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Version: Accepted Version

The final publication is available at Springer via
http://dx.doi.org/10.1007/s00737-015-0558-4

Relationships between Paranoid Thinking, Self-Esteem and the Menstrual Cycle

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Abstract

This study aimed to investigate whether paranoid experiences and levels of self-esteem fluctuate over the menstrual cycle and whether levels of self-esteem are lower when perceived persecution is felt to be deserved.

Measures of anxiety, depression, persecution, deservedness and self-esteem were completed on-line by 278 women over their menstrual cycle. Responses were compared at the paramenstrual (three days before and after menses onset) and mid-cycle phase.

 At the paramenstrual phase persecution, negative self-esteem, anxiety and depression were higher and positive self-esteem was lower than at mid-cycle.   A greater proportion of women experienced persecution as deserved at the paramenstrual phase. This was associated with higher depression and negative self-esteem scores. Increased levels of deservedness significantly strengthened the relationship between persecution and negative, but not positive, self-esteem.

These findings suggest that the paramenstrual phase is a time of vulnerability to increased paranoid experiences, an increased likelihood that feelings of persecution will feel deserved and lowered self-esteem. The findings support the view that interpersonal sensitivities may be key to menstrual cycle symptoms and have an impact on relationships. Further, the study illustrated that ideas developed for psychosis could make a valuable contribution to understanding and managing this aspect of menstruation-related distress.

Relationships between Paranoia, Self-Esteem and the Menstrual Cycle

The menstrual cycle is characterised by hormonal fluctuations which accompany the processes of ovulation and menses in female human reproduction. The phases of the cycle have been linked to changes in both physical and psychological phenomena, the presentation and intensity of which varies considerably from woman to woman (Gonda et al. 2008). Typically, negative effects occur in the few days preceding and during menstruation. Increased interpersonal oversensitivity is commonly reported within the PMS literature (Pinkerton et al. 2010). Such sensitivities are likely to have major impacts upon relationships, and other commonly reported symptoms such as anxiety and depression. However, these sensitivities are rarely specifically investigated. Paranoia and low self-esteem both reflect oversensitivity to interactions with others.

Links between menstrual cycle phase and psychosis have long been postulated (see Brockington 2005 for a review).   The literature also includes examples of exacerbation of bipolar disorder (Hendrick et al. 1996), exacerbation of schizophrenic symptoms (Harris 1997; Levitte 1997; Riecher-Rossler 2002; Hsiao et al. 2004; Bergemann et al. 2007) and the presentation of psychotic symptoms in major depression during the premenstrual and menstrual phases. Due to the physiological changes underpinning the menstrual cycle, research has focused upon physiological reasons for these phenomena, such as the impact of fluctuation in hormone levels However, a definitive aetiology has not been established (Clayton 2008) and research into disorders such as PMS has produced evidence that social, cultural (Slade 1984; Bancroft and Backstrom 1985) and cognitive factors (Reading 1992) also impact on menstruation-related distress.

Paranoia is a common symptom of psychotic illness which historically was considered primarily within the domain of illnesses such as schizophrenia (Whaley 1999). However, theoretical and empirical advances have emphasised the study of paranoia as a concept in its own right. Present in major depression, bipolar disorder and the non-clinical population, paranoia occurs on a continuum from normal mistrust to the paranoid delusions found in the acutely unwell (Ellet et al. 2003).

Paranoid thoughts are relatively common in non-clinical populations (Freeman 2007) and there is evidence suggesting exacerbation of paranoia around menstruation within PMS populations (Choung et al. 1988; Palmer et al. 1991; McLeod et al. 1993). However, very little of either the PMS or psychosis research directly explores whether paranoid experiences vary in response to the menstrual cycle.

Paranoia and Self-esteem

The link between self-esteem and paranoia has been the subject of conjecture. Some studies have found an association between paranoia and low self-esteem, while others have reported relatively high or normal levels of self-esteem in paranoid individuals (for a discussion, see Bentall et al. 2001).

