Daily symptom ratings for studying premenstrual dysphoric disorder

Bosman, Renske C.; Jung, Sophie E.; Miloserdov, Kristina; Schoevers, Robert A.; aan het Rot, Marije

Published in: Journal of Affective Disorders

DOI: 10.1016/j.jad.2015.08.063

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date: 2016

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment.

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Download date: 18-09-2023
Review

Daily symptom ratings for studying premenstrual dysphoric disorder: A review

Renske C. Bosman<sup>a,b,1</sup>, Sophie E. Jung<sup>a</sup>, Kristina Miloserdov<sup>b</sup>, Robert A. Schoevers<sup>c</sup>, Marije aan het Rot<sup>a,b</sup>

<sup>a</sup>Department of Psychology, University of Groningen, The Netherlands
<sup>b</sup>School of Behavioural and Cognitive Neurosciences, University of Groningen, The Netherlands
<sup>c</sup>University of Groningen, University Medical Centre Groningen, Department of Psychiatry, Groningen, The Netherlands

ABSTRACT

Background: To review how daily symptom ratings have been used in research into premenstrual dysphoric disorder (PMDD), and to discuss opportunities for the future.

Methods: PsycINFO and Medline were systematically searched, resulting in the inclusion of 75 studies in which (1) participants met the diagnostic criteria for late luteal phase dysphoric disorder (LLPDD) or PMDD and (2) diaries were used to study LLPDD/PMDD.

Results: To date, diaries have been used to gain insight into the aetiology and phenomenology of PMDD, to examine associated biological factors, and to assess treatment efficacy. We found low consistency among the diaries used, and often only part of the menstrual cycle was analysed instead of the whole menstrual cycle. We also observed that there was substantial variability in diagnostic procedures and criteria.

Limitations: This review excluded diary studies conducted in women with premenstrual syndrome, women seeking help for premenstrual complaints without a clear diagnosis, and women without premenstrual complaints.

Conclusions: Prospective daily ratings of symptoms and related variables provide a valuable and important tool in the study of PMDD. This paper addresses some options for improving the use of diaries and proposes the use of experience sampling and ecological momentary assessment to investigate within-person variability in symptoms in more detail.

Keywords:
- Premenstrual syndrome
- Menstrual cycle
- Premenstrual dysphoric disorder
- Daily ratings
- Diaries

Article history:
Received 20 April 2015
Received in revised form 26 August 2015
Accepted 28 August 2015
Available online 14 September 2015

Article info

© 2015 Elsevier B.V. All rights reserved.
1. Introduction

The menstrual cycle is often characterized by somatic and psychological changes. Women show variation in the extent to which they experience these changes and are distressed or impaired by them. Premenstrual symptoms are thought to adversely affect a significant proportion of women, but the prevalence of premenstrual disorder depends on the diagnostic criteria used to assess it. For example, premenstrual syndrome (PMS) is thought to affect around one in four premenopausal women (Steiner et al., 2003). PMS is a gynaecological condition characterized by psychological as well as somatic symptoms (American College of Obstetricians and Gynaecologists, 2000; Royal College of Obstetricians and Gynaecologists, 2007). Functional impairment in PMS may be mild and related to either somatic or psychological symptoms.

In contrast, according to the current Diagnostic and Statistical Manual of Mental Disorders (DSM-5), a diagnosis of premenstrual dysphoric disorder (PMDD) requires the presence of at least one marked psychological symptom (i.e. affective lability, irritability, depressed mood, or anxiety) and at least four additional psychological, somatic, or behavioural symptoms which interfere with daily life (American Psychiatric Association, 2013). Depending on the study method and assessed population, the prevalence of PMDD in premenopausal women varies between 2–8% (Epperson et al., 2012; European Medicines Agency, 2012). PMDD was first added to the DSM-III-R in the Appendix, under the name late luteal phase dysphoric disorder (LLPDD). In the DSM-IV, PMDD remained in the Appendix under its current name. In the DSM-5, PMDD has been classified as a depressive disorder. To confirm a PMDD diagnosis, the DSM-5 requires at least two consecutive months of daily symptom ratings. These prospective ratings are used to determine symptom cyclicity, thus differentiating PMDD from other depressive disorders such as major depressive disorder (MDD) (American Psychiatric Association, 2013; Epperson et al., 2012; Rapkin et al., 2002).

