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An Investigation into the Relationships between Paranoia, Self-esteem and the Menstrual Cycle

LITERATURE REVIEW AND RESEARCH REPORT

Submitted by

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July 2011

Thesis submitted for the degree of Doctor of Clinical Psychology,
To the Department of Clinical Psychology, University of Sheffield

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Declaration

This work has not been submitted for any other degree or to any other institution.

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Abstract

There is some evidence that psychotic symptoms are exacerbated in the days before and during menstruation. Paranoia is frequently reported in psychosis, and is a common experience for non-clinical populations. A review of the literature regarding paranoia and the menstrual cycle is presented, finding evidence that paranoid experiences increase around menstruation for women diagnosed with schizophrenia, episodic psychosis or premenstrual syndrome. This literature is limited in quality and quantity, and predominantly psychiatric.

Some general psychological theories of paranoia have investigated the role of self-esteem, with inconsistent findings. The evidence regarding menstruation-related fluctuations in self-esteem is also contradictory. Therefore, the research report aimed to extend the literature by investigating whether menstrual cycle phase was associated with fluctuations in feelings of persecution and self-esteem in a non-clinical population. Further, these variables were considered within the psychological theory that self-esteem would be lower if perceived persecution was felt to be deserved.

The results showed that in the three days before and after menses onset persecution and negative self-esteem was higher compared to mid-cycle, while positive self-esteem was lower. At both phases, increased persecution was related to increased negative self-esteem and decreased positive self-esteem. Deservedness intensified the relationship that persecution had with negative but not positive self-esteem.

These findings could inform treatment approaches for women who experience menstruation-related difficulties and also those vulnerable to paranoid thinking styles.

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**DOES THE MENSTRUAL CYCLE HAVE AN IMPACT ON
PARANOID THINKING? A REVIEW OF THE LITERATURE**

DOES THE MENSTRUAL CYCLE HAVE AN IMPACT ON PARANOID THINKING? A REVIEW OF THE LITERATURE

Abstract

Background. Possible connections between mental health and the menstrual cycle have been investigated for over a hundred years. Some research suggests that there may be a connection between the menstrual cycle and psychotic symptoms. Paranoia is a common psychotic symptom found in both clinical and non-clinical populations. The aim of this paper was to review the literature, specifically investigating links between paranoia and the menstrual cycle.

Method. Literature published in English between 1960 and 2010 is reviewed. Eight empirical studies and 24 case reports were identified and critically reviewed. The findings of both sources were considered together.

Findings. Paranoia has not been well researched within the context of the menstrual cycle. The majority of literature was written from a psychiatric perspective and predominantly biological theories were presented. Due to the limited nature of the research, the conclusions of this review are tentative. However, there was an indication that paranoid experiences increased in the premenstrual and menstrual phases within women diagnosed with schizophrenia, episodic psychosis and premenstrual syndrome.

Implications. The premenstrual and menstrual phase may represent a time of increased vulnerability to paranoid thinking for some women. More systematic research is needed to verify the findings, and to explore perspectives other than biological explanations.

Introduction

The menstrual cycle is a normal part of a woman's reproductive life. However, for some women, the menstrual cycle has a prominent impact on their psychological well-being. As a result its effect on mental health has been studied for over a hundred years (Brockington, 2005). This paper is specifically interested in whether and how paranoid experiences are affected by menstrual cycle phase.

The menstrual cycle typically follows a twenty eight day pattern. Conventionally, the first day of menstruation is counted as day one, with menses usually lasting four to six days. This first part of the cycle is termed the follicular phase and is characterised by low levels of progesterone and estradiol (the predominant form of oestrogen in humans). The follicular phase continues until ovulation (around day 14) with oestrogen levels rising rapidly in the late follicular phase and peaking the day before ovulation. The luteal phase commences after ovulation and is characterised by a steady rise in progesterone, peaking at the mid-luteal phase (typically day 21). Estradiol and progesterone levels both decline through the late luteal phase until menstruation (Farage, Osborn and MacLean, 2008). Figure 1 illustrates these phases. One of the complications of the literature related to menstruation is that authors use the same terminology to define different time periods. However, the three days before menstruation is frequently termed the premenstrual phase, and the three days before and including menses is generally termed the paramenstrual phase.

Much research supports the importance of examining the impact of the reproductive

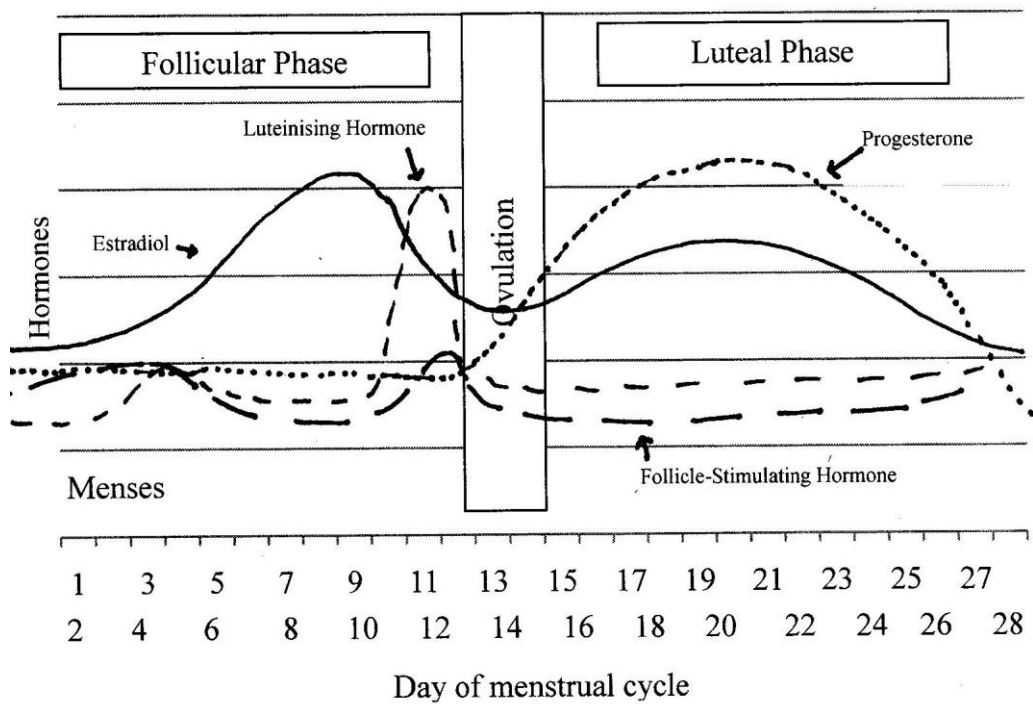


Figure 1. Hormonal fluctuations across the menstrual cycle¹

cycle on mental well-being. For example, Saunders and Hawton's (2006) meta-review demonstrated a positive relationship between non-fatal suicidal behaviour and the low oestrogen phases of the menstrual cycle. Targum, Caputo and Ball (1991) found that 47% of female psychiatric admissions occurred during the four to five days before and during menses. Further, it has been estimated that 95% of women have recurrent and noticeable increases in negative emotion related to menstruation (Farage et al., 2008). Accordingly, research into this topic has been extensive, ranging from the investigation of purely physical symptoms, to mood, cognitive functioning, and mating behaviour (Farage et al., 2008; Gangestad, Thornhill and Garver-Apgar, 2005). However, many of the findings have been inconsistent and cyclical psychological changes are not a routine part of clinical assessments.

¹ Adapted from Wikipedia and Wikimedia Commons image from the user Chris 73, freely available at <http://commons.wikimedia.org/wiki/Image:MenstrualCycle.png> under the creative commons cc-by-sa 2.5 license

Premenstrual syndrome (PMS) is the best researched presentation of menstrual difficulty (Stanton, Lobel, Sears and DeLuca, 2002). PMS is characterised by specific physical and affective symptoms which appear in apparent synchronicity with hormone fluctuations. The most common symptoms include irritability, hostility, and depressed mood; breast pain, bloating, abdominal pain and headaches (Stanton et al., 2002). Due to the affective components of PMS, feelings of depression and anxiety are well researched in relation to the menstrual cycle.

Psychosis is a condition that changes the way a person thinks, feels and behaves and which is often characterised by difficulty distinguishing between reality and imagination (NHS Choices, 2010). For over one hundred years there have been reports in the literature of a relationship between menstrual cycle phase and psychosis (Brockington, 2005). For example, Brockington (2005) reviewed over two hundred years of international literature, identifying 27 statistically reliable cases and 200 possible cases of a relationship between the menstrual cycle and psychotic episodes. Further, Bergemann et al. (2002) have found increased psychiatric hospitalisation during the paramenstrual phase in women with schizophrenia. It has been suggested that cyclical changes in psychotic symptoms might represent an extreme form of PMS, a theory however that Severino and Yonkers (1993) were unable to find sufficient evidence in the literature to support. Other researchers have investigated the hypothesis that oestrogen may have a protective function against schizophrenia (Riecher-Rossler, 2002). However, at present the evidence is inconclusive, and the mechanism is likely to be complicated and multi-faceted (Kulkarni, 2009).

As a common symptom of psychotic illness, paranoia has historically been 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. As such, paranoia has been conceptualised as a dimensional symptom present in major depression, bipolar disorder and the non-clinical population, occurring on a continuum from normal mistrust to the paranoid delusions found in the acutely unwell (Ellet, Lopes and Chadwick, 2003). There is some debate as to whether the difference between psychopathological symptoms and normal experience is qualitative or whether it is a matter of intensity, persistence and debilitating impact (Costello, 1994). However, its presence in milder forms may indicate a vulnerability to developing more severe symptoms.

Vulnerability-stress models propose that people have varying levels of vulnerability to developing mental health problems such as psychosis, and that it is the interaction between underlying predispositions and life stressors which leads to symptom expression (Zubin and Spring, 1977). As a result, one of the key components of psychological approaches (such as Cognitive Behavioural Therapy) to managing paranoia involves helping individuals recognise times and situations when they may be more vulnerable so that they can engage proactively in strategies to manage paranoid thoughts before they escalate and become problematic (Smith, Nathan, Juniper, Kingsep and Lim, 2003).

It has been suggested that for individuals who are predisposed to certain thinking styles or behaviours (such as those found in depression, anxiety, bipolar disorder and eating disorders), the perimenstrual phase represents a period of increased sensitivity to these

predispositions (Pinkerton, Gucio-Pabia & Taylor, 2010). Some research also indicates that some women find situations more stressful during the premenstrual phase than they would at other times (Burrage and Schomer, 1993). If certain cycle phases do increase a vulnerability to maladaptive thinking styles, then it is plausible that this vulnerability would extend to paranoia. If this is true, awareness of the impact of menstrual cycle phase might be an important consideration in relapse management for women prone to paranoid thinking. Further, conceptualising premenstrual symptoms in this way can be combined with theories, such as the oestrogen hypothesis mentioned above (Riecher-Rossler et al., 2002), to provide a more bio-psycho-social approach.

Aim

Therefore, the aim of this paper is to review the current literature to explore what is known about the relationship between the menstrual cycle and paranoid experiences.

Method

Inclusion/exclusion criteria

This paper reviewed literature published in English between 1960 and 2010. To be included, a paper had to specifically mention paranoid or persecutory thoughts or experiences within the context of the menstrual cycle. Papers were excluded where menstruation and paranoid experiences were each linked to another phenomenon, but not considered in relation to each other. Papers which included pre-menarche or post-menopause cases were also excluded.

Search strategy

As illustrated in Figure 2., an automated database search was conducted on 23rd January

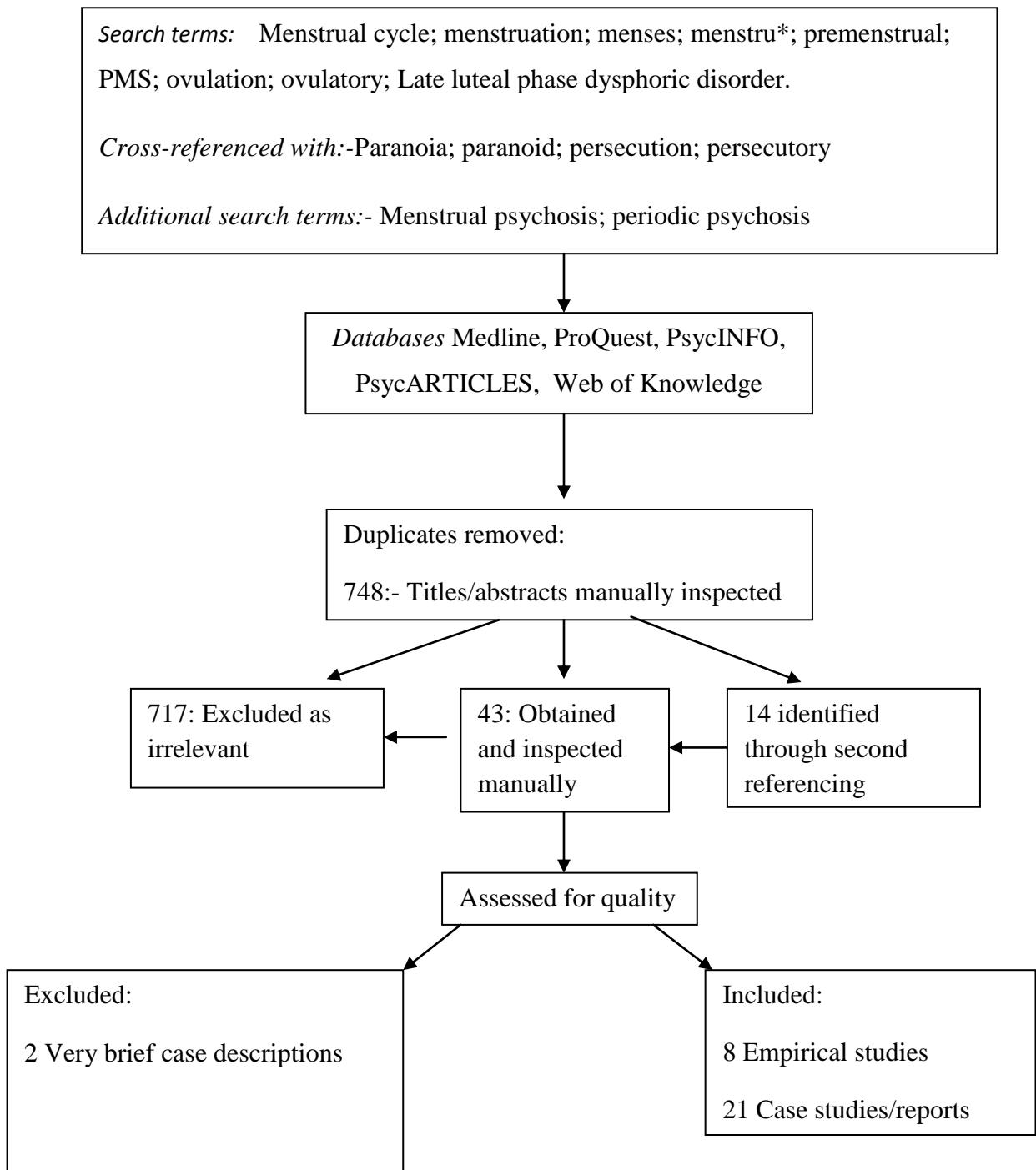


Figure 2. Search strategy of literature review

2011. A manual search was then conducted to ensure the inclusion criteria were met.

Where this process identified further papers of potential interest, these articles were also sought and included.

This procedure identified eight empirical studies and 21 case reports or case studies describing 24 cases.

Case study research is often considered to be the poorest level of evidence quality (Greenhalgh, 2006). Case studies have limited generalisability due to their small sample size. They are often criticised for having few quality controls, and for relying on clinical description rather than formal, systematic measures. Due to their limitations they are usually excluded from systematic literature reviews. However, some researchers argue that case study research has a number of strengths which make them an important component to theory development and the accumulation of knowledge (e.g. Eisenhardt, 1989; Jensen and Rogers, 2001; Hartley, 1994). Case studies typically draw on both quantitative and qualitative data collection techniques, providing rich sources of data regarding particular topics and unusual phenomena. This richness of data forms the basis of theory development, guides empirical research and informs practitioner understanding (Keen and Packman, 1995). Policy-makers and practitioners are becoming increasingly aware that quantitative meta-analyses can be limited in their ability to consider the clinical complexity of cases or capture rare phenomena (Lemmer, Grellier and Steven, 1999). As a result, some researchers have begun to develop ways of synthesising quantitative and qualitative research (Dixon-Wood, Agarwal, Jones, Young and Sutton, 2005).

Jensen and Rogers (2001) suggest that careful, systematic, meta-analysis can address some of the weaknesses of individual studies. Combining results from different researchers reduces bias and makes findings more generalisable while maintaining the rich data (Larsson, 1993).

It was therefore decided that for this review, case study research would not be excluded, but rather it would be evaluated using the methodical “cross-case analysis” approach described by Miles and Huberman (1994). This approach is designed to find patterns and differences within and between case-studies, which was appropriate given that the aim of this paper is exploratory as opposed to hypothesis testing. Although both case studies and case reports were included, for ease of reading, the term “case study” will be used from here on.

Theory development often begins with reports of individual cases, from which empirical studies evolve to test hypotheses. To reflect this process, the following sections are organised so that the findings from case studies are presented first, followed by the empirical studies.

Case study literature

Analysis of case studies

As cross-case analysis involves combining the data from numerous cases, a general critique of all of the case studies is presented first to provide a quality context within which to consider the results.

Case study quality. The quality of the case study literature was assessed using the criteria described by Lee, Mishna, and Brennenstuhl (2010) and the qualitative critical appraisal tool developed by The Critical Appraisal Skills Programme (Public Health

Resource Unit , 2006). These processes do not provide a score but rather consider external, internal and construct validity, as well as the reliability of findings, by examining design, data collection and analysis procedures.

The majority of the papers aimed to describe interesting cases, as opposed to test specific hypotheses, so were not pre-designed. This was reflected in the lack of standardised, systematic assessment. In fact, as can be seen from the summary of the case reports presented in Table 1, formal symptom measures were administered in only six of the papers. None of the papers specifically reported scores from measures of paranoid experiences. Therefore, all of the findings regarding paranoia are based on clinical description.

There were four studies designed to explore specific phenomena. Janowsky, Gorney and Mandell (1967) investigated hormonal fluctuations and emotional upset associated with the menstrual cycle. Despite being the oldest study, this was the most standardised report. Janowsky et al (1967) attempted to control confounding factors by limiting medication and maintaining their participant in hospital for the duration of the study. Results were triangulated using self-report, nurse and psychiatrist ratings. They were the only authors to conduct a statistical analysis, which was presented in the context of biochemical information and day of cycle.

Abe & Ohta (1995) conducted a longitudinal case series study of adolescents who had affective or psychotic episodes. Symptoms were assessed using clinical interview at repeated hospital admissions. Endo, Daiguji, Asano, Yamashita and Takahashi (1978) conducted physiological tests to explore brain and hormonal functioning which they

thought might underlie episodic psychosis associated with the menstrual cycle.

Psychotic symptoms were described by clinical description. Hsiao and Liu (2007) reported unusual manifestations of premenstrual syndrome (one experienced persecutory delusions) using formal measures to assess inclusion/exclusion criteria, and treatment outcomes. However, these were not aimed at measuring paranoia.

The Brief Psychiatric Rating Scale (BPRS, Overall and Gorham, 1962) was used by two studies (Levitte, 1997; Stein et al., 1993). However, it was not administered or reported in a systematic way. Glick and Stewart (1980) assessed their participants daily using the Global Assessment Scale (GAS; Luborsky, 1962) and reported results graphically.