Bentall et al. (2001) draw on the work of Trower and Chadwick (1995) to suggest that the inconsistent findings in the literature might indicate that people vulnerable to paranoia have low implicit self-esteem (spontaneous, automatic or unconscious self-evaluations). Research indicates an association between paranoia and information processing biases including reasoning about the mental states of others, a tendency to jump to conclusions, and attribution biases (Bentall et al. 2001). Externalising attributions for negative events reduces negative thoughts about the self and protects self-esteem. However, this increases beliefs that others have malevolent intentions, resulting in paranoid feelings. These cognitive biases therefore act as a dysfunctional defence system which fluctuates in its ability to protect against negative thoughts about the self. Trower and Chadwick (1995) propose two types of paranoia, "poor-me" and "bad-me". Poor-me paranoia is characterised by a feeling of undeserved persecution by a bad or inferior other. Bad-me paranoia is characterised by a feeling of persecution that is felt to be deserved, because the individual holds a belief that the self is in fact "bad", and therefore punishment by others is justified. These two types of paranoia differ then in the extent of "deservedness" the sufferer experiences. Bentall et al. (2001) propose that because negative events are attributed to others in poor-me paranoia, self-esteem is protected. Bad-me paranoia reflects a failure of this defensive process, negative events are attributed to the self and the persecution is experienced as justified. If this theory is correct, it would be expected that when feelings of persecution are accompanied by feelings of "deservedness", the relationship between persecution and self-esteem would be changed (moderated). Specifically, levels of self-esteem would lower as feelings of deservedness increase.

Melo et al. (2006) have provided evidence that people fluctuate between poor-me and bad-me paranoia, in response to 'daily experiences'. This idea has been supported by recent research demonstrating that people from non-clinical populations who regularly experience paranoid thoughts have highly fluctuating self-esteem scores (Thewissen et al. 2008). The current study is interested in whether the menstrual phase might constitute a "daily experience" that can impact on these fluctuations by influencing the relationship between paranoia, deservedness and self-esteem. Lecomte et al. (2006) suggest that measuring both positive and negative self-esteem can help make sense of complicated or contradictory self-esteem scores.

Self-esteem and the Menstrual Cycle

How the menstrual cycle affects self-esteem is unclear with evidence being inconsistent. For example, Bloch et al. (1997) found that in 16 women with PMS, self-esteem was lower in the premenstrual phase compared to the week following menses for 30 out of 65 cycles. Taylor (1999) also reported lower self-esteem scores in the premenstrual period than post-menstruation in women with PMS. However, some research suggests that women with PMS have generally lower self-esteem scores than non-clinical controls (Morse et al.1988) and therefore may have less stable self-esteem generally (Thewissen et al. 2008). Hill and Durante (2009) investigated a non-clinical population of 52 undergraduate students, finding that self-esteem was higher at the least fertile phase of the cycle (late luteal phase), and low around the five days before and two days after ovulation (the most fertile point of the cycle). However, Edmonds et al. (1995) found that self-esteem was not related to the menstrual cycle in their sample of 68 college students

There is a considerable body of literature indicating that both anxiety and depression are exacerbated in the few days before and during menstruation (Clayton 2008). As both anxiety and depression are related to self-esteem (e.g. Leary et al. 1995; Orth et al. 2008) it seems intuitive that this would also be when self-esteem is lowest. Increased levels of paranoia are associated with increased anxiety (Freeman 2007). Depression though is more likely to be associated with bad-me paranoia than poor-me paranoia where persecution may be felt but self-esteem and affect are protected. Given the relationships between paranoia and anxiety and depression, it was decided that although not a focus, inclusion of these variables would aid interpretation.

Paranoia and low self-esteem both reflect over-sensitivity to interactions with others. Increased interpersonal over-sensitivity is commonly reported within the PMS literature and indeed could be considered one of the defining characteristics (Pinkerton et al. 2010). This would strengthen the reasoning that both self-esteem and paranoia might fluctuate in response to menstrual cycle phase.

Aims

1) To determine whether levels of self-esteem and paranoia fluctuate in relation to the menstrual cycle in a non-clinical sample. Specifically, the paramenstrual phase,(defined as day 1 of the menstrual cycle plus or minus three days) will be compared with the mid-cycle phase (11 to 17 days before menses, around the point of ovulation).

2) To investigate whether feeling that perceived persecution is deserved changes with cycle phase and whether this affects the relationship between persecution and self-esteem.

Hypotheses

Hypothesis 1: Levels of a) persecution, b) negative self-esteem, c) anxiety, and d) depression will be higher during the paramenstrual phase compared to mid-cycle.

Hypothesis 2: Levels of positive self-esteem will be lower during the paramenstrual phase compared to mid-cycle.

Hypothesis 3: Within each phase, when persecution is felt to be deserved, there will be lower levels of positive self-esteem, and higher levels of negative-self-esteem than when persecution is not felt to be deserved.

Materials and methods

This study received ethical approval from the University of Sheffield Department of Psychology Ethics Sub-Committee (DESC).

