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Stress-affected brain region is smaller in veterans with PTSD

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(PhysOrg.com) -- A specific region of the hippocampus, a brain structure that is essential to memory, is significantly smaller in veterans with post-traumatic stress disorder than in those without the condition, according to a study by researchers at the San Francisco VA Medical Center and University of California, San Francisco.

The researchers used magnetic resonance imaging to scan the brains of 40 veterans - 20 with combat-related PTSD and 20 without - and found that the region known as the CA3/dentate gyrus was more than 11 percent smaller on average in the veterans with PTSD.

Just as significantly, the CA1 region of the hippocampus, which shrinks as a part of normal aging, was not significantly affected in the veterans with PTSD, according to principal investigator Norbert Schuff, PhD, a senior research scientist at the SFVAMC Center for Imaging of Neurodegenerative Diseases and professor of radiology at UCSF.

The study appears in the March, 2010 issue of "Archives of General Psychiatry."

"This is the first time in human subjects that PTSD has been shown to be associated with changes in certain specific hippocampal regions and not in others," says Schuff.

The hippocampus, a finger-joint size structure found in both hemispheres of the brain, is essential for laying down memories, as well

as for retrieving them, explains study author Thomas C. Neylan, MD, director of the PTSD program at SFVAMC and a professor of psychiatry at UCSF. He notes that recurring or intrusive memory of traumatic events is a common symptom of PTSD, “and thus the hippocampus is of great interest in PTSD research.”

The dentate gyrus contains adult neural stem cells, and is a site for the creation of new neurons, while the CA3 region contains receptors for glucocorticoids, which are steroids that are elevated in the brain during stress. Previous studies in animals had shown that these regions are the parts of the hippocampus most directly affected by stress, says Neylan, “so we thought these changes might show up in people with PTSD, and they did.” He notes that the two regions are too closely intertwined physically to be imaged separately by current MRI technology, and so are measured together.

Neylan says the results raise the intriguing possibility that since the dentate gyrus has the ability to create new neurons, “these changes might actually be reversible through treatment.”

Schuff cautions that while the results are highly suggestive, they cannot yet be used by clinicians to identify individuals with PTSD. “This is a research finding, which deals in group comparisons,” he says. “We can only observe that these changes have occurred on average across the entire group with PTSD. We can’t yet nail it down to an individual. That will require much further study.” He emphasizes that the findings also need to be replicated independently in a new and larger population of PTSD subjects in order to eliminate the possibility of spurious results.

“This is an incremental step toward establishing a physical biomarker for PTSD,” adds Neylan. “A biomarker is our ultimate goal, since, currently, PTSD is diagnosed based on a subjective neuropsychiatric examination rather than on physical symptoms.”

Neylan predicts that a biomarker would provide clinicians and researchers with an objective way to measure the progress of PTSD treatment, “which would also allow us to no longer think of PTSD as a mental health diagnosis, with all of its associated stigma for our veteran and military patients, but to view it as a physical wound instead.”

Provided by University of California, San Francisco