

Presentation 4 – John Hart, Jr.

Gulf War Illness Neuroscience Projects Overview

John Hart, Jr.
Professor of Brain and Behavioral Sciences and Neurology
UTD and UTSW

Gulf War Illness Symptoms

- Trouble finding words/speech difficulty
- Attention/concentration
- Slow thinking/processing speed/putting things together
- Memory
 - Short-term (frontal lobe)
 - Semantic object (thalamus and basal ganglia)
 - Learning new material (hippocampus)
- Depression/anxiety/hyperarousal/irritability
- Confusion

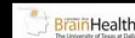
GWV Anatomical Regions Affected

- Basal ganglia
- Thalamus
- Hippocampus
- Amygdala
- Frontal lobes/insula
- White matter
- Brainstem



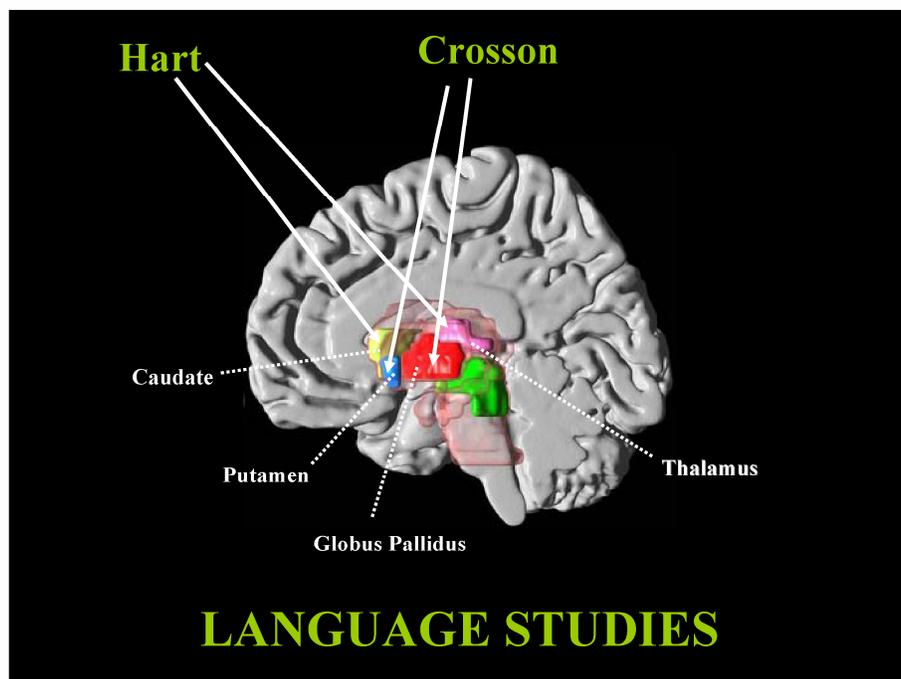
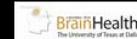
Gulf War Neuroscience Projects

- Word Finding
- Complex Verbal Functions & the Basal Ganglia
- Attention & Executive Function in Prefrontal Circuits
- Auditory Visual Memory Conjunction
- Material Specific Encoding & Recognition in the Medial Temporal Lobes
- Emotional Memory Circuits



Gulf War Neuroscience Projects

- Word Finding (Hart)
- Complex Verbal Functions & the Basal Ganglia (Crosson)
- Attention & Executive Function in Prefrontal Circuits
- Auditory Visual Memory Conjunction
- Material Specific Encoding & Recognition in the Medial Temporal Lobes
- Emotional Memory Circuits

