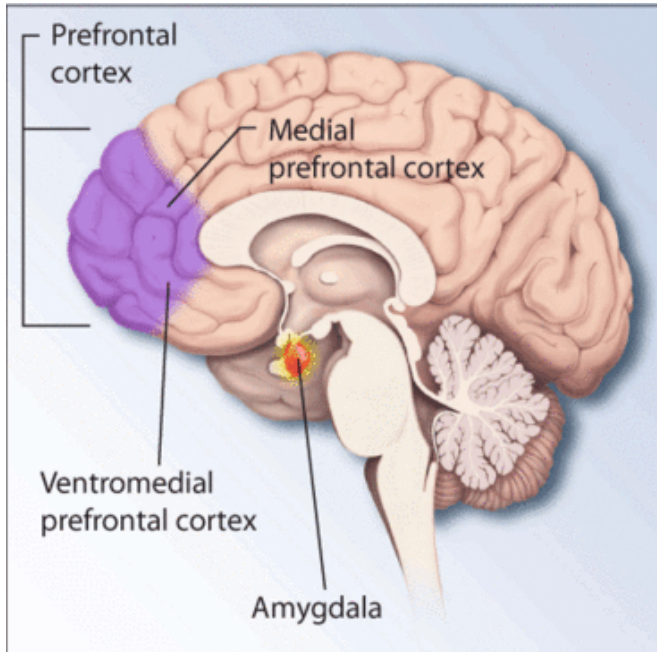


# Research links locus coeruleus activity with hyperarousal in PTSD

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Regions of the brain associated with stress and posttraumatic stress disorder. Credit: National Institutes of Health

A new study in *Biological Psychiatry* has linked signs of heightened arousal and reactivity—a core symptom of posttraumatic stress disorder (PTSD)—to overactivity of the locus coeruleus (LC), a brain region that mediates arousal and reactivity. By combining bodily responses and brain imaging data, the new paper by Dr. Christoph Mueller-Pfeiffer at the University of Zurich, Switzerland and colleagues is the first to provide direct human evidence for a theory over 30 years old. Pinpointing the origin of symptoms in the brain is a major step in efforts to improve treatment options for patients with the disorder.

"The authors are to be congratulated on imaging this part of the brain," said Dr. John Krystal, Editor of *Biological Psychiatry*. "Demonstrating the

presence of LC hyperactivity in PTSD sets the stage for clarifying the relationship of LC activity to stress response, resilience, PTSD symptoms, and the treatment of PTSD," he added.

In the study, first author Christoph Naegeli, also of University of Zurich, and colleagues analyzed 54 participants who had been exposed to trauma, about half of whom developed PTSD. When the participants listened to random bursts of white noise, those who were diagnosed with PTSD had more frequent eye blinks, and increased heart rate, skin conductance and pupil area responses—indicators of the body's autonomic response—than participants without PTSD.

Using functional magnetic resonance imaging to measure brain activity, Naegeli and colleagues found that patients with PTSD had larger brain responses in the LC and other regions wired to the LC that control alertness and motor preparation. According to Mueller-Pfeiffer, the increased brain activity and autonomic responses measured in the participants provide a biologically plausible explanation for hypervigilance and exaggerated startle responses in PTSD. However, LC activation was not directly associated with arousal symptoms. Thus, direct links between LC hyperactivity and PTSD symptom severity still need to be demonstrated.

The study may also reveal new avenues for treating these common and disabling symptoms of PTSD. "Our results suggest that targeting [locus coeruleus](#) system hyperactivity with new pharmacological or psychotherapeutic interventions are approaches worthy of further investigation," said Dr. Mueller-Pfeiffer.

**More information:** Christoph Naegeli et al, Locus Coeruleus Activity Mediates Hyperresponsiveness in Posttraumatic Stress Disorder, *Biological Psychiatry* (2017). DOI: [10.1016/j.biopsych.2017.08.021](https://doi.org/10.1016/j.biopsych.2017.08.021)

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