



# PSYCHOLOGICAL SCIENCES INSTITUTE, P.C.

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## NEUROMETRIC EVALUATION

**PATIENT:** P, F

**DATE OF BIRTH:** 9/6/1941

**TEST DATE:** 4/4/2000

**TECHNICIAN:** David Cantor, Ph. D.

**REFERRING CLINICIAN:** David Cantor, Ph. D.

**CURRENT MEDICATIONS:** Neurontin (300 mg. q.i.d.); Buspar (15 mg. t.i.d.); Prilosec; Percocet (20 mg. t.i.d.); Digoxin (25 mg. h.s.); Vitamins; Human Growth Hormone

**PRELIMINARY DIAGNOSES:** Traumatic Brain Injury with cognitive sequelae; panic attacks; agoraphobia; depression; anxiety

**REASON FOR REFERRAL:** The patient is referred for a neurofunctional evaluation to rule out organic brain syndrome. Neuropsychological testing September 1995 following a CHI (6/22/95) had shown impaired sustained attention in auditory and visual modalities, impaired recent memory (auditory and visual); impaired visual-motor speed and coordination and decreased speed of cognitive processing. More recent testing (March 1997) has shown improved attention with continuing deficits, improved speed of cognitive processing and improved but continuing problems with verbal and visual short-term memory.

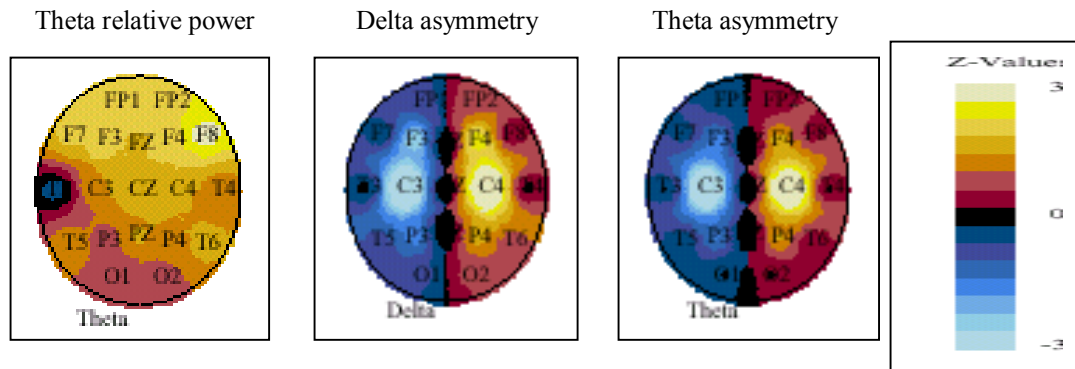
**BEHAVIORAL/TECHNICAL OBSERVATIONS:** F P is a 58-year-old right-handed man. He was awake and alert throughout the test session.

## CLINICAL CORRELATE SUMMARY CHART

Brain Region	Measures	Severity Indicators
Widespread	Increased theta; incoherences	Significant anterior with trends elsewhere; significant
Left Frontal		
Right Frontal	Asymmetries	Significant
Left Temporal	Beta and beta asymmetry	Significant (artifact)
Right Temporal		
Left Central		
Right Central	Asymmetries	Significant
Left Parietal		
Right Parietal	Asymmetries	Trend
Left Occipital		
Right Occipital		

Significant History	Clinical Observations/Data	Correlating QEEG Features
Head injury		PCS <u>not</u> indicted ( $p < .025$ ) Discriminant function: Abnormal ( $p < .025$ ) -bip. coh. combined anterior -mono abs. power comb. anterior -bip. relative beta head
Attention deficits	Digit Span; VSAT	Increased theta
Attention deficits	Digit Span; VSAT	Increased theta:beta (max. F8)
STM deficits		Increased theta; central and temporal asymmetries and incoherences
Impaired visual-motor coordination and speed	Digit Symbol	Central and occipital increased theta, asymmetries and incoherences

### Imported Maps



### FOLLOW-UP/TREATMENT CONSIDERATIONS:

- The QEEG should be interpreted with caution since the patient is currently taking medications. If the diffuse theta is not related to medication effects or to a metabolic disorder, the QEEG profile of diffuse increased theta and abnormal coherences has been reported to be responsive to treatment with anticonvulsant medications such as Tegretol or Depakote. Since the patient is currently taking an anticonvulsant (Neurontin), consideration should be given to the type and dose which may improve medication efficacy.
- The patient may benefit from neurofeedback training. Theta:beta is greater than 3:1 in right and midline anterior regions. Consider an initial site of F8 where the ratio is 3.5:1. The target should be 2:1.