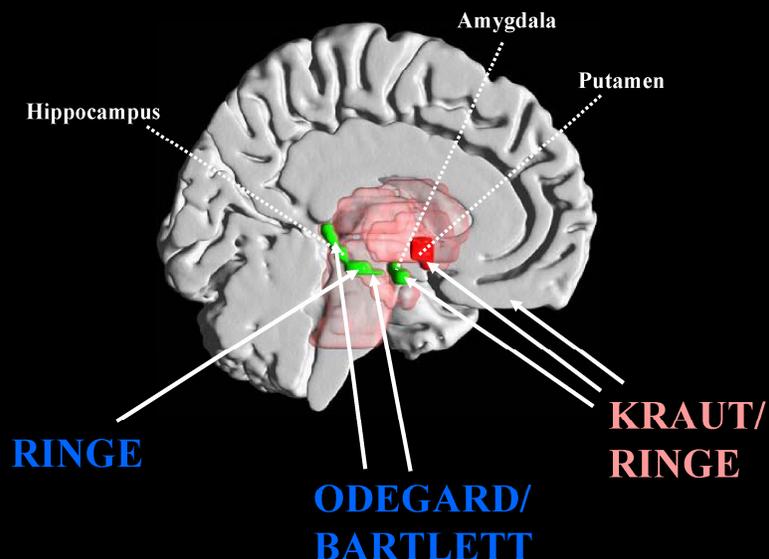


Gulf War Neuroscience Projects

- Word Finding
- Complex Verbal Functions & the Basal Ganglia
- Attention & Executive Function in Prefrontal Circuits
- Auditory Visual Memory Conjunction (Odegard & Bartlett)
- Material Specific Encoding & Recognition in the Medial Temporal Lobes (Ringe)
- Emotional Memory Circuits (Kraut & Ringe)

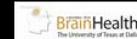


MEMORY AND AFFECT STUDIES

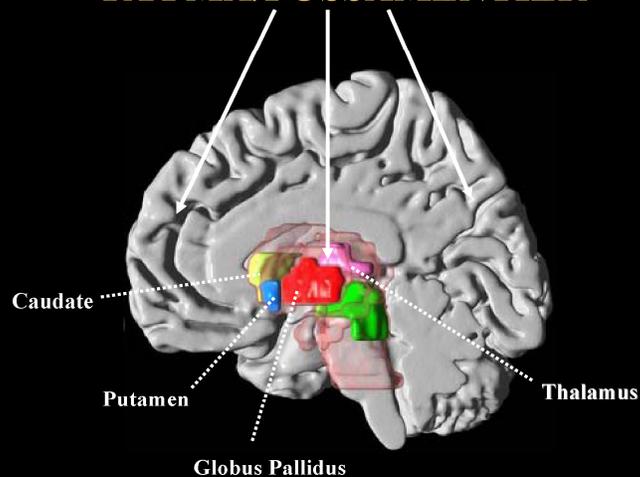


Gulf War Neuroscience Projects

- Word Finding
- Complex Verbal Functions & the Basal Ganglia
- Attention & Executive Function in Prefrontal Circuits (Rypma & Possamentier)
- Auditory Visual Memory Conjunction
- Material Specific Encoding & Recognition in the Medial Temporal Lobes
- Emotional Memory Circuits



RYPMA/POSSAMENTIER



ATTENTION & EXECUTIVE FUNCTION

Gulf War Neuroscience Projects

- TARGETED INTEGRATION OF RESULTS
 - Hypothesis-driven combined analysis
 - Projects
 - Neuroimaging findings
 - Survey
 - Pre-clinical findings
 - Targets
 - Mechanistic understanding
 - Diagnostic toolset
 - Treatment



Gulf War Illness Neuropsychological Sub-Core

John Hart, Jr.
Munro Cullum
Professor of Brain and Behavioral Sciences and Neurology
Professor of Psychiatry
UTD and UTSW

Neuropsychological Test Battery

- Global cognition
- Attention
- Short-term memory
- New learning (declarative memory)
- Language
- Visuospatial abilities
- Executive functions/reasoning
- Psychomotor speed
- Psychological symptoms
- Motivation/effort

Neuropsychological Testing

- choice of tests based on
 - symptoms expressed by patients
 - tests previously impaired in studies
 - tests administered to the Seabee cohort when last examined

