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

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Background

- The 1990-91 Gulf War (GW) represented the largest deployment of women serving in a war zone in U.S. military history
- Thirty years later a third of GW veterans are suffering from Gulf War Illness (GWI)
- GWI is a multi-symptomatic disorder caused by war-related exposures that includes chronic fatigue, pain, gastrointestinal problems, *cognitive decrements* and mood problems
- Prior research has examined combined samples of male and female GW veterans mostly due to lack of data on women veterans
- The Boston, Biorepository, Recruitment and Integrative Network (BBRAIN) stores data on GWI to be used in large analyses

Objective

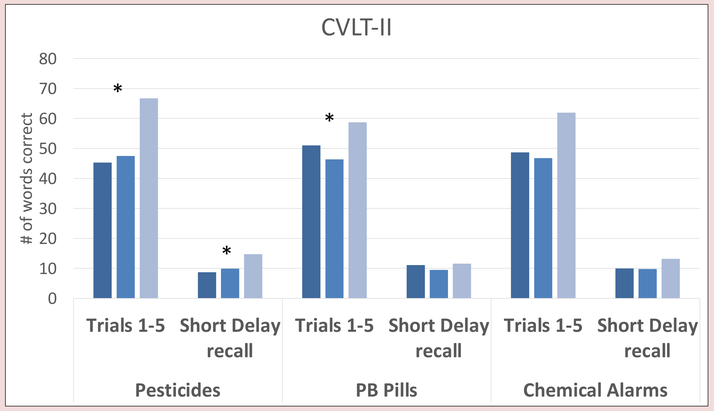
Use BBRAIN data to examine neurocognitive outcomes in women veterans of the Gulf War with war-related toxicant exposures

Methods

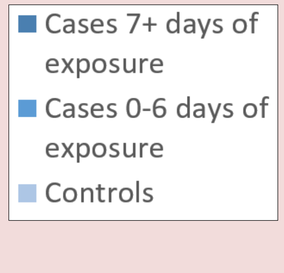
- 71 female veterans deployed to the 1990-91 Persian Gulf were enrolled
- All participants completed a series of neuropsychological tests including the Conners Continuous Performance Test Third Edition (CPT3), Delis-Kaplan Executive Function System (D-KEFS) Color-Word Interference Test, and the California Verbal Learning Test (CVLT-II)
- War-related exposures were measured by a self-reported survey
- Exposures were classified into three groups based on exposure duration
- GWI case status was defined by the Kansas case status criteria
- Multiple linear regression was used to analyze the differences in neurocognitive outcomes across three exposure groups

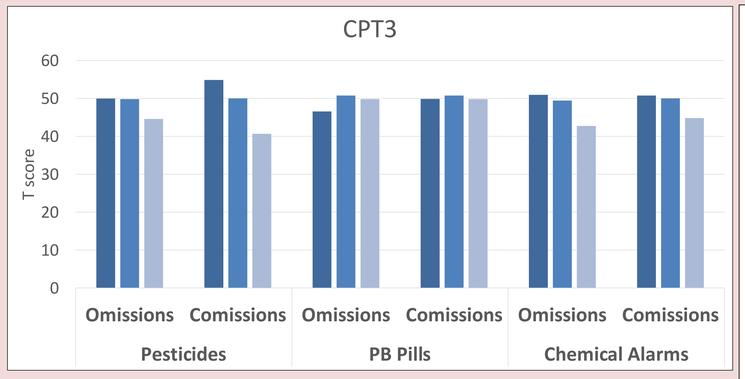
Female veterans with GWI who had higher levels of exposure to pesticides, oil well fires and who took more anti-nerve gas pills during the Gulf War showed an increase in impulsivity, greater deficits in cognitive flexibility and inhibition and worse verbal learning than their counterparts with less exposure to war-related neurotoxicants.

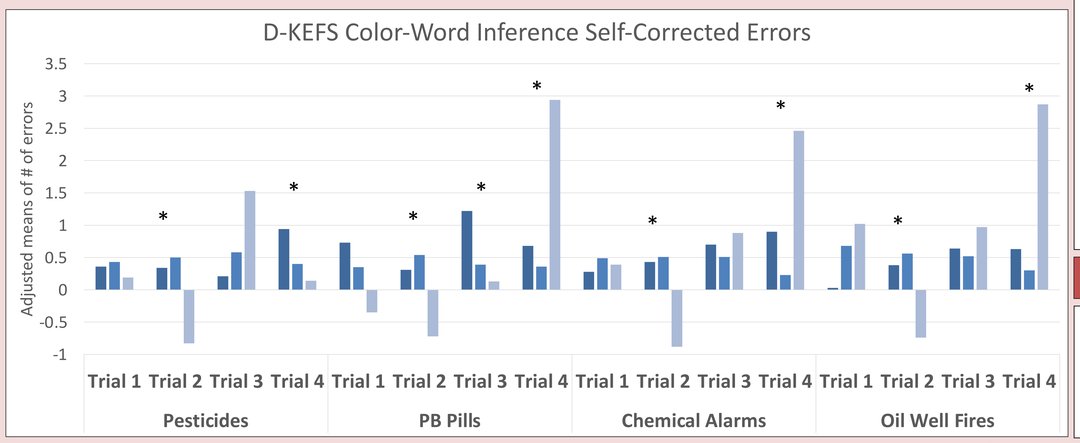
Figures 1-3: Cognitive Outcomes in female Gulf War veterans by duration of exposure and GWI case status



All models adjusted for age, education level, PTSD and other exposures







*p<0.05

Table 1. Demographics of sample

		Overall *N=71*	Cases N=57	Controls N=14
Age *mean(SD)*		55(7.2)	54(6.7)	59(7.8)
PTSD *n(%)*	**Yes**	46(64.8)	41(71.9)	5(35.7)
	No	25(35.2)	16(28.1)	9(64.3)
Race *n(%)*	**White**	55(77.5)	43(75.4)	12(85.7)
	Black	10(14.1)	9(15.8)	1(7.1)
	Other	5(7)	4(7)	1(7.1)
Highest level of Education *n(%)*	**High School**	3(4.2)	3(5.3)	0
	Some college	21(30)	17(30)	4(28.6)
	Bachelor's Degree	20(28.2)	17(30)	3(21.4)
	Advanced Degree	27(38)	20(28.2)	7(50)

Results

- An increase in pesticide exposure and anti-nerve gas (PB) pills were significantly associated with worse verbal learning on the CVLT-II. Additionally, pesticide exposure showed a decline in short delay verbal memory on the CVLT-II
- There were no significant differences in errors or reaction times on the CPT3 when examined across exposures
- Exposure to oil well fires, chemical alarms, pesticides and PB pills were significantly associated with an increase in self-corrected errors on Trials 1 & 2 of the DKEFS Color-Word Interference, indicating impulsivity
- Exposure to chemical alarms, oil well fires and PB pills showed more self-corrected errors on Trial 4 of the DKEFS Color-Word Interference, indicating deficits in cognitive flexibility and inhibition switching
- Future research should compare cognitive outcomes in female GW veterans to male GW veterans with higher war-time related toxicant exposures

Acknowledgements

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