Participants

As mentioned above, this study is interested in non-clinical populations. Freeman (2007) argues that non-clinical populations provide a greater range of paranoia scores, and do not have the complications of the impact that being a "patient with psychosis" may have on self-esteem. Accessing a non-clinical population through the internet enables access to a large sample. Freeman *et al.* (2005) also suggest that the internet provides a safe forum for participants to disclose paranoid thoughts, which is supported by evidence that on-line participants are more willing to disclose self-relevant information (Buchanan 2000). Internet-based studies have limitations, such as selection bias, technological factors outside the researcher's control and issues of generalisability (Witmer et al.1999). However, it was decided that in this instance the benefits of the internet would outweigh the limitations.

Participants were recruited from the community between July 2010 and January 2011 using advertisements distributed through various websites (some specifically aimed at women such as "mums forums", others were more general such as local information sites), women's organisations, local colleges and University of Sheffield staff and students. The advert was designed to appeal to a wide range of women, regardless of the presence or absence of menstrual cycle complaints.

Participants were between 18 and 45 years old and menstruating regularly (defined as having a cycle length between 24 and 34 days, (NHS 2010). Participants provided details of hormonal contraception. An "opt-in" informed consent approach was used.

1069 women started the study, 344 completed all four weeks but 66 were excluded. 33 did not provide

follow-up information and therefore could not be reliably allocated to the comparison points. The cycle length of ten participants was outside the acceptable criteria during the period of study. Sixteen participants did not provide responses at the time points required for the analysis. Seven were excluded due to completion errors. The final sample consisted of 278 individuals. 126 participants were recruited from the community, 152 from university staff and student populations.

Power analysis

An a priori power analysis was conducted using G*Power (Faul et al. 2007) to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, a medium effect size (d= 0.30). As it was anticipated that the sample might need to be disaggregated depending on factors such as use of hormonal contraception it was decided that between 164 and 300 participants would be required.

Measures

At each stage participants were asked to report where they were in their cycle before completing the following measures:-

Hospital Anxiety and Depression Scale (Zigmond and Snaith 1983). The HADS is a self-report questionnaire consisting of two subscales of seven items designed to measure levels of anxiety and depression in non-psychiatric populations. The anxiety scale has internal consistency coefficients of 0.80 to 0.84, the depression scale 0.76 to 0.82 (Bjelland et al.2002). Test-retest reliability for anxiety is 0.79, 0.63 for depression and 0.78 for the full scale.

The Persecution and Deservedness Scale (Melo et al. 2009). The PADS provides scores for both persecution and deservedness of persecution. Respondents can score highly on the persecution subscale, while scoring high or low on the deservedness scale. Deservedness is only scored when a certain level of persecution is reported.

The persecutory subscale – participants score from 0 (certainly false) to 4 (certainly true) on ten items that state or imply that the individual is at risk as a consequence of the untrustworthiness or malevolence of others. The scale has a Cronbach's alpha of 0.84.

The deservedness subscale – Items are completed only following a score greater than 1 on the related persecution item. Participants score 0 (not at all) to 4 (very much). An interclass correlation of 0.43 is reported

by the authors as Cronbach's alpha cannot be calculated.

Self-Esteem Rating Scale - Short Form (Lecomte et al. 2006). The SERS-SF is a shortened version of Nugent and Thomas' (1993) Self-Esteem Rating Scale. Participants score 1 (never) to 7 (always) on ten items measuring positive self-esteem and ten measuring negative self-esteem. The positive scale has a consistency alpha coefficient of 0.91, and the negative scale of 0.87. The test-retest reliability of the positive and negative scales demonstrate stability of r=0.90 and r=0.91, P<0.001, respectively.

Procedure

Participants completed the measures once a week, for four consecutive weeks. Actual menstruation dates were used to allocate responses to cycle phase as they were considered to be more accurate than mid-cycle estimates of menstruation date. The "paramenstrual phase" (day 1 of their period plus or minus three days) and "mid cycle phase" (11 to 17 days prior to menses) were used for the data analysis.

A binomial test found that the entry timings of participants were naturally well counter-balanced, offsetting order effects.

Results

The statistical analysis was conducted using PASW Statistics 18.

Comparison of cycle phases

Wilcoxon-Signed Ranks tests were used to test the hypotheses 1 and 2 (median scores, Z values and significance levels are displayed in Table 1).

Persecution, negative self-esteem, anxiety and depression were all significantly higher at the paramenstrual phase than at mid-cycle. Positive self-esteem was found to be significantly higher at mid-cycle than at the paramenstrual phase.

