

**Results:** Correlation between SES and memory performance was found to be marginally significant ( $R=.188$ ,  $p=.061$ ). All tasks had areas of positively correlated activation for age. The Logical Memory task had multiple areas of brain activation that were positively correlated with age, particularly at the lateral occipital cortex, lingual gyrus, and the occipital fusiform gyrus, all areas that underlie visual processing. There were no areas of correlated brain activation for SES, sex, and task performance for the Pair Associates and Logical Memory tasks. Brain activation for the Word order task in the left precuneus cortex and the right middle frontal gyrus, left lateral occipital cortex, left occipital fusiform gyrus, and parts of the lingual gyrus was positively correlated with memory performance when controlled for age, sex, and SES.

**Conclusions:** The hypothesis was not entirely supported by the results of this study, but the marginal effect between SES and memory performance can suggest that SES may affect memory performance within middle-aged adults. While we did not find a brain association with SES in this age group, we observed regions that underlie task performance. Further research can be done on possible moderating effects of Socioeconomic Status on memory and executive function with structural neuroimaging to further investigate the effects of SES on cognition.

**Categories:** Cognitive Neuroscience

**Keyword 1:** neuroimaging: functional connectivity

**Keyword 2:** executive functions

**Keyword 3:** memory: normal

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## 16 Longitudinal Cognitive Functioning in Gulf War veterans with and without Gulf War Illness: Data Mining from the BBRAIN Repository

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**Objective:** Veterans from the 1991 Gulf War (GW) experienced several neurotoxicant exposures, including chemical weapons, pesticide sprays and creams, oil well fires and pyridostigmine bromide anti-nerve gas pills during the war. Research has shown these exposures to affect cognition and mood. Moreover, MR diffusion imaging has shown microstructural changes in the white matter that may be related to psychomotor slowing. Over a third of all GW veterans suffer from a chronic multi-symptom disorder called Gulf War Illness (GWI). The Kansas Criteria for GWI consists of six distinct criteria including symptoms of fatigue/sleep problems, pain symptoms, neurologic/cognitive/mood symptoms, gastrointestinal symptoms, respiratory symptoms, and skin symptoms. The Boston Gulf War Illness Consortium (GWIC) was a multi-site study designed to assess symptoms of GWI. After the conclusion of the GWIC study, the Boston Biorepository Recruitment and Integrative Network for Gulf War Illness (BBRAIN) was developed to harmonize retrospectively collected GW Veteran data while simultaneously collecting Time 2 data and samples from GW veterans who participated in the original study. This analysis includes the first 58 participants who have completed the GWIC study and the BBRAIN study.

**Participants and Methods:** We conducted a longitudinal analysis of cognitive outcomes from the BBRAIN data repository. Verbal learning, memory, attention, and executive functioning were assessed using neuropsychological tests including the Continuous Performance Test (CPT3), Trail Making Test A, Delis-Kaplan Executive Function System (DKEFS), California Verbal Learning Test (CVLT-II). A total of 58 participants were re-evaluated from the original GWIC cohort with a total of 47 cases and 11 controls. Paired t-tests for the cognitive measures were completed separately for GWI cases and healthy GW veteran controls for each of the neuropsychological test measures. Average time between assessments was four years.

**Results:** The overall sample was on average 56 years old, 84% male and 75% White. The average level of education was 15 years. GWI

cases showed significantly more commission errors and slower reaction times on the CPT3 at Time 2 compared to Time 1 ( $p < 0.05$ ). Cases also showed a slowing in time to completion on Trails A at the second time point ( $p < 0.05$ ). On the other hand, controls only showed significantly slower reaction times on the CPT3 at Time 2 ( $p < 0.05$ ).

**Conclusions:** These results showed that veterans with GWI are showing more decline over time in cognitive functioning particularly on psychomotor slowing and impulsivity than control veterans. It is important to document illness trajectories for veterans with GWI in order to devise strategies for interventions and treatments. The importance of studying longitudinal cohorts is to document changes in the same individuals over time. The next steps are to assess if this accelerated aging develops into neurodegenerative conditions by using brain imaging and other biomarkers in addition to cognitive evaluations. This could identify individuals who should be the focus of targeted treatment strategies while there is still time to intervene.

**Categories:** Cognitive Neuroscience

**Keyword 1:** environmental pollutants / exposures

**Keyword 2:** cognitive functioning

**Keyword 3:** motor speed

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## 17 Norming for the reverse-translated 5-choice continuous performance test (5C-CPT) of attention and cognitive control

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**Objective:** Translatability of preclinical results remains a major obstacle in neuropsychiatric research. Even when cognitive tests in preclinical models show translational validity for human testing, with sensitivity to clinical deficits, there remains the issue of heterogeneity among human participants. Norming of performance on cognitive tasks enable corrections for any

differences in performance that may arise from the influence of socioeconomic factors, and thus a more direct comparison with preclinical testing results. The 5-choice continuous performance task (5C-CPT) is a test sensitive to changes in sustained attention and cognitive control in rodent manipulations and clinical populations, including schizophrenia and bipolar disorder. Herein, we present normed results of 5C-CPT data from a cohort of human participants, enabling greater comparison to future clinical and rodent testing.

**Participants and Methods:** 5C-CPT data were generated from a range of participants from the Translational Methamphetamine AIDS Research Center ( $n=82$ ) and a study of bipolar disorder ( $n=45$ ). Participant demographics were as follows: Age  $M=38.5$ ,  $SD=16.7$ , Education:  $M=14.5$ ,  $SD=1.9$ , 45% female, 10% Asian, 17% African American, 27% Hispanic, and 46% non-Hispanic White. We used the test2norm R-package to create norms for each of the major outcomes from the 5C-CPT. Non-normally distributed raw scores were transformed to generate more normally distributed data needed for the norming process. Raw scores were first converted into uniform scaled scores that range from 0-20 where a higher score indicated better performance. We then generated T-score formulas, which are standardized residuals and scaled to have a mean of 50 and standard deviation of 10. The residuals are obtained from regressions, modeled using multiple fractional polynomial method (MFP), which regresses scaled scores on demographic variables, which a user wishes to control for (gender, age, education, ethnicity, etc.). MFP models allow to fit non-linear effects for numeric demographic factors (e.g., age), if such effects exist.

**Results:** New, demographically corrected T-score formulas were calculated for each major outcome of the 5C-CPT: reaction time (MCL), reaction time variability (VarRT), dprime, hit rate (HR) and false-alarm rate (FAR). MFP models showed that age had a significant effect on MCL, VarRT, dprime, and HR (all  $p < 0.01$ ), while gender only showed a significant effect for MCL and VarRT (all  $p < 0.05$ ). Interestingly, education and ethnicity did not show a significant effect for any MFP model and none of the demographic factors (age, education, gender, ethnicity) were significant in the model for FAR. As defined in the test2norm package, all scaled scores had a mean of 10 and SD of 3 and all T-scores had a mean of 50 and SD of 10.