Compared to retrospective assessments such as the Premenstrual Assessment Form (PAF) (Allen et al., 1991) and the Premenstrual Symptoms Screening Tool (PSST) (Steiner et al., 2003), diaries are more time consuming and more demanding for both patient and clinician. However, retrospective assessments tend to result in an overestimation of symptoms (Haywood et al., 2002). This is explained by intrinsic differences between the two measurement approaches. Firstly, retrospective assessments rely on the recall of memories. As memories are not exact reflections of the past, they can be biased, for example by previous experience and by the context in which retrieval occurs (Conner and Barrett, 2012; Eich, 1980). Therefore, memory-distorting factors are more likely to play a role in retrospective assessment than in assessment by diary (Conner and Barrett, 2012; Schwarz, 2012; Shiffman et al., 2008). Secondly, variability of symptoms is harder to assess in retrospect than mean levels of symptoms (Ebner-Priemer and Trull, 2012). This is very relevant for the diagnosis of PMDD, which includes affective lability as a characteristic psychological symptom. To accurately examine this symptom, it appears necessary to assess positive and negative affect repeatedly.

There may be benefits beyond diagnosis when asking women, who are seeking help for premenstrual discomfort, to keep a diary for two months. First, daily ratings of symptoms and other self-report variables may contribute to insights into the phenomenology of PMDD and into the aetiology and impact of premenstrual symptoms. Second, daily symptom ratings may be linked to levels of various biomarkers, thus providing insight into the biology of PMDD. Third, diaries may yield important information about the efficacy of and mechanisms underlying PMDD treatment. Fourth, within-person processes can be studied in addition to between-person differences (Molenaar, 2004; Molenaar and Campbell, 2009).

The present review had two major aims. As indicated in the previous paragraph, there are at least four different ways in which PMDD diaries can be applied in research. By reviewing the extent to which this has been done to date, we aimed to uncover lacunae in the PMDD literature. Additionally, we reviewed the type of diary and data extraction used in the various studies. This was done to promote methodological consensus across future diary studies on PMDD. In the discussion, we also discuss how standardisation of PMDD diaries might benefit clinical practise.

2. Methods

We conducted a search in PsycINFO and Medline using the following string of search terms: "(‘LLPDD’ OR ‘late luteal phase dysphoric disorder’ OR ‘PMDD’ OR ‘PMS’ OR ‘premenstrual’) AND (‘diary’ OR ‘diaries’ OR ‘daily’ OR ‘prospective’ OR ‘momentary assessment’ OR ‘experience sampling’). In August 2015 this resulted in a total of 1444 hits.

We formulated the following study selection criteria: (1) Publication as an empirical article in an English-language journal; (2) A majority of study participants met the diagnostic criteria of LLPDD or PMDD according to a validated retrospective measure such as the PAF or the PSST (Allen et al., 1991; Steiner et al., 2003) in combination with at least two months of daily symptom ratings; (3) Daily ratings were not solely used for diagnostic purposes but also as an outcome measure, i.e. daily ratings were included in the statistical analysis as a dependent variable and the outcomes of the analysis were described in the result Section; (4) Daily ratings that were used as an outcome measure were provided at least once a day for at least one month.

In accordance with the PRISMA guidelines (Menzies, 2011; Moher et al., 2009), studies were subsequently selected by two independent reviewers (RCB and SEJ) via a three-stage procedure. In the first stage, studies were selected based on title. After excluding studies for which the title clearly indicated that the study did not meet the selection criteria, 420 studies remained. In the second stage, the abstracts of the remaining studies were read. Studies were excluded based on their abstract when the abstract stated that participants had no diagnosis, or a diagnosis other than PMDD/LLPDD (236 studies); when the abstract did not mention the use of daily ratings (13 studies); when the abstract indicated that daily ratings were only used to assess the diagnosis (7 studies), or when the abstract revealed e.g. a review or commentary (44 studies). After completing this stage, 120 studies remained. In the final stage, studies were selected by reading their methods and, if it remained unclear whether daily ratings were included in the statistical analyses as an outcome variable, the result section was read. Disagreements between the reviewers were solved by reaching consensus through discussion.
Table 1

Overview of studies included in the systematic review.

