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20 Congenital Left Temporal Lobe Cyst: A Case Study of rs-fMRI and Cognitive Performance

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Objective: Behavior is the product of interconnected brain regions that work together as networks. This case study examines whether there are differences between a participant with a large congenital left temporal lobe cyst, which impacted the volume of structures in the region, and control subjects of similar age on cognitive tasks and network connectivity as measured by resting-state functional magnetic resonance imaging (rs-fMRI).
Participants and Methods: The case participant (CP; 71 year old female) and controls (CON; n = 25; 48% female) were recruited as part of a larger aging study. CON were chosen from the larger study population by age (+/- 10 years from CP; Range = 68-86 years). Cognitive tasks included: Shopping list memory task, Montreal Cognitive Assessment, WAIS-IV subtests: Digit Span, Digit-Symbol, Symbol Span, and Letter-Number Sequencing. For rs-fMRI, we administered four blood-oxygen level dependent (BOLD) functional connectivity (rs-fMRI) scans at 6 minutes each. Image processing was conducted using the CONN toolbox. Independent sample t-tests evaluated differences between CP and CON. Segregation was evaluated in the Auditory (Au), Cerebellar-basal ganglia (CBBG), Cingulo-Opercular Task Control (COTC), Dorsal Attention (DA), Default Mode (DMN), Fronto-Parietal Task Control (FPTC), Salience (Sa), Sensory Somatomotor Hand (SSH), Sensory Somatomotor Mouth (SSM), Visual (Vi), and Ventral Attention (VA) networks to assess CP's functional segregation by network throughout the brain. Bonferroni correction was applied to account for multiple comparisons in cognitive testing (.05/7 for significance at $p \leq 0.007$) and network segregation (.05/11 for significance at $p \leq .005$).
Results: Independent samples t-tests did not reveal significant differences across cognitive tasks ($t(24) < 1.04$, $p > .05$). Network segregation did not reveal significant differences between CP and CON across networks examined ($t(24) \leq 1.269$, $p > .005$). However, DMN and DA segregation trended toward significance ($t(24) = -2.724$, $p = .006$ and $t(24) = -2.006$, $p = .028$, respectively) with CP demonstrating lower segregation as compared to CON.
Conclusions: CP performed similarly on cognitive testing to CON, indicating that the congenital presence of a large temporal lobe cyst did not impact global cognition, list learning and memory, working memory, or processing speed. CP did not demonstrate significantly different segregation across networks of interest after Bonferroni correction. Our cognitive performance results are consistent with a similar case-study examining language, which revealed intact linguistic abilities (Tuckete et al., 2022). The lack of differences in cognitive performance and segregation highlight the capacity for plasticity in the human brain, even in the presence of a large structural abnormality. This also suggests that the processes of aging in this case are not markedly different from controls. In future research we intend to expand on this case study by evaluating right temporal to hippocampal seeds and language network seeds to delve deeper into memory and language functioning.

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21 Toxic Wounds are Associated with Cognitive Decrements in Women Veterans of the 1991 Gulf War

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Objective: Gulf War Illness (GWI) is a debilitating multi-symptom condition that affects nearly a third of 1990-91 Gulf War (GW) veterans. Symptoms include chronic pain, debilitating fatigue, gastrointestinal issues, and cognitive decrements. Prior studies have documented reduced cognitive functioning in this affected population, particularly in the areas of memory, attention and response inhibition. To date, research has focused on cognitive functioning in male and female veterans together. Very limited research has reported on GW women's cognitive functioning separately mostly due to scarcity of data on women veterans. In this study, we had the unique opportunity to utilize a newly combined neuropsychological test dataset from women GW veterans in the Boston, Biorepository and Integrative Network (BBRAIN) for GWI. The aim was to compare neuropsychological outcomes with toxicant exposures in women veterans with and without GWI.

Participants and Methods: Cognitive data from the BBRAIN biorepository was used for this study. The sample consisted of 62 women veterans who were deployed to the Persian Gulf War from 1990-91. Neuropsychological test scores included the Conners Continuous Performance Test Third Edition (CPT3), Delis-Kaplan Executive Function System (D-KEFS) Color-Word Interference, and the California Verbal Learning Test Second Edition (CVLT-II). War-related exposure to chemical weapons, anti-nerve gas pills and pesticides were measured by a self-reported survey. For analysis, war-related exposure was classified into three groups: controls with 0-6 days of exposure; cases with 0-6 days of exposure and cases with 7 or more days of exposure. Multiple linear regression modeling was used to measure differences in neuropsychological scores across the three groups by each war-related exposure.

Results: After adjusting for age, education and other exposures, an increase in duration of exposure to pesticides was significantly associated with worse CPT3 commission errors, fewer words correct in the CVLT-II trials 1-5, and an increase in self-corrected errors on DKEFS Color-Word Interference Test Trials 1, 2 and 4

(p<0.05). More days reported hearing chemical alarms and seeing smoke from oil well fires was significantly associated with fewer words correct on all CVLT-II trials, and more self-corrected errors on Color-Word Interference Trials 2 and 4 (p<0.05). An increase in exposure duration to pyridostigmine bromide anti-nerve gas pills was associated with fewer words correct on the CVLT-II learning Trials 1-5 and short delay recall and an increase in self-corrected errors on Color-Word Interference Trials 2, 3, and 4 (p<0.05). When associations were adjusted for PTSD, all significant associations stayed constant (p<0.05).

Conclusions: In this study, women veterans with GWI who had higher levels of exposure to pesticides, oil well fires and who took more anti-nerve gas pills during the war are showing increased learning difficulties and more deficits in attention and response inhibition. Future research should examine if similar patterns of neuropsychological symptoms are also present in male GW veterans with higher war-time related toxicant exposures.

Categories: Drug/Toxin-Related Disorders (including Alcohol)
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22 Neuropsychological Outcomes Vary by Sex in Neurotoxicant Exposed Veterans with Gulf War Illness

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