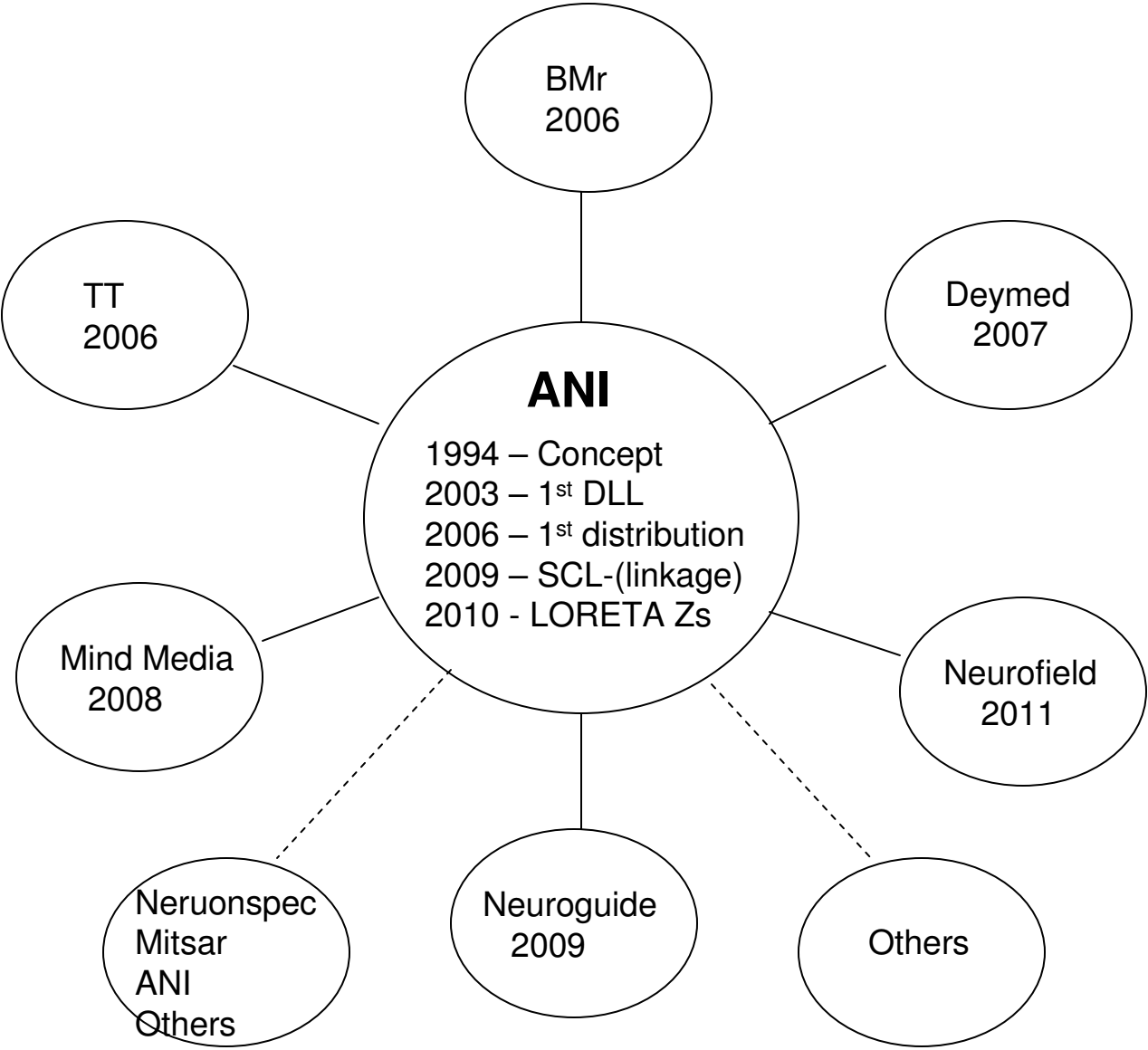


LORETA Z SCORE BIOFEEDBACK CONFERENCE

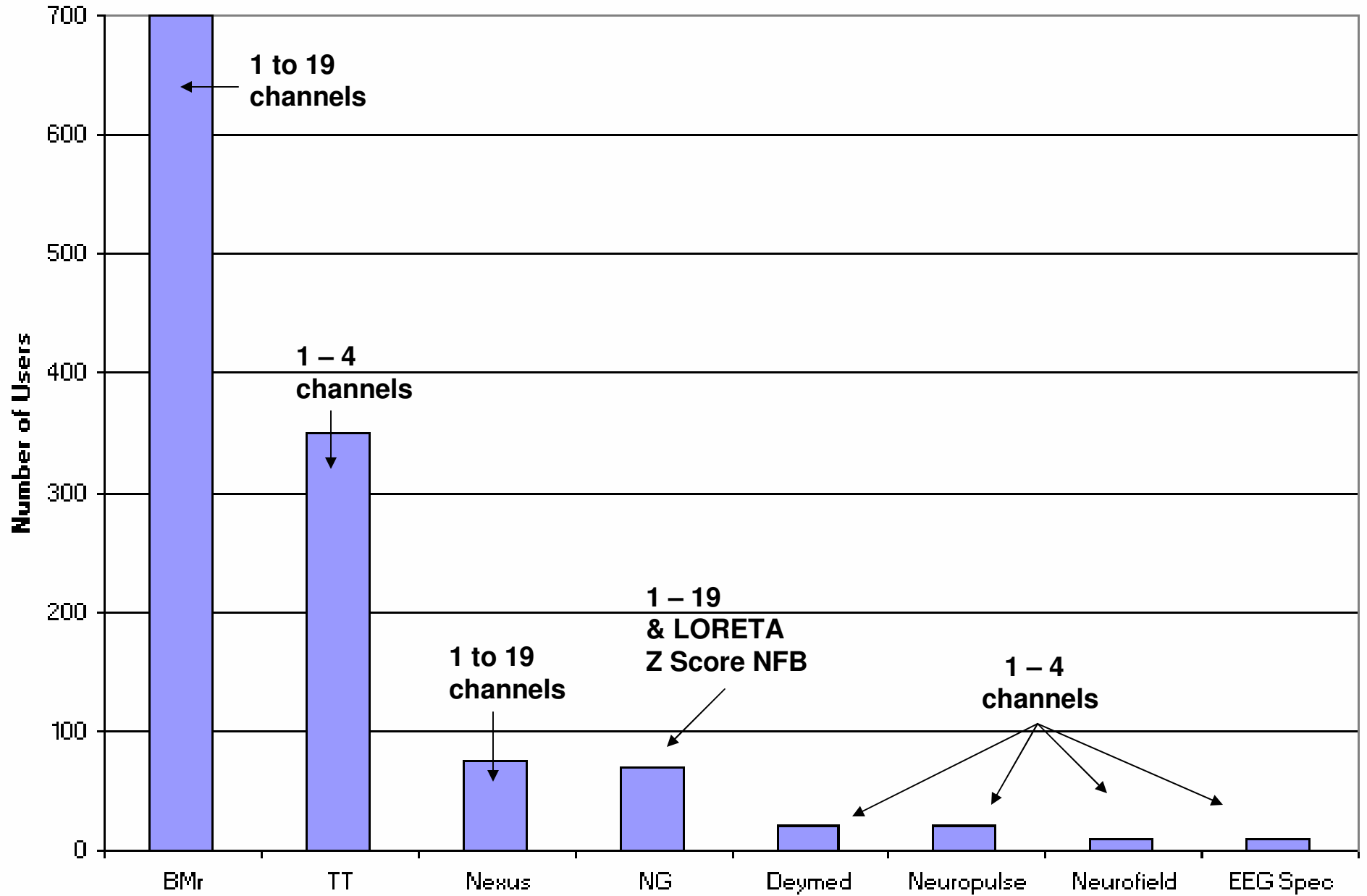
**Cancun – Mexico
May 2012**

History, Principles and Future Perspectives