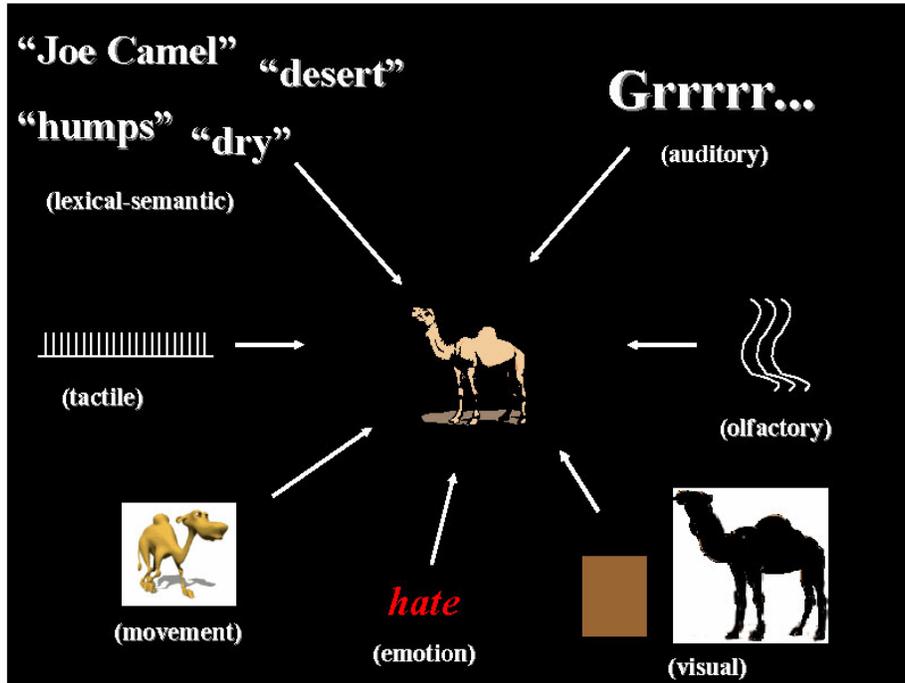
Neuropsychological Testing

- data will provide first longitudinal assessment of cognitive deficits in GWI
 - deficits with aging
 - recovery
 - static
- provide correlates for other studies
 - symptom checklist
 - illness subtypes
 - neuroimaging