The remaining papers were even less rigorous. Six reached the conclusion that symptoms and the menstrual cycle were linked from the coincidence of hospital admission and menstruation. The others relied on clinical observations, although several at least referred to standardised criteria from the Diagnostic and Statistical Manual of Mental Disorders third or fourth edition (DSM-III or DSM-IV), or the International Classification of Diseases (ICD-10).

Combining findings from multiple researchers and settings inevitably introduces a number of uncontrolled variables such as nurse interventions or family support. In terms of generalisability, all cases were identified opportunistically through hospital admission and therefore represent the extreme end of the spectrum. However, combined, generalisability is improved as the cases covered a range of backgrounds, levels of intelligence, educational and employment status and were set in a number of countries.

Table 1

Summary of case reports

ID	Author	N	Age	Diagnosis if given	Physical assessment	Assessment	Timing of paranoid experiences		
							Onset	Remit	Between episodes
A	Altschule and Brem (1963)	1	13	Menstrual psychosis	Medical exam : Normal	Hospital admission	At menstruation	After Nine days	Complete remission
B	Janowsky, Gorney and Mandell (1967)	1	24	PMS	Biochemical analysis: atypical progesterone, hydroxy-corticosteroid	Formal, systematic, statistical assessment: Self-report, Nurse report, BPRS, MMPI, Shipley-Harford psychological tests.	At ovulation and mid-luteal phase		Complete remission
C	Endo, Daiguji,	3	C)15	Menstrual psychosis	C) EEG: High voltage, slow wave burst D) none reported E) EEG – atypical spike wave complex	Clinical interview, graphical presentation	C) Menses onset	C) menses end	Complete remission
D	Asano,	of	D)13				D) Premenstrual phase	D) menses onset	
E	Yamashita and Takahashi (1978)	7	E) 23				E) before and after menstruation	E) Not specified	

F	Felthous, Robinson, Conroy (1980)	1	21	Menstrual psychosis	Physical, neurologic, serum, EEG and echoencephalogram: Normal	Clinical description	Menses onset	After seven days	Complete remission
G	Glick and Stewart (1980)	1	18	Schizophrenia		Daily: GAS, graphical analysis	Exacerbation in premenstrual phase	At menses	Reduced
H	Berlin, Bergey and Money (1982)	1	15	Menstrual psychosis	hormone levels: elevated prolactin levels, low FSH and LH, elevated androstenedione	Clinical description	Premenstrual phase (estradiol: progesterone peak)	After menses end	Complete remission
I	Dennerstein, Judd, & Davies. (1983)	1	26	Depression		Hospital admission	Just before menstruation		Complete remission
J	Conrad & Hamilton (1985)	1	16	Bipolar disorder with psychotic features	Blood tests: Symptoms worse when lithium concentration falls	Clinical description	Exacerbation of psychotic features premenstrually.	Two days after menses onset	Continue at reduced intensity
K	Gerada and Reveley (1988)	1	34	Menstrual psychosis	Hypoglycaemia premenstrually hormone level, EEG, blood tests: normal	Hospital admission	Four to six days prior to menses	Subside at menses onset, total remit at menses end	Complete remission

L	Labbate, Shearer & Waldrep (1991)	1	35	Premenstrual psychosis	Brain electrical activity mapping : right temporal-occipital abnormality	Clinical description	Ten days prior to menses	Menses onset	Complete remission
M	Lovestone (1992)	1	21	Menstrual psychosis	Blink rate increased when psychotic. Physical exam normal.	Clinical description, counting blinks	one or two days prior to menses	Three to five days later	Complete remission
N	Schenck, Mandell and Lewis (1992)	1	26	Depression	Physical exam, blood chemistry and urinalysis, thyroid hormone levels: normal	DSM-III-R	Premenstrual	Two to three days after menses onset.	Complete remission
O	Stein, Hanulkoglu, Blank and Elizur (1993)	1	35	Menstrual psychosis	Physical, gynaecological, EEG and endocrine measurements returned normal	BPRS, Moos Distress Questionnaire, Mini Mental State Exam	48-72 hours prior to menses	24-48 hours after menses	Complete remission
P Q	Abe and Ohta (1995)	2 of 11	P)12 Q)12	Recurrent depressive disorder with psychotic features		Hospital admission ICD-10	P) Just after menses Q) Premenstrual phase	Q) for ten to seventeen days	Complete remission
R	Korhonen, Saarijarvi, and Aito. (1995)	1	48	Schizo affective psychosis	Endocrine tests normal twice Day 2: low estradiol	DSM-III-R	Two weeks before menses	Menses onset	Unclear

S	Levitte (1997)	1	37	Chronic Paranoid Schizophrenia		BPRS	Exacerbation 6 days prior to menses	Two days after menses	Reduced
T	Shah et al. (2003)	1	16	Menstrual psychosis	Physical, neurological and neuro-cognitive tests normal. Low progesterone in follicular phase	Clinical description	Five days prior to menses,	two days after menses end	Complete remission
U	Hsiao and Liu (2007)	1	34	Bipolar disorder		ICD-10 Neuropsychiatric Interview, Prospective Impact and Severity of Menstrual Symptoms, Clinical Global Impressions Scale	One week prior to menses	After Three to four days	Complete remission
V	Andreou, Syngelakis, and Karavatos (2008)	1	21	Menstrual psychosis	MRI, EEG : Normal Polycystic ovaries, elevated testosterone and Lutenising: Follicle-stimulating hormones, Mild hyperprolactinemia	Clinical description	Premenstrual phase	At menses	Almost complete remission

W	Sadurni, Rodie, de Montagut and Autet (2009)	1	30	Menstrual psychosis		Hospital admission	Three to five days before menses	Two to six days later	Complete remission
X	Ellison-Wright and O'Keane (2010)	1	14	Menstrual psychosis	hormone levels, EEG and MRI: Normal	Hospital admission	Three days before menses	seven to ten days after menses onset	Complete remission

In summary, this body of literature has numerous scientific limitations. The most significant is the lack of formal, controlled measurement and analysis which limits the credibility of observations, introduces subjectivity, and threatens the construct validity of “paranoia”. This review will attempt to report only the more reliable data. However, the findings below are presented tentatively, and cannot be considered to be conclusive.

Cross-case analysis. Following Miles & Huberman’s (1994) approach, a summary of each case was developed. The summary identified the units of information in each report which were then coded. Analytic categories of codes were clustered together within “variables”. For example, the variable “timing of onset” of paranoid symptoms was developed from the cluster of category codes including “two days before menstruation” or “at menses”. Initially a meta-matrix was produced including 33 variables with up to 34 categories.

The meta-matrix was refined in response to the quality of the data and the relationships of interest. Some variables were excluded, others were clustered together. Twelve relevant and common variables were identified and used to transform descriptive data from each case into a standardised format. Using these variables, cross-case analysis was conducted by clustering cases by variable or category to see whether patterns emerged.

Results of Case Studies

Mental health. Fourteen of the studies described episodic presentation of paranoid experiences, along with various other psychotic symptoms, which remitted between

episodes. All 14 corresponded to the description by Brockington (2005) of “Menstrual Psychosis” which has the following characteristics: a) acute onset against a background of normality, b) of brief duration with full recovery between episodes, c) psychotic features, d) occurring in rhythm with the menstrual cycle. Although Brockington reports that menstrual psychosis has been described in the literature since the eighteenth century it is not a disorder generally recognised or included in the DSM-IV. Janowsky et al. (1967) described their patient as having an extreme case of PMS. The other studies used the terms “episodic” or “menstrual” psychosis.

The remaining cases consisted of women who had existing mental health problems, for whom paranoia was exacerbated close to menstruation. Two women had a diagnosis of schizophrenia, and one a diagnosis of schizoaffective psychosis. Four women had a diagnosis of depression. For two, depression onset followed child birth. The other two were adolescents, for whom paranoid thoughts presented with primarily depressive symptoms, remitting completely between episodes. However, in the same study there were two other adolescents who experienced episodic paranoid thoughts, but for whom the timing of paranoia did not coincide with the menstrual cycle, illustrating that episodic psychosis in females is not necessarily associated with menstruation. Two women had received a diagnosis of bipolar disorder, (one of whom was two weeks post-partum at illness onset).

Diagnostic decisions were discussed at length as authors had difficulty in whether and how to distinguish the cases from other atypical or episodic psychoses (e.g. Gerada and Reveley, 1988) or extreme PMS (Dennerstein, Judd & Davies, 1983).

Co-morbid symptoms. Paranoid experiences coincided with other symptoms in all cases. A large range of symptoms were reported, with delusions, hallucinations and sleep disturbances being the most common. Suicidal thoughts were reported in nine cases and the only suicide attempts reported (two) occurred during the menstrual phase. Premenstrual paranoia, irritability and “PMS” (which is assumed to mean typical affective and physical symptoms) were the most common symptoms to endure once psychotic symptoms were controlled with medication. There was no information about whether any of the women had previously displayed paranoid thinking styles.

Timing. Some studies did not provide exact timing of when paranoid experiences occurred. However, Figure 3 illustrates the approximate timing of paranoid experiences, predominantly starting in the days prior to menses and remitting at menses onset or menses end. There is considerable variation in the duration of symptoms, with a range of three to fifteen days and a mean duration of 6 days. For ten women, paranoid, or other psychotic experiences did not occur at every cycle.

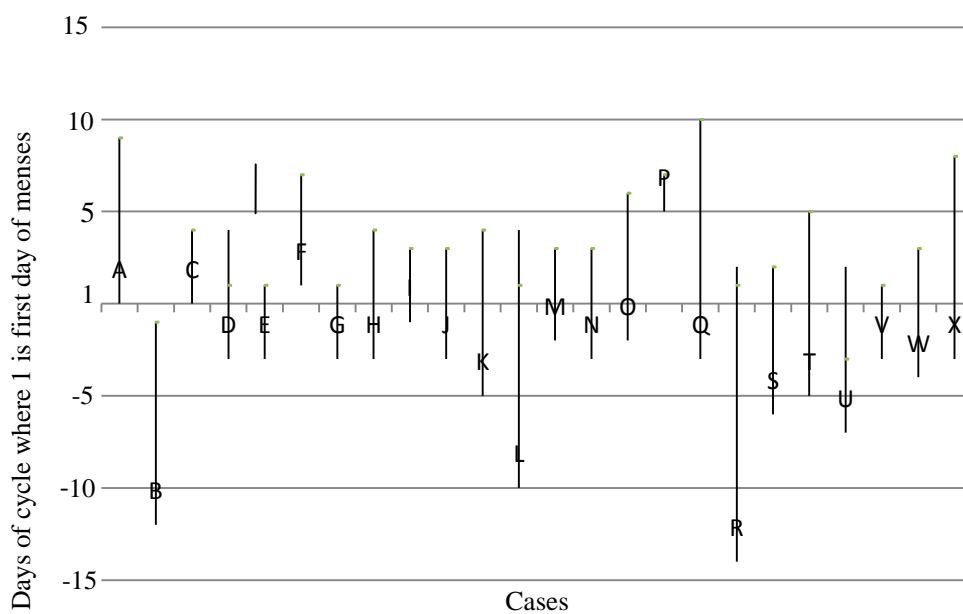


Figure 3. Timing of paranoid experiences

Age. The sample age range was 12 to 47, which coincides with the usual age range of menstruation. There was a slight bias towards younger participants, and the mean age was 23 (see Figure 4). Only two women were over 35. This might indicate that the hormonal imbalances found in adolescence are a factor in these cases.

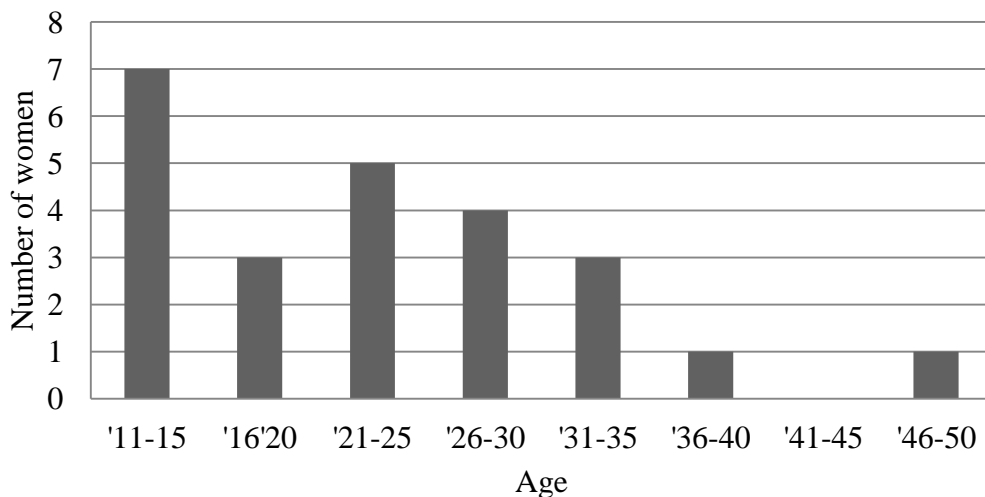


Figure 4. Distribution of age of cases

Predisposing factors. Predisposing factors were generally not well discussed. Family histories of psychiatric illness were reported in three cases. Five women had mothers who suffered with PMS. Fourteen women had pre-existing psychiatric difficulties, and five had previously reported symptoms consistent with PMS. Five of the women had had disrupted childhoods, including adoption (1), behavioural difficulties (3) and abusive parents (2).

Explanations proposed. All of the studies were written from a psychiatric perspective, which was apparent in the theoretical discussions which were dominated by biological processes. One case was attributed to catamenial epilepsy (Labbate, Shearer &

Waldrep, 1991); Endo et al. (1978) proposed an interaction between monoamine metabolism, psychological factors and central nervous system activity and Lovestone (1995) proposed an interaction between falls in oestrogen and dopamine receptors. The information regarding physical explanations was inconsistent. Ten cases were investigated for brain abnormalities, yet only three displayed any irregularity. Several authors drew on the success of hormonal treatments which successfully stabilised five women, and were successful in conjunction with other medications for four more. Hormonal theories were also supported by Janowsky et al. (1967) who found evidence of a correlation between oestrogen levels and behavioural disturbance. Further, six women had hormonal imbalances, another was diagnosed with poly cystic ovary syndrome (PCOS) and three developed symptoms post-partum. However, the pattern of hormonal irregularities and timing of symptoms was not consistent and hormonal therapy did not result in improvements for five women.

Psychological theories were generally not considered. The exceptions were Janowsky et al. (1967) and Shah et al. (2003) who drew on psychodynamic theory suggesting that menstrual psychosis may represent an interaction between etiological factors and “ego destruction”. More modern or bio-psycho-social models were not considered.

Summary

In summary, all of these cases reported fluctuations in paranoid experiences in time with menstrual cycle phase. For some women, paranoid experiences presented as part of exacerbation of an existing mental health problem. For others, symptoms presented against a background of good mental health. Although paranoid experiences generally

presented in the days before and during menstruation, there was significant variation in the timing and duration of symptoms which poses a question for hormonal explanations.

The sample size was very small and the case studies were not scientifically rigorous.

Therefore, the next step was to compare the results with those of the empirical studies.

Empirical Studies

Nine empirical studies were identified which compared symptoms at different points of the menstrual cycle (summarised in Table 2). However, none of the studies focussed on paranoia, rather measures of paranoia have been included as part of more general, and different aims. As a result, and in reference to the discussion of quality assessment presented by Juni, Altman and Egger (2001), it was decided that the most appropriate quality assessment procedure would be to employ the tool for assessing cohort studies developed by the Critical Appraisal Skills Programme (Public Health Resource Unit, 2004). The assessments of quality will therefore be incorporated into the discussion of the papers below.

In-patients diagnosed with Schizophrenia

Riecher-Rossler, Hafner, Stumbaum, Maurer, Schmidt (1994), So-Hyun, Sang-Bum and Sook-Haeng (2001) and Bergemann, Parzer, Runnebaum, Resch and Mundt (2007) were all interested in the theory that oestrogen may act as a protective factor against schizophrenia. They investigated whether women who had been diagnosed with schizophrenia experienced exacerbation of psychotic symptoms during the late luteal phase of the menstrual cycle, when estradiol levels were low.

Table 2.

Summary of Empirical Studies

Population/focus	Author	N	Controls	Measures	Administered	Results
In-patients diagnosed with schizophrenia	Bergemann, Parzer, Runnebaum, Resch and Mundt (2007)	125		Positive and Negative Syndrome Scale BPRS Reproductive hormones	Days 2-4, 10-12 and 20-22	Paranoia: Decrease from day 10-12 to 20-22., and days 1-2 to 10-12. Improvement in psychotic, not depressive symptoms in luteal phase. Generally low estradiol levels
	So-Hyun, Sang-Bum and Sook-Haeng (2001)	24		BPRS Daily Rating Form Esotrogen and progesterone	Daily for 1 cycle 5-7 days pre- and post menses.	BPRS Total score: Higher premenstrually, lowest in postmenstrual phase. Paranoia: not significant No significant correlation between BPRS and estrogen.
	Riecher-Rossler, Hafner, Stumbaum, Maurer, Schmidt (1994)	32		BPRS, BFS, Nurses Observation Scale for In-patient Evaluation, Paranoia Depression Scale, Estradiol, progesterone,	Day of admission, days 2, 7, 13, 14, 21 and 28 of cycle.	26 had hyperprolactinemia Estradiol low normal range Symptomatology improves as estradiol rises, strong effect for psychotic symptoms, including paranoia.

Premenstrual Magnification of Major Depression	Miller, Miller, Chinouth, Coyle and Brown (2002)	3	Within-subjects ABA design	SCL-90 BDI	Follicular and luteal phase for three months when nefazadone was administered and three months when it was not	Statistically significant reduction in paranoia during both phases when nefazadone was administered. No difference between phases.
Non-clinical administered oral contraceptive	Paoletti al. (2004)	10 (OC)	12	SCL-90	Follicular and luteal phase first cycle Luteal phase third cycle.	Paranoid ideation: no significant change between visits for control group or time 1 and 2 of OC group. Significant at third visit for OC group
Outpatient women with PMS/GAD	McLeod, Hoehn-Saric, Foster & Hipsley (1993)	41	21 GAD only 19 non-clinical	(HARS) (HSCL-90)	GAD/PMS premenstrual and follicular GAD and control at study entry.	Paranoia: GAD/PMS: more severe in premenstruum. Higher scores than control at both times. GAD only higher than controls. GAD no different to GAD/PMS at premenstruum, higher at follicular.

Women with PMS	Choung, Colligan, Coulam and Bergstralh (1988)	20	20	MMPI	Days 7 and 25 of menstrual cycle	Control group: no significant change. PMS group: Significant increase in paranoia at day 25. Identified two subgroups
	Palmer, Lambert and Richards (1991)	214		MMPI	Self perceived best and worst times of cycle	Paranoia increases in premenstruum (worst time) 3 subgroups

So-Hyun et al. (2001) did not find a significant relationship between BPRS scores and estradiol levels although they did find a significant change in total BPRS scores between the premenstrual and postmenstrual phases. However, the subscale measuring paranoia did not show significant change. Both Riecher-Rossler et al. (1994) and Bergemann et al. (2007) found significant relationships between paranoia (and other psychotic symptoms) and estradiol levels, in that when estradiol levels were lower, symptomology increased. Riecher-Rossler et al. (1994) found that the relationship was stronger for psychotic symptoms than affective symptoms, and that changes were more marked when changes in estradiol levels were more severe. Neither found a significant change in depression. Interpreting these findings is complicated slightly because Riecher-Rossler et al. (1994) did not explicitly say when the low estradiol phase is for their sample. However, they did discuss estradiol fluctuations in normal women, describing the three days before and during menses as the low estradiol phase. Bergemann et al. (2007) did provide exact timings. Symptoms were least at days 20-22 when estradiol was at its highest, and worst at days 2-4 when estradiol levels were lowest. Interestingly, they did not find a significant change in symptoms between days 2-4 and 10-12, despite there being a significant increase in estradiol.

