

Neurocognitive Findings in Gulf War Illness

- Literature suggests symptomatic veterans show evidence of subtle neurocognitive dysfunction
- Attention, Executive Function, Memory, Visuospatial Skills, Psychomotor Function, and Mood
- Not explained by PTSD or other psychological conditions

RAC Scientific Findings and Recommendations, 2008

Neurocognitive Battery

- **Global Cognitive**
 - Wechsler Adult Intelligence Scale-3rd Edition (WAIS-3)
- **Academic Achievement**
 - Wide Range Achievement Test (WRAT-4)
- **Reasoning / Executive Function**
 - Wisconsin Card Sorting Test
 - Trail Making Test- Part B
 - Texas Card Sort
- **Attention / Concentration**
 - Digit Vigilance Test
 - Continuous Performance Test (CPT)
 - Trail Making Test – Part A
 - Stroop Test
 - Digit Span, Coding, Arithmetic (WAIS-3)
- **Working Memory**
 - Phonological Auditory Serial Addition Test (PASAT)
 - Digit Span backwards (WAIS-3)
 - Letter-Number Sequencing (WAIS-3)
- **Declarative Memory**
 - California Verbal Learning Test (CVLT-2)
 - Rey-Osterrieth Complex Figure Test
 - Wechsler Memory Scale-3rd Edition (WMS-3)
- **Language**
 - Controlled Oral Word Assoc. Test (COWAT)
 - Boston Naming Test (BNT)
 - Verbal Comprehension Index (WAIS-3)
 - Vocabulary, Information (WAIS-3)
- **Visuospatial**
 - Rey-Osterrieth Complex Figure
 - Perceptual Organization Index (WAIS-3)
 - Block Design (WAIS-3)
- **Psychomotor**
 - Finger Tapping test
 - Grooved Pegboard
 - ANAM4 Reaction Time
- **Motivation/Effort**
 - Test of Memory Malingering (TOMM)
 - Dot Counting Test

Clinical Ratings of Neurocognitive Impairment

	Normal	Impaired
Group A	2/13	11/13
Group B	10/13	3/13

Most common impairments in Exec Fx, Memory, Attn/Conc.

Statistical Comparison of Neurocognitive Results

- **Global Cognition**
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Importance

- **This MRI study confirmed previous SPECT findings that Syndrome 2 patients and control veterans show significant differences in cholinergic system, especially in deep brain structures.**
- **MRI perfusion techniques have great potential as a cost-effective biomarker for GW syndrome studies/screenings.**

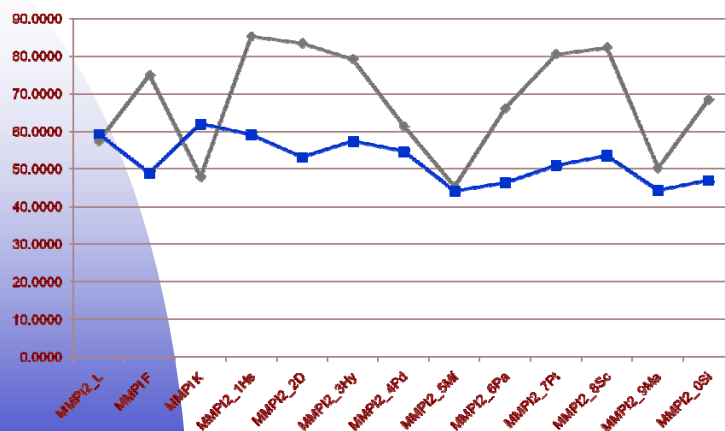
Neurocognitive Findings: 2008

- Frequent, subtle to mild impairment in Group A
- Primary deficits in executive function, declarative memory, working memory & sustained attention/concentration
- Group B largely normal

Neurocognitive Findings: 1998-2008

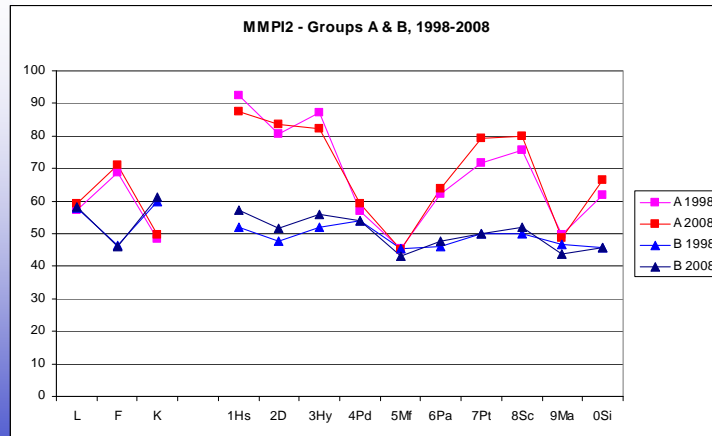
- Consistent findings over time
- Group A: 7/10 showed slight decline since 1998 (no dementia)
- Primary changes in memory, attention/concentration, and fine motor speed
- Group B: 10 largely unchanged

Psychological Data: MMPI-2



MMP-2 results 2008: Group A (gray diamonds) vs B (blue squares)

Psychological Data: MMPI-2 x Time



MMPI2: 1998-2008

Summary of Neurocognitive and Psychological Data

- Mild neuropsychological dysfunction (possible frontotemporal pattern) Group A
- Ongoing depression, anxiety, somatic symptoms, Group A
- Both groups consistent over time, though slight worsening in Group A