Table 1

Summary Statistics of Wilcoxon-Signed Ranks Tests for Differences in Measures between Cycle Phases

N=278	Para-menstrual	Mid-cycle		Z	P	Effect size
	Mdn	*Mdn*				
Positive Self-esteem	48	51	28	4.39	P<0.001*	0.26
Negative Self-esteem	31	29	27	4.85	P<0.001*	0.29
Persecution	1.2	1	40	4.18	P<0.001†	0.25
Anxiety	7	6		-6.62	P<0.001†	0.40
Depression	3	2		-5.74	P<0.001†	0.34

Note * two-tailed, † one-tailed

Investigation of sample subgroups

To explore the potential that subgroups might exist within the data the sample was divided so that participants recruited through University populations were compared with participants recruited from other sources (referred to as "community"), and participants using hormonal contraception were compared with those who were not.

In regards to recruitment group, using Mann Whitney U tests it was identified that at mid-cycle, the University (Mdn=3) scored significantly higher for depression than the community sample (Mdn=2), $U = 8027$, $p=0.01$. However, the effect size was small, $r=0.19$.

In regards to hormonal contraception, at the paramenstrual phase women using hormonal contraception (*Mdn*=3) had a significantly lower depression scores (*Mdn*=4), $U=6681.5$, $p=0.003$, $r=0.17$, and significantly higher (*Mdn*=52) positive self-esteem scores than those who did not (*Mdn*= 50), $U=7324.5$, $p= 0.042$, $r=0.10$. At mid-cycle, women using hormonal contraception (*Mdn*=1) showed significantly lower depression scores than women not using hormonal contraception (*Mdn*=2), $U = 7299.50$, $p=0.04$, $r=0.10$. The effect sizes were all very small so it was decided the subgroups could be combined for analysis.

Proportion of participants experiencing persecution

A McNemar's test was conducted to determine whether there was an effect of cycle phase on the proportion of participants who experienced persecution. A significantly higher proportion of participants

experienced some persecution at the paramenstrual phase (80.2%) than at mid-cycle (73.4%)   (χ^2 (1, $N=278$)= 3.64, $p<0.001$),   However the effect size was small ($V= 0.11$)

Proportion of participants experiencing deservedness.

A Chi-square test was conducted to examine whether there was a difference between the phases in terms of the proportion of people that felt that their experience of persecution was deserved.

Following the conservative approach suggested by Melo et al. (2009) for this part of the analysis, participants who answered at least three deservedness items were included. Participants scoring less than the median deservedness score of week 1 (1.29) were allocated to the "poor-me" group. Those scoring more than 1.29 were allocated to the "bad-me" group.

A significant relationship between menstrual cycle phase and proportion of participants allocated to each group was found (χ^2(1, $N=297$)= 5.325, $p=0.01$). A higher proportion of participants were allocated to the "bad-me" group at the paramenstrual phase (42.4%) than at mid-cycle (29.5%). However the effect size was small (V= 0.13).

Correlations between persecution, deservedness, positive self-esteem, negative self-esteem, anxiety and depression.

As hypothesis 3 is primarily interested in the relationship that persecution and deservedness have with the other variables, the remaining analysis was conducted using data from participants who, because of their paranoia scores, were required to complete at least one deservedness item.

A Spearman's correlation coefficient was conducted to investigate the relationships between persecution, deservedness, self-esteem, anxiety and depression. Table 2 displays the results of these correlations. At both phases, persecution and deservedness were significantly positively correlated with negative self-esteem and inversely related to positive self-esteem.

Table 2

Spearman's Correlation Coefficients between Measures at the Paramenstrual and Mid-cycle Phases

	Phase	Positive Self-esteem	Negative Self-esteem	Anxiety	Depression
Persecution	Paramenstrual phase [a]	-0.52***	0.56***	0.48***	0.33***
	Mid-cycle [a]	-0.49***	0.49***	0.44***	0.37***
Deservedness	Paramenstrual phase[b]	-0.52***	0.50***	0.30***	0.31***
	Mid-cycle[c]	-0.46***	0.48***	0.25***	0.21**

Note [a] $N=278$, [b]$n=223$, [c]$n=204$; **$p=0.002$ (two-tailed) *** $p<0.001$ (two-tailed)

Investigation of the impact that deservedness has upon the relationship between persecution and self-esteem.