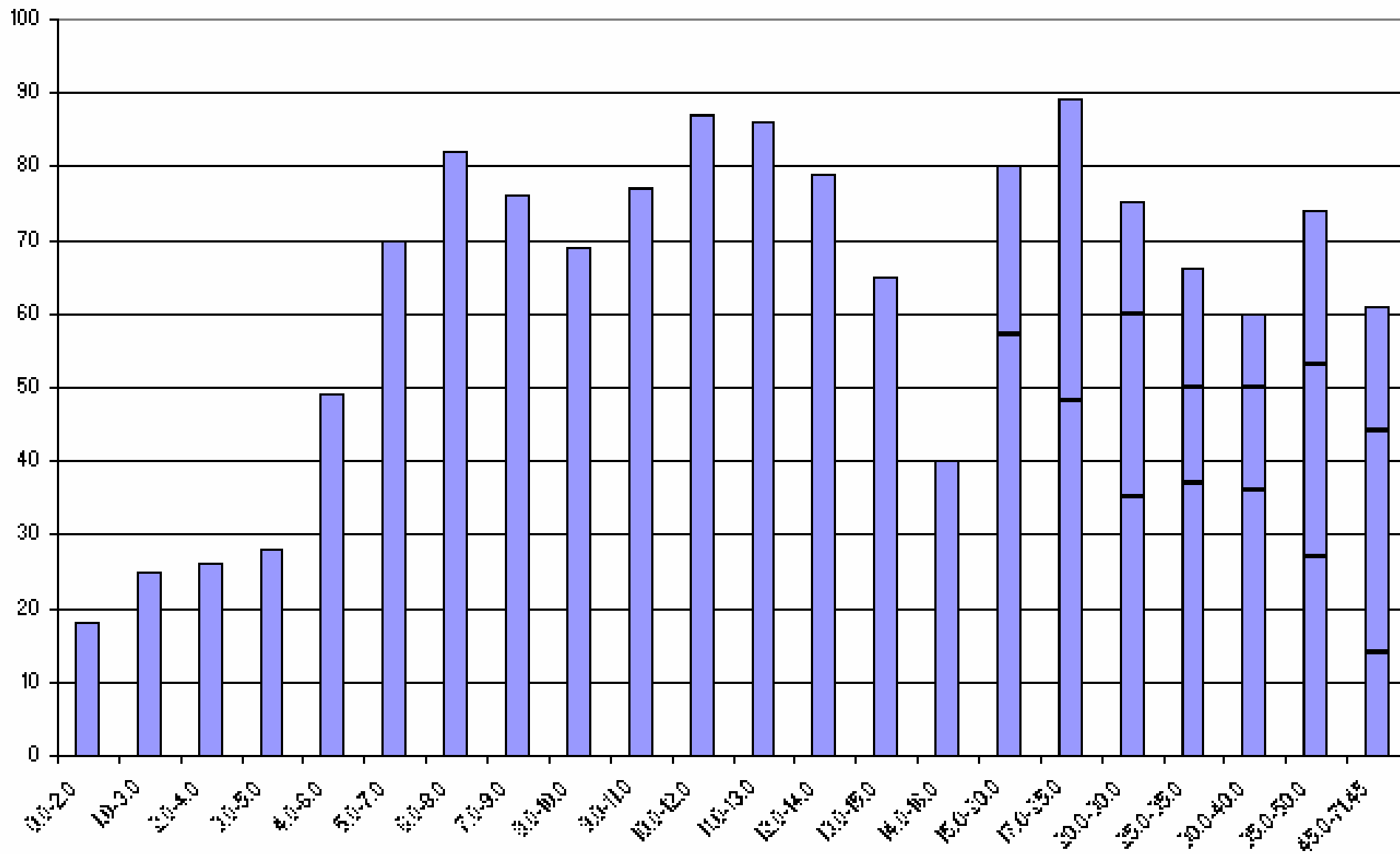
Z Score EEG Biofeedback – History and Future Plans



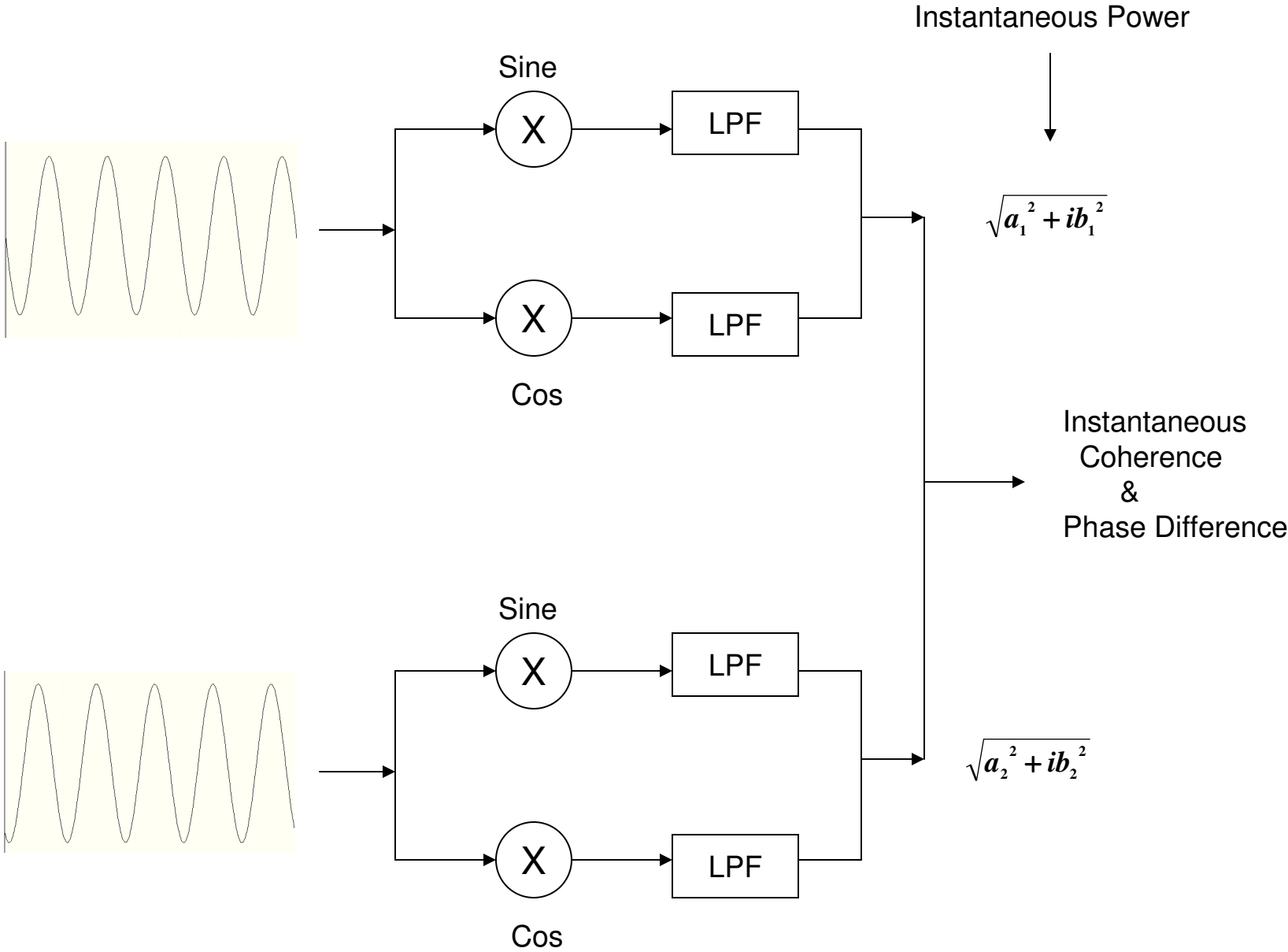
Z Score Biofeedback Clinicians - Total = 1,255



