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Exploring the Mediating Role of Cognitive Flexibility in the Relationship between Rumination and Premenstrual Syndrome Severity

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ABSTRACT

Premenstrual Syndrome (PMS) effects many women in their reproductive years and often brings emotional, physical and behavioral changes that can make everyday life harder. While hormones are usually seen as the main cause, recent studies suggest that how women think and manage emotions might also influence how intense their PMS symptoms feel. This study explored how rumination repeatedly thinking about distressing thoughts might make PMS symptoms worse and whether cognitive flexibility the ability to shift and adapt one's thinking could ease this impact. The study included 150 women aged 18 to 35 who completed self- report questionnaires. The data were analyzed using SPSS and mediation analysis. Findings showed that women who tend to ruminate more also experienced more severe PMS symptoms. It also appeared that rumination was linked to lower levels of cognitive flexibility. However cognitive flexibility did not mediate the connection between rumination and PMS severity. Thus, overthinking seemed to have a direct impact on PMS symptoms and being mentally flexible didn't change that link. These results highlight the importance of addressing unhelpful thinking patterns like rumination when supporting women dealing with PMS. They also suggest that other psychological factors might be involved and deserve further study to develop effective and culturally relevant mental health support.

DOI: Availability

INTRODUCTION

Premenstrual syndrome (PMS) affects a large proportion of women worldwide, with rates ranging from 47.8% to 88.4 % in African countries (Deyab et al., 2024). In Pakistan around 68.3% of university students and 64% of female medical students experience moderate to severe PMS symptoms (Ghaffar, 2025; Bukhari et al., 2023). Rumination is frequently observed in women with PMS. Studies report that 73.4% of women with PMS engage in daily ruminative thinking (Nayman et al., 2023) and over 60% show increased mood reactivity linked to trait rumination (Tauseef et al., 2024). Cognitive flexibility appears to be limited in vulnerable populations. In women with PMS over 65% report low cognitive flexibility (Kappen et al., 2022). Among university students, only 41.5% demonstrate high flexibility with the rest falling into moderate or low ranges (Gokce & Guner, 2024).

A study has been conducted that explored the relationship between rumination and Premenstrual symptoms. Their findings showed that higher levels of rumination were linked to greater PMS severity (Kappen et al., 2022). It has also been examined that cognitive flexibility among women with premenstrual mood disturbances reduced flexibility (Aoki et al., 2024). Furthermore, while exploring the role of cognitive flexibility between rumination and PMS severity, it has been indicated that low flexibility worsens PMS through ruminative thinking (Nayman et al., 2023). Other than that, neurological factors of PMS focusing on cognitive control and the HPA axis also found that poor regulation in these areas contributed to PMS symptoms (Dong et al., 2025).

There are a variety of studies that have been conducted to explore the association between cognitive flexibility and rumination and explored that low flexibility is highly related for enhancing the ruminative tendencies (Zareian et al., 2021: Kim and Lee, 2021).

Furthermore, it has been also investigated the role of cognitive flexibility in psychological resilience under chronic stress. Their results indicated that greater flexibility led to reduced stress and better adaptation (Hu et al., 2024) which also enhanced the emotional reactivity among PMS patients (Farina et al., 2025: Singh and Mishra, 2023).

A study has been conducted in Pakistan among university students, which revealed that cognitive reappraisal mediated the link between distress and PMS symptom and enhance the emotional dysregulation (Tauseef et al., 2024). Moreover, a qualitative study with Pakistani women to explore PMS-related emotional and cognitive challenges and poor coping flexibility which worsened mood and stress symptoms has been explored (Bukhari et al., 2023). A study has

been conducted by Hussain et al. (2023) in Pakistan to examine psychological flexibility in women with chronic illness. Finding revealed that higher flexibility improved emotional regulation and mental health. Though PMS was not directly studied the results imply its relevance in emotionally stressful conditions. Moreover, a study has been conducted by Khan et al. (2022) to explore the effect of perceived stress on PMS symptoms among working in Pakistan. Women with higher stress and low emotional flexibility experienced more severe symptoms. The study highlights the importance of emotional adaptability in managing PMS. Furthermore, a study has been conducted by Azan and Shoaib (2024) in Pakistan assessing how CBT influences PMDD symptoms in adolescent girls. The intervention led to reduced emotional distress and improved flexible thinking. This suggests cognitive strategies can ease premenstrual difficulties. Moreover, a study has been conducted by Mayo et al. (2025) among female students in Lahore examining PMS, stress and self-control. Greater distress and poor self-control were linked to severe PMS symptoms. The results underline the value of emotional and cognitive regulation.