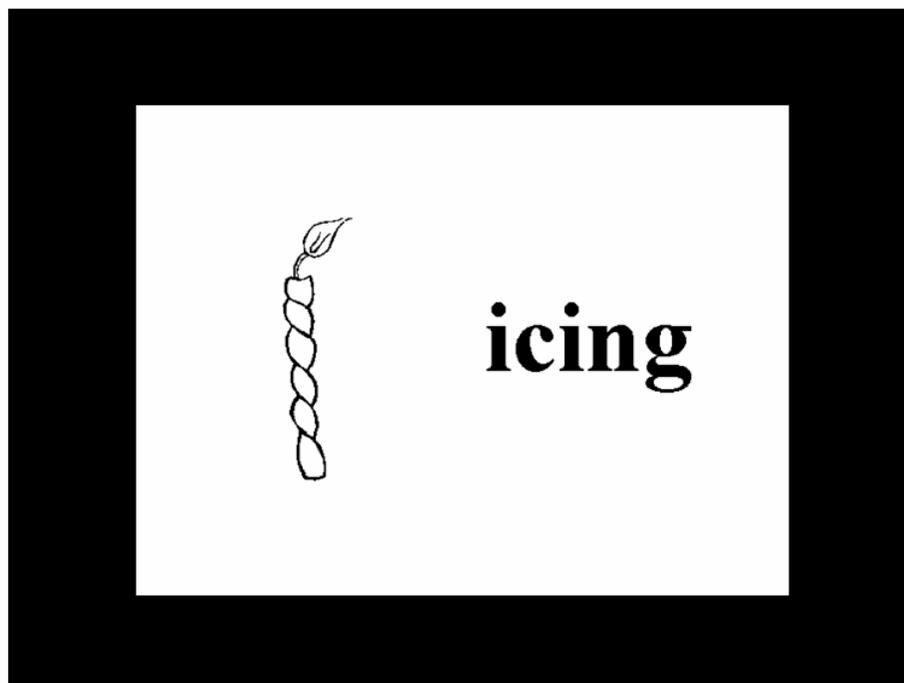
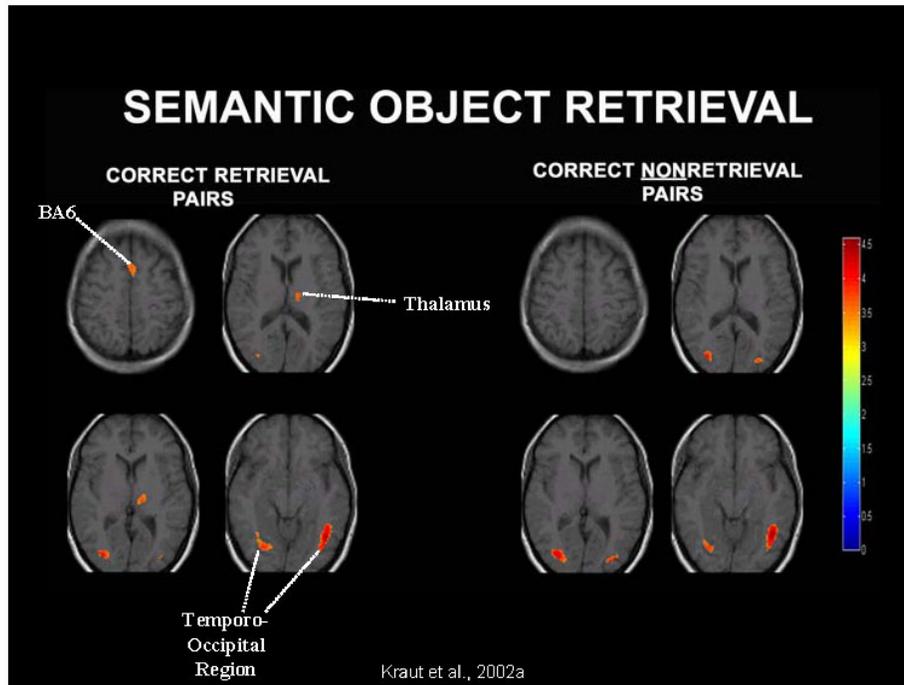


