

# Changes in the brain detected in severe PMS

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It is possible to see changes in both brain function and structure in women with premenstrual dysphoric disorder, which is a severe form of PMS. This is shown in a new doctoral thesis at Umeå University, Sweden. The changes in the brain can persist even after the premenstrual period.

"The results bring us closer to a biological explanation for why women with severe PMS are more prone to have strong emotional reactions to things in their environment during the premenstrual phase. It's about certain parts of the brain becoming more active," says Louise Stiernman, doctoral student at Umeå University.

In her thesis, Louise Stiernman and the research group she is part of at the Department of Clinical Sciences at Umeå University have conducted four studies of women with premenstrual dysphoric syndrome, PMDD, which is a form of severe PMS. The studies have been carried out with [magnetic resonance](#) imaging (MRI) to be able to follow the activity in the different parts of the brain.

It turned out that women with PMDD have increased activity in parts of the brain that are important for assessing the emotional significance of environmental factors as well as coordinating appropriate behavioral responses to them. The pattern was evident in the period before menstruation.

The researchers also found support that activity in certain key areas is linked to an altered regulation of the receptor that is sensitive to metabolic products of progesterone. This has long been hypothesized in research but has not previously been shown in humans.

One of the studies in the thesis shows that increased activity in the amygdala was linked to lower gene expression of a protein that determines how sensitive the main receptor for the neurotransmitter GABA is to progesterone metabolites.

The amygdala is a part of the brain that is heavily involved in detecting emotionally relevant stimuli and participates in generating emotion. The role of the receptor in question is to suppress the activity of brain cells, and it is also a target receptor for alcohol, certain anti-anxiety

medications, and anesthetics.

The conclusion of the study is that women with PMDD are likely to have an aberrant regulation of this receptor type, which causes an imbalance in [brain activity](#) during periods when hormone levels fluctuate.

"A surprising discovery was that it was possible to see that the brain's function also differed during the part of the menstrual cycle when the [test subjects](#) felt well, and that this was linked to how severe PMDD they had. In addition, we saw that the structure of the brain, i.e. the thickness of the cerebral cortex, was smaller in women with PMDD, which indicates more long-lasting effects on the brain," says Louise Stiernman.

It is unclear what these findings mean; what is cause and what is effect. It is possible that underlying, innate differences in [brain structure](#) and function cause a vulnerability to experiencing severe mood symptoms under certain conditions. Another possibility is that the recurrent experience of severe premenstrual symptoms or stress over time affects how the brain is composed and how it functions.

"It is important to investigate in the future whether these differences increase the risk of other mental disorders and whether it is possible to treat with drugs," says Louise Stiernman.

Around 60,000 women in Sweden suffer from premenstrual dysphoric syndrome, PMDD, which is the most severe form of PMS. Women with PMDD experience severe mood symptoms during the period before menstruation, when levels of progesterone are high.

Three of the studies were conducted in Umeå and included 29 women with PMDD and 27 women without premenstrual symptoms. The study on brain structure included 89 women with PMDD and 42 women without premenstrual symptoms, and was conducted in Uppsala and

Umeå.

**More information:** Thesis: [Premenstrual dysphoric disorder: brain structure and function, GABAA-active neurosteroids and GABAA receptor plasticity](#)

Provided by Umea University

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