<table>
<thead>
<tr>
<th>Reference</th>
<th>N</th>
<th>Diagnosis</th>
<th>Required magnitude of symptom change</th>
<th>Diary</th>
<th>Cycles</th>
<th>Rating days</th>
<th>Research question(s) answered using the diary data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application 1: Increase knowledge on aetiology and impact of premenstrual symptoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Berger and Presser, 1994)</td>
<td>48</td>
<td>LLPDD</td>
<td>30%</td>
<td>VAS</td>
<td>6</td>
<td>9–12; 25–28</td>
<td>How do symptoms vary from the premenstrual to the post-menstrual phase?</td>
</tr>
<tr>
<td>(Bloch et al., 1997)</td>
<td>16</td>
<td>PMDD</td>
<td>30%</td>
<td>VAS</td>
<td>≥3</td>
<td>Postmenstrual; 22–28</td>
<td>How do premenstrual symptoms in women with PMDD differ from symptoms in women without PMDD?</td>
</tr>
<tr>
<td>(Bloch et al., 1998)*</td>
<td>10</td>
<td>PMDD</td>
<td>30%</td>
<td>DRF</td>
<td>1</td>
<td>Postmenstrual; Premenstrual</td>
<td>How do premenstrual symptoms and hormone levels vary throughout the menstrual cycle?</td>
</tr>
<tr>
<td>(Marks et al., 1994)</td>
<td>9</td>
<td>LLPDD</td>
<td>30%</td>
<td>DRF</td>
<td>2</td>
<td>All</td>
<td>Are there cycle-to-cycle differences in symptoms?</td>
</tr>
<tr>
<td>(Marr et al., 2011a)</td>
<td>449</td>
<td>PMDD</td>
<td>100%</td>
<td>DRSP</td>
<td>5</td>
<td>6–10; 24–28</td>
<td>Are premenstrual symptoms and functional impairment linked?</td>
</tr>
<tr>
<td>(Morgan et al., 1996)</td>
<td>30</td>
<td>PMDD</td>
<td>30%</td>
<td>Unclear</td>
<td>2</td>
<td>8–12; 24–28</td>
<td>Are premenstrual symptoms and substance use linked?</td>
</tr>
<tr>
<td>(Parry et al., 1993)*</td>
<td>19</td>
<td>LLPDD</td>
<td>Not reported</td>
<td>VAS</td>
<td>4</td>
<td>Unclear</td>
<td>Are premenstrual symptoms and cognitive functioning linked?</td>
</tr>
<tr>
<td>(Pearlstein et al., 2005c)</td>
<td>281</td>
<td>PMDD</td>
<td>75%</td>
<td>DRSP</td>
<td>3</td>
<td>1–4; 12–28</td>
<td>How do premenstrual symptoms and hormone levels vary throughout the menstrual cycle?</td>
</tr>
<tr>
<td>(Pincus et al., 2008)</td>
<td>15</td>
<td>PMDD</td>
<td>30%</td>
<td>VAS</td>
<td>1–4</td>
<td>All</td>
<td>Are there cycle-to-cycle differences in symptoms?</td>
</tr>
<tr>
<td>(Rapkin et al., 1998)*</td>
<td>32</td>
<td>PMDD</td>
<td>50%</td>
<td>Unclear</td>
<td>3</td>
<td>8–12; 24–28</td>
<td>How do premenstrual symptoms and hormone levels vary throughout the menstrual cycle?</td>
</tr>
<tr>
<td>(Sundblad et al., 1993)*</td>
<td>29</td>
<td>LLPDD</td>
<td>100%</td>
<td>VAS</td>
<td>6</td>
<td>6–10; 24–28</td>
<td>Are premenstrual symptoms and major depression linked?</td>
</tr>
<tr>
<td>(Sundström et al., 1997)</td>
<td>12</td>
<td>PMDD</td>
<td>Unclear</td>
<td>VAS</td>
<td>3</td>
<td>All</td>
<td>How do symptoms vary from the premenstrual to the post-menstrual phase?</td>
</tr>
<tr>
<td>(Sundström et al., 1999)*</td>
<td>27</td>
<td>PMDD</td>
<td>Unclear</td>
<td>VAS, CD</td>
<td>5</td>
<td>All</td>
<td>Are there cycle-to-cycle differences in symptoms?</td>
</tr>
<tr>
<td>(Wang et al., 1996)*</td>
<td>12</td>
<td>LLPDD</td>
<td>Not reported</td>
<td>DRF</td>
<td>≥2</td>
<td>15–28</td>
<td>How do premenstrual symptoms differ from symptoms in women without PMDD?</td>
</tr>
<tr>
<td>(Yonkers and White, 1992)</td>
<td>5</td>
<td>LLPDD</td>
<td>Not reported</td>
<td>DRF</td>
<td>≥2</td>
<td>3 worst days of 5 postmenstrual days; 3 worst days of 5 premenstrual days</td>
<td>Are there cycle-to-cycle differences in symptoms?</td>
</tr>
</tbody>
</table>