METHODOLOGY

This study used a cross-sectional, quantitative approach to explore how rumination, cognitive flexibility and premenstrual syndrome (PMS) severity are connected and effect the individual's well-being. The data has been collected through purposive sampling technique for only those patients who were suffering with the problems. By collecting data at a single point in time, the aim was to understand the patterns and links between these psychological factors. Participants were recruited from universities, women's clinic and social media platforms across Pakistan.

INCLUSION CRITERIA

- Female between ages 18-35 years.
- Women who have a regular menstrual cycle.
- Women who were able to read and understand either Urdu or English.
- Female residence of Pakistan.
- Capable of giving informed consent.

EXCLUSION CRITERIA

- Women diagnosed with any neurological or Psychiatric disorder.
- Currently using hormonal contraceptives.
- Pregnant during the study period.

MEASURE

The demographic information sheet was used to gather personal information. It included Age, Gender, Marital Status, Family Type, Siblings, Birth order, family background, Monthly income, earning persons in family and number of dependents on family income, occupation and menstrual history has been explored. Psychological assessments were done using three established tools.

- The Rumination Response Scale-Short Form (RRS-10): was used to measure how often participants engage in repetitive negative thinking. This 10-item scale uses a simple 4-points responses system and has shown strong reliability. To assess how flexible participants were in adapting their thoughts and behaviors during stressful situations,
- The Cognitive Flexibility Inventory (CFI): was used. It includes 20 items focusing on two main areas, considering alternative perspectives and feelings in control, and it also has high reliability.
- Premenstrual Symptoms Screening Tool (PSST): PMS symptoms were measured using the PSST scale, which measures at emotional, physical and behavioral symptoms across 19 items.
- The tools were completed in person using paper-based forms and the whole process took about 15-20 minutes.

PROCEDURE

This study at Superior University in Lahore began with selecting a topic under supervisor guidance: explore how rumination, cognitive flexibility and premenstrual syndrome (PMS) severity are connected. Permission for established scales was secured. Ethical considerations included informed consent emphasizing voluntary participation and confidentiality. Purposive sampling gathered data from diverse university departments, room universities, women's clinic and social media platforms across Pakistan. Participants completed demographic sheets and scales with clear instructions. After data collection, statistical techniques analyzed correlations. This research aims to deepen understanding and inform future studies in psychology and related fields. Data were analyzed using SPSS 23 with descriptive statistics Pearson correlation and mediation analysis used to examine if cognitive flexibility mediated the link between rumination and PMS severity using a significance level $p<.05$.

RESULTS

This study explored how rumination and cognitive flexibility are linked to PMS severity focusing on whether cognitive flexibility helps explain the effect of rumination on PMS symptoms. To understand these connections, descriptive statistics, correlations, and mediation

analysis

DESCRIPTIVE STATISTICS TABLE 1

DESCRIPTIVE STATISTICS ANALYSIS FOR DEMOGRAPHICS AND VARIABLES

	N	Min	Max	Mean	SD
Age	150	18	32	23.84	2.873
Marital	150	1	2	1.83	.374
Family	150	0	2	1.77	.440
RRS	149	10.00	41.00	22.8389	5.29669
PSST	148	18.00	69.00	42.5878	9.07784
CFI	149	54.00	105.00	84.9309	8.95435
Valid N	146				

Participants were mostly young adult females (M age=23.84) unmarried and from unclear families. They reported moderate rumination (M =22.84) moderate to high PMS symptoms (M=42.59) and moderately high cognitive flexibility (M=84.63).

PEARSON PRODUCT MOVEMENT CORRELATION TABLE 2

PEARSON CORRELATION FOR RUMINATION AND PREMENSTRUAL SYNDROME

Variables	1	2
Rumination Response Scale	1	.452
Premenstrual syndrome	.452	1

SCREENING TOOLS

Correlation is significant at the 0.01 level (2 tailed)

Pearson correlation showed a significant positive relationship between rumination and PMS severity (r=.45, p<.001) indicating that higher rumination is linked to more severe PMS symptoms.