Discrepancies between the studies may be explained by differences in the study designs. Riecher-Rossler et al. (1994) and So-Hyun et al. (2001) both reported small sample sizes of 34 and 24 respectively, which might make them vulnerable to the effects of just a few participants. Both Riecher-Rossler et al. (1994) and Bergemann et al. (2007) reported low levels of estradiol generally in their sample. Riecher-Rossler et al. (1994) also report that only six of their participants had a normal ovulation period. So-Hyun et al. (2001) do not compare the hormonal levels of their sample to a normal population, or

describe their recruitment strategy, making it difficult to identify whether the differences in results may be explained by different hormonal profiles in the samples.

Bergemann et al. (2007) employed a much larger sample size. However, the results were based on two samples from some participants and up to five by others. It is not clear how this was managed in the analysis. A strength of Reicher-Rossler et al.'s (1994) study was the use of triangulated measures from psychiatrists, nurses and participants. This included a paranoia self-report scale, which, as the only study to employ a paranoia-specific scale, lends some weight to their findings in regards to paranoia at least. So-Hyun et al. (2001) asked participants to complete a daily rating form of affective, behavioural and somatic symptoms. It is possible that this primed their participants to these symptoms but not psychotic ones.

All three studies employed strict inclusion and exclusion criteria to control for extraneous variables. However, this may have limited generalisability as participants with irregular cycles were excluded despite menstrual abnormalities being a common phenomenon in women with schizophrenia (Bergemann et al. 2007).

So-Hyun et al. (2001) suggested that their findings support the hypothesis that in women diagnosed with schizophrenia, the affective symptoms of PMS are being misinterpreted as exacerbation of psychotic symptoms. However, when considering the strengths and limitations of all three studies, it would seem that the other two studies are methodologically stronger. Reicher-Rossler et al. (1994) particularly support the theory that estradiol has a protective function in schizophrenia, and Bergemann et al. (2007)

particularly support the theory that symptoms are exacerbated at the paramenstrual phase for this population.

Women Diagnosed with Depression

One study looked at paranoia and the menstrual cycle within the context of depression. Miller, Miller, Chinouth, Coyle and Brown (2002) evaluated the effectiveness of Nefazadone, an antidepressant, compared to placebo, on premenstrual magnification of major depression (PMMD). Participants were three women who met DMS-IV criteria for major depression or dysthmic disorder. The results showed that when receiving Nefazadone there was a significant improvement in depression and paranoid ideation at both the luteal and follicular phases. The mean scores reported graphically by the authors did not show an obvious change in paranoia for either condition between the luteal and follicular phase. Reporting of exact scores and use of a single case series design would have improved the understanding of the results considerably. As a pilot study the sample size of three is much too small to generalise from, especially given the limited description of the recruitment procedure and sample. So although changes in paranoid experiences at different cycle phases were not apparent in this study the methodological limitations mean that the results cannot be considered to be conclusive.

Women with PMS

Three studies compared paranoia scores at different phases of the menstrual cycle in women diagnosed with PMS. Choung, Colligan, Coulam and Bergstralh (1988) used

the Minnesota Multiphasic Personality Inventory (MMPI; Dahlstrom, Welsh & Dahlstrom, 1972) to compare twenty women with PMS to twenty women without PMS at days 7 and 25 of the menstrual cycle. Palmer, Lambert and Richards (1991) also used the MMPI to compare scores at the self-perceived “best” and “worst” times of the menstrual cycle in 214 outpatients diagnosed with PMS. McLeod al. (1993) were interested in whether the scores on the Hopkins Symptom Checklist (HCL-90; Lipman, Covi and Shapiro, 1979) and the Hamilton Anxiety Rating Scale (HARS; Hamilton, 1959) would change over the menstrual cycle if a woman had PMS and generalised anxiety disorder (GAD).

All three studies found that women with PMS reported increased levels of paranoia during the premenstrual phase. Palmer al. (1991) identified three sub-groups within their sample, based on MMPI scores. Although they did not define these sub-types, they reported that paranoia scores were significantly higher during the premenstrual/ “worst time” for subtypes one and two. The size of change was reported for each subgroup, although a standardised effect size would have been useful. Subtype one, the largest subgroup, included women who demonstrated severe psychological maladjustment during the worst phase, whilst being normally adjusted at the “best time”. Subtype two displayed moderate change from the best to the worst time, and subtype three, the smallest sub-set, demonstrated significant change on only two of 15 subscales. Choung et al. (1988) also identified two subgroups within their sample of women who had PMS. Similar to Palmer et al.’s (1991) subtypes one and two, one of the subgroups demonstrated exacerbation of symptoms that were also present during the follicular phase while the other group demonstrated symptoms only at the luteal phase.

Choung et al. (1988) compared their PMS group to a control group and norms from 1983, finding that women with PMS had significantly more symptomology even at the follicular phase. The authors included details of score change sizes which was useful as it was comparable to those reported by Palmer et al. (1991). McLeod et al. (1993) did not investigate whether their PMS sample consisted of any subgroups. They took measurements at the follicular and luteal phase for women who had both PMS and GAD, and compared these within-subjects, as well as to scores administered regardless of phase from women with just GAD, and non-clinical controls. It was found that both the follicular and luteal paranoia scores of the GAD/PMS group were higher than the clinical controls. The GAD/PMS luteal scores were also more severe than the GAD only scores. However, the GAD group's scores were higher than the PMS/GAD group's follicular scores. The GAD group's scores could have been artificially inflated by higher premenstrual scores mixed with follicular phase scores, or by the PMS/GAD group scoring artificially lower during their follicular phase. The comparisons would have been clearer if all three groups had completed measures at both time points. McLeod et al. (1993) ensured that researchers were blind to menstrual phase. However, the other researchers did not. As the MMPI is administered by a professional, blind-rating would have been useful in reducing the risk of researcher bias.

The three studies were in agreement that paranoid experiences increase during the premenstrual phase in women with PMS. These results were consistent across different measures. Together the studies are able to compensate for each other's design flaws. For example, Choung et al. (1988) employed a small sample size which was bolstered by the findings of Palmer et al. (1991). Likewise, the allocation of best and worst time

described by Palmer et al. (1991) was not clear, and their results would have been much less robust without corresponding findings from another study.

Non-clinical populations

Paoletti et al. (2004) were the only authors to look exclusively at changes across the cycle in a non-clinical sample. They investigated whether an oral contraceptive could modify psychological symptoms in a non-clinical population. Twelve women were recruited to the control group, and ten to the experimental group. The SCL-90 was administered at the follicular and luteal phases of the first month. The experimental group then took the oral contraceptive for two months and both groups were measured at the luteal phase of the third month. Although no statistical test is reported, the authors state that there was no difference in scores between the first luteal and follicular measurements. In the experimental group, paranoid ideation, as well as anxiety and phobic anxiety, was significantly lower in the luteal phase after taking the oral contraceptive. Interestingly the profiles of the control and experimental groups before treatment are different, with the experimental group generally scoring more highly. The authors admit that no attempts at randomisation or blinding were attempted, which may have biased results.

On its own the small sample size of Paoletti et al.'s (2004) study limits the generalisability of the findings. This is especially true as the age range of participants was just 24 to 26 years of age, indicating a very specific sample. Choung et al. (1988) also found no variation in experiences of paranoia between phases in their non-clinical

control group. However, their sample was also small (twenty), and recruited from a specific population of medical staff, limiting the generalisability of their findings. Therefore, even combined, it is difficult to draw conclusive results about changes in paranoid experiences over the menstrual cycle in non-clinical populations.

Summary

These papers indicate that levels of paranoid experience increase in the paramenstrual phase in women who have a diagnosis of PMS or schizophrenia, although there is some inconsistency within the results for women with schizophrenia. There was not sufficient evidence regarding women who have been diagnosed with depression, or recruited from non-clinical populations from which to draw conclusions.

Discussion

Limitations

There are a number of limitations which mean that the findings of this review must be interpreted with caution. First of all, the quality of many of the papers was scientifically poor, which severely limits the conclusions that can be drawn. However, given that so many of the papers identified were case studies, excluding them would have meant ignoring a large part of the literature on this subject. Further, these papers do provide some context in which to place the larger studies, and consider their findings.

The second limitation of this review is that only papers that explicitly mentioned paranoia or delusions of persecution were included. Given the clinical description of

the case reports, it is possible that cases where paranoia might have been present may not have been identified due to the wording used. Empirical studies that used measures which include paranoia scales may also have been overlooked if the scale either was not significant or was not explicitly referred to, which could potentially bias the results. It is also true that the review does not account for or compare the many episodic psychoses that are not related to the menstrual cycle. It is possible that the timing of episodes was coincidentally linked to menstrual cycle phase, a hypothesis that has not been tested here.

Finally, this review only includes papers that were written in English. Brockington (2005) makes reference to studies of menstrual psychosis written in other languages which were not pursued for this review, and therefore the literature search is not complete.

Discussion of Findings

Despite these limitations, there was a suggestion that paranoid experiences increase in the days before and during menstruation for some women, and that there were two distinct patterns of presentation. One pattern is the exacerbation of pre-existing symptoms, while the other was the presentation of paranoia (and other symptoms) at the paramenstrual phase, but with complete recovery between menses. For women with schizophrenia, both the case studies and the research reports provided evidence of symptom exacerbation at the paramenstrual (or at least low estradiol) phase. The evidence regarding depression and bipolar disorder was much more limited. However, four women who experienced paranoia in concurrence with episodic or exacerbated

depressive symptoms were described. Two women with bipolar disorder also demonstrated a similar pattern of paranoia presentation. In the PMS literature two large studies identified one subgroup who demonstrated exacerbation of existing symptoms in the premenstruum. The other subgroup only demonstrated difficulty at the premenstrual phase. The women classified within the case study literature as having “menstrual psychosis” presented in the same, although more severe, way, which raises the question of whether they might represent a more extreme version of the same subgroup. It is interesting that the studies looking at non-clinical populations did not detect any fluctuations in paranoia levels. Given that paranoia is thought to exist on a spectrum with normal experience, it would not seem unreasonable to expect that both of the patterns mentioned might be observable in less extreme forms in non-clinical populations. The studies into non-clinical populations were both quite small and methodologically limited and would need further verification.

Theoretical Implications

Within the literature, the hypotheses regarding menstruation-related fluctuations in psychotic symptoms predominantly focus on hormonal components such as the oestrogen hypothesis discussed by Reicher-Rossler (1994) and Bergemann et al. (2007). The evidence supporting these theories was inconsistent. Compellingly, two empirical studies and one case study found a statistically significant relationship between estradiol levels and psychotic symptoms. Riecher-Rossler et al. (1994) and Bergemann et al. (2007) also found generally lowered levels of estradiol in their samples. Several of the case studies were adolescents, and three experienced symptom onset post-partum when their hormone levels were likely to be disrupted. However, although the case studies

were not well-controlled, many of them did report physical and hormonal testing, but the results did not present a unified profile of hormone imbalances. Further, responses to hormonal treatment were inconsistent. So, although low estradiol levels may make individuals more vulnerable to psychotic symptoms, the theory doesn't explain what other factors may be important, or explain why psychotic episodes did not necessarily occur every month.

Stress vulnerability models (Zubin & Spring, 1977) propose that individuals have varying levels of predisposed vulnerability, and it is the interaction of these vulnerabilities with other stressors that cause symptom presentation. Low estradiol levels may well represent an increased vulnerability. However, it is interesting that both McCleod et al. (1993) and Choung et al. (1988) reported that women with PMS had generally increased levels of distress. It may be that these women are already predisposed to experiencing distress. It is not clear whether menstrual cycle phase causes a change in sensitivity to stress, or whether it acts as a stressor itself (Sabin & Slade, 1999). Nevertheless, the stress-vulnerability perspective could account for the wide variation in symptom presentation as well as explaining why symptoms do not necessarily occur at every cycle or for every woman.

Clinical Implications

The literature indicated that women with PMS may have an increased predisposition to paranoid thinking styles, and that they are particularly susceptible to increased paranoid thinking in the premenstruum. Most treatment approaches to PMS concentrate on

affective or physiological fluctuations, and it may be that these programmes would benefit from including attention to paranoid thinking styles.

Increasing awareness of times of susceptibility to symptom increase is a common component of approaches developed to help people manage psychotic symptoms (Freeman, Freeman & Garety, 2006; Smith et al., 2003). Both Reicher-Rossler et al (1994) and Bergemann et al (2007) comment that their samples predominantly entered hospital during menstruation, and several of the case studies relied on psychiatric admission to link with menstrual timing. Therefore, for these women, attention to menstrual cycle phase could be of considerable importance. However, menstrual cycle phase is not necessarily a routine consideration for professionals working with people experiencing paranoia, possibly because it is a taboo subject. Another reason may be that of timing. Several authors referred to the variability in timing and the difficulty it causes in concluding that episodic symptoms are related to the menstrual cycle, or whether the timing is coincidental. It is likely that such variability would also contribute to clinicians missing possible associations. Educating clinicians about the potential timing variability and encouraging them to explore these issues idiosyncratically may be useful in identifying if and when the menstrual cycle is important. Susceptible women can then consider reducing stress at certain times in their cycle, and professionals can incorporate this issue into risk management plans. Smith et al. (2003) suggest further that by personalising assessments of stressors, people are better able to understand experiences such as paranoia, which in turn reduces the distress that is caused.

Future research

From the literature identified here, it appears that paranoid experiences have not been well researched in relation to the menstrual cycle. Therefore, further research focussing specifically on paranoia would be needed to verify whether levels of paranoia are different at different phases of the menstrual cycle.

A bias towards endocrine theories was noted in the literature. Some theories of PMS consider bio-psycho-social factors, but as yet they do not extend to paranoid (and possibly psychotic) experiences. Given that theories of mental health difficulties increasingly contain biological, psychological and social components it seems unlikely that fluctuations in symptoms such as paranoia will be explained purely by hormonal activity. A useful path for future research would be to combine theories from these different dimensions to develop more holistic understandings. Further, it would be useful to understand how feelings of paranoia at the paramenstrual phase might affect an individual and why such feelings might arise.

The generalisability of the literature is limited as it was primarily conducted with in-patients or women diagnosed with PMS. However, paranoid experiences are common in non-clinical populations as well as people who have bipolar disorder and major depression. The research into these populations was sparse. Paranoia is also thought to exist on a continuum with normal experiences. If paranoia and the menstrual cycle do indeed interact at the more extreme end of the spectrum, then investigating whether they also interact at the less extreme end could be useful for understanding both.

Conclusions

The research identified in this review is not of a quality or quantity to allow definitive conclusions to be drawn. However, there is certainly a suggestion that a relationship between the menstrual cycle and paranoid experiences may exist, and that this is most likely to present as an increase in paranoid experiences during the paramenstrual phase. The case study literature indicated that the timing and presentation of this increase varies considerably between individual women. This poses a challenge which clinicians and researchers in this field need to consider.

It appeared that women who experienced persecution associated with the menstrual cycle fell into two groups. The first group included women who experienced some distress throughout the cycle, which was exacerbated at the paramenstrual phase. The other group appeared to only demonstrate paranoid thinking, along with other symptoms, close to menstruation.

The predominant treatment approaches involved hormonal or antipsychotic medication, which reflected the predominantly medical model that these women had been considered within. Given the side-effects associated with such medication, and the contribution that psychology has made to treatment approaches for both persecutory delusions (Freeman, Bentall and Garety, 2008) and PMS (Connolly, 2001), it seems timely and necessary that further psychological research into this topic should be conducted.

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RESEARCH REPORT:
AN INVESTIGATION INTO THE RELATIONSHIPS BETWEEN PARANOIA,
SELF-ESTEEM AND THE MENSTRUAL CYCLE IN A NON-CLINICAL
POPULATION

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Abstract

Background. The literature suggests that paranoia and self-esteem may fluctuate in response to menstrual cycle phase. However, the evidence is limited and inconclusive. Therefore, this report aimed to contribute a large non-clinical study exploring self-esteem and paranoia across the menstrual cycle. Further, the study aimed to investigate whether psychological theory developed within the psychosis literature could be applied to menstruation-related fluctuations and help explain the contradictory findings regarding the relationships between paranoia, self-esteem and the menstrual cycle. Specifically, the focus was whether self-esteem is lower when a person believes that perceived persecution is deserved.

Method. An online questionnaire including measures of anxiety, depression, persecution, deservedness and self-esteem was completed by 278 participants. Responses were compared at the paramenstrual (three days before and after menses onset) and mid-cycle phase.

Results. At the paramenstrual phase anxiety, depression, persecution, and negative self-esteem were higher and positive self-esteem was lower than at mid-cycle. A greater proportion of people experienced persecution as deserved at the paramenstrual phase. Experiencing persecution as deserved was associated with increased depression and

negative self-esteem. Increased levels of deservedness significantly strengthened the correlation between persecution and negative but not positive self-esteem.

Implications. These findings suggest that the paramenstrual phase is a time of vulnerability to increased paranoid experiences and lowered self-esteem, and thus heightened interpersonal sensitivity. These results can inform approaches to managing psychotic and paramenstrual symptoms. Furthermore, the study illustrated that a model developed for psychosis could make a valuable contribution to understanding this aspect of menstruation-related distress.

1. Introduction

1.1 The Menstrual Cycle and Mental Health.

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, Telek, Juhasz, Lazary, Vargha and Bagdy, 2008). Typically, negative effects occur in the few days preceding and during menstruation. Since the 18th century, physicians have also recorded links between the menstrual cycle and psychotic experiences such as hallucinations, delusions and confused or disturbed thoughts (Brockington, 2005). This literature contains various clinical case reports of relationships between the menstrual cycle and periodic psychosis (for a review see Brockington, 2005; Mahe & Dumaine, 2001) as well as exacerbation of bipolar disorder (Hendrick, Altshuler and Burt, 1996), and the presentation of psychotic symptoms associated with major depression (e.g. Schenck, Mandell and Lewis, 1992). Case report and empirical studies also indicate an exacerbation of schizophrenic symptoms in the premenstrual and menstrual phases (e.g. Bergemann, Parzer, Runnebaum, Resch, and Mundt, 2007; Hsiao, Hsiao and Liu, 2004; Harris, 1997; Levitte, 1997).

There is much research that explores sub-clinical psychotic experiences and the concept that psychosis exists on a continuum with normal experiences (van Os, Linscott, Myin-Germeys, Delespaul and Krabbendam, 2008). Persecutory delusions (or paranoia, the feeling associated with persecutory delusions) are one of the most common types of delusion in psychotic patients and have been observed in people with schizophrenia,

bipolar disorder and major depression (Bentall, Corcoran, Howard, Blackwood and Kinderman, 2001). Paranoid thoughts are also relatively common in non-clinical populations (Freeman, 2007). Despite this, the majority of the literature cited at the beginning of this paper, focuses on menstrual exacerbation of psychotic symptoms at the clinical, and therefore more severe, end of the continuum. Further, although research investigating psychosis has moved increasingly towards symptom-led models (Bentall, 1990), very little research exists that directly explores whether paranoid experiences vary in response to the menstrual cycle. The purpose of this study is to explore whether there is an impact of menstrual-cycle phase at the non-clinical end of the paranoia spectrum, and if so, whether this phenomenon makes sense within a current psychological model of paranoia.

Much of the research investigating the menstrual cycle and psychiatric disturbances has focused on hormonal explanations. However, despite extensive research, a definitive aetiology has not been established (Clayton, 2008). Research into disorders such as premenstrual syndrome (PMS) has produced evidence that social, cultural (Bancroft and Backstrom, 1985) and cognitive factors (Reading, 1992) also have an impact on menstruation-related distress. As a result, these disorders are increasingly viewed as complicated and multi-factorial, and treatment approaches are developing to reflect this (Taylor, 1999; Blake, Salkovskis, Gath, Day & Garrod, 1998). It is generally accepted that the presentation of psychotic disorders also results from a combination of biological, social and psychological factors (e.g. Bentall et al. 2001). It seems likely then that if psychotic symptoms do vary with the menstrual cycle, then there would be some overlap between factors which affect menstruation-related difficulties and factors which affect psychotic symptoms. Therefore, theories relating to menstruation-related

fluctuations in psychotic symptoms are likely to benefit from incorporating ideas from both the psychosis literature and the menstruation literature.

However, at present, treatments for psychotic illnesses related to or exacerbated by the menstrual cycle are predominantly hormonal or pharmaceutical (Brockington, 2005; Bergemann et al. 2007) despite the increasing desire for treatment choice among service user groups (Sainsbury Centre for Mental Health, 2006). A potential path away from medically dominated models might be found by exploring psychological understandings of psychotic phenomena, such as paranoia, within the context of the menstrual cycle. Such exploration may also contribute to our understanding of how psychological processes may be involved in other menstruation-related difficulties.

1.2 Paranoia and Self-esteem

General theories of paranoia suggest an association with specific information processing biases including reasoning about the mental states of others, a tendency to jump to conclusions, and attribution biases (Bentall et al., 2001). There has also been much research into the link between self-esteem and paranoia. Bentall, Kinderman and Kaney (1994) suggest that individuals prone to paranoid thinking have a tendency to externalise attributions for negative events, thus reducing negative thoughts about the self and protecting self-esteem. However, this increases beliefs that others have malevolent intentions, resulting in the feeling of paranoia.

The research findings regarding the link between self-esteem and paranoia have been varied. 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). There is also some evidence that people who have been diagnosed with schizophrenia may paradoxically score highly on scales of both positive and negative self-esteem. Lecomte, Corbiere and Laisné (2006) suggest self-esteem is a complicated concept, neither being a static “trait” or a transient “state”. Therefore, measuring both positive and negative self-esteem can be useful for making sense of complicated or potentially contradictory self-esteem scores.

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 (their spontaneous, automatic or unconscious self-evaluations). For these individuals, certain cognitive biases, such as attribution styles, act as part of a dysfunctional defence system which fluctuates in its ability to protect against negative thoughts about the self.

Trower and Chadwick (1995) suggest that there are 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. The difference between these two types of paranoia then is strongly dependent on the extent of “deservedness” they experience. Bentall et al. (2001) propose that because negative events are attributed to others in poor-me paranoia, self-esteem is protected. Meanwhile, bad-me paranoia reflects a failure of this defensive process, negative events are attributed to the self, negative self-schemas are activated and the persecution is experienced as justified. If this theory is correct, it would be expected that when feelings of persecution are

accompanied by a feeling of “deservedness”, the relationship between persecution and self-esteem would be changed (moderated). Specifically, levels of self-esteem would become lower as the feeling of deservedness becomes stronger. Bad-me paranoia is therefore also more likely to be associated with depression than poor-me paranoia where persecution may be felt but self-esteem and affect are protected. Both types of paranoia are likely to be associated with increased anxiety (Freeman, 2007).

Recent research by Melo, Taylor and Bentall (2006) has provided evidence that people fluctuate between poor-me and bad-me paranoia, and that daily experiences can impact on these fluctuations. This idea has been supported by recent research identifying a high level of fluctuation in self-esteem levels in people from non-clinical populations who regularly experience paranoid thoughts (Thewissen, Bentall, Lecomte, van Os and Myin-Germeys, 2008). The current study is interested in whether the menstrual cycle might be a “daily experience” that might impact on these fluctuations, and that this impact might be related to fluctuations in self-esteem.

1.3 Self-esteem and the Menstrual Cycle

The literature regarding self-esteem and its fluctuation over the menstrual cycle is inconsistent. Edmonds, Cahoon, Steed, and Gardner (1995) for example, found that self-esteem was not related to the menstrual cycle in their sample of 68 college students. Bloch, Schmidt and Rubinow (1997) found that self-esteem was lower by at least 30% in the premenstrual phase as opposed to the seven days following menses for 30 out of 65 cycles for the sixteen women with PMS. Taylor (1999) reports finding lower self-esteem scores in the premenstrual period than post-menstruation in women with PMS. However, it has been found that women with PMS have generally lower self-esteem

scores than non-clinical controls (Morse, Dennerstein, Varnarides & Burrows, 1998). Thewissen, et al. (2008) found that low self-esteem was related to more instability in self-esteem generally, and therefore the self-esteem of women with PMS may fluctuate in a different pattern to other populations. A more recent study by Hill and Durante (2009) investigated a non-clinical population, 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). To explain their findings, Hill and Durante (2009) drew on research that indicates that some women are more likely to increase self-grooming and ornamentation around ovulation (Haselton, Mortezaie, Pillsworth, Bleske-Recheck and Frederick, 2007). Hill and Durante (2009) propose that the drop in self-esteem prompts women to put more effort into their appearance, thus making themselves more attractive to the opposite sex at the time when they are most likely to conceive. However, 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. Orth, Robins & Brent, 2008; Leary, Schreindorfer & Haupt, 1995) it would seem intuitive that this would also be when self-esteem is lowest.

Paranoia and low self-esteem both reflect oversensitivity to interactions with others. Increased interpersonal oversensitivity is commonly reported within the PMS literature (Pinkerton, Guico-Pabia, & Taylor 2010). It seems to make sense then that both self-esteem and paranoia might fluctuate in response to menstrual cycle phase. However, the inconsistent findings regarding self-esteem might be explained by Bentall et al.'s (2001) proposal that sometimes self-esteem is protected (as in poor-me paranoia), but sometimes it is not (as in bad-me paranoia).

1.4 Use of the internet

As mentioned above, this study focussed on non-clinical populations. Freeman et al. (2007) argue that non-clinical populations provide a larger sample, 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 an even greater sample. Internet-based studies have limitations, such as selection bias, the impact of technological factors outside the researcher’s control and issues of generalisability (Witmer, Colman, & Katzman, 1999). However, there is some evidence indicating that on-line participants are more willing to disclose self-relevant information (Buchanan, 2001), and Freeman et al. (2005) suggest that the internet provides a safe forum for participants to disclose paranoid thoughts. There is also evidence that more women than men participate in online psychological studies (Birnbaum, 2001) and, importantly for studies employing repeated measures designs, once a participant has entered an online-study it is likely to be fairly easy for them to access the internet again to complete subsequent sets of questionnaires. The internet also provides a fast medium for researchers to monitor responses and send reminders if necessary.

1.5 Aims

First of all the study aimed to examine the relationship that menstrual cycle phase has with self-esteem and paranoia to determine whether levels of self-esteem and paranoia fluctuate in relation to the menstrual cycle in a non-clinical sample. Specifically we will compare the paramenstrual phase, (defined as day 1 of the menstrual cycle plus or minus three days) with the mid-cycle phase (11 to 17 days before menses, around the

point of ovulation). Secondly, the study aimed to investigate whether these two phenomena are linked and, if so, whether this provides support for the hypothesis that paranoia acts as a defence for self-esteem. To investigate this proposal, the analysis considered the differences between people who feel persecution is deserved and those who do not. Then, the analysis considered whether feeling that the persecution is deserved changes the way that feelings of persecution impact on levels of self-esteem. As anxiety and depression are closely related to both self-esteem and paranoia, these variables were also investigated..

1.6 Hypotheses

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

Hypothesis 2: Levels of positive and negative self-esteem will fluctuate between the paramenstrual and mid-cycle phase.

Hypothesis 3:

- a) Increased levels of persecution will be associated with increased levels of anxiety.
- b) Increased levels of deservedness will be associated with increased levels of depression.

Hypothesis 4: 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.

Hypothesis 5: Changes in self-esteem during the menstrual cycle will be related to changes in persecution and deservedness.

2. Method

2.1 Design

The study employed a repeated-measures within subjects design. Measures were administered using an online questionnaire supported by SurveyMonkey.com.

2.1.1 Population Participants were recruited from a non-clinical population.

2.1.2 Recruitment Participants were recruited from the community using adverts placed on various websites and through women's organisations (see Appendix A).

An email containing the same information was sent out to the staff of Barnsley college, and notices advertising the study were placed on the University of Sheffield intranet, the Barnsley College intranet, the Sheffield College Facebook page, and the University of Hallam vacancy advertising site. Leaflets advertising the study were distributed to University of Sheffield students and the University of Sheffield International Women's Group. An email was also sent out to the University of Sheffield staff and student volunteers list alongside another study which used some of the same measures (see Appendix B). Potential participants were given the option of taking part in both studies or one or the other. If participants wanted to take part in both studies, they completed the other study first, and then followed a link to the present study which contained the formal measures employed by both.

While it was important that participants were aware that the research was interested in the menstrual cycle, the wording of the adverts was designed to appeal to a wide range of women, regardless of the presence or absence of specific menstrual cycle complaints.

2.1.3 Inclusion/exclusion criteria Participants were between 18 and 45, this age range was chosen to minimise anomalies that may be attributable to hormonal imbalances during adolescence and menopause. Participants were excluded if they were not menstruating regularly. Regular menstruation was defined as having a cycle between 24 and 34 days (NHS, 2010). Participants were asked to report their cycle length, and where possible, this was verified using the dates that they reported menstruating during the study. As it is unclear how and whether menstrual hormonal fluctuations interact with the psychological processes that the study was interested in it was decided not to exclude women using hormonal contraceptives. Participants were asked to provide details of hormonal contraception to be considered in the analysis.

2.2 Measures

Women who were interested in taking part followed a link to the study information page. They were then asked to confirm their age, that they had read the information provided and gave their consent to participate. An option to exit the survey was present on every page (see Appendix C for full survey, formal measures, consent and information pages).

At the first stage of the study participants were asked to provide information regarding their age, ethnicity, the length and variability of their menstrual cycle and whether they used hormonal contraception (and if so what type). At each stage participants were also asked to report where they were in their cycle before completing the following measures:-

2.2.1 *Hospital Anxiety and Depression Scale (Zigmond and Snaith, 1983)*. The HADS is a 14-item self-report questionnaire that consists of two subscales of seven items designed to measure levels of anxiety and depression in non-psychiatric populations. The HADS is quick and easy to administer. In the general population the anxiety scale has internal consistency coefficients of 0.80 to 0.84, the depression scale 0.76 to 0.82 (Bjelland, Dahl, Haug and Neckelmann, 2002). Test-retest reliability for anxiety is 0.79, 0.63 for depression and 0.78 for the full scale and is acceptable for weekly administration. Cronbach's alpha was acceptable for anxiety (Paramenstrual $\alpha = 0.85$, mid-cycle $\alpha = 0.83$), and for depression (Paramenstrual $\alpha = 0.85$, Mid-cycle = 0.82).

2.2.2 *The Persecution and Deservedness Scale (PADS) Melo, Corcoran, Shyrane and Bentall, 2009*). The PADS is a ten item measure which provides scores for both persecution and deservedness of persecution. It is possible to score highly on the persecution subscale, while scoring high or low on the deservedness scale, but deservedness can only be scored if an individual reports a certain level of persecution.

The persecutory subscale – participants score from 0 (certainly false) to 4 (certainly true). Items explicitly state or imply that the individual is at risk as a consequence of the untrustworthiness or malevolence of others. The scale has good internal consistency, with a Cronbach's alpha of 0.84. Acceptable internal consistency was found for this study at both phases (Paramenstrual $\alpha=0.90$, mid-cycle $\alpha = 0.91$).

The deservedness subscale – items follow each persecution item. Participants only complete these items if they scored greater than 1 on the persecutory item. Participants score 0 (not at all) to 4 (very much). Due to this it is not possible to calculate internal consistency using Cronbach's alpha. However, an interclass correlation of 0.43 is reported by the authors.

2.2.3 Self-Esteem Rating Scale - Short Form (SERS-sf) Lecomte, Corbiere and Laisne (2006). The SERS-SF is a shortened version of Nugent and Thomas' (1993) Self-Esteem Rating Scale. It consists of 20 items, ten measure positive self-esteem, ten measure negative self-esteem. Participants rate answers from 1 (never) to 7 (always). Each subscale ranges from 10 to 70; high scores indicate high positive or high negative self-esteem. The scale has good internal consistency, 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. Cronbach's alpha was acceptable for both the positive self-esteem scale (paramenstrual $\alpha=0.96$, mid-cycle $\alpha=0.96$), and for negative self-esteem (paramenstrual $\alpha=0.93$, mid-cycle $\alpha=0.93$).

2.3 Ethical considerations

This study gained ethical approval from the University of Sheffield Department of Psychology Ethics Sub-Committee (DESC). It was made clear that participation was entirely voluntary and participants were free to withdraw from the research at any time, without penalty. Participants confirmed that they were over 18, and an "opt-in" informed consent approach was used, and "opt-out" options were included in all emails. Internet provider addresses were not recorded and it was made explicit that email

addresses were only used to send out reminder emails and link responses. All email addresses would be destroyed once the study was completed and removed from the data before the analysis. All data were password protected. A contact email was provided for direct queries and it was stated that if participants found any of the questions distressing they should contact their General Practitioner. University of Sheffield students were provided with information for the student counselling service.

2.4 Procedure

2.4.1 Pilot Five women were asked to complete the questionnaire designed above, to provide timing information for adverts and for information regarding ease of completion. Following this process, the configuration of the questionnaire was changed so that respondents could not move on to the next page without completing all items.

2.4.2 The study Participants in the final study were asked to complete the battery of measures once a week, for four consecutive weeks. One week after completion of each phase, participants were contacted by email with the link to the next phase (Appendix D). If they did not complete the study within two days a reminder email was sent (Appendix E). Two weeks after completing the study participants were emailed to ask for the date of their next period (Appendix F).

Participants' reports of menstruation date were considered to be more accurate than mid-cycle estimates of where they were in their cycles. The menstruation dates were therefore used to allocate responses to menstrual cycle phase. 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.

Allocation was done in this way because although the luteal phase duration is fairly consistent, the duration of the follicular phase can be highly variable (Leibenluft, Fiero & Rubinow, 1994). Therefore allocation to mid-cycle had to be calculated by counting backwards from the first day of the period. It was anticipated that asking participants to estimate these time points would be difficult and unreliable, therefore measures were completed on more than two occasions to maximise the chances of capturing the points of interest. Further, very few participants completed each section of the study exactly at the time required. It is likely that many participants would have found it difficult to complete the study correctly if there had been additional timing demands.

Where participants had a shorter than four week cycle, or completed the study over longer than four weeks, duplicate phase responses occurred. In these cases the first response was used.

A binomial test was conducted, which found that the entry timings of participants were naturally well counter-balanced, with 150 (53.96%) participants completing their paramenstrual response before their mid-cycle response, and 128 (46.04%) completing their mid-cycle response before their paramenstrual response ($p=0.21$, two-tailed).

Therefore order effects should have been offset.

2.5 The sample

2.5.1 Non-completion. Not all of the organisations were able to provide figures regarding site visitors or advert hits, however from the available figures, the response rates ranged between 1 and 11 % (see Appendix G for a complete list of organisations

and figures, where available). 1069 women entered the first week of the study. 725 (68%) did not complete the study. Completion rates for each week are displayed in Table 1.

Table 1.

Weekly completion rates.

	Entered	Week 1	Week 2	Week 3	Week 4	Total
University	509	471 (93%)	323 (69%)	227 (70%)	192 (85%)	38%
Community	560	466 (83%)	293 (63%)	172 (59%)	152 (88%)	27%
Total	1069	937 (88%)	616 (57%)	399 (65%)	344 (86%)	32%

2.5.2 Participants excluded. Figure 1 illustrates the decision making process for the 66 participants excluded from the study. 33 participants did not provide the follow-up information of their period date after completing the study 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 (five were too long, five were too short). Sixteen participants did not provide responses at the time points required for the analysis, eight had prolonged gaps between response completion, and eight completed correctly but coincidentally missed the point of interest. Seven participants were excluded due to completion errors indicating that they did not understand the instructions, as five indicated that they were at the same point in their cycle at each response, and two participant responses did not fit with the timing of response completion.

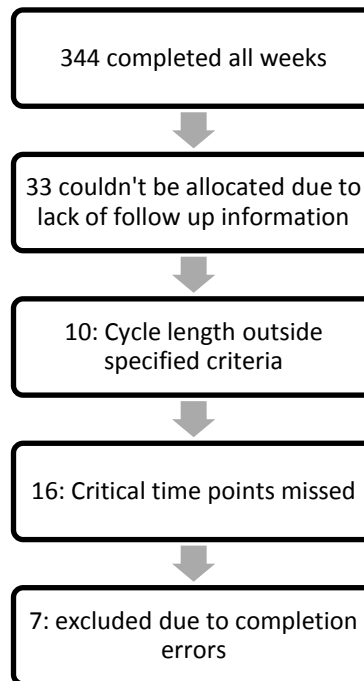


Figure 1. Excluded participants

2.5.3 *The final sample.* The final sample consisted of 278 individuals. 126 participants were recruited from the community. 152 were recruited through university staff and student populations. Participants in the final sample were compared to those who dropped out in order to identify whether there were any important differences (see Table 2). Using a Mann Whitney U test, it was found that women included in the study (Mdn=27) were significantly older than those who did not complete the study (Mdn=25), $U= 89612.00, p=0.01$. A chi-squared test also identified that there was a significant difference between the two groups in terms of the ethnic mix, where a higher percentage of the final sample than would be expected indicated their ethnic origin as ‘White’ or ‘Mixed’, and a lower percentage indicated that their ethnic origin was ‘Black’, ‘Asian’ or ‘Other’, $\chi^2 (4, N=1003) = 14.35, p=0.01$.

Table 2

Comparison of Demographic Information of the Final Sample and People Who Did Not Complete the Study.

	Dropped-out <i>N</i> =725	Included <i>N</i> =278	<i>p</i>
Age	Mean:27.2 <i>SD</i> : 8.35 Range 18-48	Mean: 28.25 <i>SD</i> :7.43 Range:27 (18-45)	0.01
Ethnicity	White = 596 (82%) Mixed =18 (2.5%) Asian = 62 (8.6%) Black = 37 (5.1%) Other = 12 (1.7%)	White = 247 (88.8%) Mixed: 10 (3.6 %) Asian: 16 (5.8%) Black: 2 (0.7%) Other: 3 (1.1%)	0.01
Hormonal contraceptive use	No= 478 (65.9%) Yes= 247 (34.1%)	No: 189 (68%) Yes: 89 (32%)	0.27
Average cycle length	Mean: 28.4 days, <i>SD</i> 3.47, Range: 14-45	Mean: 28.43 days, <i>SD</i> : 2.11 Range: 24-35	0.47

2.6 Analysis Procedure

The analyses were organised as follows:-

- 1) Exploration of the data.
- 2) Comparison of the measures at the paramenstrual and mid-cycle phases.
- 3) Comparisons between people who do not experience feelings of persecution, people who experience feelings of persecution but do not feel it is deserved, and people who experience feelings of persecution which they feel is deserved.
- 4) Investigation of the relationships between the variables.

- 5) Investigation of whether deservedness changes the relationships between persecution and self-esteem.
- 6) Investigation of the relationships between the variables in terms of how much participants changed between menstrual cycle phases.

2.6.1 Power analysis. An a priori power analysis was conducted using G*Power (Faul, Erdfelder, Lang & Buchner, 2009). For the comparisons between scores at different phases, a power analysis for a Wilcoxon Signed-Ranks test was conducted to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, a medium effect size ($d = 0.30$), resulting in 74 participants being required. For a Chi Square test with the same parameters and 1 degree of freedom a sample of 134 was required. For a hierarchical regression analysis, assuming a medium effect size of $R^2 = 0.15$, a significance level of $\alpha = 0.05$, two tested predictors, and five total predictors, a sample size of 68 is needed to achieve 80% power.

Jaccard, Turrisi and Wan (1990) provide recommendations that for achieving power of 0.80 using an alpha of 0.05 with one interaction term, where the squared multiple correlation for the main effects model would be 0.15, and the full model would be 0.20 a sample size of 135 is required. Although previous research did not provide information that could be used for estimating effect sizes for this study, research into non-clinical populations employed larger sample sizes. Pickering, Simpson and Bentall (2008) recruited 551 participants for their study, Freeman et al. (2005) recruited 1202, and Ellett, Lopes and Chadwick (2003) recruited 324. As it was anticipated that the samples 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.

3. Results

The statistical analysis was conducted using PASW Statistics 18.

3.1 Distribution of scores

Prior to analysis, a check for normality was conducted on all scales. Kolmogorov-Smirnov analyses and visual checks using QQ-plots and histograms demonstrated that apart from the scale for positive self-esteem at the perimenstrual phase ($z=0.05$, $p=0.20$), none of the scales were normally distributed (Z value range 0.07 to 0.20, $p<0.05$). Data transformation was not successful, and therefore non-parametric statistical procedures were employed.

However, hypothesis 4 was particularly interested in how deservedness changed the relationship between persecution and positive and negative self-esteem. A moderation regression was the method most suitable for examining this hypothesis. Further, hypothesis 5 was specifically interested in the relationships between the variables, for which a regression analysis was most useful. Following the procedures described by Tabachnick and Fidell (2001, pp 125-128) and Field (2006, pp 162-175), the residuals of the regression analyses, were checked for normality, linearity, and homoscedacity. Durbin-Watson statistics, and tolerance statistics were examined in regards to autocorrelation and multicollinearity. None of the assumptions were violated, and therefore it was decided that although the original data was not ideal for a regression analysis, the regression models were robust enough for this analysis procedure to be employed.

Outliers existed within the data. However, a comparison of mean scores and 5% trimmed means and tolerance statistics showed that the impact of outliers across measures was minimal. The Cook's distance of all of the regression analyses was below one, indicating that the outliers did not significantly influence the overall models. Further, examination of individual cases did not identify any questionable response patterns, rather the scores seemed to reflect participants who had high scores on the measures, and therefore the outliers were not excluded from the analysis (Kolmogorov-Smirnov and trimmed mean analyses are available in Appendix H).

3.2 Comparison of cycle phases

3.2.1 Overall sample. Table 3 illustrates the mean scores and standard deviations of the sample across the measures at the paramenstrual phase and at mid-cycle. It is worth noting that the clinical cut-off for "caseness" for the HADS anxiety and depression scores is 8.

Table 3

Mean (and standard deviation) Scores at the Paramenstrual and Mid-Cycle Phases

	Paramenstrual		Mid-cycle	
	Mean (<i>SD</i>)	Range	Mean (<i>SD</i>)	Range
Anxiety	7.78 (4.37)	0-20	6.1 (3.75)	0-17
Depression	4.49 (3.80)	0-21	3.05(3.15)	0-16
Positive Self-esteem	47.54 (11.34)	10-70	49.67 (10.90)	19-70
Negative Self-esteem	32.22 (9.98)	16-64	30.22 (9.08)	16-68
Persecution	1.30 (0.96)	0-3.8	1.14 (0.92)	0-3.9
Deservedness	1.36 (0.93)	0-4	1.19 (0.85)	0-4

Wilcoxon-Signed Ranks tests were used to test the hypotheses that levels of anxiety, depression and persecution would be significantly higher at the paramenstrual phase compared to mid-cycle, and that there would be a significant difference in positive and negative self-esteem scores between phases (median scores, *Z* values and significance levels are displayed in Table 4).

Anxiety, depression, persecution and negative self-esteem 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 4

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

N=278	Para- menstrual <i>Mdn</i>	Mid-cycle <i>Mdn</i>	Ties	<i>Z</i>	<i>P</i>	Effect size	Power
Anxiety	7	6	33	-6.62	<i>P</i> <0.001 ^a	0.40	0.99
Depression	3	2	51	-5.74	<i>P</i> <0.001 ^a	0.34	0.99
Positive Self-esteem	48	51	28	4.39	<i>P</i> <0.001 ^b	0.26	0.99
Negative Self-esteem	31	29	27	4.85	<i>P</i> <0.001 ^b	0.29	0.99
Persecution	1.2	1	40	4.18	<i>P</i> <0.001 ^a	0.25	0.99

Note ^a one-tailed, ^b two-tailed

3.2.2 *Recruitment population.* A consideration for the analysis was whether subgroups existed within the sample, and whether these subgroups impacted upon the overall analysis. Previous research has indicated that results based on University

populations may not reflect more diverse populations (Peterson, 2001). Therefore the sample was divided so that participants recruited through University populations represented one subgroup, and participants recruited from other sources formed another group, referred to as “community”. Mann Whitney U tests showed that at mid-cycle, the University (Mdn=3) scored significantly higher for depression than the community sample (Mdn=2), $U = 8027, p=0.01$ (one-tailed – this level of significance was used as it was a more conservative test of differences). However, the effect size was small, $r=0.19$. It was therefore decided that the University and Community populations were similar enough to be analysed together. See Table 5 for mean scores of the two groups and summary statistics of the Mann Whitney U tests are available in Appendix I.

Table 5

Comparison of Mean Scores by Recruitment Group

Phase		University	Community
		<i>Mean (SD)</i> <i>n= 152</i>	<i>Mean (SD)</i> <i>n=126</i>
Para-menstrual	Anxiety	7.67 (4.25)	7.90 (4.52)
	Depression	4.30 (3.97)	4.72 (3.58)
	Positive Self-esteem	47.39 (11.38)	47.72 (11.34)
	Negative Self-esteem	32.25 (10.48)	32.17 (9.39)
	Persecution	1.31 (1.02)	1.28 (0.89)
	Deservedness	1.41 (0.83)	1.3 (0.83)
Mid-cycle	Anxiety	5.92 (3.69)	6.31 (3.83)
	Depression	2.68 (2.90)	3.49 (3.38)
	Positive Self-esteem	50.11 (10.67)	49.13 (11.18)
	Negative Self-esteem	29.74 (9.13)	30.79 (9.03)
	Persecution	1.12 (0.93)	1.17 (0.90)
	Deservedness	1.24 (0.82)	1.13 (0.73)

3.2.3 *Use of hormonal contraception.* As hormone levels are a pertinent characteristic of the menstrual cycle, a second potential division was the use of hormonal contraceptives. The sample was therefore divided into a subgroup that used hormonal contraception, and a subgroup that did not.

Using a one-tailed Mann-Whitney U test, at the paramenstrual phase, people using hormonal contraception ($Mdn=3$) had a significantly lower depression score than those who were not ($Mdn=4$), $U=6681.5$, $p=0.003$, $r=0.17$, 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, people using hormonal contraception ($Mdn=1$) had significantly lower depression scores than the group not using hormonal contraception ($Mdn=2$), $U = 7299.50$, $p=0.04$, $r=0.10$. Table 6 provides a summary of the mean scores and Mann-Whitney U tests are available in Appendix I. The effect sizes of the differences were all small. However, to further examine whether these differences were important, the next stage of the analysis was conducted for these variables with the sample disaggregated into the two groups. It was found that the two groups showed a similar pattern, although the effect sizes for the group using hormonal contraception was slightly smaller. When use of contraception was entered into regression equations as a dummy variable, it was not found to be a significant predictor ($p>0.05$). It was therefore decided to combine the subgroups for analysis. Details of the analysis of the disaggregated groups are available in Appendix I.

Table 6

Comparison of Mean Scores (and Standard Deviations) by Use of Hormonal Contraception

Phase		Using Hormonal Contraception <i>Mean (SD)</i> <i>n= 89</i>	Not Using Hormonal Contraception <i>Mean (SD)</i> <i>n=189</i>
Para-menstrual	Anxiety	7.63 (3.96)	7.85 (4.55)
	Depression	3.48 (2.91)	4.96 (4.07)
	Positive Self-esteem	49.20 (10.03)	46.76 (11.86)
	Negative Self-esteem	30.70 (8.94)	32.93 (10.38)
	Persecution	1.26 (0.94)	1.32 (0.97)
	Deservedness	1.16 (0.71)	1.47 (0.86)
Mid-cycle	Anxiety	6.35 (3.82)	2.65 (3.04)
	Depression	2.65 (3.04)	3.24 (3.19)
	Positive Self-esteem	50.18 (10.34)	49.42 (11.17)
	Negative Self-esteem	29.03 (8.04)	30.77 (9.51)
	Persecution	1.13 (0.92)	1.12 (0.76)
	Deservedness	1.15 (0.92)	1.23 (0.79)

3.2.4 *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 at each cycle phase. A significant relationship between menstrual cycle phase and proportion of participants who experienced persecution was found ($\chi^2 (1, N=278)= 3.64, p<0.001$), in that a

higher proportion of participants experienced some persecution at the paramenstrual phase (80.2%) than at mid-cycle (73.4%). However the effect size was small ($V= 0.11$). The mid-cycle phase is much similar to the proportion of participants that Melo et al. (2008) found reported some level of persecution (approximately 72%). Figure 2 illustrates the comparisons between phases.

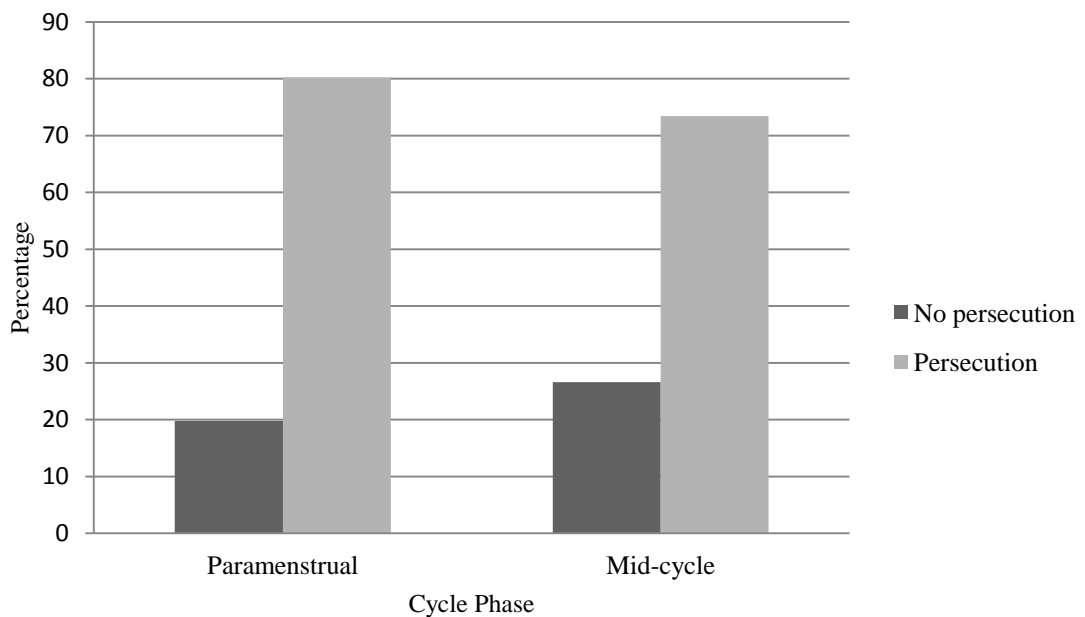


Figure 2 Percentage of sample experiencing persecution at each phase

3.2.5 Proportion of participants experiencing deservedness. Items on the PADS are only completed if the participant reports a certain level of persecution. This means that as participants reported different amounts of persecution at different time points, there were different participants reporting deservedness scores at each phase. Due to this reason, and the non-parametric nature of the data 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 and those who did not.

The developers of the PADS do not provide a clear procedure for group allocation. However, they do suggest that for some purposes a conservative approach to exploring deservedness is to include only participants who complete at least three deservedness items. Pickering et al. (2008) used the median score to divide the subgroup of their participants into groups based on deservedness scores. The median score on the deservedness score from data collected in week1 was 1.29.

Therefore, for this part of the analysis, participants who answered at least three deservedness items were selected and those scoring less than 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 ($\chi^2(1, N=297)= 5.325, p=0.01$). 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 ($V= 0.13$). Figure 3 illustrates these comparisons.

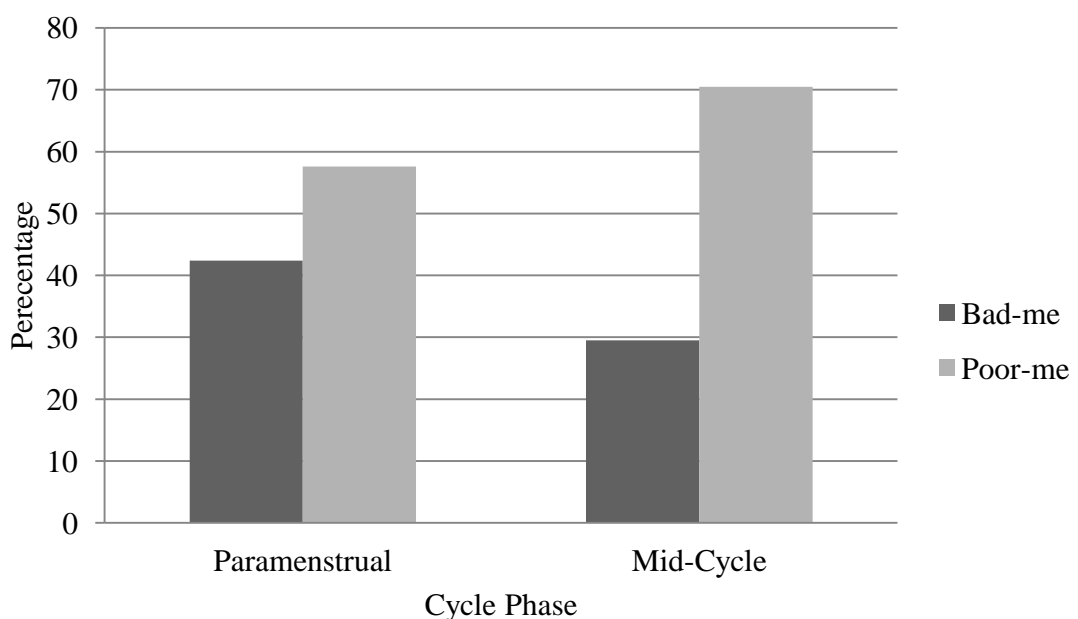


Figure 3 Percentage of sample allocated to poor-me or bad-me groups at each phase.

3.2.6 Summary

A significant impact of menstrual cycle was found. Participants had lower positive self-esteem scores at the paramenstrual phase, and higher levels of negative self-esteem, anxiety, depression and persecution. A significantly higher proportion of participants had persecutory experiences at the paramenstrual phase. At the paramenstrual phase, a higher proportion of participants believed that their experiences of persecution were deserved.

3.3 Investigation of deservedness groups

3.3.1 Differences between deservedness groups

Kruskal-Wallis tests were conducted at each time point to investigate whether there were differences between the three groups. At the paramenstrual phase, significant differences were found in anxiety ($H(2) = 17.38, p < 0.001$), depression ($H(2) = 9.54, p = 0.01$), positive self-esteem ($H(2) = 16.28, p < 0.001$), negative self-esteem ($H(2) = 23.75, p < 0.001$) and persecution ($H(2) = 7.45, P = 0.02$).

At the mid-cycle phase significant differences were also found between anxiety ($H(2) = 49.64, p < 0.001$), depression ($H(2) = 35.00, p < 0.001$), positive self-esteem ($H(2) = 72.73, p < 0.001$), negative self-esteem ($H(2) = 67.53, p < 0.001$) and persecution ($H(2) = 157.73, < = 0.001$).

Post-hoc tests were conducted to evaluate pair-wise differences among these groups. To protect against Type 1 errors, the Bonferroni approach was used ($p = 0.017$). The

results of these tests indicated a significant difference between all groups ($p < 0.001$), see Table 7 for group median scores, effect sizes are reported in Table 8.

3.3.2 Summary. This tells us that women who experienced no persecution were the least distressed. The bad-me group were the most distressed, experiencing higher levels of depression, anxiety, persecution and negative self-esteem.

However, the PADS was not designed to allocate poor-me and bad-me groups and therefore does not have a clear cut-off point for allocation. Therefore in testing hypotheses three and four, it was also important to investigate the relationships of persecution and deservedness with other variables.

Table 7

Deservedness Subgroup Median Scores

	Paramenstrual			Mid-cycle		
	No Paranoia	Poor Me	Bad- Me	No Paranoia	Poor- me	Bad- me
<i>n</i>	120	91	67	139	98	41
Anxiety	5.00	8.00	11.00	4.00	7.00	9.00
Depression	2.00	4.00	6.00	1.00	2.00	5.00
Positive Self- esteem	55.00	47.00	38.00	57.00	49.00	38.00
Negative Self- esteem	25.50	31.00	40.00	25.00	31.00	40.00
Persecution	0.40	1.70	2.10	0.30	1.70	2.10

Table 8

Effect Sizes of Post Hoc Comparisons between Deservedness Groups

	Paramenstrual			Mid-cycle		
	No Paranoia/ Poor-Me	Poor-Me/ Bad-Me	No Paranoia/ Bad Me	No Paranoia/ Poor-Me	Poor-Me/ Bad-Me	No Paranoia/ Bad Me
Anxiety	0.37*****	0.23 *	0.52***	0.35*****	0.17 *	0.44*****
Depression	0.21 ****	0.26*****	0.45*****	0.18 ***	0.26*****	0.43*****
Positive self-esteem	0.28 ****	0.42*****	0.61*****	0.37*****	0.42*****	0.55*****
Negative Self-esteem	0.37*****	0.42*****	0.64*****	0.36*****	0.42*****	0.52*****
Persecution	0.84*****	0.24***	0.82**	0.71*****	0.24, ***	0.67*****

Note 1 * $p=0.02$. ** $p=0.01$. *** $p=0.002$, ***** $p<0.001$

3.4 Correlations between variables

The remaining analysis was conducted using only data from participants who completed at least one deservedness item. This decision was made because hypotheses 3 to 5 are primarily interested in the relationship that persecution and deservedness have with the other variables. Therefore it is acceptable to only conduct the analysis on people reporting at least a low level of persecution. However, Melo et al. (2008) state that including participants who complete at least one deservedness item yields a more inclusive sample than the more conservative approach, while also, from their analysis, still producing very similar response patterns. Therefore, including participants who completed at least one deservedness item seemed to balance inclusivity with selection of the population of interest.

3.4.1 *Spearman's correlations.* In relation to hypothesis three and four, a Spearman's correlation coefficient was conducted to investigate the relationships between persecution, deservedness, self-esteem, anxiety and depression. Table 9 displays the results of these correlations; Appendix J displays full correlation information between all variables.

At both time points, persecution and deservedness were significantly correlated with the other variables. Positive self-esteem had a significant negative correlation with persecution and deservedness. Negative self-esteem, anxiety and depression were positively correlated with both persecution and deservedness. Although the correlations support the hypothesis that increased deservedness will be related to increased depression scores, it is of interest that the relationship between depression and persecution was stronger. It is also interesting that the relationship between deservedness and depression is stronger at the paramenstrual phase compared to mid-cycle.

Table 9

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

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

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

3.4.2 Summary. This confirms that increased persecution would be related to increased levels of anxiety. It also confirms that deservedness is related to increased levels of depression. However, the strength of this relationship is not as strong as the relationship between persecution and depression. Both persecution and deservedness have strong relationships with self-esteem.