Application 2: Elucidate the biology associated with premenstrual symptoms

| Reference                   | N     | Diagnosis | Required magnitude of symptom change | Diary | Cycles | Rating days | Research question(s) answered using the diary data                                      |
|-----------------------------|-------|-----------|---------------------------------------|-------|--------|-------------|                                                                                         |
| (Bloch et al., 1998)        | 10    | PMDD      | 30%                                   | DRF   | 1      | Postmenstrual; Premenstrual | How do premenstrual symptoms and hormone levels vary throughout the menstrual cycle?   |
| (Eriksson et al., 2006)     | 8     | PMDD      | 100%                                  | VAS   | 3      | 6–10; 24–28 | Are changes in daily symptom ratings related to changes in brain 5-hydroxytryptophan?  |
| (Rapkin et al., 1998)       | 32    | PMDD      | 50%                                   | Unclear | 3    | 8–12; 24–28 | How do premenstrual symptoms and hormone levels vary throughout the menstrual cycle?   |
| (Seippel and Bäckström, 1998) | 30    | PMDD      | Not reported                          | VAS   | 2      | 19–28       | What is the relation between premenstrual symptom changes and hormonal changes?        |
| (Wang et al., 1996)*        | 12    | LLPDD     | Not reported                          | VAS   | 2      | 15–28       | What is the relation between premenstrual symptom changes                                |
### Application 3: Efficacy of LLPDD/PMDD treatment

#### Pharmacological treatment approaches

**Studies investigating treatment with a Selective Serotonin Reuptake Inhibitor**

<table>
<thead>
<tr>
<th>Reference</th>
<th>N</th>
<th>Diagnosis</th>
<th>Required magnitude of symptom change</th>
<th>Diary</th>
<th>Cycles</th>
<th>Rating days</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunter et al., 2002a, 2002b</td>
<td>60</td>
<td>PMDD</td>
<td>30%</td>
<td>COPE</td>
<td>8</td>
<td>7 days postmenstrual; 22–28</td>
<td>CBT</td>
</tr>
<tr>
<td>Parry et al., 1993</td>
<td>19</td>
<td>LLPDD</td>
<td>Not reported</td>
<td>VAS</td>
<td>4</td>
<td>Premenstrual</td>
<td>Light therapy, Changes in diet, exercise, and stress management</td>
</tr>
<tr>
<td>Pearlstein et al., 1992</td>
<td>48</td>
<td>LLPDD</td>
<td>30%</td>
<td>DAF</td>
<td>2.5</td>
<td>7 postmenstrual days; 7 premenstrual days</td>
<td></td>
</tr>
</tbody>
</table>

**Fluoxetine**

- Fluoxetine (multiple doses) (relapse after discontinuation)
- Escitalopram (symptom onset vs. luteal phase only)
- Paroxetine (multiple doses)

**Paroxetine**

- Paroxetine (symptom changes throughout the day)
- Fluoxetine (multiple doses) (luteal phase only) (relapse after discontinuation)
- Paroxetine (luteal phase only)

**Venlafaxine**

- Venlafaxine (luteal phase only)
- Paroxetine
- Duloxetine

**Sertraline**

- Paroxetine (continuous vs. luteal phase only)
- Fluoxetine (symptom changes throughout the day)
- Paroxetine (multiple doses) (luteal phase only)

**Ramos et al., 2008**

- Paroxetine (continuous vs. luteal phase only)
- Duloxetine
- Duloxetine

**Ramos et al., 2009**

- Paroxetine (luteal phase only)
- Duloxetine
- Duloxetine
A LLPDD—Late Luteal Phase Dysphoric Disorder; PMDD—Premenstrual Dysphoric Disorder.

b Reported magnitude symptoms had to change from the postmenstrual to the premenstrual phase in order to receive the diagnosis PMDD. In some studies additional criteria were set, those are not reported here.

c Diaries used in the different studies (see Table 2 for acronyms and descriptions; sometimes modified versions were used).

d Number of menstrual cycles during which the diaries were used for research purposes (i.e. not just for diagnostic purposes).

e Days of cycle included in each study for research purposes. Days 1–6 indicate the menstrual period, days 4–14 the postmenstrual period, days 12–16 the ovulatory period, days 17–20 the postovulatory period, and days 21–28 indicate the premenstrual period. Overlap in the day ranges is due to variation across studies.

f CBT: cognitive behavioural therapy.

* Study included more than once in the Table.
This three-stage procedure yielded 47 studies. The references of these studies were checked for additional studies. This resulted in the inclusion of 92 additional studies that were not initially selected because they never showed up in the search (13 studies), they had been excluded based on the title (3 studies), or they had been excluded based on the abstract, mostly because it mentioned a diagnosis other than LLPDD or PMDD (13 studies). In total we reviewed 75 studies.