To investigate whether deservedness would affect the relationship between self-esteem and persecution a moderation regression analysis was conducted following the method used by Sheeran et al. (2003). To reduce potential multi-collinearity, the variables were mean-centred (Aiken and West 1991).

For each cycle phase a three step hierarchical regression was conducted where *positive self-esteem* was the dependent variable. Persecution was entered into the equation at the first step, deservedness was entered at the second step, and the interaction of persecution by deservedness was entered as the final step. Persecution accounted for 31% of variance in positive self-esteem at the paramenstrual phase and 27% at mid-cycle. The second step accounted for a significant increase in the overall variance of the model (paramenstrual R^2 change = 0.11; mid-cycle: R^2 change = 0.10). The third step did not produce a significant change in R^2 (paramenstrual phase $p=0.58$; mid-cycle $p=0.62$), indicating that the interaction between deservedness and persecution did not significantly moderate the relationship between persecution and positive-self-esteem, see Table 3.

The procedure was repeated with *negative self-esteem* as the dependent variable. Persecution explained 35% of variance in negative self-esteem, at the paramenstrual phase and 27% at mid-cycle 27%). The second step accounted for a significant increase in the overall variance of the model (paramenstrual phase R^2 change = 0.09; mid-cycle R^2 change = 0.12). The interaction between persecution and deservedness at the third step contributed a significant but small increase in the variance accounted for (paramenstrual phase R^2 change = 0.01, mid-cycle R^2 change = 0.02) indicating that the interaction between deservedness and persecution did moderate the relationship between persecution and negative-self-esteem. Also presented in Table 3.

Table 3

Summary of the Moderation Regression Analysis of the Impact of Deservedness on the Relationship between Persecution and Positive Self-Esteem, and Persecution and Negative Self-Esteem

		Positive Self-Esteem			Negative Self-Esteem		
	Variable	B	$SE\ B$	β	B	$SE\ B$	β
				Paramenstrual Phase			
Step1	Persecution	-7.06	0.72	-0.55*	6.84	0.62	0.59*
Step 2	Persecution	-5.35	0.71	-0.41*	5.40	0.62	0.47*
	Deservedness	-4.26	0.67	-0.36*	3.58	0.59	0.33*
Step 3	Persecution	-5.30	0.72	-0.41*	5.23	0.62	0.45*
	Deservedness	-4.24	0.67	-0.35*	3.49	0.58	0.32*
	Interaction	-0.34	0.61	-0.03^{ns}	1.09	0.53	0.10*
				Mid-Cycle Phase			
Step1	Persecution	-6.86	0.79	-0.52*	5.80	0.66	0.53*
Step 2	Persecution	-5.33	0.78	-0.41*	4.44	0.64	0.40*
	Deservedness	-4.44	0.77	-0.34*	3.94	0.63	0.36*
Step 3	Persecution	-5.27	0.79	-0.40*	4.21	0.64	0.38*
	Deservedness	-4.40	0.77	-0.34*	3.81	0.63	0.35*
	Interaction	-0.35	0.70	-0.03^{ns}	1.34	0.57	0.13*

Note: * significant $P<0.001$; ^{ns} = Not significant

Following the procedure described by Aiken and West (1991, pp 9-20) an analysis of simple slopes was conducted at three levels of the moderator, deservedness; low (one standard deviation below the mean), moderate (the mean) and high (one standard deviation above the mean). See Figure 1 for paramenstrual phase and Figure 2 for mid-cycle. At the paramenstrual phase slopes with high and low values of deservedness were significantly different from zero, (the standard error and t-test are identical at each value: t (219)=2.06, p=0.04). The slopes were also significantly different from zero at mid-cycle , t (200)=2.35, p=0.02).

Therefore as levels of deservedness increase the relationship between persecution and negative self-esteem intensifies and this pattern was demonstrated regardless of cycle phase.

Fig. 1 Paramenstrual phase: Moderating effect of deservedness on the relationship between persecution and negative self-esteem

Fig. 2 Mid-cycle phase: Moderating effect of deservedness on the relationship between persecution and

negative self-esteem

Discussion and Conclusion

Effect of cycle phase

The results found that at the paramenstrual phase levels of persecution were higher than at mid-cycle. Further, a greater proportion of the sample experienced persecution in the paramenstrual phase. Of the women who experienced persecution, a higher percentage felt that the persecution was deserved at the paramenstrual phase than at mid-cycle. Positive self-esteem was lower, and negative self-esteem was higher, at the paramenstrual phase than at mid-cycle. This finding is consistent with the increase in depression and anxiety levels at the paramenstrual phase compared with mid-cycle. Increased persecution was related to increased anxiety, depression, negative self-esteem, and lower positive self-esteem. As feelings of deservedness increased, the relationship between persecution and negative self-esteem intensified. Although the individual variables fluctuated, the relationships between the variables remained fairly stable.