### II. DETAILED NARRATIVE

#### QUANTITATIVE DATA

#### QUANTITATIVE NEUROMETRIC ASSESSMENT (QEEG):

Twenty-one electrodes using an electro-cap consistent with the International 10/20 systems were placed. Routine EEG was recorded on a Cadwell Easy II using a linked ear montage and with electrodes digitally referenced to the Cz electrode allowing for retrospective montage analysis of all data. Using data gathered under technical conditions as listed above, 122.07 seconds of EEG were selected and subjected to

quantitative analysis of absolute power, relative power, power asymmetry and coherence. These measurements are logarithmically transformed and referenced to age-adjusted population norms.

Analysis of the monopolar data shows significantly increased absolute theta in right central, right frontal, right parietal and bilateral occipital regions. Significantly increased left temporal absolute beta is exaggerated by muscle tension. Theta:beta is increased, maximal at F8 where it is about 3.5:1. The relative power distribution shows significantly increased anterior theta with trends in most other regions. Beta is significantly decreased in right frontal and right fronto-temporal regions. Significant interhemispheric central asymmetries in all frequencies show relatively larger right hemisphere voltages. Similarly, significant frontal delta asymmetry with theta and alpha trends show relatively larger right hemisphere voltages. A similar trend is noted in parietal regions. Significant intrahemispheric delta asymmetry shows relatively larger voltage in left occipital compared to left frontal regions. Significant interhemispheric delta incoherence occurs in frontal regions, significant theta incoherences occur in parietal, occipital and posterior-temporal regions and significant delta, theta and beta incoherences are noted in central regions. Significant intrahemispheric theta incoherence occurs between left frontal and left occipital regions with a trend in the right homologous derivation. Significant left temporal beta incoherence is influenced by muscle artifact. Mean delta frequency is significantly increased in right anterior, right central, left parietal, left posterior-temporal and bilateral occipital regions with diffuse trends. Mean theta frequency is significantly increased in fronto-polar regions. Mean alpha frequency is significantly decreased diffusely. Selected multivariate measures (which take into account intercorrelation of measures) show significant anterior and overall combined relative power scores, a significant overall theta combined coherence score, significant overall delta and beta asymmetry scores, significant central asymmetry scores in most frequencies, widespread significant alpha mean frequency scores and significant anterior and overall delta mean frequency scores.

Analysis of the bipolar data shows significantly decreased left fronto-temporal relative delta. These regions and posterior-temporal regions show significant beta increases and significant beta asymmetries and/or incoherences, the scores being influenced by muscle tension. Theta is increased in central, right posterior-temporal and bilateral parieto-occipital regions but scores are not significant. Most significant scores are related to the beta artifacts. However, central regions show significant total power asymmetry and significant delta, theta and beta asymmetries with relatively larger right hemisphere voltages. The multivariate measures (which take into account intercorrelation of measures) show significant theta relative power scores in left hemisphere, anterior and overall regions. Significant left hemisphere and overall beta relative power scores and significant beta asymmetry and coherence scores may be influenced by artifact. The discriminant function analysis indicates that scores lie outside normal limits ( $p < .025$ ) but do not indicate Post Concussion Syndrome ( $p < .025$ ).

**Impression:** Caution should be used in interpreting the QEEG results since the patient is currently taking medications. On face value, the QEEG shows widespread increased relative theta significant in anterior regions, significant frontal and central asymmetries with relatively larger right hemisphere voltages and widespread significant incoherences. Theta:beta is increased, especially in frontal regions. Significant left hemisphere temporal and fronto-temporal beta scores are influenced by muscle tension. There is some evidence of greater dysfunction in the right hemisphere, especially right central and right frontal regions, as evidenced by the significant asymmetries. This may be related to right frontal contusions noted on the CT scan following the CHI. However, left temporal and left fronto-temporal scores are influenced by muscle tension which may affect the results so no definite conclusions can be made.

**QUALITATIVE ELECTROENCEPHALOGRAPHIC EVALUATION:** The following represents impressions based upon visual examination of the EEG. Specific abnormalities such as sharp waves, asymmetries, or unusual responses to evocative procedures are described when observed in order to alert the clinician to possible abnormalities other than those detected in the quantitative analysis. This visual impression is not intended as a substitute for a conventional neurological EEG. Should the clinician be concerned about the presence of epilepsy, neurological abnormalities or the findings described below referral for a conventional EEG may be warranted.

The patient was cooperative with testing procedures and recording was achieved in awake, alert, resting conditions. Hyperventilation was not carried out but photic evocative procedures were employed.

Visual examination of more than 13 minutes of available EEG with multiple montages reveals a high background voltage of 45 to 50 micro-volts and a posterior alpha frequency of 9 to 10 cycles per second. Intermittent 7 Hz activity is noted predominantly over anterior regions. Muscle tension is noted at T3 throughout the test with occasional muscle at T4. Activity appears symmetrical and no spikes or epileptiform activity is noted. Photic stimulation yields no further information. Photic driving with suppression of alpha is noted during photic stimulation.

**Impression:** EEG with intermittent 7 Hz activity.

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Date:

Report reviewed by: