ECNP Congress – press release

Women's brain regions may lose ability to synchronise after sexual assault

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Type of study: Not peer-reviewed/observational study/people

Around 70% of women who suffer a sexual assault develop PTSD; now scientists have shown that many of these women show a marked reduction in the usual communication between two important brain areas involved in processing and control of emotions, the amygdala and the pre-frontal cortex. In some women, synchronisation between these areas can drop to near zero. This work is presented at the ECNP conference in Amsterdam.

Worldwide, between 17% and 25% of women undergo a sexual assault, with around 70% subsequently developing PTSD (Post-Traumatic Stress Disorder). Previous PTSD studies, after natural disasters, accidents or war, have revealed changes in how the brain communicates. Now a group of Spanish scientists have shown that sexual assault can lead to similar brain changes.

The researchers studied 40 women with PTSD as a result of recent sexual assault trauma (within the past year), recruited from the Hospital Clinic of Barcelona, along with a matched control group. All underwent brain scans (via resting-state functional MRI) to look at brain connectivity, and how they relate to depressive and PTSD symptoms. Resting-state fMRI measures how different brain areas communicate with each other.

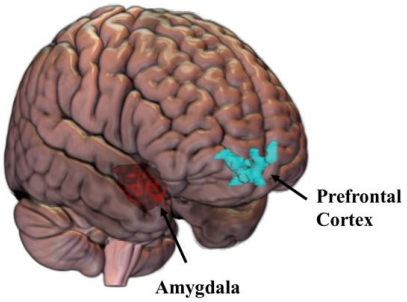

Figure: location of amygdala and prefrontal cortex in the brain
Image credit: Lydia Fortea

Lead researcher, Dr Lydia Fortea (of the Hospital Clinic, Barcelona) said

"PTSD following sexual assault tends to be especially severe and is often accompanied by higher rates of depression, anxiety, and suicidal thoughts. Despite sexual violence being one of the most widespread forms of trauma affecting women, most research on PTSD has focused on other types of trauma, such as war. This is one of the first, and certainly the largest, connectivity study to look at PTSD in sexual assault in teenagers and adult women.

We looked at how key brain regions involved in fear and emotion regulation synchronise with the rest of the brain in women with PTSD following sexual assault. We focussed on the fronto-limbic system, which plays a crucial role in regulating emotions and responding to threats

We found that in 22 of the 40 women with PTSD following a recent sexual assault, communication between the amygdala and the prefrontal cortex was effectively lost, dropping to zero or near zero. The amygdala helps process emotions like fear, and the prefrontal cortex, helps control and regulate those emotions. When this connection weakens, the brain might struggle to manage fear responses or regulate emotions, which could explain why people with PTSD often experience intense fear and mood changes.

However, we didn't find that this brain change was directly linked to how severe their PTSD and depressive symptoms were. This suggests that while this brain difference might be a feature of the disorder itself, it's not necessarily a sign of how bad the symptoms are; this is probably dependent on other factors.

This supports the idea that PTSD after sexual assault is linked to problems in brain circuits that regulate emotion and fear. One of the things we will do now is to see if these connectivity disruptions following a sexual assault could help to predict response to PTSD

treatment. If so, we would be able to identify early which patients are at risk of worse outcomes and intensify clinical efforts to help them recover. So far, this is a study of 40 women, but the work is ongoing. We need more studies to confirm the findings".

Commenting, Dr Marin Jukić (from the Karolinska Institute, Stockholm, and the University of Belgrade, Serbia) said:

"This study demonstrates profound fronto-limbic dysconnectivity in women with PTSD following sexual assault, a population historically underrepresented in brain connectivity research. The finding that amygdala–prefrontal communication can drop to near zero underscores the severity of circuit-level disruptions in emotional regulation networks after trauma. Notably, the absence of a direct correlation with symptom severity suggests that these connectivity deficits may serve more as a biological signature of the disorder rather than a state-dependent marker. This raises the possibility that such disruptions could become predictive biomarkers for treatment response, guiding personalized interventions. However, larger longitudinal studies are needed to determine how these neural patterns evolve and whether targeted therapies can ameliorate connectivity".

This is an independent comment, Dr Jukić was not involved in this work.