The current study is the first to focus specifically on feelings of persecution and menstrual cycle phase. The results indicate that even within a non-clinical population the menstrual cycle has a significant impact on distress and that both persecution and deservedness are important components of this distress. These findings are especially relevant given the body of literature which indicates increased interpersonal sensitivity at the paramenstrual phase (Pinkerton et al. 2010). Specifically, the increased persecution suggests that some women may interpret interpersonal interactions differently, making them more sensitive to perceived attacks or criticisms from others.

The increased deservedness suggests that women may also feel that perceived attacks have occurred because of something bad about themselves. In western, and many other cultures, menstruation is often related to feeling ashamed or of being dirty (Lee 1994; Johnston-Robledo et al. 2006). This shame may partly explain why there is a greater sense that persecution is deserved during the paramenstrual phase.

Persecution, deservedness and self-esteem

At both phases, increased deservedness was associated with increased depression. This finding corresponds with previous research about the concept of deservedness (e.g. Chadwick et al. 2005). Both positive and negative self-esteem were related to levels of persecution and deservedness. This relationship was very similar at both phases indicating that, although levels of each variable may change, the relationships

between the variables remained stable, regardless of an external factor, cycle phase.

Bentall et al. (2001) propose that the "poor me" stance, that persecution is not deserved, is part of a defence intended to prevent the self being experienced as bad or flawed, thus protecting self-esteem. The results reported here indicate that deservedness had a different relationship with positive than negative self-esteem. A fairly strong negative relationship was found where increased persecution was related to decreased positive self-esteem. Deservedness did not significantly change this relationship. The investigation of negative self-esteem demonstrated a different pattern. As persecution increased, so did negative self-esteem. However, deservedness moderated this relationship, in that increased deservedness intensified the relationship between persecution and negative self-esteem. This would suggest that while levels of persecution are related to both positive and negative self-esteem, the impact of deservedness was only an important factor for negative self-esteem.

Blake (1995) proposes a cognitive model for PMS. She suggests that some women hold preconceptions that the paramenstrual phase is a time of increased difficulty in functioning. If one of these women is experiencing other psychosocial stressors then noticing a physiological change that she associates with menstruation may be interpreted as threatening because it represents an indicator that functioning will become more difficult. As a result she begins to feel anxious and depressed. Blake suggests that two different responses occur, which are part of vicious circles of negative thinking. The first is that, feeling anxious and depressed, a woman may become more sensitive, leading to resentment and anger in response to demands or criticisms from others. This leads to irritable outbursts and reinforces the belief that the paramenstrual phase is a period of interpersonal difficulty. When considering the types of paranoia proposed by Trower and Chadwick (1995), this response pattern could fit with a poor-me presentation, where negative events are attributed to the other who is perceived as bad and persecuting the self unjustly. The other cycle Blake describes is characterised by the woman feeling guilty and self-critical about feeling less able to cope, leading to further low mood. This response would seem to fit with the bad-me presentation, where the feeling of persecution is felt to be deserved.

The cognitive therapy for PMS developed by Blake focuses on giving a woman the ability to cope with the paramenstrual phase, by understanding her perceptions and reducing feelings of distress. Paranoid thinking styles represent particular perceptions of interactions. It would therefore seem important to incorporate attention to paranoid thinking styles within models for understanding menstrual cycle related symptoms. In particular focusing on modification of perceptions of deservedness might protect against negative self-esteem. However, it might be necessary to guard against an increase in poor-me perceptions and any consequent increase in irritation with others.

Anxiety and depression have been the main focus of research into emotional changes over the menstrual cycle. However a key element of menstrual cycle related distress is interpersonal sensitivity. Consideration of paranoia and deservedness and how these relate to self-esteem is potentially a novel way of considering the underlying mechanisms of what is one of the most debilitating aspects of menstrual cycle related emotional distress. It therefore warrants further consideration.

One of the limitations of this study was that as an online study the participants' cycle phase could not be hormonally verified. Further, it was conducted over only one menstrual cycle. It is generally accepted that menstrual cycle research should be conducted over a period of two cycles, to account for idiosyncrasies (Haywood et al. 2009). However, it is likely that women who committed themselves to such an extended period would be particularly interested in menstrual cycle research, and could thus skew the sample. However, participants were aware of the study purpose, and it is probable that many were interested in mood changes or menstruation (Slade 1984), and therefore the results could have been influenced by participants' expectations. The issue of generalisability also arises because the sample was a primarily UK population, recruited over the internet and because over half was recruited through educational establishments.

