Pain catastrophizing across the menstrual cycle: Associations with menstrual distress and ovarian hormones

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**Introduction**

Pain catastrophizing is a set of cognitive-affective processes associated with enhanced pain and pain-related outcomes. Prior research suggests that hormone levels (e.g., estradiol and progesterone) can influence numerous cognitive-emotional processes, but it is currently unclear how the menstrual cycle changes in ovarian hormones affect pain catastrophizing. Moreover, it is also unclear whether pain catastrophizing is associated with severe premenstrual distress (e.g., premenstrual dysphoric disorder, PMDD). The present study assessed state (i.e., situation-specific) and trait (i.e., traditional) pain catastrophizing during the mid-follicular, ovulatory, and late-luteal phases of the menstrual cycle in women with and without PMDD.

**Objective**

To examine the effects of ovarian hormones on state and trait pain catastrophizing as they fluctuate across the menstrual cycle in women with and without PMDD.

**Participants**

- Healthy control (HC) women (n=20) & women with PMDD (n=20)

- Participants did not differ significantly in age, race, sexual orientation, years of education, employment, or marital status.

- Exclusion Criteria:
  - <18 yrs of age
  - Failure to regularly cycle within 2 months of study inclusion
  - Use of hormone preparations within the past 6 months
  - Menopause or pre-menopausal condition
  - Cardiovascular, neurological, circulatory problems
  - Chronic pain condition (e.g., back pain)
  - Recent use of analgesic medication
  - Use of hormone preparations within the past 6 months
  - Failure to regularly cycle within 2 months of study inclusion

**Experimental Procedure**

- Tested during three phases: mid-follicular, ovulatory, and late-luteal
- Testing order was counterbalanced.
- Menstrual phase and ovulation were verified via daily symptom diaries, luteinizing hormone surge tests, and salivary hormone levels.
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**Data Analysis**

- Correlation analyses were used to assess relations between hormone levels and trait and state catastrophizing.
- Linear mixed model analyses were used to assess menstrual cycle influences on trait and state catastrophizing and sex hormones.

- **Catastrophizing and Hormone Correlations**

- Estradiol was negatively correlated with state catastrophizing in both groups during the mid-follicular phase.
- Estradiol was related to trait catastrophizing in the two groups during ovulation.

**Results: Hormone Levels Across Menstrual Phase**

- In both groups, estradiol was significantly lower during the mid-follicular phase, compared to ovulation and late-luteal phases (p < .05). There were no differences between groups.

**Results: Menstrual Cycle Phase Differences in State and Trait Catastrophizing**

- Trait catastrophizing did not differ by menstrual phase or PMDD diagnosis, p = .33.
- State catastrophizing was lower during the late-luteal phase relative to the other two phases (p < .05), an effect that did not differ by diagnosis (p = .59).
- Women with PMDD tended to express more state (p = .15) and trait catastrophizing (p = .45), however this effect did not reach statistical significance.

**Conclusions**

- State catastrophizing demonstrates some variability across the menstrual cycle, with lower levels during the late luteal phase relative to the mid-follicular and ovulatory phases.
- Elevated estradiol levels may reduce tendencies to engage in state catastrophizing during the mid-follicular phase.
- Estradiol may differentially relate to trait catastrophizing in the two groups during ovulation.

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