3.5 Deservedness, persecution and self-esteem.

In relation to hypothesis 4 a moderation regression analysis was conducted following the method used by Sheeran, Trafimow and Armitage (2003). This analysis investigated whether deservedness would affect the relationship between self-esteem and persecution. Self-esteem was entered as the dependent variable because the focus of the hypothesis was on identifying whether the impact that persecutory feelings have on self-esteem is different when the persecution is felt to be deserved than when it is not. To reduce potential multi-collinearity, the variables were mean-centred (Aiken & West, 1991).

3.5.1 Positive self-esteem. 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 a significant proportion of variance in positive self-esteem, $R^2 = 0.31$, $F(1,221) = 97.06$, $P < 0.001$. This means that persecution accounted for 31% of the variance of positive self-esteem. The second step accounted for a significant increase ($F(2, 220) = 77.47$, $p < 0.001$) in the overall variance of the model (R^2 change = 0.11). This

demonstrates that 11% of the variance can be accounted for by deservedness. The third step did not produce a significant change in R^2 ($p=0.58$), indicating that the interaction between deservedness and persecution did not significantly moderate the relationship between persecution and positive-self-esteem. The results of this regression are displayed in Table 10.

Table 10

Summary of the Moderation Regression Analysis of Deservedness on the Relationship between Persecution and Positive Self-Esteem at the Paramenstrual Phase

	Variable	<i>B</i>	<i>SE B</i>	β	<i>P</i>
Step1	Persecution	-7.06	0.72	-0.55	<0.001
Step 2	Persecution	-5.35	0.71	-0.41	<0.001
	Deservedness	-4.26	0.67	-0.36	<0.001
Step 3	Persecution	-5.30	0.72	-0.41	<0.001
	Deservedness	-4.24	0.67	-0.35	<0.001
	Interaction	-0.34	0.61	-0.03	0.58

This process was repeated for positive self-esteem at mid-cycle, resulting in the same pattern. Persecution accounted for a significant proportion of variance in positive self-esteem, $R^2 = 0.27$, $F(1,202) = 75.43$, $P<0.001$. This means at mid-cycle persecution accounted for 27% of the variance of positive self-esteem. The second step accounted for a significant increase ($F(2, 201) = 60.63$, $p<0.001$) in the overall variance of the model (R^2 change = 0.10). This demonstrates that 10% of the variance at mid-cycle can be accounted for by deservedness. The third step did not produce a significant change in R^2 ($p=0.62$). The results are summarised in Table 11.

Table 11

Summary of the Moderation Regression Analysis of Deservedness on the Relationship Between Persecution and Positive Self-Esteem at Mid-Cycle

	Variable	<i>B</i>	<i>SE B</i>	β	<i>P</i>
Step 1	Persecution	-6.86	0.79	-0.52	<0.001
Step 2	Persecution	-5.33	0.78	-0.41	<0.001
	Deservedness	-4.44	0.77	-0.34	<0.001
Step 3	Persecution	-5.27	0.79	-0.40	<0.001
	Deservedness	-4.40	0.77	-0.34	<0.001
	Interaction	-0.35	0.70	-0.03	0.62

3.5.2 Negative self-esteem. The procedure was then repeated with negative self-esteem as the dependent variable. At the paramenstrual phase, persecution explained a significant proportion of variance in negative self-esteem, $R^2 = 0.35$, $F(1,221) = 120.60$, $P < 0.001$. This means that persecution accounts for 35% of the variance of negative self-esteem. The second step accounted for a significant increase ($F(2, 220) = 88.98$, $p < 0.001$) in the overall variance of the model (R^2 change = 0.09). This demonstrates that 9% of the variance can be accounted for by deservedness. The entry of the interaction between persecution and deservedness at the third step contributed a significant ($F(2, 200) = 61.61$, $p < 0.001$), but small increase in the variance accounted for (R^2 change = 0.01, $p = 0.04$). See Table 12 for a summary.

At mid-cycle, persecution explained a significant proportion of variance in negative self-esteem, $R^2 = 0.27$, $F(1,202) = 77.23$, $P < 0.001$. This means that persecution accounts for 27% of the variance of negative self-esteem. The second step accounted for a significant increase ($F(2, 201) = 65.33$, $p < 0.001$) in the overall variance of the model (R^2 change = 0.12). This demonstrates that, at mid-cycle, 12% of the variance can be

accounted for by deservedness. The entry of the interaction between persecution and deservedness at the third step contributed a significant, ($F(2, 200) = 46.37, p < 0.001$) but small increase in the variance accounted for (R^2 change = 0.02, $p = 0.02$). See Table 13 for a summary.

Table 12

Summary of the Moderation Regression Analysis of Deservedness on the Relationship Between Persecution and Negative Self-Esteem at the Paramenstrual Phase

	Variable	<i>B</i>	<i>SE B</i>	β	<i>P</i>
Step 1	Persecution	6.84	0.62	0.59	<0.001
Step 2	Persecution	5.40	0.62	0.47	<0.001
	Deservedness	3.58	0.59	0.33	<0.001
Step 3	Persecution	5.23	0.62	0.45	<0.001
	Deservedness	3.49	0.58	0.32	<0.001
	Interaction	1.09	0.53	0.10	<0.001

Table 13

Summary of the Moderation Regression Analysis of Deservedness on the Relationship Between Persecution and Negative Self-Esteem at Mid-Cycle

	Variable	<i>B</i>	<i>SE B</i>	β	<i>P</i>
Step 1	Persecution	5.80	0.66	0.53	<0.001
Step 2	Persecution	4.44	0.64	0.40	<0.001
	Deservedness	3.94	0.63	0.36	<0.001
Step 3	Persecution	4.21	0.64	0.38	<0.001
	Deservedness	3.81	0.63	0.35	<0.001
	Interaction	1.34	0.57	0.13	<0.001

Following the procedure described by Aitken 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). These slopes are illustrated in Figure 4 for paramenstrual phase and Figure 5 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, $t(200)=2.35$, $p=0.02$.

This analysis illustrates that as level of deservedness increases the relationship between persecution and negative self-esteem intensifies. The illustration produced by an analysis of simple slopes provides an indication of the impact that the moderating variable has, in that, the more that the lines deviate from parallel, the greater the effect that the moderator variable has. As can be seen, the impact of deservedness upon the relationship between persecution and negative self-esteem is moderate.

3.5.3 Summary. These results show that the positive relationship between negative self-esteem and persecution is moderated by deservedness, such that as deservedness increases the relationship between persecution and negative self-esteem becomes stronger. These interactions were the same at both phases of the menstrual cycle. The same moderation effect was not present for positive self-esteem.

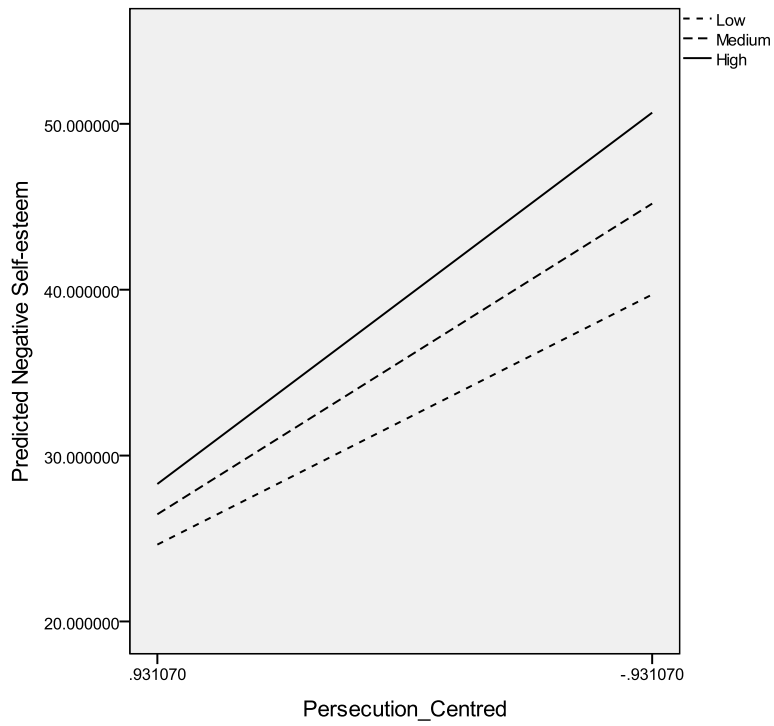


Figure 4 Paramenstrual phase: Moderating effect of deservedness on the relationship between persecution and negative self-esteem

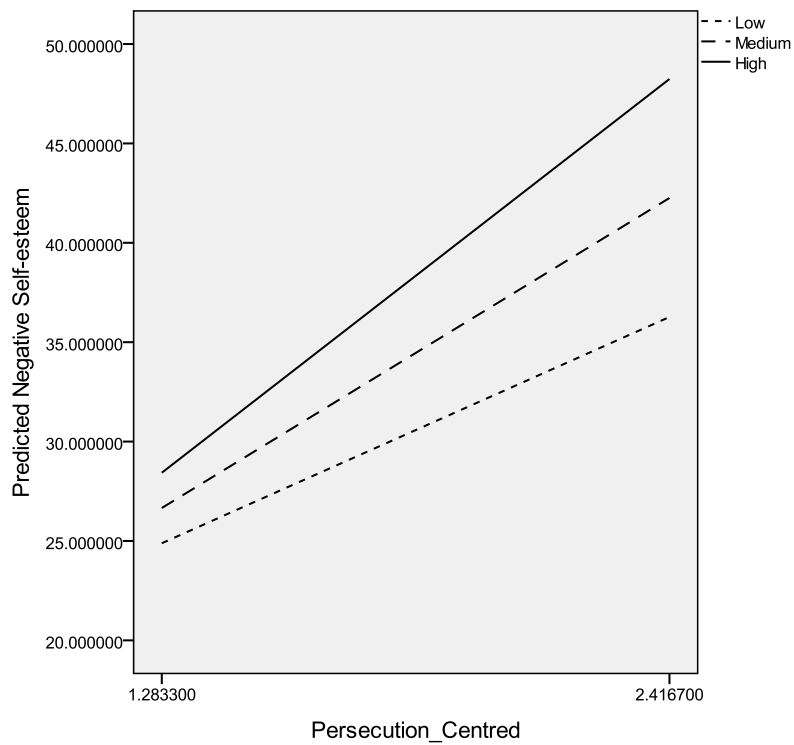


Figure 5 Mid-cycle phase: Moderating effect of deservedness on the relationship between persecution and negative self-esteem

3.6 Changes in self-esteem, persecution and deservedness

To further investigate the relationships between persecution, deservedness and self-esteem, the relationships between how much these variables changed between the paramenstrual and mid-cycle phases was explored. For each variable, the participants' score at mid-cycle was subtracted from the score at the paramenstrual phase, producing a "change score".

3.6.1 Correlations of change in variables. A Spearman's Correlation Coefficient was conducted to examine the relationship between the change in positive and negative self-esteem and the other variables. As can be seen in Table 14 changes in positive self-esteem had a significant negative correlation with change in each of the other variables. Changes in negative self-esteem had a significant positive relationship with anxiety, depression, persecution and deservedness, and a negative relationship with changes in positive self-esteem.

Table 14

Inter-correlations between Change in Positive and Negative Self-Esteem and Change on the Other Measures (N=237)

	Negative Self-esteem	Anxiety	Depression	Persecution	Deservedness
Positive Self- esteem	-0.59****	-0.52****	-0.61****	-0.54****	-0.43****
Negative Self- esteem		0.52****	0.53****	0.55****	0.45****

Note **** p<0.001

3.6.2 *Changes in positive self-esteem.* A hierarchical regression was conducted to examine the unique contributions of persecution and deservedness when the other variables had been controlled. For the change in positive self-esteem a significant change in adjusted R^2 value was found at steps 2 and 3, where step 1 included (changes scores for) negative self-esteem, anxiety and depression ($F(3, 233) = 70.80, p < 0.001, R^2 = 0.48, p < 0.001$) and where step 2 included the change in persecution ($F(4, 232) = 59.25, p < 0.001, R^2 \text{ change} = 0.03, p < 0.001$), and step 3 included the change in deservedness ($F(5, 231) = 48.88, p < 0.001, R^2 \text{ change} = 0.01, p = 0.04$). Although the unique contribution of deservedness was significant, the effect size was very small. As can be seen in Table 15 at step one, anxiety was almost not significant ($p = 0.05$). When persecution was entered into the model, anxiety became non-significant.

Table 15

Summary of Hierarchical Regression Analysis for Variables Predicting Change in Positive Self-Esteem (N= 237)

	Variable (Change in)	<i>B</i>	<i>SE B</i>	β	P
Step 1	Negative SE	-0.38	0.06	-0.34	<0.001
	Anxiety	-0.25	0.13	-0.13	0.05
	Depression	-0.71	0.13	-0.34	<0.001
Step 2	Negative SE	-0.30	0.07	-0.27	<0.001
	Anxiety	-0.14	0.13	-0.07	0.28
	Depression	-0.66	0.13	-0.32	<0.001
	Persecution	-2.66	0.73	-0.21	<0.001
Step 3	Negative SE	-0.27	0.07	-0.24	<0.001
	Anxiety	-0.11	0.13	-0.06	0.40
	Depression	-0.67	0.13	-0.32	<0.001
	Persecution	-2.22	0.75	-0.18	0.004
	Deservedness	-1.05	0.51	-0.11	0.04

Note $R^2 = 0.48$ for step 1; $\Delta R^2 = 0.50$ for step 2; $\Delta R^2 = 0.50$ for step 3

3.6.2 *Hierarchical regression of changes in negative self-esteem.* For change in negative self-esteem scores a significant change in adjusted R^2 value was found at steps 1 and 2, where step 1 included (changes scores for) positive self-esteem, anxiety and depression ($F(3, 233) = 56.76, p < 0.001$) and where step 2 included the change in persecution ($F(4, 232) = 49.37, p < 0.001, R^2 \text{ change} = 0.04$), and step 3 included the change in deservedness ($F(5, 231) = 41.34, p < 0.001, R^2 \text{ change} = 0.01, p = 0.02$). The unique contribution of deservedness was significant, however the effect size was very small. Table 16 summarises the regression model.

Table 16

Summary of Hierarchical Regression Analysis for Variables Predicting Change in Negative Self-Esteem (N= 237)

	Variable (Change in)	B	$SE B$	β	P
Step 1	Positive SE	-0.35	0.06	-0.38	<0.001
	Anxiety	0.40	0.12	0.22	0.001
	Depression	0.29	0.13	0.16	0.03
Step 2	Positive SE	-0.27	0.06	-0.29	<0.001
	Anxiety	0.27	0.12	0.15	0.03
	Depression	0.27	0.13	0.14	0.04
	Persecution	2.77	0.69	0.24	<0.001
Step 3	Positive SE	-0.24	0.06	-0.27	<0.001
	Anxiety	0.24	0.12	0.13	0.05
	Depression	0.28	0.13	0.15	0.03
	Persecution	2.28	0.71	0.20	0.002
	Deservedness	1.13	0.48	0.13	0.02

Note $R^2=0.42$ for step 1; $\Delta R^2= 0.45$ for step 2; $\Delta R^2=0.46$ for step 3

3.7 Overall summary of results

The results indicate that:-

- Levels of anxiety, depression, persecution and negative self-esteem are higher at the paramenstrual phase than at mid-cycle.
- Levels of positive self-esteem are lower at the paramenstrual phase.
- A greater proportion of the sample experienced feelings of persecution at the paramenstrual phase.
- Of these, a greater proportion felt that persecution was deserved at the paramenstrual phase (this effect size was small).
- Increased persecution was related to increased anxiety, depression, and negative self-esteem, and lower positive self-esteem.
- As feelings of deservedness increase the relationship between persecution and negative self-esteem is intensified.
- Although the individual variables fluctuated, the relationships between the variables remained fairly stable.
- Changes in levels of persecution and deservedness contribute significantly to predictions of changes in self-esteem, even when changes in anxiety and depression are controlled.

4. Discussion

4.1 Effect of cycle phase

As found by previous research, the sample had higher levels of anxiety and depression at the paramenstrual phase than at mid-cycle (Farage et al., 2008). Hill and Durante (2009) reported lowered levels of self-esteem at ovulation. However, the present study found that 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 and the evidence from the PMS literature which reported lower levels of self-esteem premenstrually (Taylor, 1999; Bloch et al., 1997).

Levels of persecution have not been well researched in relation to the menstrual cycle, and the current study is the first to focus specifically on persecution and menstrual 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. Applying Cohen's (1988; 1992) conventions for effect sizes, cycle phase had a medium effect for both anxiety and depression, indicating that even within a non-clinical population the menstrual cycle has a significant impact on distress. Although the effect sizes for both persecution and deservedness were smaller, they were both related to anxiety and depression. Therefore it is likely that both of these factors can be an important component of the distress experienced. These findings are especially important given the body of literature which indicates increased interpersonal sensitivity at the paramenstrual phase (Pinkerton et al. 2010). It would suggest that for some

women interpersonal interactions may be interpreted differently at this phase.

Specifically, the increased persecution may mean they are more sensitive to perceived attacks or criticisms from others, which in turn may impact on how they respond to people around them, impacting on both personal and professional relationships.

The increased deservedness suggests that women may also then feel that these perceived attacks have in fact occurred because of something bad about them, impacting on how they feel about themselves. In western, and many other cultures, menstruation is often related to feelings of being dirty and shameful, and many women go to considerable lengths to conceal the fact that they are menstruating (Lee, 1994; Johnston-Robledo, Barnack, Wares, 2006). It is possible that this sense of shame may be why there is a greater sense that persecution is deserved during the paramenstrual phase.

4.2 Persecution, deservedness and self-esteem

At both phases, increased deservedness was associated with increased depression. This finding was in agreement 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. The examination of change scores provides support for the relationship between persecution, deservedness and self-esteem. It also shows that the amount of change in persecution and deservedness scores makes a unique contribution to predictions of how much self-esteem scores will change over the cycle. The contribution of change in deservedness to these models was quite small, which is likely to be due to the correlations with all of the other variables. It is of note, that the contribution was particularly small for change

in positive self-esteem. Together these two findings indicate that, although levels of each variable may change, the relationships *between* the variables remained roughly the same, demonstrating stability in these relationships, regardless of an external factor, cycle phase.

Bentall et al. (2002) propose that the “poor me” stance, that persecution is not deserved, is part of a system of defences intended to prevent experiences of the self as bad or flawed, thus protecting self-esteem. The results found in the present study demonstrated 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. When the sample was divided into the groups “no-persecution”, “poor-me” and “bad-me”, the bad-me group had the lowest positive self-esteem, followed by poor-me, then no-persecution. However, the bad-me group also had the highest level of persecution, which may have accounted for the lower positive self-esteem score. The moderation regression supports this view, as deservedness did not significantly change the relationship between persecution and positive self-esteem. These results suggest that the presence of persecution has an impact on positive self-esteem, but deservedness does not significantly affect this relationship.

The investigation of negative self-esteem demonstrated a different pattern. Persecution was also related to negative self-esteem, in that 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.

This finding illustrates that measuring both positive and negative self-esteem may be important when exploring the relationships between persecution, deservedness and self-esteem. It is possible that some of the inconsistencies in previous research into persecution and self-esteem may have arisen as a result of the measures used.

These findings offer support for the theory that people who feel they deserve to be persecuted have lower *negative* self-esteem. However, a complication of interpreting the current finding is that people allocated to the “no-persecution” had less negative self-esteem than both paranoia groups. Therefore it is not clear whether persecution without deservedness is *protecting* self-esteem, or whether feeling that persecution is deserved *causes* (or is caused by) more negative self-esteem. This lack of clarity may well be a product of investigating a non-clinical population. Self-esteem “protection” may only be observable when comparing a clinical “poor-me” paranoid group to a non-clinical control group.

