotted Data
Percent Reward by Session
100
80
60
40
20
0
1
2
3
4
5
6
Average Z Scores by Session
3
2
1
0
1
2
3
4
5
6

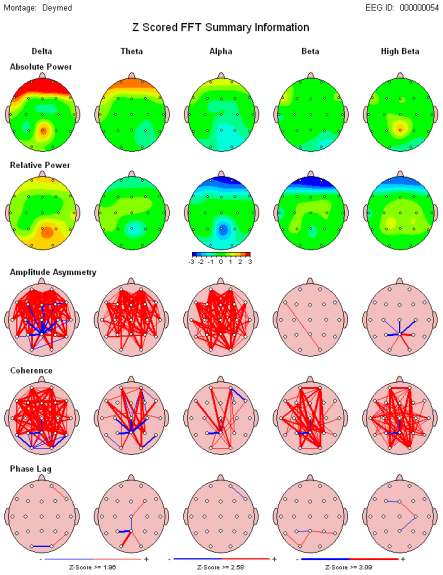

LORETA Neurofeedback Inter-Session Progress
Plot Selections
Plotted Data
Percent Reward by Session
100
80
60
40
20
0
1
2
3
4
5
Average Z Scores by Session
6
5
4
3
2
1
0
-1
1
2
3
4
5


Average Z Scores by Session
2
1
0
-1
1
2
3
4
5
6
Average Z Scores by Session
1
0
-1
1
2
3
Absolute Power
Relative Power
Power Ratio
Amplitude Asymmetry
Coherence
Phase

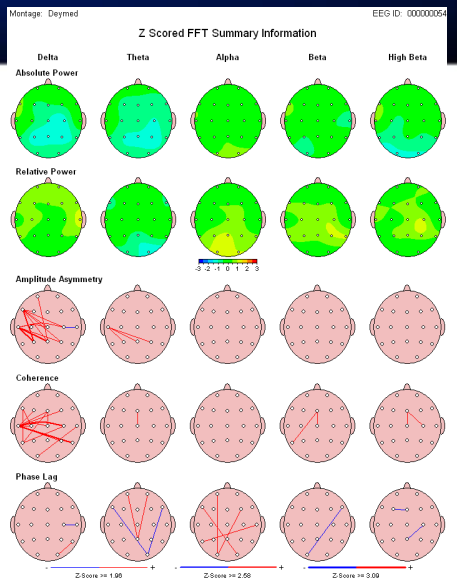
Examples of Surface EEG Changes After EEG Neurofeedback

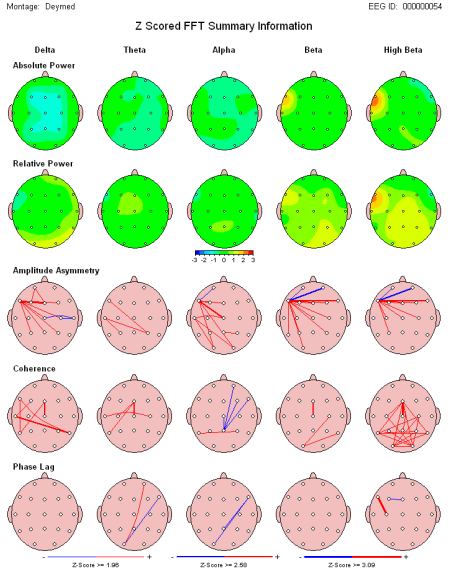
Pre-Treatment





Post – 10 Treatments





Examples of Electrical Neuroimaging After Neurofeedback