

European College of Neuropsychopharmacology – press release

Study finds symptoms of depression during pregnancy linked to specific brain activity: scientists hope to develop test for “baby blues” risk

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- *Type of work: not peer-reviewed/experimental study/people*

Milan, Italy: Around 80% of women suffer from “baby blues” after the birth of their child. Normally this is a brief period of feeling down which disappears in a few days. But around 1 woman in 7 develops postpartum depression; this is a more serious depression which can affect how mothers bond with their baby and can have long-term consequences. These women seem unable to regulate the negative emotions which can follow giving birth.

Now a group of European scientists have found that in healthy pregnant women activity in a specific area deep in the brain is linked to regulation of negative emotions and the tendency towards symptoms of depression. The researchers hope that testing for this activity, along with how emotions are regulated, will indicate which women are at risk for postpartum depression.

Presenting the work at the ECNP Congress in Milan, presenter Ms Franziska Weinmar (University of Tübingen, Germany) said:

“This is amongst the first trials to compare brain activity in pregnant and non-pregnant women. The ability to regulate emotions is essential for mental health, and this interplay was our starting point”.

The researchers took 15 healthy pregnant women with very high oestrogen levels (due to the pregnancy). The pregnant women were between 5 and 6 months into their first pregnancy. These women were compared with 32 non-pregnant women, who had naturally fluctuating oestrogen levels, as occurs during the menstrual cycle. Each woman was put in an MRI scanner and shown upsetting/disturbing pictures. They were then asked to regulate their emotional state using cognitive reappraisal, which is a technique where the person aims to modify their emotional state by changing their thoughts and trying to reinterpret the situation.

Franziska Weinmar added:

“We questioned all the women in the study on how they dealt with negative emotions and found that the pregnant women in our study reported that they seldom tried to change their emotional perspective by using cognitive reappraisal, in contrast to the non-pregnant women. However, when asked to regulate their emotions while undergoing an MRI scan, they were just as successful at managing their emotional state as the non-pregnant women.

Both pregnant and non-pregnant women are equally capable of managing emotions by deliberately trying to reinterpret a situation, but for the pregnant women it seems to be more difficult to take this step towards consciously controlling these negative emotions,

although they may deal with them in other ways.

We found that in the MRI scans, pregnant women who showed more activity in the amygdala while regulating their emotions were less successful in controlling emotions. In addition, pregnant women with this greater activity in the amygdala reported more symptoms of depression”.*

Franziska Weinmar continued: *“We need to be cautious in interpreting this - this is a small sample, and we are the first to undertake this work. However, if larger studies confirm higher activity in the amygdala in women at risk of postpartum depression, we could assess and specifically target these women during this vulnerable phase - for example, by training them in emotion regulation skills. This may be one approach to cope with the baby blues”.*

Commenting, Dr Susana Carmona (Gregorio Marañón Hospital, Madrid) said

“Studies like this are essential for understanding one of the most extreme physiological processes a human can experience: gestation. It’s astonishing how little we still know. Recently, the FDA approved the first treatment for postpartum depression. However, we still have a long way to go in characterizing what happens in the brain during pregnancy, identifying biomarkers that can indicate the risk of developing perinatal mental disorders, and designing strategies to prevent mother and infant suffering during the delicate and critical peripartum period”.

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

* The amygdala is small almond-shaped brain region near the base of the brain, which deals with learning, memory and emotions and which is also thought to be involved in maternal behaviour and caregiving.

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Notes for Editors

This work is presented at the 37th ECNP Congress, taking place in Milan and online 21-24 September 2024, see <https://www.ecnp.eu/Congress2024/ECNPcongress>. With more than 6,500 participants the ECNP Congress is Europe’s leading platform for the latest research in disease-related neuroscience.

A preprint manuscript related to this work can be seen at:

<https://doi.org/10.1101/2024.09.13.24313410>

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Neural emotion regulation during pregnancy – a fMRI study investigating a transdiagnostic mental health factor in healthy first-time pregnant women

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Background: Pregnancy is a psycho-neuro-endocrinological transition phase in which a plethora of hormone levels rise substantially, modulating socioemotional functions, brain structures, and networks and thus presenting a window of vulnerability for mental health. A transdiagnostic factor for psychopathology is emotion regulation, which is influenced by sex hormones, such as estradiol (E2), across the menstrual cycle on the behavioral and neural level. Whether this is also the case in the antepartum period remains unknown. Addressing this gap in research, the present study investigated behavioral and neural emotion regulation for the first time in primiparous pregnant females using a standard emotion regulation paradigm for negative emotions during functional magnetic resonance imaging (fMRI).

Methods: In the present study 15 primiparous pregnant females with extremely high E2 levels during the second trimester were compared to naturally-cycling females with high E2 levels (after E2-administration, N = 16) and low E2 levels (early follicular phase, N = 16). In the MR-scanner, all participants were exposed to highly negative pictures and instructed once to view the picture without changing their emotional state and once to downregulate their emotional response by applying cognitive reappraisal. After each picture, participants rated their emotional state on a visual analogue scale. Emotion regulation success was compared between groups and task-based functional activity was analyzed at the whole-brain level and for regions of interest (ROIs; inferior frontal gyrus, middle frontal gyrus, amygdala). ROI-to-ROI functional connectivity was investigated during emotion regulation using psychophysiological interaction (PPI) analysis and during resting-state. Linear regression analyses were performed to assess the relation of brain activity during downregulation, regulation success, and self-reported depression scores.

Results: Although pregnant females reported the lowest trait use of cognitive reappraisal (group effect: $p = .025$), all females successfully regulated their emotions by applying cognitive reappraisal in the scanner (regulation effect: $p < .001$). On the neural level, all females had increased activity in the left middle frontal gyrus during downregulation of negative emotions (regulation effect: $p < .001$). Pregnant females showed no significant differences in functional connectivity (resting-state, PPI) related to emotion regulation compared to the nonpregnant group (group effect: all $ps > .243$). However, group differences emerged for amygdala activation (group effect: left: $p = .015$; right: $p = .034$), reflecting an inverted-U shape activity pattern in relation to E2 levels. In pregnant females, increased left amygdala activity during downregulation predicted reduced regulation success ($R^2 = .36$, $r = -.60$, $p = .023$) and was positively associated with depression scores ($r = .61$, $p = .018$).

Conclusion: This first fMRI study during pregnancy indicates that depression scores are reflected in heightened amygdala activity already observable in the antepartum period. Thus, through its association with reduced regulation success, increased amygdala activity suggests a neural risk marker for peripartum mental health. Future research needs to investigate emotion regulation in pregnant and postpartum women to further understand pregnancy-related changes and associations of mood, emotional and neural functions. Eventually, this will allow enhanced identification, prevention, and treatment of peri- and postpartum mental ill-health.

References No conflict of interest