4.3 Clinical Implications

Many service user groups have expressed a desire for less reliance on pharmaceutical approaches (Sainsbury Centre for Mental Health, 2006). However, for women who are affected by their menstrual cycle, at present such fluctuations in mental health are predominantly managed through medical therapies (Brockington, 2005; Bergemann et

al., 2007). Therefore the clinical implications of this study arise from the drawing together of knowledge from the psychosis literature and from PMS literature.

For example, Blake (1995) proposes a cognitive model for PMS. She suggests that some women may 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 trigger these negative schemas. Accordingly, these physiological changes are interpreted as threatening because she sees them as indicators that functioning will become more difficult at a time when she may already be struggling. As a result she begins to feel anxious and depressed. It is likely that in women vulnerable to feelings of persecution, this would also represent a period when they might feel attacked, criticised or persecuted by others. 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 be more sensitive, leading to resentment and anger in response to demands or criticisms from others. This leads in turn to irritable outbursts and reinforces the belief that the paramenstrual phase is a period of interpersonal difficulty. Using the types of paranoia proposed by Trower and Chadwick (1995), it is possible that this response pattern would 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 less able to cope at this time, but that she feels guilty and self-critical about this, 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 because the self is in fact “bad” or lacking.

The cognitive therapy for PMS developed by Blake focuses on giving a woman the ability to cope with the paramenstrual phase, to be able to understand her perceptions and reduce her 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 such as Blake's. For example, if feelings of persecution are accompanied by feelings that persecution is deserved because of a woman's own attitudes towards menstruation, then these attitudes can be modified to reduce the distress associated with menses. Furthermore, by understanding and being able to recognise whether and when she is feeling paranoid, she can engage in techniques such as thought testing and challenging or behavioural experiments (Smith, Nathan, Juniper, Kingsep, & Lim, 2003). If the psychological mechanism is that menstruating acts as a stressor, then it is possible that paranoid thinking styles may arise at other times and in response to different stressors. If this is the case, then she could also generalise coping skills to other stressful situations.

For women prone to paranoid thinking or psychotic illnesses, awareness of the potential impact of the menstrual cycle may also be useful. The stress-vulnerability model (Zubin and Sping, 1977) is prominent within strategies for management and relapse prevention of psychotic experiences. The paramenstrual phase could be conceptualised as a period of increased stress or vulnerability to experiences of persecution for some women. Exploration by clinicians can help women be aware of and prepared for this potential stressor. Further, being able to understand causes of persecutory or psychotic symptoms can reduce the distress these experiences cause (Smith et al., 2003).

Therefore being able to attribute an increase in feelings of persecution to menstrual cycle phase may reduce the distress that paranoid thoughts and feelings cause.

In addition, one of the aims of investigating these two types of paranoia has been to explore the need for different therapeutic approaches (Chadwick, Trower, Juusti-Butler & McGuire, 2005). It may be that different therapeutic skills are required at different menstrual phases, and clinicians would need to be able to respond to idiosyncratic changes in individual women.

4.4 Limitations

The study had a number of limitations which need to be considered when interpreting the results. One consideration is that of timing. Hill and Durante (2009) identified lowered self-esteem at ovulation using specific hormonal measures. As the current study used an online study design, participants' cycle phase was estimated and could not be verified. This would mean that some women may have been ovulating and some may not, which may have affected the results. It is also possible that different results may have been obtained if one of the comparison points had been strictly the premenstrual phase, as symptoms may be relieved once menstruation begins (Blake, 1995). However, this would pose a design problem as measures would have to either be administered daily or rely on participant estimations of when menstruation was expected which could be affected by inaccurate estimations (Jukic, Weinberg, Wilcox, McConnaughey, Hornsby & Baird, 2007). It would also have been beneficial to have a third comparison point in the follicular phase. Unfortunately to do so here would have

involved excluding a number of participants, so it was decided to maximise the number of responses that could be used, and examine just two comparison points.

A further limitation is that the study was only conducted over 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, Slade and King, 2007). The decision to measure one cycle was based on the anticipation that it would be difficult to retain a high number of participants for such an extended period (an anticipation that was corroborated by the high drop-out rate), and that women who did commit to such a long period were likely to be particularly interested in menstrual cycle research, and thus skew the sample.

It is also likely that as participants were aware of the study purpose, the results may have been influenced by participants' expectations of mood changes, and it is possible that only women who were interested in mood changes or menstruation were recruited (Slade, 1984). Generalisability is limited by studying a primarily UK population and because over half of the sample was recruited through educational establishments.

Further, using an online study may have limited the sample as the Office for National Statistics (2010) stated that in 2010, 97% of adults educated to a degree level regularly accessed the internet, while only 45% of people without formal qualifications did so. However, as 76% of women, and 81-82% of people aged between 18 and 45, used the internet every day, the bias may be reduced in the population of interest here. It is hoped that the large sample size will counteract some of the issues regarding responder bias, while also improving the generalisability of the study.

4.5 Future Research

Since paranoia has generally not been researched in relation to the menstrual cycle, the findings reported here would need to be replicated by future studies. This is especially true as the issue of generalisability is important. Because the results indicate a significant effect of menstrual cycle phase on persecution within a non-clinical sample, there is an indication that this effect is important for women other than those diagnosed with PMS or other mental health problems. If this can be generalised then the findings could be usefully employed to educate society about the impact of the menstrual cycle. It will be also important to investigate the impact of the menstrual cycle within clinical populations and to clarify the extent of this effect.

The present study did not concentrate on the causes of the observed fluctuations. Previous researchers have focussed on the interaction between physiological factors such as oestrogen levels and psychotic illnesses such as schizophrenia. However, this study found that use of hormonal contraception was not associated with differences in variable scores across the cycle, which may support the view that social and psychological factors are important as well, and paranoid experiences and related difficulties arise as a result of an interaction between biological, social and psychological factors.

There are indeed numerous complex factors implicated in theories of paranoia, self-esteem and menstruation-related distress which have not been considered here. For example, concrete thinking, jumping to conclusions, attribution styles and sleeping difficulties have all been related to paranoia. The paramenstrual phase has been linked to numerous physiological and cognitive changes (Farage et al., 2008). As an example,

difficulty in sleeping has been noted during the cycle (Manber & Bootzin, 1997) and could be one mechanism that contributes to increased vulnerability to paranoia.

The results showed that levels of persecution increased and a greater proportion of the sample experienced paranoia at the paramenstrual phase than at mid-cycle. However, questions remain as to precisely what mechanism caused the increase in persecution.

Was the presentation of these thinking styles caused by increased stress due to social or psychological processes as, for example, suggested by Blake (1995)? Or, did they arise because of an increase in vulnerability caused by lowered oestrogen levels as suggested by Riecher-Rossler (2002)? Or was there an interaction between these and other factors? Further research is needed to unpick these various strands and explain *why* paranoia and self-esteem might be affected by menstrual cycle phase.

The results here also suggest that women are more likely to experience “bad-me” paranoia at the paramenstrual phase. However, this was not the main focus of the study. More finely tuned research is required to explore in detail whether women fluctuate in terms of the deservedness they experience, or whether women who are not usually paranoid tend to present as predominantly “bad-me” at the paramenstrual phase, possibly because of the feelings of shame discussed above.

5. Conclusion

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

At both phases, anxiety and depression were both related to persecution and deservedness. There was a negative relationship between persecution and positive self-esteem, and a positive relationship with negative self-esteem. The results supported the theory that increased deservedness would be related to increased negative self-esteem, although a similar relationship was not found with positive self-esteem. The relationships between the variables remained fairly stable even though the levels of individual variables changed. Changes in levels of persecution and deservedness significantly contributed to a model of change in negative self-esteem. Although the contribution of deservedness was very small, especially for positive self-esteem.

The interactions between self-esteem, persecution and the menstrual cycle were considered in the context of psychological models developed within the PMS and the psychosis literature. 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 and important perspective to understanding the interpersonal difficulties that some women experience at the paramenstrual phase.

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Appendices

(i)	Appendix	1	Journal Approval Letter
		2	Instructions for authors : Journal of Reproductive and Infant Psychology
		3	Instructions for authors: Personality and Individual Differences
(ii)	Appendix	a	Ethics Acceptance Letter
(iii)	Appendix	A	Recruitment advert
		B	Recruitment email for the present study and the study conducted by another trainee
		C	Survey: Information for participants, consent and introductory questions Hospital Anxiety and Depression Scale Self-Esteem Rating Scale – Short-Form Persecution and Deservedness Scale Final page
		D	Weekly email
		E	Reminder email
		F	Follow-up email
		G	Organisations through which participants were recruited and response rate estimates
		H	Kolmogorov-Smirnov and trimmed mean analysis
		I	Analysis of sub-groups
		J	Correlation Matrix

Appendix 1: Journal Approval Letter



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Doctor of Clinical Psychology (DClin Psy) Programme
Clinical supervision training and NHS research training
& consultancy.

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21st February 2011

Roz Hall
Third year trainee
Clinical Psychology Unit
University of Sheffield

Dear Roz

I am writing to indicate our approval of the journal(s) you have nominated for publishing work contained in your research thesis.

Literature Review: Journal of Reproductive and Infant Psychology

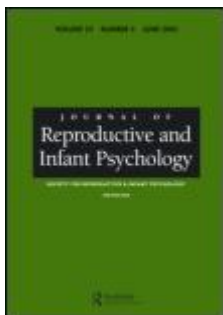
Research Report: Personality and Individual Differences

Please ensure that you bind this letter and copies of the relevant Instructions to Authors into an appendix in your thesis.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Rebecca Knowles'.

Dr Rebecca Knowles
Research Tutor



Journal of Reproductive and Infant Psychology

Published By: Routledge

Volume Number: 29

Frequency: 5 issues per year

Print ISSN: 0264-6838

Online ISSN: 1469-672X

Instructions for Authors

Journal of Reproductive and Infant Psychology welcomes reports of original research and creative or critical review articles which make an original contribution. Articles should not currently be submitted for publication elsewhere.

Topics of interest to the journal include psychological, behavioural, cognitive, affective, dynamic, medical, societal and social aspects of: fertility and infertility; menstruation and menopause; pregnancy and childbirth; antenatal preparation; motherhood and fatherhood; early infancy; infant feeding; early parent-child relationships; postnatal psychological disturbance and psychiatric illness; obstetrics and gynaecology including preparation for medical procedures; psychology of women; nursing, midwifery, neonatal care, health visiting, health promotion and health psychology.

The journal also publishes brief reports, comment articles and special issues dealing with innovative and controversial topics. A review section reports on new books and

training material.

All submissions should be made online at the *Journal of Reproductive and Infant Psychology* [ScholarOne Manuscripts site](#). New users should first create an account. Once a user is logged onto the site submissions should be made via the Author Centre.

Authors should prepare and upload two versions of their manuscript. One should be a complete text, while in the second all document information identifying the author should be removed from files to allow it to be sent anonymously to referees. When uploading files authors will then be able to define the non-anonymous version as “File not for review”.

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Dr. Maggie Redshaw, National Perinatal Epidemiology Unit, University of Oxford, Oxford, OX3 1LF, UK

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Book Review Editor: Kirstie McKenzie-McHarg, National Perinatal Epidemiology Unit, University of Oxford, Old Road Campus, Oxford, OX3 7LF, UK

Contributions should be as concise as possible and should not normally exceed 3500 words excluding references (2500 words for short reports) with a limited number of tables or figures (not exceeding 6 in number). Any figures should be in black, white and grey tones. The title should not exceed 15 words and the references should be no more than 50 in number. Each paper should be accompanied by a structured abstract - Objective, Background, Methods (to include design and participants), Results, and Conclusion, with a total length of not more than 250 words.

Papers are refereed anonymously. Criteria for review include: importance of topic, theoretical and practical relevance, contribution to knowledge, quality of research design, appropriate analysis and effective interpretation of results.

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Diagrams, graphs, drawings and half-tone illustrations should be on a separate sheet labelled 'Figure. 1' and so forth. Where possible they should be submitted as artwork ready for photographic reproduction, larger than the intended size. Where more than one figure is submitted, they should as far as possible be to the same scale.

SI units should be used for all measurements. Imperial measurements may be quoted in brackets. Where studies involve small numbers of subjects, both numbers and percentages of groups should be given.

Authors are advised to avoid sexist sentiments and language, except insofar as these form part of a study.

Manuscripts and correspondence concerning publication of articles will only be kept for 3 years by the Editors.

Page proofs will be sent to the author submitting each article. Correction of typographical errors only will be permitted at this stage. Textual alterations may be charged to authors in exceptional circumstances.

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Advice to authors on preparing a manuscript

NB: Please follow any specific instructions for authors provided by the Editor of the journal

Font: Times New Roman, 12 point. Use margins of at least 2.5 cm (1 inch).

Title: Use bold for your article title, with an initial capital letter for any proper nouns.

Authors' names: Give the names of all contributing authors on the title page exactly as you wish them to appear in the published article.

Affiliations: List the affiliation of each author (department, university, city, and country).

Correspondence details: Please provide an institutional email address for the corresponding author. Full postal details are also needed by the publisher, but will not necessarily be published.

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First-level headings (e.g. Introduction, Conclusion) should be in bold, with an initial capital letter for any proper nouns.

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Fourth-level headings should also be in italics, at the beginning of a paragraph. The text follows immediately after a full stop (full point) or other punctuation mark.

Tables and figures: Indicate in the text where the tables and figures should appear, for example by inserting [Table 1 near here]. The actual tables and figures should be supplied either at the end of the text or in a separate file as requested by the Editor. Ensure you have permission to use any figures you are reproducing from another source. Advice on artwork is available here.

Running heads and received dates are not required when submitting a manuscript for review.

If your article is accepted for publication, it will be copy-edited and typeset in the correct style for the journal.

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Appendix3: Instructions for authors- Personality and Individual Differences

The Official Journal of the International Society for the Study of Individual Differences (ISSID).

Personality and Individual Differences will be published monthly with additional issues in January, April, July and October--2 volumes/annum.

Neither the Editors nor the Publisher accept responsibility for the views or statements expressed by authors.

All incoming papers are subject to the refereeing process, unless they are not appropriate for the Aims and Scope of the journal as outlined, do not follow the Guide for Authors, or clearly suffer from methodological problems (e.g. unsatisfactory sample size). Correspondence regarding decisions reached by the editorial committee is not encouraged.



Before You Begin

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Preparation

Article structure

Subdivision - numbered sections

Divide your article into clearly defined and numbered sections. Subsections should be numbered 1.1 (then 1.1.1, 1.1.2, ...), 1.2, etc. (the abstract is not included in section numbering). Use this numbering also for internal cross-referencing: do not just refer to "the text". Any subsection may be given a brief heading. Each heading should appear on its own separate line.

Introduction

State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods

Provide sufficient detail to allow the work to be reproduced. Methods already published should be indicated by a reference: only relevant modifications should be described.

Theory/calculation

A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

Results

Results should be clear and concise.

Discussion

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations

and discussion of published literature.

Conclusions

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

Appendices

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information

- **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- **Author names and affiliations.** Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name, and, if available, the e-mail address of each author.
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Abstract

An abstract, not exceeding 200 words should constitute the first page of the article.

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A Graphical abstract is optional and should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership online. Authors must provide images that clearly represent the work described in the article. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531×1328 pixels (h \times w) or proportionally more. The image should be readable at a size of 5×13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. See <http://www.elsevier.com/graphicalabstracts> for examples.

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Immediately after the abstract, provide a maximum of 8 keywords, reflecting the essential topics of the article, which may be taken from both the title and the text. These keywords will be used for information retrieval systems and indexing purposes.

Abbreviations

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

Acknowledgements

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

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Footnotes, as distinct from literature references, should not be used unless there are very exceptional circumstances. If they are included, they should be indicated by the following symbols: *, †, ‡, §, ||, ¶, commencing anew on each page.

Artwork

Electronic artwork

General points

- Make sure you use uniform lettering and sizing of your original artwork.
- Save text in illustrations as "graphics" or enclose the font.
- Only use the following fonts in your illustrations: Arial, Courier, Times, Symbol.
- Number the illustrations according to their sequence in the text.
- Use a logical naming convention for your artwork files.
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- Produce images near to the desired size of the printed version.
- Submit each figure as a separate file.

A detailed guide on electronic artwork is available on our website:

<http://www.elsevier.com/artworkinstructions>

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Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

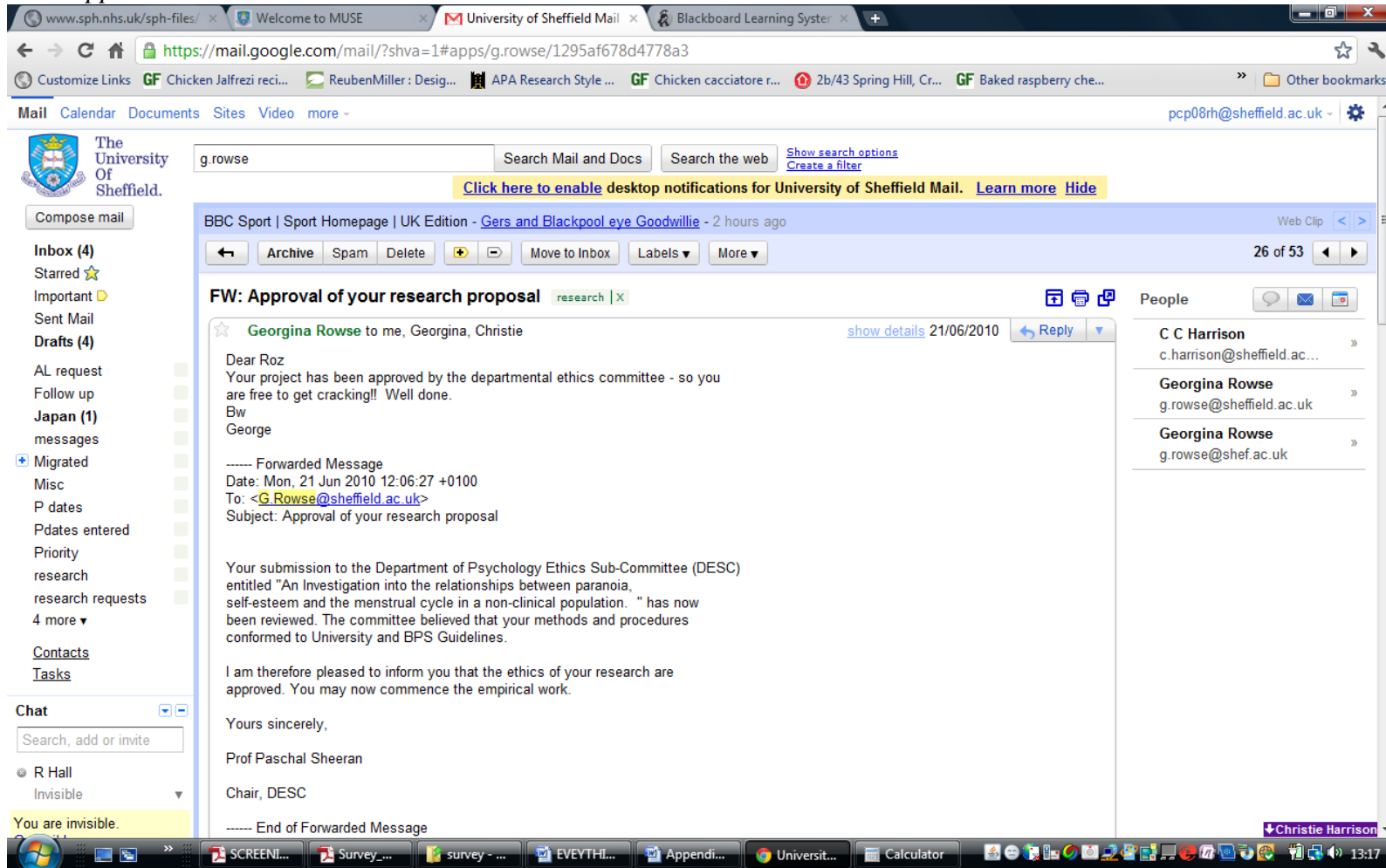
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References should be prepared using the *Publication Manual of the American Psychological Association* for style. They should be placed on a separate sheet at the end of the paper, double-spaced, in alphabetical order.