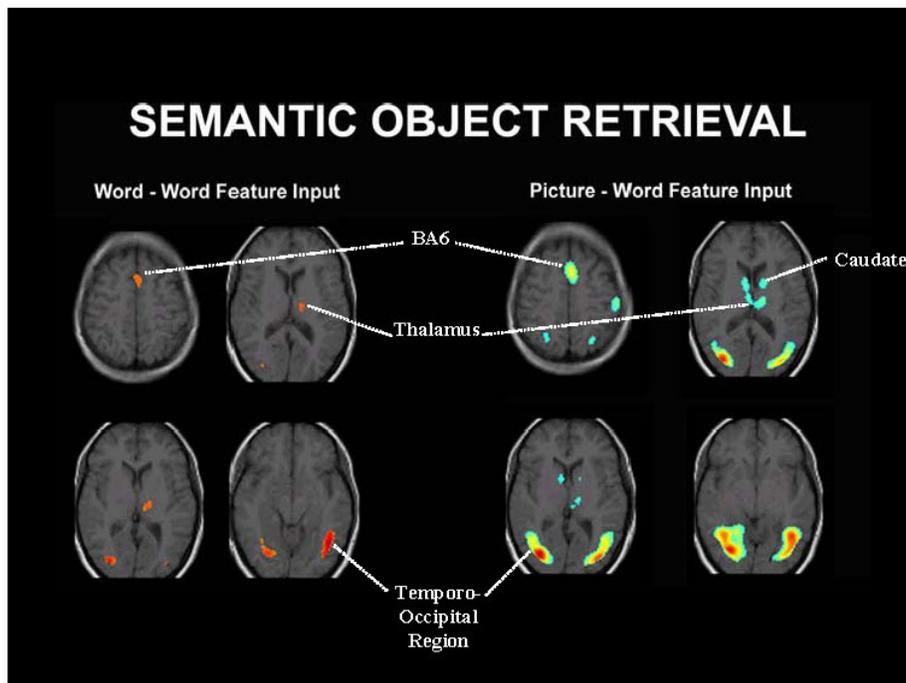
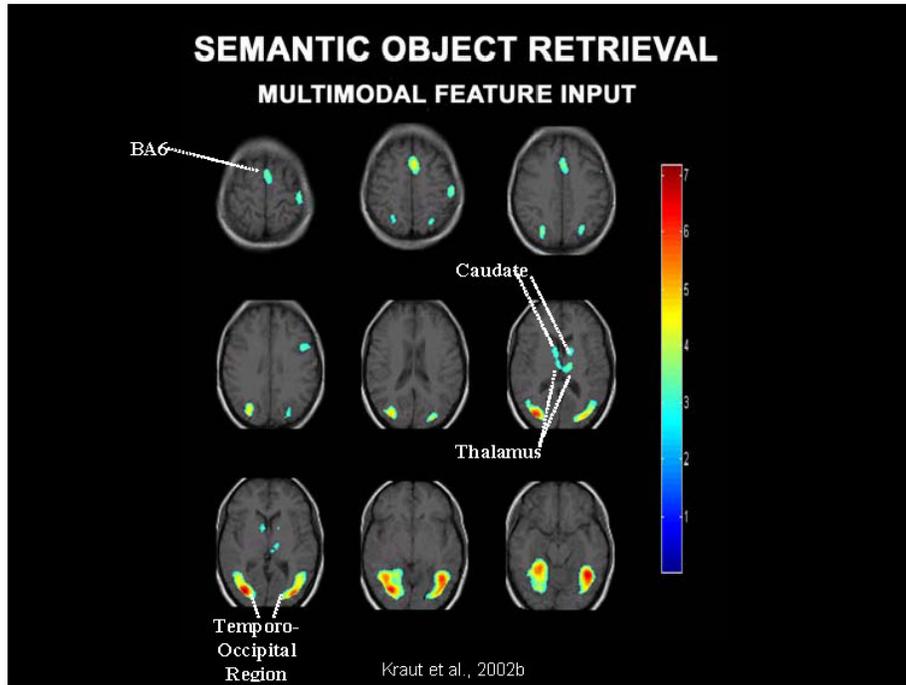
Gulf War Illness Word Finding Project

John Hart, Jr.
Professor of Brain and Behavioral Sciences and Neurology
UTD and UTSW



desert
humps



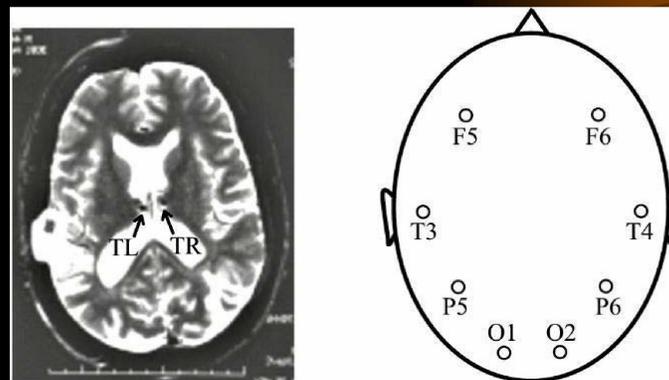


Expected Regions of Activation during fMRI

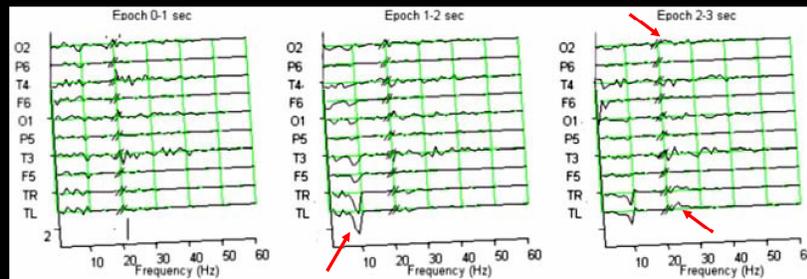
Cognitive Tests	TO	BA 6	Dorsomedial Nucleus	Pulvinar	Basal Ganglia
SORT (picture-word)	B	B	B	B	B
SORT (word-word)	B	B	L	L	
Object-Category Recall (word-word)	B	B			

