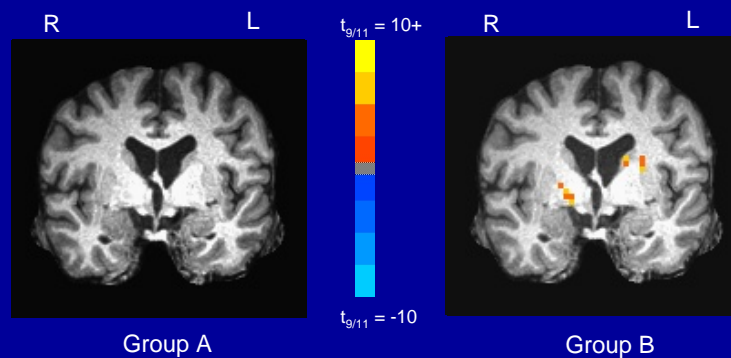


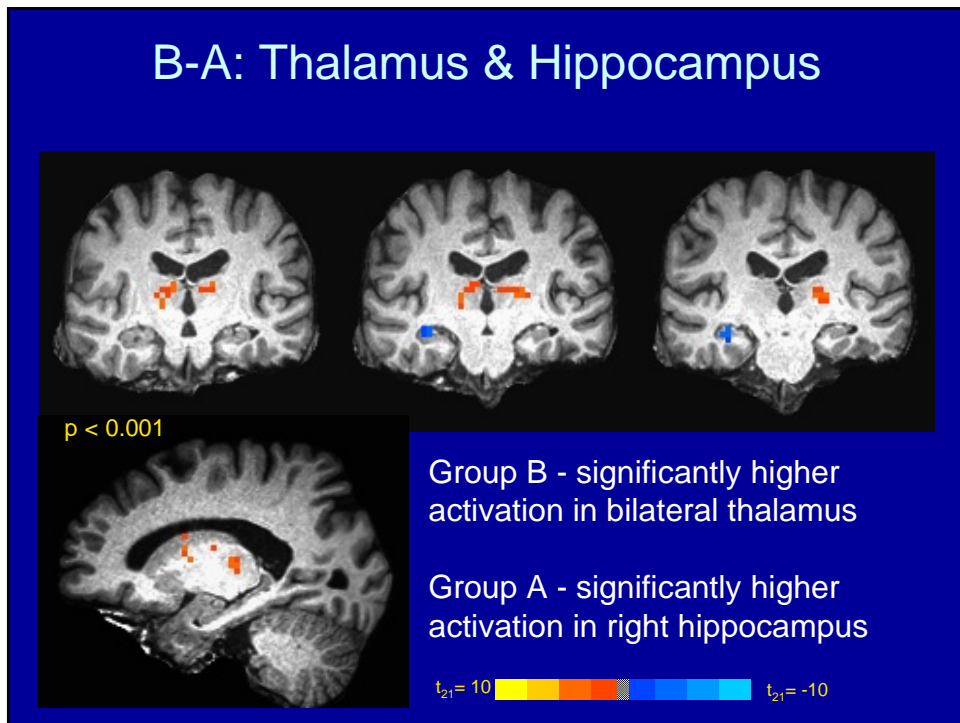
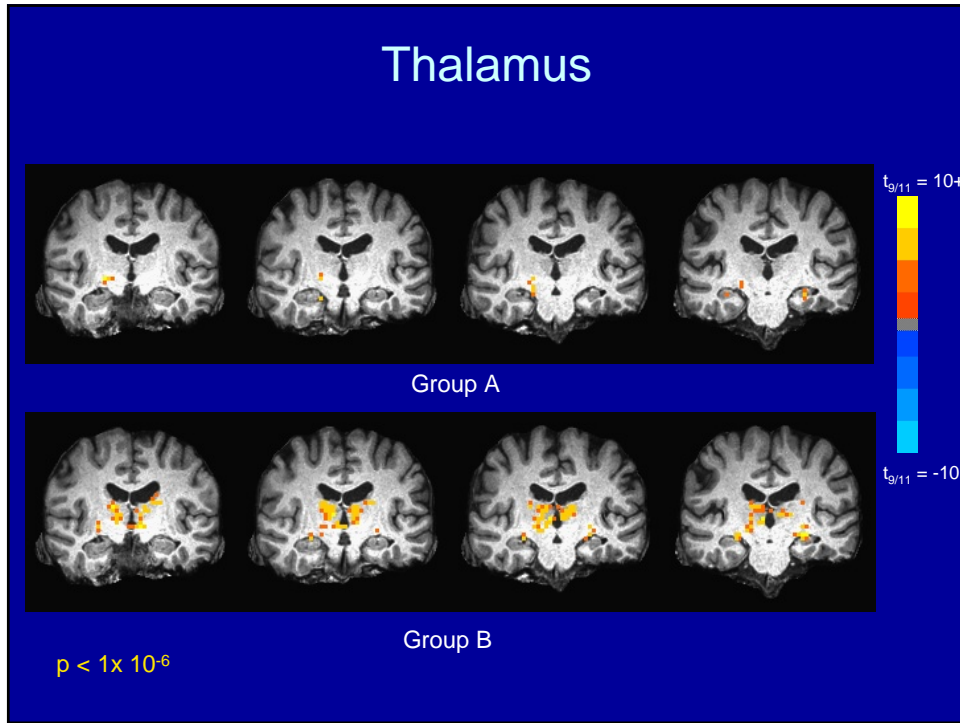
FMRI of Complex Verbal Functions in GWS