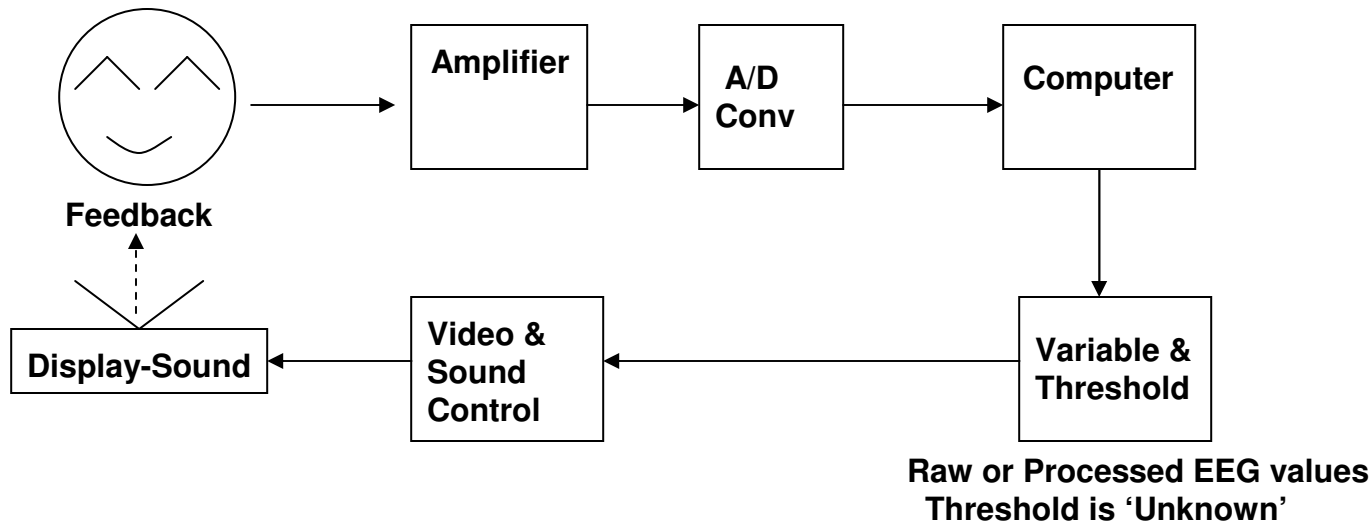
NORMATIVE DATABASE N = 727 Subjects as of 8/24/2011