TO=Temporo-occipital; BA6=Brodmann Area 6; B = bilateral; L = left; R = right

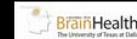
Thalamic Depth and Scalp Electrode Placement



Semantic Object Retrieval Test Difference Power Spectra



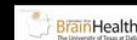
Slotnick et al., 2002



Semantic Object Memory Retrieval

- EEG alpha power change globally for memory retrieval vs. misses
- EEG gamma power increase in thalamus & occipital for memory retrieval
- synchronized, rhythmical neural firing of regions encoding memory retrieval

Slotnick et al., 2002



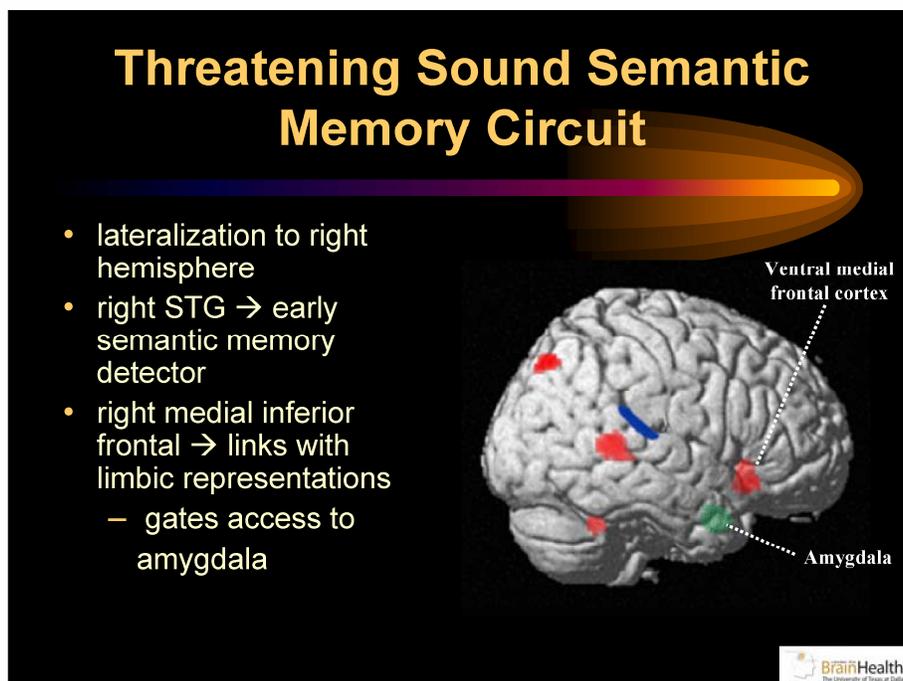
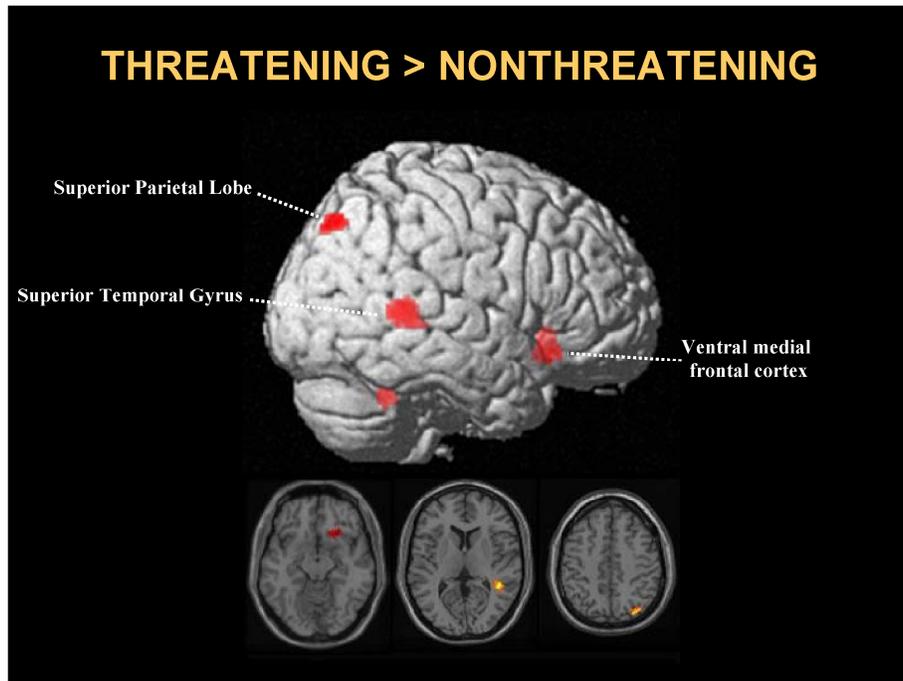
Analysis of Semantic Object Memory Retrieval in GWI

