<u>Presentation 12 – Roberta White</u>

MRI reveals evidence of structural
brain *differences* among veterans
deployed to the first Gulf War

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Main study collaborators

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VA Merit Review Study of GW veterans

2004-2007

Hypotheses

- High symptom GW veterans will have lower white matter volumes than low symptom GW veterans
  - Pilot data
  - Site of action of neurotoxicants
- Structural findings from MRI will relate to functional findings from neuropsychological tests

Study participants

• Devens Time 3 cohort members

• DoD treatment study cohort members

• (Pain clinic patients with high symptoms)

Ft Devens subjects

• Fort Devens cohort: Time 1 survey
  – 2949 US Army GW veterans who were interviewed at Ft Devens when they returned from the Gulf (Spring 1991)
  – Psychological and health symptom questionnaires
• Fort Devens Cohort--Time 3 study
  – 220 Devens cohort members examined in Boston
  – Sampled to include individuals with low symptom complaints (<5/20), high symptom complaints (5 or more); over-sampled for women

Treatment seeking population

- Treatment seekers; GW-era veterans
  - 207 GW deployed; 53 non-GW deployed
  - VA clinical patients
  - Studied twice

Symptom division

- High symptom ($\geq$5/20 symptoms when first evaluated)

- Low symptom (<5/20 symptoms when first evaluated)

Outcome measures

- Structural MR

- Neuropsychological test results
  - California Verbal Learning Test
  - Grooved Pegboard

Preliminary results

(American Academy of Neurology poster, May 2007)

Participant groups

- 18 high-symptom veterans

- 18 low-symptom veterans

- 78% male, mean age=47, mean
  education=14 years

Neuroimaging

- MPRAGE sequence, FOV of 256 with a
  matrix of 256, 170 slices 1.2mm thick, TR of
  3000mms
- MPRAGE images post-processed with
  FreeSurfer
- Each brain processed through automated
  Talaraich based analysis with skull removed,
  checked for errors of grey and white matter
  borders, segmented and statistically
  corrected for intracranial cavity volume

Preliminary results

Whole Brain Analysis
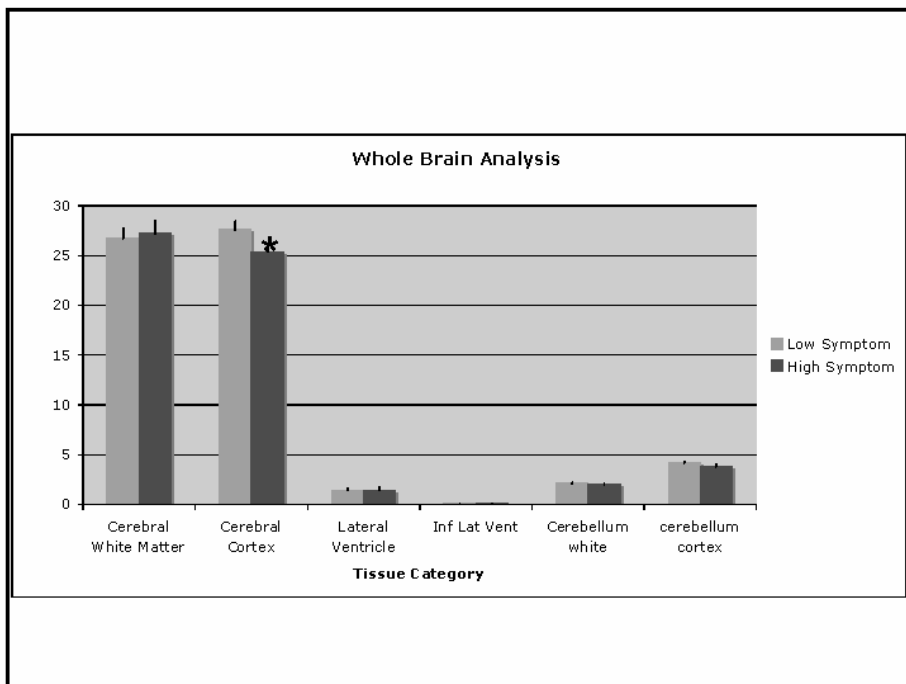
Results-1

– High symptom veterans showed lower total cortical brain volume (5% difference)
– Cingulate measures smaller in high symptom veterans (6% difference)

California Verbal Learning Test
D.C. Delis, J.H. Kramer, E. Kaplan, & B.A. Ober (1994

List A Immediate
Free-Recall Trials
(number correct)   List B Trial   List A Delayed Recall

Trial 1   ___   Short-Delay Free Recall ___
                          ___
Trial 2   ___   Long-Delay Free Recall   ___

Trial 3   ___   Short-Delay Cued Recall ___

Trial 4   ___   Long-Delay Cued Recall   ___

Trial 5   ___   Long-Delay Recognition   ___

Results-2

- High symptom veterans performed 15% worse on the distractor task (List B) from the CVLT; this was related to overall cortical brain volume
- High symptom veterans also performed worse on the CVLT short delayed recall and this was associated with smaller rostral cingulate gyrus measures

Conclusions

- These data are *preliminary*
- They suggest structural *differences* in brains of high and low symptom veterans
- We know nothing about causation vs. vulnerability factors at this point

Next steps

- All 59 subjects (data collected)
- FreeSurfer analyses
- Structure-function explorations
- White matter measures
- Connectivity measures
- Relate findings to exposure measures
- Relate findings to both past and current symptom rates
- Relate to CMI