TABLE 3: PEARSON CORRELATION FOR RUMINATION AND COGNITIVE FLEXIBILITY

Variable	1		2
Rumination Scale	response	1	.248
CF Inventory	.248		1

Correlation is significant at the 0.01 level (2 tailed)

A weak but significant positive correlation was found between rumination and cognitive flexibility. (r=.25, p=.002) suggesting a slight tendency for the two to increase together though this contrasts with theoretical expectations.

TABLE 4: PEARSON CORRELATION FOR COGNITIVE FLEXIBILITY AND PREMENSTRUAL SYNDROME SEVERITY

Variable	1	2
CF inventory	1	.181
PSST	.181	1

Correlation is significant at the 0.01 level (2 tailed)

A weak but significant positive correlation was found between cognitive flexibility and PMS severity (r=.181, p = .029) suggesting a slight increase in PMS symptoms with higher cognitive flexibility.

LINEAR REGRESSION MEDIATION AMONG DEPENDENT VARIABLES AND INDEPENDENT VARIABLES TABLE *5*

Model summary of regression mediation analysis predicting premenstrual syndrome severity (N=150)

Model	R	R^2	Adjusted R^2	SE estimate
1	.452	.204	.199	7.25

Rumination explained 20.4% of the variance in PMS severity indicating a moderate and meaningful relationship. Higher rumination significantly predicted more severe PMS symptoms.

TABLE 6: *ANOVA FOR REGRESSION MEDIATION MODEL PREDICTING PREMENSTRUAL SYNDROME SEVERITY (N=150)*

Source	SS	df	MS	F	P
Regression	2476.036	1	2476.036	37.274	<.001
Residual	9631.964	145	66.427		
Total	12108.000	146			

The regression model was statistically significant (F 1,145) =37.27, p<.001) confirming that rumination is a meaningful predictor of PMS severity. This suggest that individuals who overthink are more likely to experience stronger PMS symptoms.

TABLE 7: *COEFFICIENT OF REGRESSION PREDICTING PREMENSTRUAL SYNDROME SEVERITY (N=150)*

Predictor	B	SE	B	t	P
Constant	24.866	2.977	-	8.353	<.001
RRS	0.774	0.127	.452	6.105	<.001

Rumination significantly predicts PMS severity (p <.001) with higher rumination linked to more

intense PMS symptoms. The moderate effect size (β = .452) highlights a meaningful psychological connection.

TABLE 8: ***MODEL SUMMARY OF MEDIATION ANALYSIS FOR RUMINATION AND COGNITIVE FLEXIBILITY (N=150)***

Model	R	R^2	Adjusted R^2	SE estimate
2	.248	.062	.055	8.6588

Rumination accounts for 6.2% of the variance in cognitive flexibility indicating a small but significant negative relationship, higher rumination is linked to slightly lower cognitive flexibility.

TABLE 9: ***ANOVA FOR REGRESSION MEDIATION MODEL PREDICTING COGNITIVE FLEXIBILITY (N=150)***

Source	F	P value
Regression	9.527	.002

The analysis showed that rumination significantly impacts cognitive flexibility (p = .002) making it harder for individuals to adapt their thinking.

TABLE 10: ***COEFFICIENT OF REGRESSION PREDICTING COGNITIVE FLEXIBILITY (N=150)***

Predictor	B	SE	B	T	P
Constant	75.041	3.130	-	23.826	<.001
RRS	0.416	0.134	.248	3.094	<.002

Result showed that higher rumination is linked to a 0.416 unit change in cognitive flexibility (B = 0.416) depending on scoring direction. The effect size was small to moderate (β = .248) and the relationship was statistically significant (p = .002)

TABLE 11: ***MODEL SUMMARY OF REGRESSION FOR RELATION BETWEEN COGNITIVE FLEXIBILITY, RUMINATION AND PREMENSTRUAL SYNDROME (N=150)***

Model	R	R^2	Adjusted R^2	SE estimate
3	.457	.209	.198	8.17529

Rumination and cognitive flexibility explained 20.9% of the variance in PMS severity showing a significant link and moderate impact of thinking patterns on PMS symptoms.