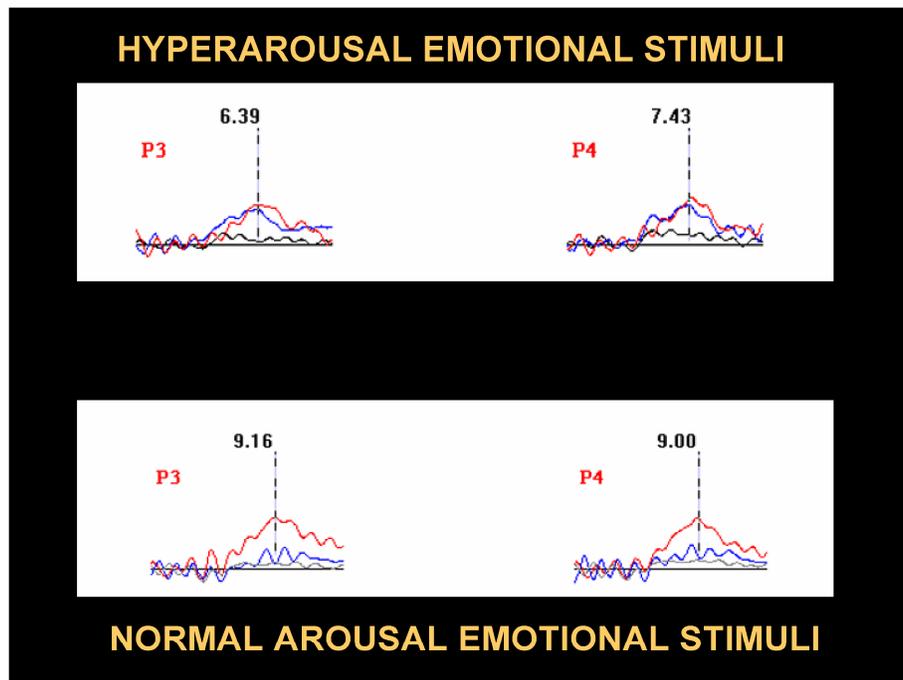
- fMRI detecting if brain regions are normally activated
- EEG alpha and gamma power assessment
 - how and why process impaired
 - if performance intact but task harder to do
 - EEG power and timing of EEG connectivity can detect



Gulf War Illness Emotional Memory Circuit Project

Michael A. Kraut
Associate Professor of Radiology
Johns Hopkins School of Medicine
Wendy Ringe
Assistant Professor of Psychiatry
UTSW





Analysis of Threatening Memory Circuit in GWI

- ERP to see if auditory and/or visual hyperarousal response
- fMRI see if regions encoding visual & auditory threat same in groups
- determine if encoding, gating, or over-responsiveness basis of difficulty
 - relate to cognitive symptoms
 - integrate with targeted neuroimaging markers