Complex Demodulation

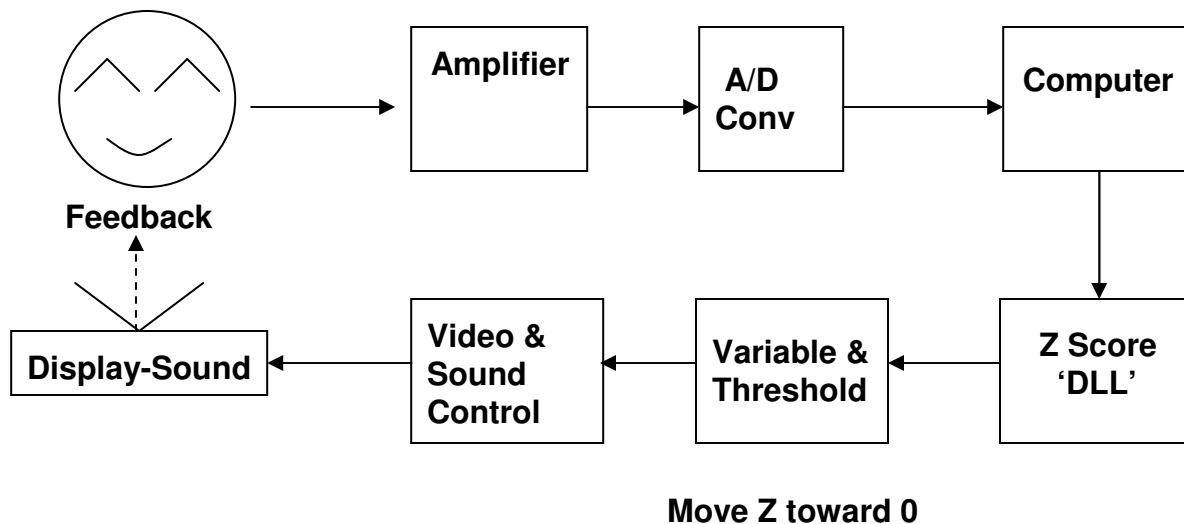


Difference Between Standard Neurofeedback vs Z Score Neurofeedback



Standard EEG Neurofeedback

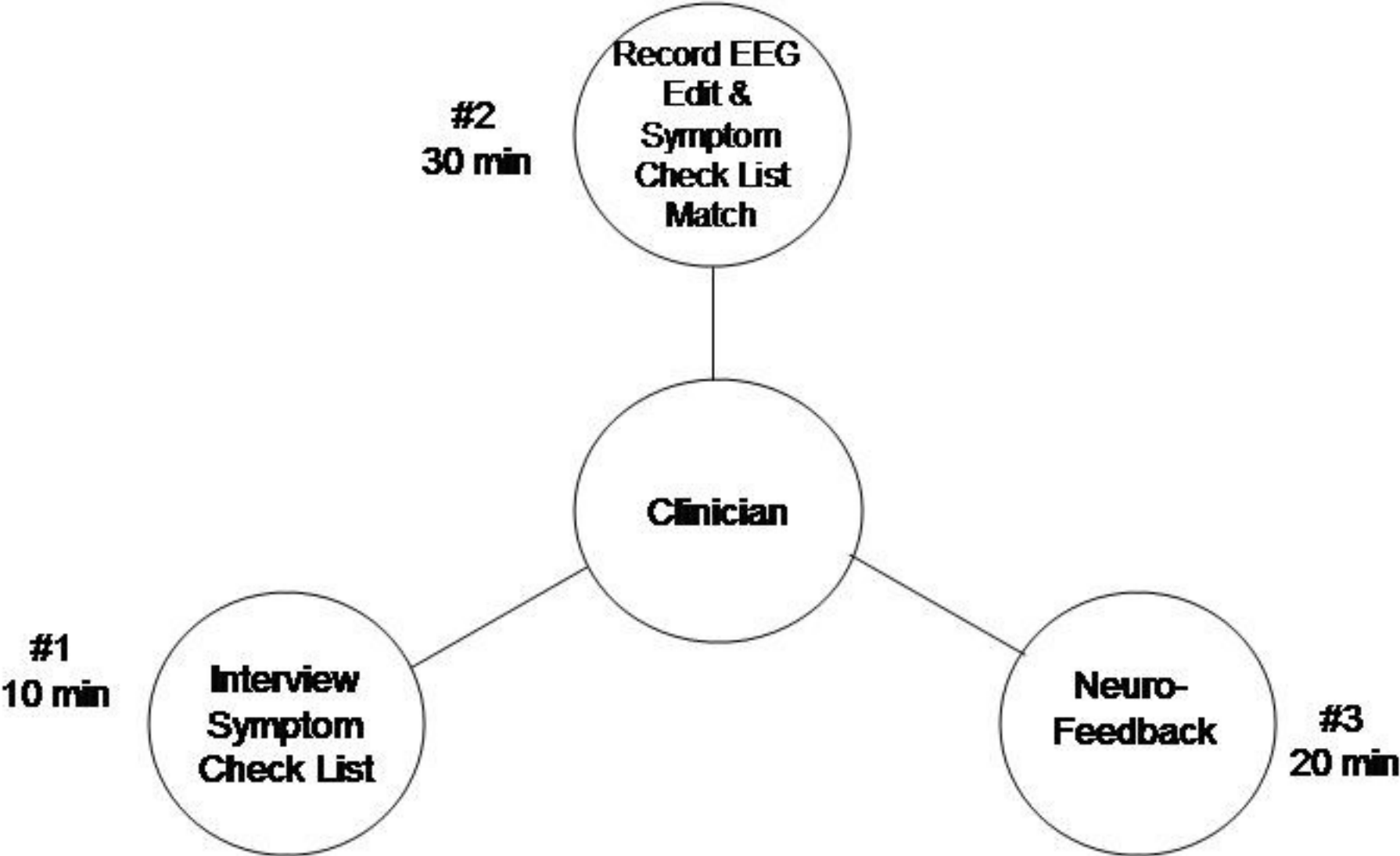
- 1- Apples & Organges
- 2- Arbitrary Threshold
- 3- No reference to Guide NF



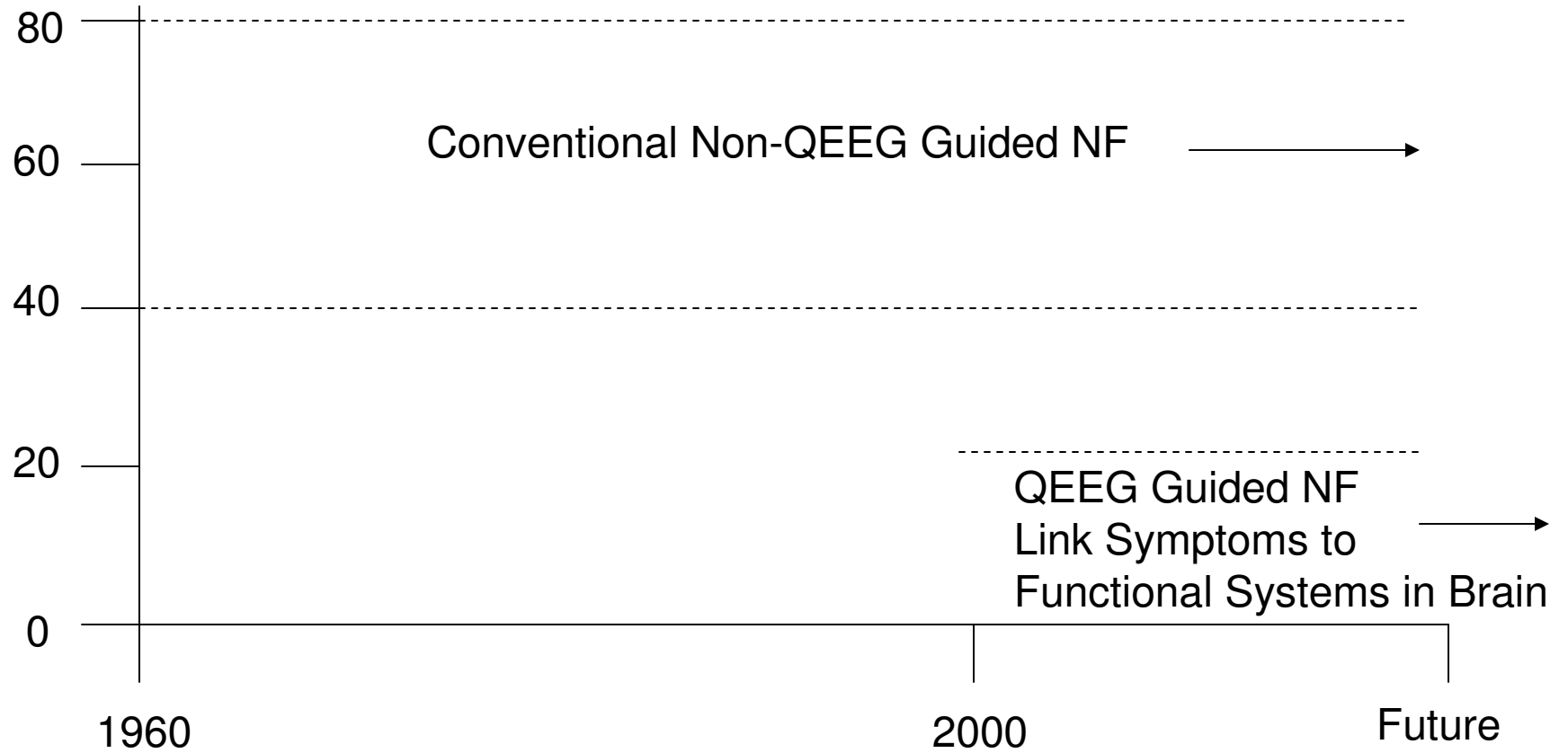
Real-Time or "Live" Z Score Neurofeedback