Notes

What is PTSD? (from the World Health Organisation)

Post-traumatic stress disorder (PTSD) is a mental health condition that develops in some people who have experienced or witnessed a traumatic or frightening event such as a natural disaster, a serious accident or assault, a terrorist act or military combat, or those who have been threatened with death, sexual violence or injury. The stress caused by witnessing or experiencing the trauma can affect all aspects of a person's life, including their mental, emotional and physical well-being.... Read more at WHOEMMNH235E-eng.pdf

For information on the association of sexual assault with PTSD, see Dworkin ER,

Jaffe AE, Bedard-Gilligan M, Fitzpatrick S. PTSD in the Year Following Sexual Assault: A Meta-Analysis of Prospective Studies. Trauma Violence Abuse. 2023 Apr;24(2):497-514.

Notes for editors

This work is presented at the 38th ECNP Congress, taking place in Amsterdam and online 11-14th October 2025, see https://www.ecnp.eu/congress2025/. With more than 6,500 participants the ECNP Congress is Europe's leading platform for the science and treatment of brain disorders.

Conference Abstract:

Disrupted fronto-limbic connectivity in posttraumatic stress disorder secondary to a recent sexual assault

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Background: Approximately 17-25% of women worldwide experience sexual assault (SA) over their lifetime, and over 70% of them subsequently develop posttraumatic stress disorder (SA-PTSD) [1]. PTSD is more prevalent following SA than other types of traumatic events and is associated with more severe depressive symptoms and heightened suicidal thoughts. The fronto-limbic system, a neural network integral to processing fear, threat, and emotion regulation, is critically involved in the pathophysiology of PTSD. Key regions within this network include the amygdala, which mediates fear and anxiety responses; the hippocampus, essential for memory formation and retrieval; and the prefrontal cortex (PFC), which contributes to executive functions and top-down modulation of emotions.

Objective: This study investigated resting-state functional connectivity (RSFC) alterations of the amygdala and hippocampus associated with SA-PTSD, aiming to further elucidate the underlying neural mechanisms.

Methods: Women with recent SA-PTSD (≤1 year) were recruited from the Hospital Clinic of Barcelona, along with age-matched community controls (CC). All participants underwent functional magnetic resonance imaging (rs-fMRI) during resting-stating. Functional data were preprocessed using *fMRIprep*, and seed-based correlation analyses were performed to estimate the RSFC between the left and right amygdala and hippocampus and all other voxels in the brain. The comparison between SA-PTSD and CC age included age as a covariate. Additionally, we examined whether RSFC differences were associated with depressive symptoms, as measured by the Beck Depression Inventory-II (BDI-II), and PTSD symptoms, as measured by the Clinician-Administered PTSD Scale (CAPS). Statistical significance was assessed using Threshold Free Cluster Enhancement (TFCE) with corrected $p < 0.05$.

Results: The final sample included 40 patients with SA-PTSD (mean age = 24.12 ± 8.58, range=16-47 years) and 45 CC (mean age = 23.27 ± 6.18, range=16-40). Patients exhibited severe PTSD symptoms (CAPS mean = 28.67 ± 9.32) and depressive symptoms (BDI-II mean = 29.82 ± 10.29), with 85% meeting the criteria for moderate to severe depression (BDI-II ≥ 17). Compared to CC, SA-PTSD patients showed significantly reduced RSFC of the right amygdala with the right orbitofrontal gyrus (x=8, y=50, z=-11, t=-4.26) and the left precentral gyrus (x=-47, y=-17, z=60, t=-4.44). These observed RSFC differences did not correlate with depressive or PTSD symptoms within the patient group. Finally, no significant RSFC differences were found in the left amygdala or bilateral hippocampus.

Conclusions: This study demonstrated that women with recent SA-PTSD exhibited disrupted connectivity within the fronto-limbic system, specifically between the right amygdala and the ventromedial PFC (vmPFC). These results align with previous research reporting impaired amygdala–

PFC connectivity in PTSD [2] and extend this evidence to SA-PTSD. Such disruption may compromise the top-down regulation from the vmPFC over amygdala-driven fear responses, potentially leading to heightened fear response [3, 4]. Overall, these findings highlight the critical role of the fronto-limbic circuitry in SA-PTSD, suggesting that altered communication within this system may contribute to the etiopathology of the disorder.

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