In conclusion, this study adds to the body of literature linking mental health to the menstrual cycle. The results indicate that the paramenstrual phase is a time when some women are vulnerable to feelings of persecution, low positive and high negative self-esteem. A greater proportion of the women who experienced persecution felt that it was deserved at the paramenstrual phase.

The results supported the theory that increased deservedness would be related to increased negative self-esteem, although the converse relationship was not found with positive self-esteem. The relationships between the variables were consistent across different cycle phases even though the levels of individual variables changed.

The findings have implications for treatment approaches for women with menstruation-related difficulties and for women prone to paranoid thinking. Furthermore, the study of self-esteem, persecution and deservedness contributes a new way of understanding some of the interpersonal difficulties that women may experience at the paramenstrual phase.

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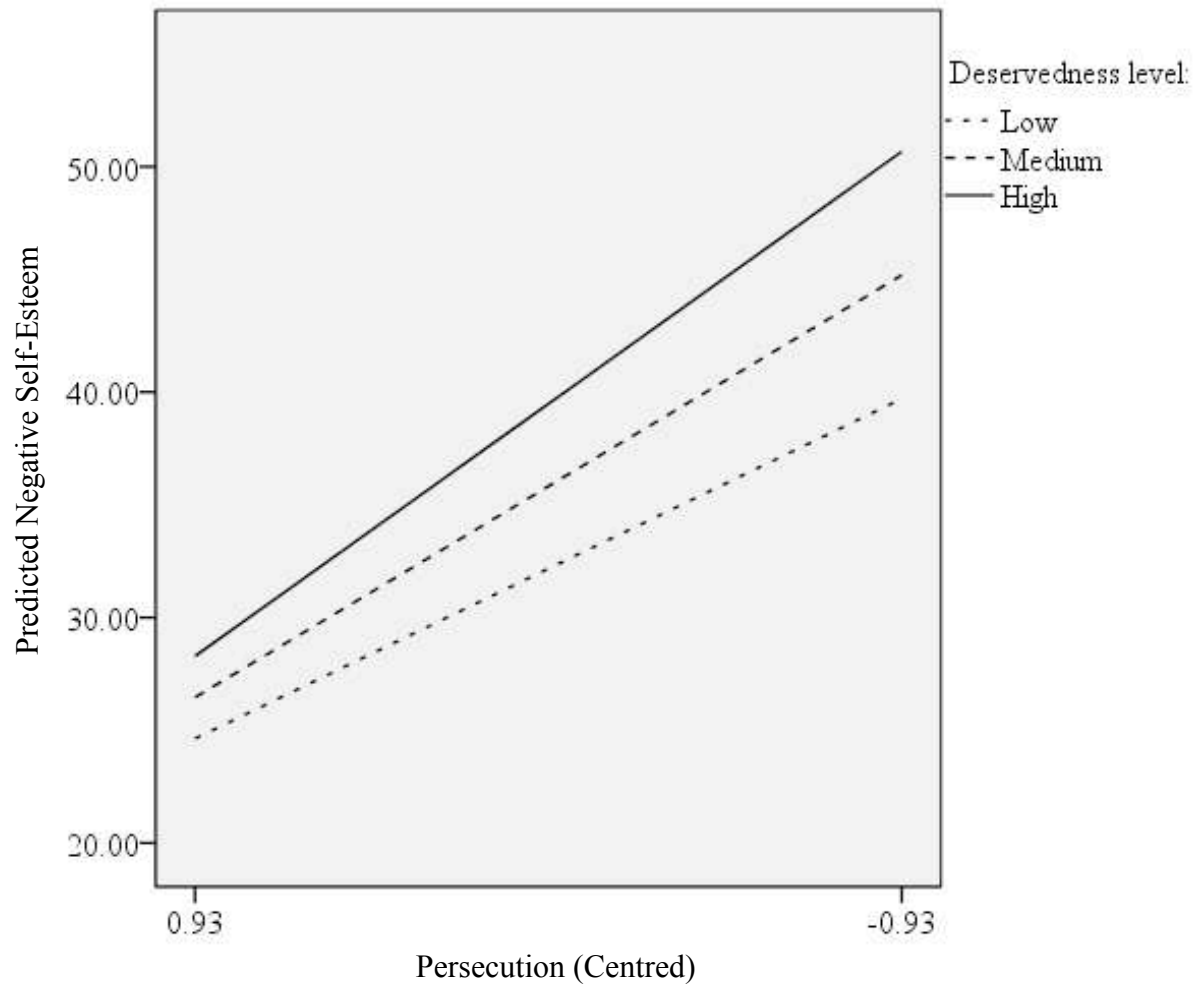
Figure 1. Paramenstrual phase: Moderating effect of deservedness on the relationship between persecution and negative self-esteem
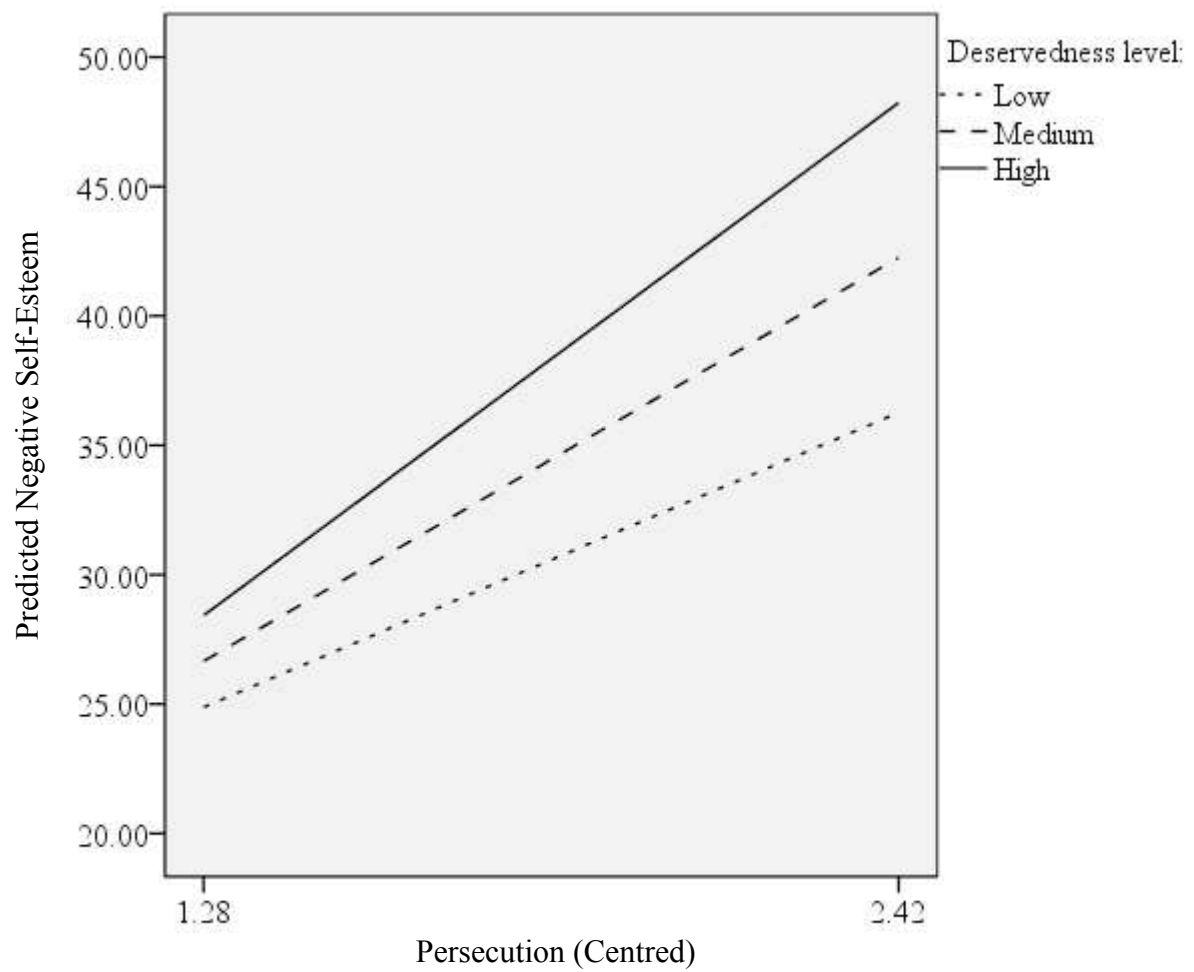
Figure 2. Mid-cycle phase: Moderating effect of deservedness on the relationship between persecution and negative self-esteem