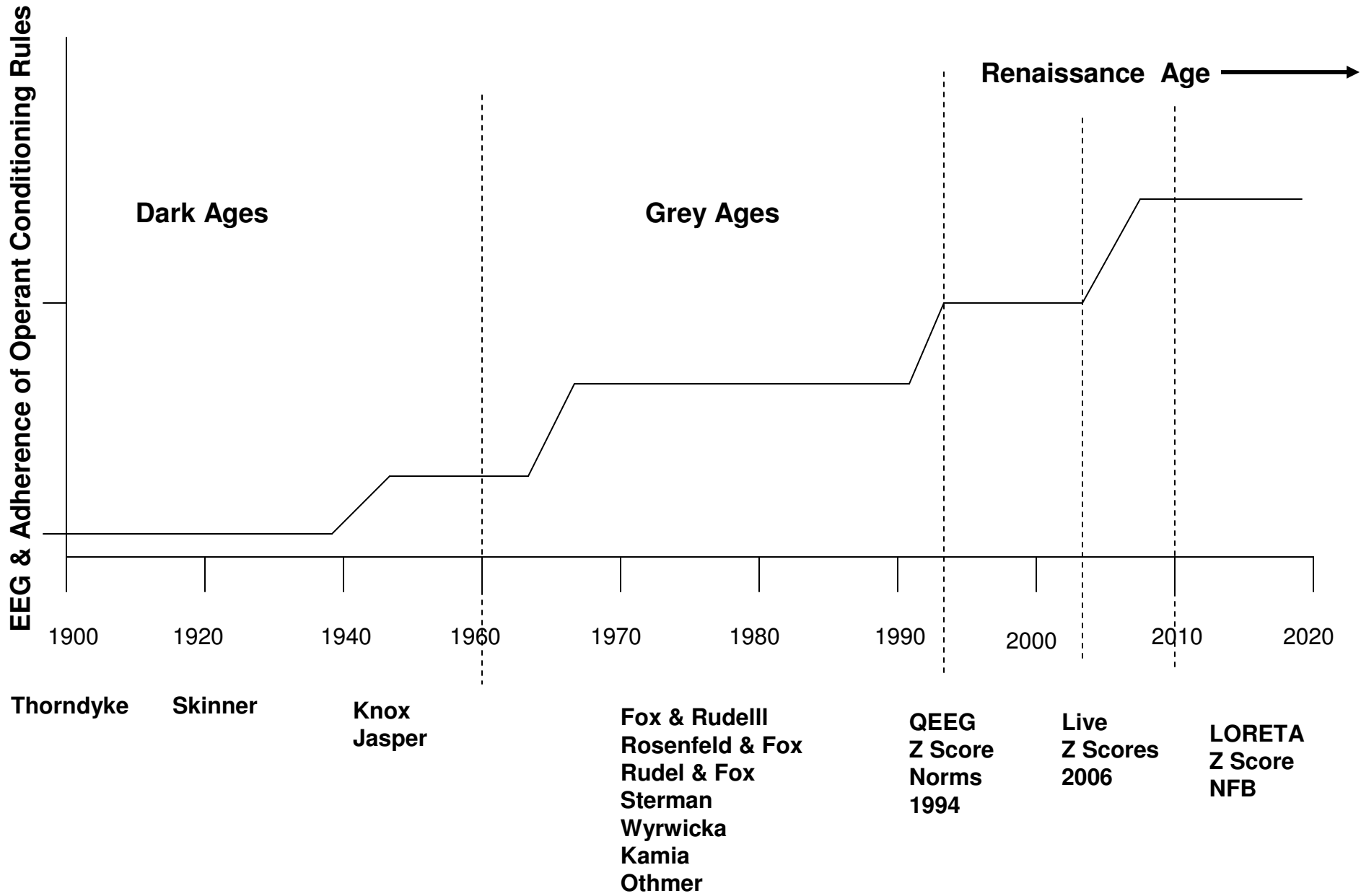
- 1- Metric, i.e., a 'Z' Score
- 2- Threshold toward '0'
- 3- Instantaneous Comparison to a normative database

Seamless QEEG and Neurofeedback – approx. 50 – 60 minutes for a single Session in four Steps from Clinical Interview to QEEG to Neurotherapy



Better Clinical Outcome & Fewer Sessions





Principles of EEG Operant Conditioning and Z Score Biofeedback

Principles

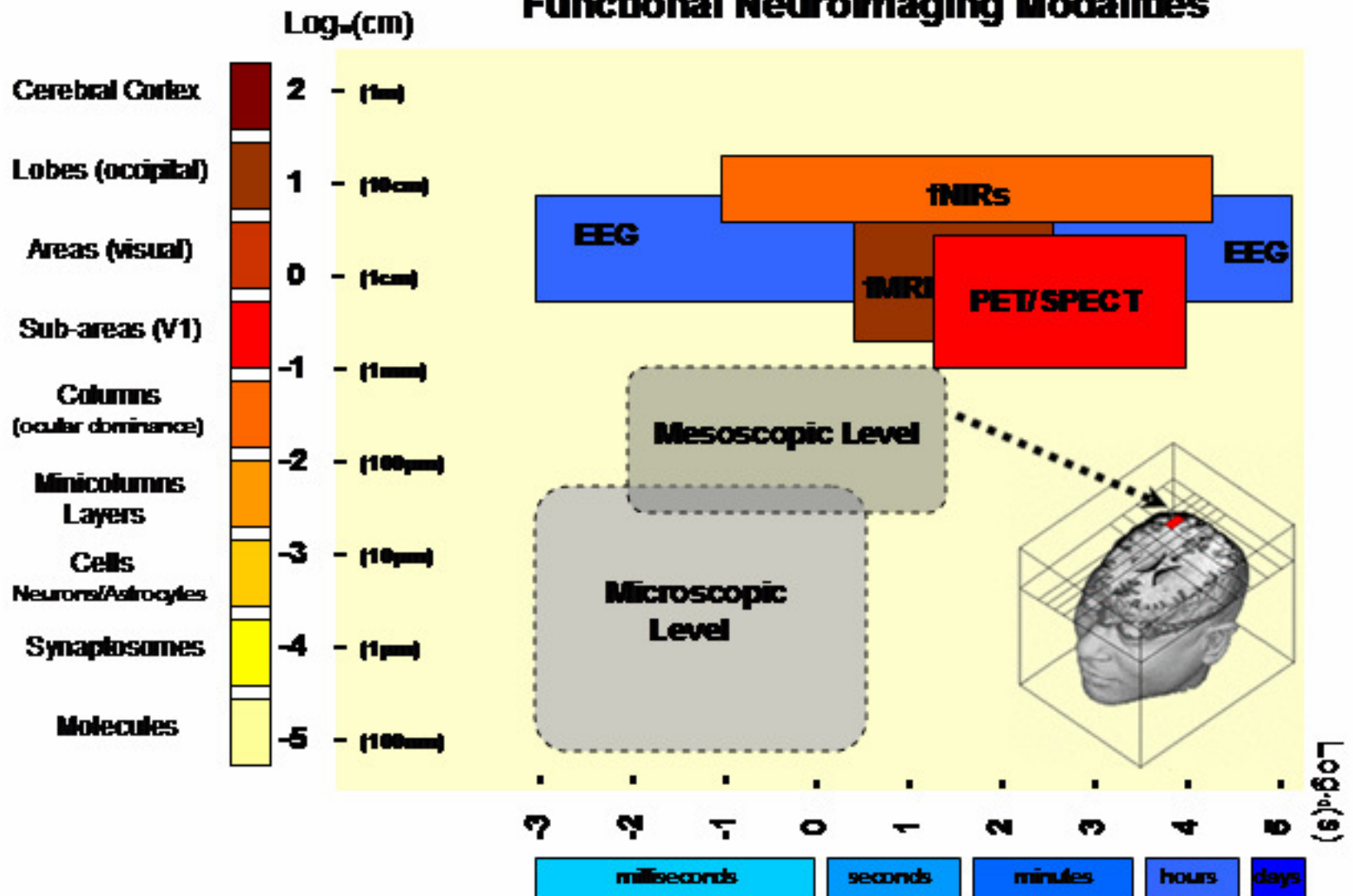
- 1- Specificity of EEG Event (E) = Neural State Interval (I)
- 2- Contiguity Window (C) = Time period preceding and following a E
- 3- Contingency of Reward Signal (S) = Feedback signal time locked to E
- 4- Reward Strength (R) = Value of the reward if N successes occur in an interval of time, e.g., toys, candy, cookies, money, etc.

