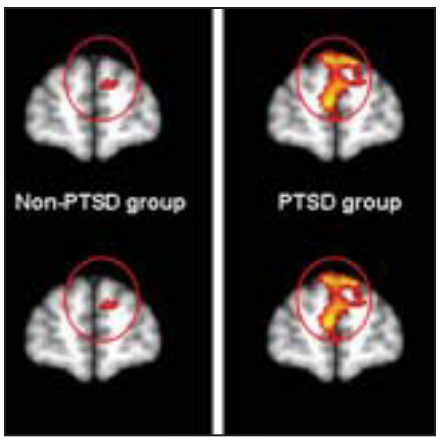
Imaging Ties PTSD to Altered Brain Function

BY BETSY BATES

Specific neural signatures of posttraumatic stress disorder in brain centers involved in cognition and emotions have been identified on imaging studies of recently returned veterans of the wars in Iraq and Afghanistan, a finding that may advance efforts to objectively diagnose individuals with the disorder.

Functional magnetic resonance imaging (fMRI) studies of 22 American soldiers diagnosed with PTSD demonstrated heightened activity in three regions of the brain during a working memory task, compared with 20 soldiers exposed to similar combat situations who did not develop PTSD, reported Florin Dolcos, Ph.D., of the University of Alberta, Edmonton.

The study, which was presented at the



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When soldiers were shown combat photos, fMRI revealed differences in activation in the brain region governing personal relevance of information.

World Psychiatry Association International Congress in Florence, Italy, provides early evidence of specific functional neuroanatomy biomarkers of PTSD in conjunction with a working memory task (J. Psychiatric Res. 2009; 43:809-17).

During fMRI, soldiers were shown photographs of three faces and later asked whether another photograph was one of the three they had previously seen.

However, during a delay period before the cognitive memory challenge, participants were shown random images of combat or noncombat (neutral) scenes. The noncombat photographs included such images as a man playing a trombone.

The investigators hypothesized that soldiers who have PTSD might process cognitive information differently when they are simultaneously distracted by exposure to a combat image. Indeed, activation of three specific brain regions distinguished participants meeting PTSD criteria and those who did not, said lead investigator Dr. Rajendra A. Morey, a Duke University psychiatrist and director of the Neuroimaging Core at the Durham (N.C.) Veterans Affairs Medical Center.

Among the investigators' specific findings:

► As expected from previous imaging studies, soldiers with PTSD reacted to combat photos with significantly elevated activation in emotion processing centers of the brain, including the amygdala (*P* less than .05), fusiform gyrus (*P* less than .005), and ventrolateral prefrontal cortex (*P* less than .001), compared with soldiers without PTSD.

► In the dorsal medial prefrontal cortex, a region associated with an individual's

sense of self and self-reflection, soldiers with PTSD exhibited significantly higher brain activity (*P* less than .004) than those without PTSD when exposed to combat photos, perhaps suggesting a tendency to relate the scenes to their own experience (although actual combat exposure was similar in both groups).

► In the dorsal lateral prefrontal cortex, a region associated with focus and concentration, soldiers without PTSD showed significant (*P* less than .05) disruption of cognitive activity (and memory performance) when distracted by combat photos, but not when shown distracting photos of neutral scenes. In contrast, soldiers with PTSD responded with reduced activity in the dorsal lateral prefrontal cortex and a decline in memory task performance—regardless of whether the distracting images depicted combat or noncombat scenes.

The latter finding "may fit with what we see clinically in people with PTSD, who often misinterpret things in the environment, reacting to nontraumatic events as if they were traumatic," Dr. Morey said in an interview.

Hypervigilance, then, may lead to the difficulty in focusing that is "one of the biggest impairments in everyday life for people with PTSD," he said.

Dr. Dolcos, a psychologist who directs a clinical neuroscience laboratory at the University of Alberta, said that a portrait of the PTSD brain is gradually evolving.

"As technology improves, imaging research is increasingly providing insights into the brains of people with PTSD, pointing to potential biological markers distinguishing the PTSD brain," he said in a statement.

"The field is still in its infancy, but this raises the possibility that one day we may be able to see the disorder in the body as plainly as we now can see conditions such as heart disease and cancer," Dr. Dolcos said.

The investigators are currently studying episodic memory and brain function in soldiers with and without PTSD and plan a larger study to evaluate how genetic differences may impact brain activity in the same groups, Dr. Morey said.

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