TABLE 12: ***ANOVA FOR REGRESSION MEDIATION MODEL PREDICTING PREMENSTRUAL SYNDROME SEVERITY (N=150)***

Source	F	P value
Regression	18.859	.001

The overall model was statistically significant (p= .010) showing that the predictors together play a key role in explaining PMS severity and highlighting their combined importance.

TABLE 13: ***COEFFICIENT OF REGRESSION PREDICTING PREMENSTRUAL SYNDROME (N=150)***

Predictor	B	SE	B	T	P
Constant	19.310	6.596	-	2.928	.004
Rumination	0.741	0.131	.434	5.649	.001
CFI	0.074	0.078	.073	0.948	.345

Rumination significantly predicted PMS severity (B = 0.741, β = .434, p = .001) while cognitive flexibility showed no unique effect highlighting rumination's stronger influence.

DISCUSSION

This study explored whether cognitive flexibility helps explain the link between rumination and PMS symptoms in young women. It found that while rumination was tied to worse symptoms and flexibility to milder ones, flexibility didn't bridge the two. The discussion reflects these results using current research and theory.

Kaluve et al. (2025) examined the role of emotional dysregulation and rumination in PMS severity. They found that both significantly predicted increased PMS symptoms supporting the current study's findings that repetitive negative thinking intensifies emotional distress during hormonal shifts. Nayman et al. (2023) explored how emotion regulation effects PMS symptoms in women who ruminate. Their study showed that poor emotional control made

PMS symptoms worse reinforcing the idea that rumination is more harmful when paired with weaker emotional regulation just as seen in our results. Dawson et al. (2020) investigated rumination as a cognitive risk factor during the luteal phase. Their findings confirmed that rumination contributed to worsening mood symptoms in PMS which supports this study's result on rumination's direct link with PMS severity. Crooks and Ness (2023) studied the interaction between hormonal sensitivity and rumination. They found that this combination significantly heightened emotional symptoms before menstruation aligning with this study's interpretation of

how cognitive vulnerability interacts with biological sensitivity. Okajima and Okajima (2025) reported that women with higher psychological flexibility cope better with PMS related emotional challenges. Greater flexibility was linked with fewer symptoms of anxiety and depression during the premenstrual phase. This aligns with the findings that better cognitive flexibility is associated with lower PMS severity. Khan and Jabeen (2023) found that women who tend to ruminate experience stronger PMS symptoms. Their study suggest that repetitive negative thinking increase emotional distress before menstruation. This supports the current findings that rumination is positively linked with PMS severity. Fonseca et al. (2020) examined cognitive flexibility is stressful parenting situations and found that it improved emotional coping. This supports the idea that flexible thinking generally promotes resilience which matches this study's result showing a negative link between flexibility and PMS severity. Avila-Varela et al. (2024) found that hormonal changes during the menstrual cycle effect brain areas tied to emotional control. This may increase emotional sensitivity and ruminative thinking. It supports the findings that more rumination relates to higher PMS severity. Avila-Varela et al. (2024) showed that cognitive functions shift with hormonal changes and age. This suggest cognitive flexibility may not consistently throughout the menstrual cycle. It helps explain it didn't significantly mediate the rumination PMS relationship in this study.

IMPLICATIONS AND FUTURE DIRECTIONS

This study emphasizes the role of rumination in worsening PMS symptoms suggesting that therapies like CBT, Rumination-Focused CBT and Mindfulness-Based Cognitive Therapy could help reduce emotional distress. Future research should explore other cognitive processes such as emotion regulation and metacognition and consider long term studies to better understand how thinking patterns like rumination and flexibility affect PMS over time.

CONCLUSION

The study found that women who ruminate more often report more severe PMS symptoms highlighting how persistent negative thinking can intensify emotional and physical discomfort. While cognitive flexibility did not mediate this relationship it was still linked to lower PMS severity overall. These findings suggest that targeting unhelpful thinking patterns could improve emotional well-being during the premenstrual phase. Future studies should include larger, more diverse samples and consider cultural and psychological factors alongside biological ones for a more complete understanding of PMS.

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