Category

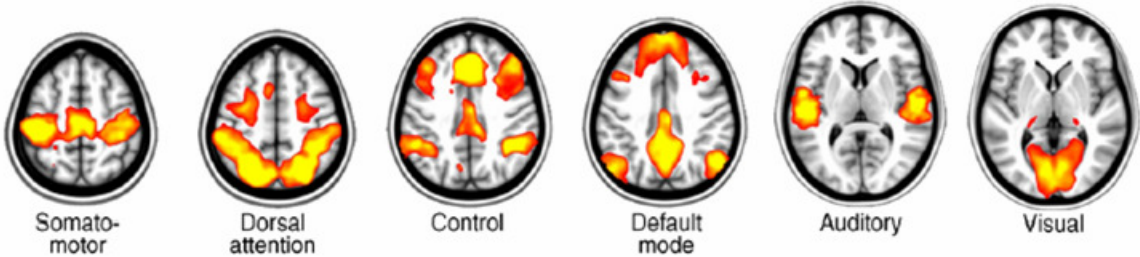
Measurement

Category	Measurement
Specificity of EEG Event (E)	Z Scores and Brodmann areas linked to symptoms
Contiguity Window (C)	Time preceding/following E (msec – sec)
Contingency of Reward Signal (S)	Feedback signal time locked to E (msec)
Reward Strength (R)	Ordinal or Nominal measure