Appendix a: Ethics Approval





The
University
Of
Sheffield.

Research &
Innovation
Services.

A Section of Academic Services

Rosalind Hall
C/O Ms Christie Harrison
Clinical Psychology Unit
Department of Psychology

New Spring House
231 Glossop Road
Sheffield
S10 2GW

22 June 2010

Telephone: +44 (0) 114 222 1400
Fax: +44 (0) 114 222 1452
Email: l.smaller@sheffield.ac.uk

Project title: An investigation into the relationships between paranoia, self-esteem and the menstrual cycle in a non-clinical population
6 digit URMS number: 128115

Dear Rosalind

LETTER TO CONFIRM THAT THE UNIVERSITY OF SHEFFIELD IS THE PROJECT'S RESEARCH GOVERNANCE SPONSOR

Research and Innovation Services has reviewed the following documents:

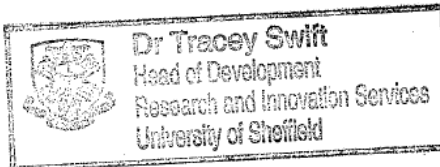
1. A University approved URMS costing record;
2. Signed, dated confirmation of scientific approval;
3. Signed, dated confirmation of ethics approval.

All the above documents are in place. Therefore, the University now **confirms** that it is the project's research governance sponsor and, as research governance sponsor, **authorises** the project to commence research activities.

You are expected to deliver the research project in accordance with the University's policies and procedures, which includes the University's Good Research Practice Standards: www.shef.ac.uk/ris/gov_ethics_grp. You are also expected to publish a lay summary of the project on the website of the National Research Ethics Service (NRES), as it appears in the research ethics application.

Your Supervisor, with your support and input, is responsible for monitoring the project on an ongoing basis. Your Head of Department is responsible for independently monitoring the project as appropriate. The project may be audited during or after its lifetime by the University. The monitoring responsibilities are listed in **Annex 1**.

Yours sincerely



cc. Supervisor: Dr Georgina Rowse
Head of Department/School: Professor Graham Turpin



Appendix A: Recruitment Information

Women needed: Can you help with online research?

Hello,

I am a trainee Clinical Psychologist, studying at the University of Sheffield. I am contacting you to tell you about my thesis research project and to invite you to participate. My study is interested in the way that thoughts and beliefs change over the menstrual cycle.

Taking part involves completing a ten minute online questionnaire each week for four weeks (we would send you a friendly reminder email each week).

For this study I need women aged 18-45 who menstruate regularly. *It does not matter at what point you are in your cycle when you enter.*

The study has received ethics approval from the University of Sheffield Department of Psychology Ethics Committee. In accordance with ethical guidance, all information you provide will remain entirely confidential, and you are free to withdraw at any time. We will need your email address to send you weekly reminders, but this information will only be available to the researchers and will be destroyed as soon as the study is complete.

If you are interested in taking part, please click here: [enter link]

If you have any further queries please do not hesitate to email me at pcp08rh@sheffield.ac.uk.

If you know anyone else who might be interested in taking part, please do forward this email to them as we appreciate every participant.

Thank you

Rosalind Hall

Researchers:

Rosalind Hall
Trainee Clinical Psychologist
University of Sheffield

Dr Georgina Rowse
Clinical Psychologist
University of Sheffield

Prof Pauline Slade
Prof. Clinical Psychology
University of Sheffield

Appendix B: Recruitment Email for The present Study and Study Conducted by Another Trainee

Research: Participants needed!

Hello,

We are trainee Clinical Psychologists. We are contacting you to tell you about two research projects and invite you to participate in either one or both of these studies. Both studies require filling an online questionnaire where you'll be asked some questions about your thoughts and feelings.

Study 1: For women only and is looking at changes over the menstrual cycle. We would therefore ask you to complete a ten minute online questionnaire each week for four weeks (we would send you a friendly reminder email each week). For this study we need women aged 18-45 who menstruate regularly.

Study 2: The other study is open to anyone, both men and women. For this study, you would need to complete a one-off questionnaire which takes 15 to 20 minutes.

If you are a woman and would like to take part in both studies, you would complete the longer one-off questionnaire first, and then on subsequent weeks you would only need to complete the shorter questionnaire.

If you are interested in taking part in the studies click here:

both studies: <https://www.surveymonkey.com/s/WR3JLYK>

Just study 1 <https://www.surveymonkey.com/s/NJWWXFN>

Just study 2 <https://www.surveymonkey.com/s/NCPSJPJ>

The study has received ethics approval from the Department of Psychology Ethics Sub-Committee. In accordance with ethical guidance, all information you provide will remain entirely confidential, and you are free to withdraw at any time.

If you have any further queries please do not hesitate to email us at pcp08rh@sheffield.ac.uk (Rosalind Hall), or pcp08jmn@sheffield.ac.uk (Jenny Neubert).

Many thanks

Rosalind Hall and Jenny Neubert

Researchers:

Rosalind Hall
Jenny Neubert
Trainee Clinical Psychologists

1. Information Page

THANK YOU for your interest in this study. Please read the following information carefully before deciding whether you want to take part in this piece of research.

This study is going to look at how people think and feel at different points in their menstrual cycle. We hope to increase our understanding and inform interventions for people who are affected by the menstrual cycle. We also hope to develop our understanding of how thoughts, beliefs and feelings interact in general.

You will be asked some questions about your menstrual cycle, then about some of your thoughts and experiences over the last week. This will take about ten minutes.

"You must be 18 to 45 years old to take part in the study"

"You must be female and menstruating regularly"

Because the study is interested in how people change over their cycle, you will be asked to complete this questionnaire **every week for four weeks**.

You will therefore be asked to provide your email address so that we can send you friendly reminder emails with the link to the next week of the study. Your email will only be used for this purpose and to link your responses together. It will not be linked to the data during analysis and will be destroyed as soon as the study is completed.

All of your answers will be **completely confidential**, and you are free to withdraw at any point. You can exit this survey at any point and your answers will not be saved. After you submit your answers, you can withdraw by contacting the researchers on the details given below.

All information collected will be stored securely. Passwords are used so that only the researchers can access the data.

The information that you provide will be used as part of my thesis, and may be submitted for publication.

If you would like to receive a summary of the results, please contact the researchers on the details below.

If you have any **questions or concerns** about the study, you can contact the researcher by email: Rosalind Hall, ppp08rh@sheffield.ac.uk.

This study has received **ethical approval** from the University of Sheffield Department of Psychology ethics committee.

2. Consent Page

If you have read the information provided and you would still like to take part, can you please confirm the following details

*** I confirm that I am between 18 and 45 years of age**

Yes

No

*** I confirm that I experience regular periods**

Yes

No

*** I have read the information provided, and hereby give my consent for the information that I provide to be used for the research purposes described**

Yes

No

3. Consent needed

You have selected 'no' as your response to the question about consenting to take part.

Sorry, you can only continue the survey once you confirm that you consent.

If you selected 'no' by mistake, click next to go back to the consent page

Otherwise, please exit the survey

4. Information about you

Please answer the following questions about yourself

*** Please can you provide your email address. This will be used to link your responses together and to send you reminder emails to complete the study in subsequent weeks.**

Please note: this information will only be available to the researchers and will be destroyed once the study is complete.

Email Address:

*** What is your age in years?**

What is your ethnic group?

- White
- Mixed
- Asian
- Black
- Other

Are you currently using hormonal contraception (including the pill, mini-pill, coil, patch or implant)?

- Yes
- No

If yes, can you tell us which one?

If the first day of your period is day 1, how long has it been since your last period?

If you aren't sure, don't worry, but please keep a record when you do start your next period so that you can enter it later in the study.

- 0 - 3 days
- 4 - 10 days
- 11 - 17 days
- 18 - 24 days
- 25 - 33 days
- Unsure

How long is your average menstrual cycle? (e.g.28 days)

Is the length of your cycle variable, and if so can you give us an estimate of by how much? (e.g. by 3-5 days)

[Hospital Anxiety and Depression Scale]

Not included due to copyright

The Self-Esteem Rating Scale

Not included due to copyright.

Persecution and Deservedness Scale

Not included due to copyright

28. Thank you

Thank you very much for participating in this study. We really appreciate all of the time that you have taken to answer our questions.

We hope this study will increase our understanding and inform interventions for people who are affected by the menstrual cycle. We also hope to develop our understanding of how thoughts, beliefs and feelings interact in general.

*** As a final request, depending on where you were in your cycle during the study we might want to email you one last time to ask for the date of your next period. If you agree to this please select "yes"; if you do not want us to contact you again, please select "no" and we will not email you again.**

Yes

No

Your email address will be used to link your responses, but it will not be linked to the data during the analysis, and will be destroyed once the study is over.

If you have any questions regarding this study, please contact Rosalind Hall on pcp08rh@sheffield.ac.uk.

If the content of this survey has caused you any concern then you can seek support from your OB, or if you are a student at the University of Sheffield, you can contact the University counselling service (details below).

**University of Sheffield Counselling Service
36 Wilkinson Street
Sheffield
S10 2GB**

Tel: 0114 2224134

Thank you

Appendix D: Weekly email

Email Subject: Menstrual Cycle Research Project: Week 2/3/final week

Dear participant,

Thank you for agreeing to participate in my research project!

It has now been a week since you completed your last questionnaire. If you still want to take part in the study then please can you find some time over the next few days to click on the link below (or copy and paste it into your web browser) and complete your next questionnaire.

All of your responses will remain completely confidential, and you are free to withdraw from the study at any time.

[Enter link]

Many thanks

Rosalind Hall

Appendix E: Reminder Email

Dear Participant,

You have recently entered my research study looking at thoughts, beliefs and the menstrual cycle. I am contacting you today because I noticed that you haven't completed the next part of the study.

If you do still want to participate, please use the link below to complete your next set of questions:-

(Enter link)

If you no longer want to take part, you can opt out of the study using the link below and we will not contact you again:-

(opt out link)

Thank you

Rosalind Hall

Trainee Clinical Psychologist

Appendix F: Follow-up Email

Subject: Menstrual Cycle Study: Follow-up

Dear Participant,

Thank you for your recent participation in my study looking at the way that thoughts, feelings and beliefs change over the menstrual cycle. Your help is truly appreciated.

I'm emailing you again is to ask you for one final piece of information: the date that you started your next period after finishing the study, as this will allow me to make best use of the information you have already kindly given me.

If you do know the date and are willing to provide this I would really appreciate it if you could email it to me at pcp08rh@sheffield.ac.uk using the email account that I have contacted you on (you can just reply to this email directly). This information will be entirely confidential and used only for the purposes of the research described.

If you do not know, or do not want to provide this information then please just discard this email.

Once more, thank you for all of the information you have provided. Please be assured I will not contact you again unless you have asked for a summary of our research findings.

Yours Sincerely

Rosalind Hall

Trainee Clinical Psychologist

Appendix G: Organisations Through Which Participants Were Recruited and Response Rate Estimates

Table G1

Organisations Contacted and Potential Advert Views

	Visitors to site	Advert hits
www.aphrodite.com	13,000 members	400
Barnsley College	360 female staff members	
www.creativewomensnetwork.co.uk	Not available	
Daph-net		
www.essexmums.co.uk	6500	
Facebook		504
www.getsetwomen.org	1,800	
www.leedsforum.co.uk		203
Mumsnet.	25 million monthly hits	Not available
www.netmums.co.uk	10,100	
www.onlinepsychresearch.co.uk	Not available	
Rotherhamweb.co.uk	Not available	
Sheffield City Council Intranet		583
Sheffield College Facebook Page	Not available	
Sheffield feminist network		220
www.sheffieldforum.co.uk	260,000 visitors/month	585
Sofeminine.co.uk	Not available	
www.thewi.org.uk	200,000 members majority over 45	
Ukfeminista.org.uk		156
University of Sheffield volunteers list		3473
University of Sheffield students	12877	12432
University of Sheffield staff	3028	
www.wherewomenconnect.com	400	
Womensthoughts.co.uk	9000 monthly visitors (two months)	
http://www.workingwoman.org.uk	10,000	
Yorkshire Women's Entrepreneurs	3-400	

Table G 2

Approximate response rates

	Approximate Response rate
University staff and students	4%
Sheffield City Council	8%
Colleges	11%
"Mums" websites	1.3%
Social networking sites	7%
Women's networking organisations	5%

Appendix H: Kolmogorov-Smirnov and Trimmed Mean Analysis

Table H1

Summary of Kolmogorov-Smirnov Analyses indicating non-normal distribution of all measures

Phase		<i>N</i>	<i>D</i>
Paramenstrual	Anxiety	278	.11*
	Depression	278	0.17*
	Positive Self-esteem	278	0.08*
	Negative Self-esteem	278	0.09*
	Persecution	278	0.11*
	Deservedness	224	0.15*
Mid-cycle	Anxiety	278	0.10*
	Depression	278	0.21*
	Positive Self-esteem	278	0.09*
	Negative Self-esteem	278	0.10*
	Persecution	278	0.11*
	Deservedness	205	0.15*

Note * $p < 0.001$

Table H2

Comparison of Means and 5% Trimmed Mean of All Measures

	Paramenstrual		Mid-cycle	
	Mean	5% Trimmed Mean	Mean	5% trimmed Mean
Anxiety	7.78	7.61	6.1	5.96
Depression	4.49	4.17	3.05	2.75
Positive Self-esteem	47.54	47.86	49.67	50.20
Negative Self-esteem	32.22	31.62	30.22	29.67
Persecution	1.2986	1.2602	1.141	1.0863
Deservedness	1.3614	1.3210	1.19	1.132

Appendix I: Analysis of Sub-Groups

Table I 1

Results of Mann Whitney U Test of Differences Between Recruitment Groups

Phase		University <i>Mdn</i>	Community <i>Mdn</i>	Z	<i>P</i> (one-tailed)
Para-menstrual	Anxiety	7.00 ^a	7.50 ^c	-0.40	0.34
	Depression	3.00 ^a	4.00 ^c	-1.56	0.06
	Positive Self-esteem	48.00 ^a	47.50 ^c	-0.23	0.41
	Negative Self-esteem	31.00 ^a	31.00 ^c	-0.38	0.35
	Persecution	1.10 ^a	1.20 ^c	-0.15	0.44
Mid-cycle	Deservedness	0.88 ^b	0.67 ^d	-0.99	0.17
	Anxiety	6.00 ^a	6.00 ^c	-0.62	0.26
	Depression	2.00 ^a	2.00 ^c	-2.35	0.01*
	Positive Self-esteem	51.00 ^a	50.50 ^c	-0.53	0.31
	Negative Self-esteem	28.00 ^a	30.00 ^c	-1.18	0.12
	Persecution	1.00 ^a	1.00 ^c	-0.69	0.24
	Deservedness	0.67 ^b	0.76 ^d	-0.80	0.21

Note ^a n=152; ^b n=123; ^c n=126; ^dn=101 *significant

Table I 2

Results of Mann Whitney U Test of Differences between Contraception Groups

Phase		Using Hormonal Contraception <i>Mdn</i>	Not Using Hormonal Contraception <i>Mdn</i>	Z	<i>P</i> (one-tailed)
Para-menstrual	Anxiety	7.00 ^a	7.00 ^c	-0.08	0.46
	Depression	3.00 ^a	4.00 ^c	-2.78	0.003*
	Positive Self-esteem	50.00 ^a	46.00 ^c	-1.74	0.04*
	Negative Self-esteem	30.00 ^a	32.00 ^c	-1.56	0.06
	Persecution	1.20 ^a	1.20 ^c	-0.33	0.37
	Deservedness	0.77 ^b	1.00 ^d	-0.79	0.21
Mid-cycle	Anxiety	6.00 ^a	6.00 ^c	-0.86	0.19
	Depression	1.00 ^a	2.00 ^c	-1.8	0.04*
	Positive Self-esteem	52.00 ^a	50.00 ^c	-0.29	0.38
	Negative Self-esteem	29.00 ^a	29.00 ^c	-1.19	0.12
	Deservedness	0.75 ^b	0.75 ^d	-0.29	0.39

Note: ^a n=89; ^b n=66; ^c n=189; ^d n=139

*significant

Table I 3

Summary of Wilcoxon signed ranks tests of changes in variables disaggregated by use of hormonal contraception

		Paramenstrual Phase	Mid- cycle	<i>Z</i>	<i>P</i>	Effect size <i>r</i>	Power
		<i>Mdn</i>	<i>Mdn</i>				
Not Using Hormonal Contraception	Anxiety	7.00	6.00	-5.75	<0.001	0.42	0.99
	Depression†	4.00	2.00	-5.19	<0.001	0.38	0.98
	Positive Self- esteem†	46.00	50.00	3.86	<0.001	0.28	0.98
	Negative Self-esteem	32.00	29.00	- 4.135	=0.001	0.30	0.99
	Persecution	1.20	1.00	-3.55	<0.001	0.26	0.97
Using hormonal contraception	Anxiety	7.00	6.00	-3.26	-0.001	0.35	0.94
	Depression†	3.00	1.00	-2.52	=0.01	0.27	0.80
	Positive Self- esteem†	50.00	52.00	2.11	=0.04	0.22	0.64
	Negative Self-esteem	30.00	29.00	-2.58	=0.01	0.27	0.80
	Persecution	1.20	1.00	2.25	-0.03	0.24	0.71

Note † variables that were significantly different between groups.

The Chi square could not be conducted (as in section 3.2.5) due to insufficient numbers in each group. Further, deservedness scores were not significantly different between the groups so this analysis was unlikely to be necessary.

Appendix J: Correlation Matrixes

Table J 1

Paramenstrual Phase: Pearson Correlation Matrix

	<i>N</i>	Anxiety	Depression	Positive Self-esteem	Negative Self-esteem	Persecution
Anxiety	278	1.00*	0.59*	-0.53*	0.58*	0.54*
Depression	278	0.59*	1.00*	-0.51*	0.50*	0.39*
Positive Self-esteem	278	-0.53*	-0.51*	1.00*	-0.69*	-0.53*
Negative Self-esteem	278	0.58*	0.50*	-0.69*	1.00*	0.61*
Persecution	278	0.54*	0.39*	-0.53*	0.61*	1.00*
Deservedness	224	0.30*	0.31*	-0.53*	0.50*	0.40*

Note 2 * $p < 0.001$

Table J 2

Mid-cycle Phase: Pearson Correlation Matrix

	<i>N</i>	Anxiety	Depression	Positive Self-esteem	Negative Self-esteem	Persecution
Anxiety	278	1.00*	0.58*	-0.46*	0.52*	0.49*
Depression	278	0.58*	1.00*	-0.45*	0.45*	0.40*
Positive Self-esteem	278	-0.46*	-0.45*	1.00*	-0.67*	-0.53*
Negative Self-esteem	278	0.52*	0.45*	-0.67*	1.00*	0.59*
Persecution	278	0.49*	0.40*	-0.53*	0.59*	1.00*
Deservedness	205	0.24*	0.21*	-0.46*	0.48*	0.38*

Note * $p < 0.001$