- Basal ganglia damage implicated in ill Gulf War veterans (Hom, Haley, and Kurt, 1997; Haley et al, 2000)
- GW Syndrome 2 patients impaired on word retrieval (Goldstein et al., 1996) and complex language tasks (Hom, Haley, and Kurt, 1997)
- Basal ganglia involved in word retrieval (Copland, 2003) and bilaterally in word generation by normal subjects (Crosson et al, 2003)
- Examined Seabees (10 Group A, 12 Group B) with fMRI during word generation

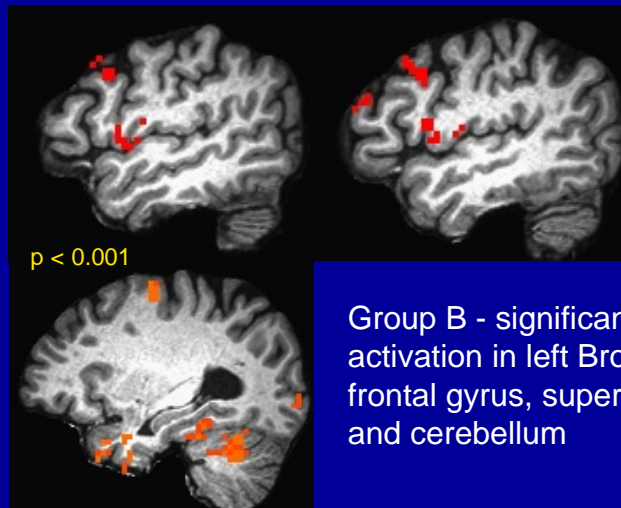
Basal Ganglia Activation



$p < 1 \times 10^{-6}$ Group B - strong activation in bilateral Basal Ganglia
Group A - weaker activation



B-A: Broca's & Cortical Language Areas



Activation Summary

- Group B ($p < 0.00001$)
- bilateral: basal ganglia, thalamus, insula, superior temporal gyrus, BA 22, 41/42, cerebellum, pre-SMA, BA6, anterior cingulate;
- left >> right: lateral frontal cortex, BA 44, inferior frontal gyrus, middle temporal gyrus
- Group A ($p < 0.00001$)
- left: basal ganglia, thalamus, lateral frontal cortex, BA 44, inferior frontal gyrus, pre-SMA, BA6, right cerebellum
- bilateral hippocampus, insula, superior temporal gyrus, BA 22, 41/42

B > A ($p < 0.01$):

bilateral: thalamus, basal ganglia, anterior cingulate, BA 38
left: lateral frontal cortex, dorsolateral prefrontal cortex, insula, medial cerebellum

A > B ($p < 0.01$): right hippocampus

Discussion

- ***Hypothesis - GWS Syndrome II patients will demonstrate decreased activity in the left and right basal ganglia during word generation relative to controls***
 - ***Implies Group A is Syndrome II***
 - *neuron-loss model of basal ganglia impairment*
 - *Group differences not yet significant in BG*
 - ***Group A (Syndrome II?) subjects exhibit much decreased activity in bilateral Thalamus***
 - *Basal Ganglia Thalamocortical Circuits impaired?*