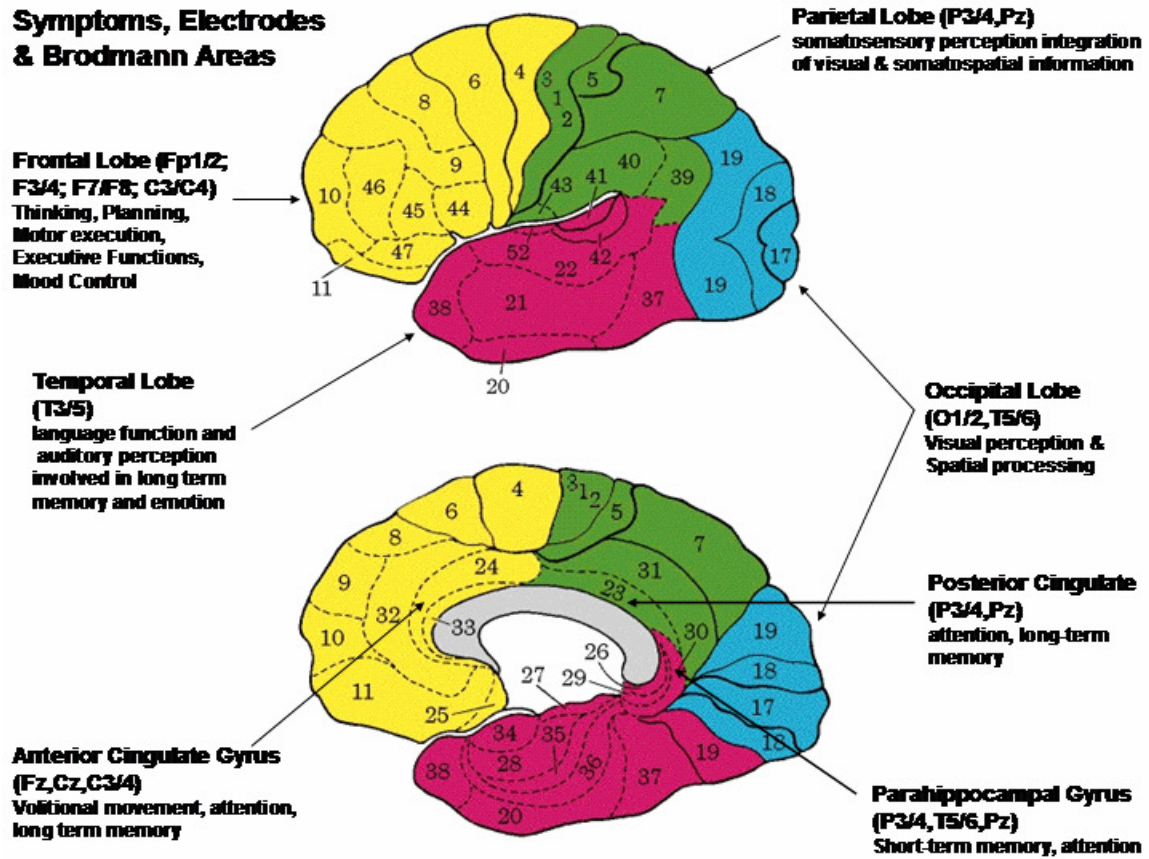
Functional Neuroimaging Modalities



Six Functional Modules as Measured by fMRI



Symptoms, Electrodes & Brodmann Areas



Click Symptoms

Double Click & Enter Severity

List of Matching Brodmann Areas

List of Symptoms

Anatomical Hypotheses

Symptom Check List

Symptoms | Neuropsychological

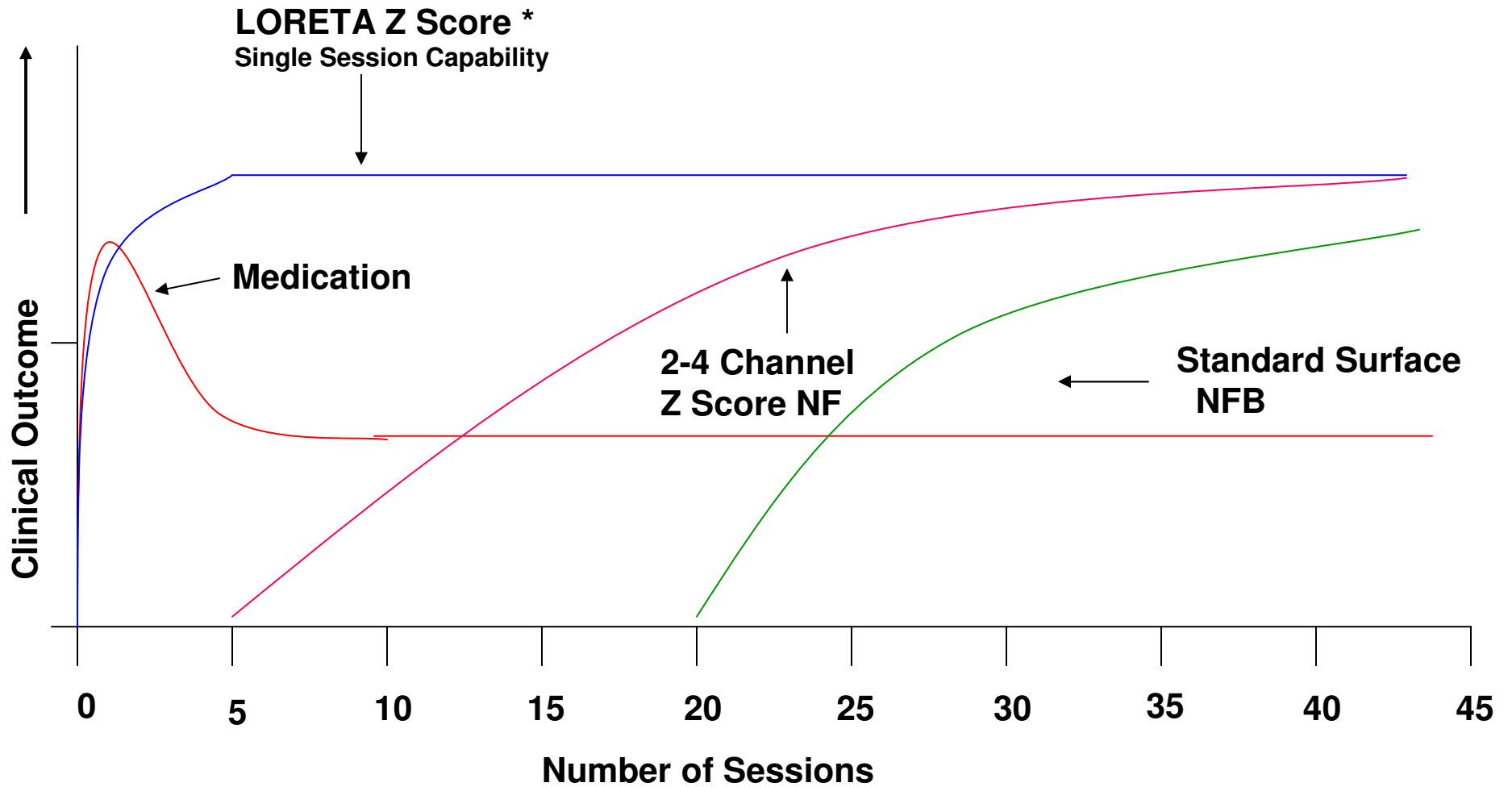
Z Score: 2.00

Symptom / Complaint	Severity
Anosognosia - Denial of a Problem	0
Anxiety	10
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

Hypothesis		Match		Mismatch	
Brodmann	Hem	Brodmann	Hem	Brodmann	Hem
13	Left	13	Left	1	Right
13	Right	13	Right	2	Right
26	Left	30	Left	3	Right
26	Right	30	Right	4	Left
30	Left	Amygdala	Left	4	Right
30	Right	Amygdala	Right	5	Left
Amygdala	Left			5	Right
Amygdala	Right			6	Left
				6	Right

OK Cancel

Increased Specificity = Improved Clinical Outcome with Fewer Sessions

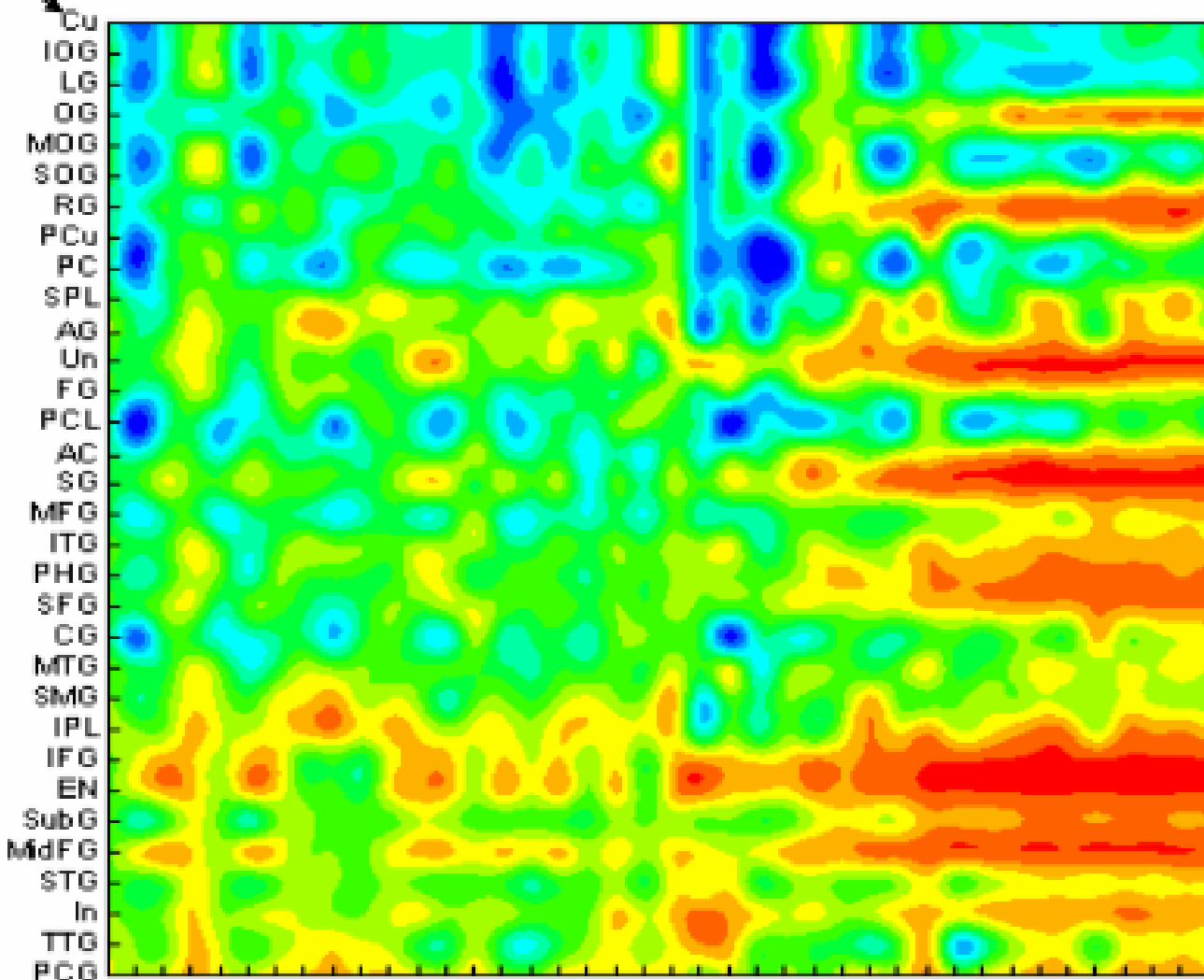


* Combine with Neurofield in cases to reset or “unstick” the brain

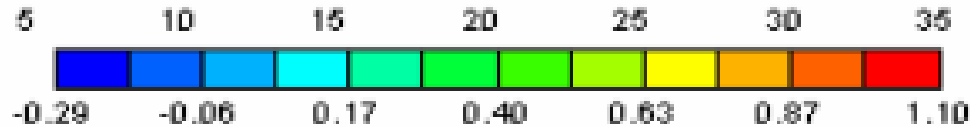
Spatial Heterogeneity of Source Correlations

Cuneus
62.75 mm

Y-Axis - Ordered Distance mm



Post Central
Gyrus 0 mm

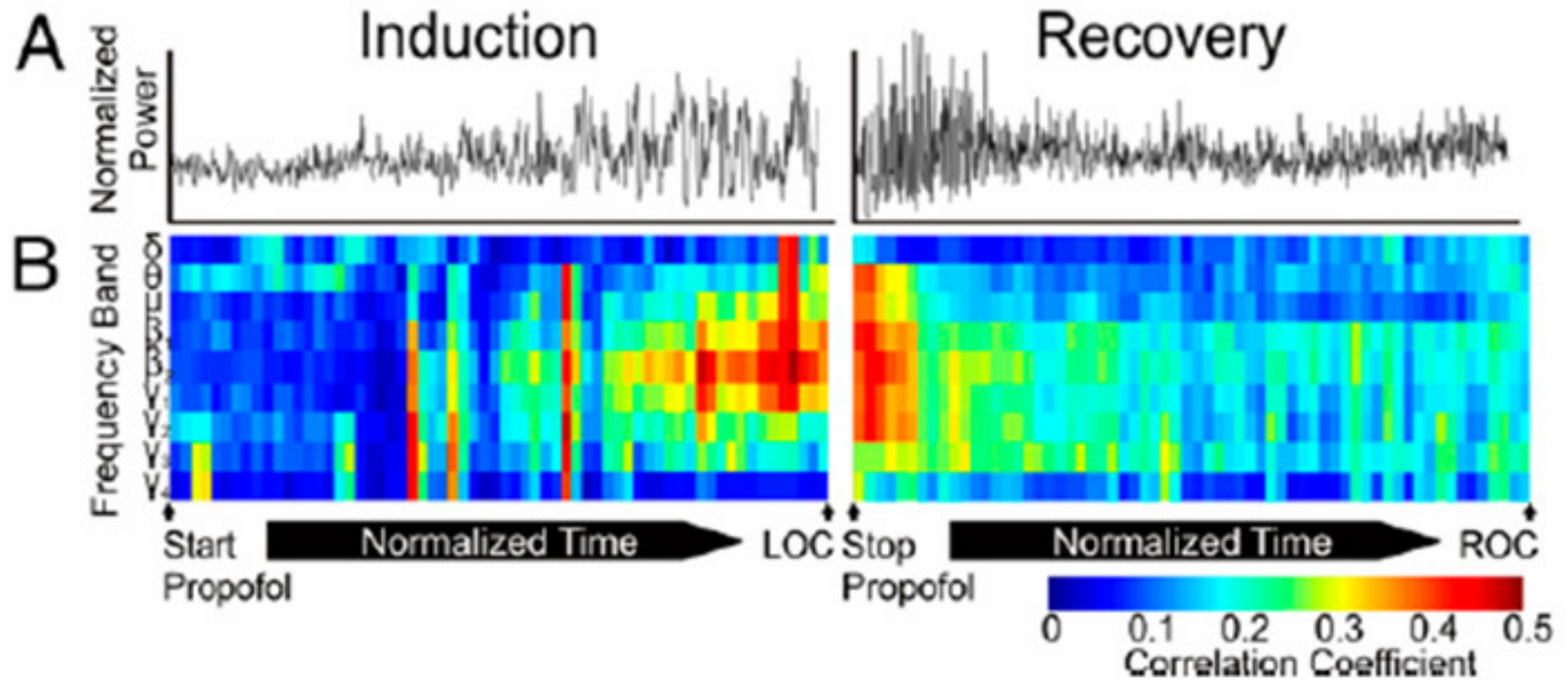


Z-Axis - LORETA Source Correlations

X-Axis
Frequency 1 to 40 Hz

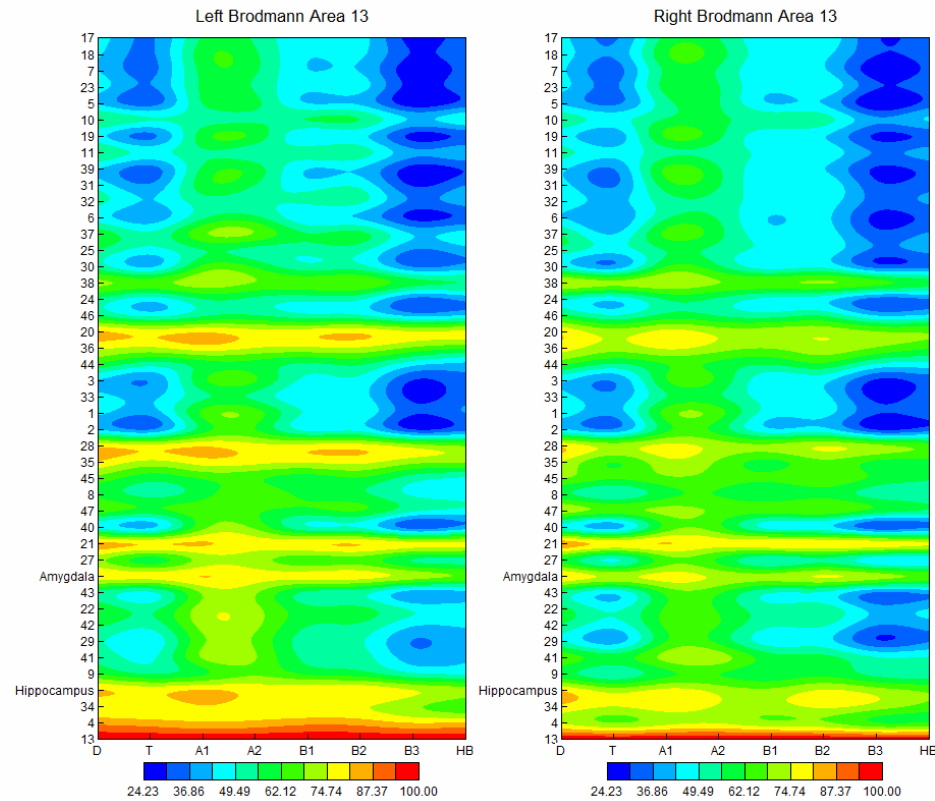
Hypothesized
'U' Shaped
Connections

Consciousness vs Anesthesia Unconsciousness



Wake State & LORETA Coherence

LORETA Coherence



Sleep & LORETA Coherence

Z Scored LORETA Coherence