3. Results

The main characteristics of the 75 diary studies are presented in Table 1. They included 59 studies on PMDD and 16 studies on LLPDD (also referred to as PMDD from here on). Below we briefly summarise how the diaries have been applied, the various diaries used across studies, and the data extraction procedures that were used.

3.1. How have diaries been applied?

Four potential applications of diaries were proposed in the Introduction. Table 1 provides an overview of which studies have been used for which applications and which research question were answered using diary data within each application.

Most studies to date were conducted to provide information about the efficacy of and mechanisms underlying PMDD treatment, focusing on both pharmacological and non-pharmacological interventions (application 3). A smaller number of studies aimed to increase knowledge about the phenomenology, aetiology, and impact of PMDD (application 1). There have been five diary studies on the biology of PMDD (application 2), although two of these studies assessed both premenstrual symptoms and hormone levels daily but did not relate them (Bloch et al., 1998; Rapkin et al., 2006; Yonkers et al., 1997). While two of these studies considered symptom levels on individual cycle days (Pincus et al., 2011, 2008; Sundström et al., 1999), one aggregated days into the different menstrual cycle in phases (Marks et al., 1994). However, often only a limited amount of the obtained data were used in the statistical analyses (Table 1).

3.2. Which diaries have been used?

In Table 2 we provide an overview of the diaries that were used and the symptom domains covered by them. Two-third of all studies used previously published self-report measures for the daily assessment of premenstrual symptoms. The remaining one-third used visual analogue scales (VAS), varying between 2 and 20 in number. Between studies there was substantial variability in the PMDD diary that was used (Table 1). The Daily Record of Severity of Problems (DRSP) was the most frequently used diary.

3.3. Which data has been extracted from the diaries?

As shown in Table 1, most studies assessed premenstrual symptoms on a daily basis for several menstrual cycles (range 1–18). Many studies extracted the premenstrual symptom scores for the data analyses, without comparing these scores to other phases of the menstrual cycle. A minority of studies used all daily symptom scores (Marks et al., 1994; Pincus et al., 2011, 2008; Sundström et al., 1999), and while three of these studies considered symptom levels on individual cycle days (Pincus et al., 2011, 2008; Sundström et al., 1999), one aggregated days into the different menstrual cycle in phases (Marks et al., 1994). However, often only a limited amount of the obtained data were used in the statistical analyses (Table 1).

4. Discussion

The aim of this review was to present an overview of the literature describing the use of diaries as a tool for studying PMDD and its treatment. We found that diaries have been applied in PMDD research in several ways. We also observed some limitations in how diaries and diary data have been used. After discussing these findings, we note some strengths and limitations of this review and provide suggestions for future research.

4.1. Research applications of diaries

Studies to date have applied diaries to a range of research questions that were mostly concerned with the phenomenology of PMDD (application 1) and with the outcomes of interventions (application 3). Fewer studies have linked diary data to biological data (application 2) and fewer still have been concerned with the investigation of within-person processes in addition to between-person differences (application 4).

While a relatively low number of studies was concerned with application 2 and application 4, a more extensive investigation of these applications might be beneficial for clinical practise. For an example regarding application 2, one study found that hormone peaks precede the development of premenstrual symptoms by

<table>
<thead>
<tr>
<th>Reference</th>
<th>Diary</th>
<th>Number of items</th>
<th>Symptom domains</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Negative mood; Positive mood; Somatic symptoms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mood reactivity; Autonomic/cognitive; Appetitive; Fluid retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dysphoric mood; Physical discomfort; Low energy; Consumption; More alcohol, sex, active</td>
</tr>
</tbody>
</table>

a Partly the same as the DRF.
b Update of the DRF according to the DSM-IV.
three to four days for progesterone, and six days for oestradiol (Wang et al., 1996). This implies that pharmacological PMDD treatment might be adjusted by prescribing hormonal medication only in the week before premenstrual symptoms arise. Nevertheless, our review only yielded studies that applied treatment continuously or throughout the entire luteal phase (Freeman et al., 1995; Marr et al., 2011a, 2011b; Yonkers et al., 2005). Regarding application 4, one study found that patients vary in the specific symptoms they experience and in the duration of symptoms (Pearlstein et al., 2005c). This implies that PMDD treatment should be tailored to the individual (Kramer et al., 2014).

4.2. Diary issues

With respect to the reviewed studies, the psychometric characteristics of the DRSP, the DSR, and Calendar of Premenstrual Experiences (COPE) have been reported (Endicott et al., 2006; Feuerstein and Shaw, 2002; Freeman et al., 1996), while those of the other diaries listed in Table 2 have not. As a result, for most of the reviewed studies the validity and reliability of the data are unknown. Haywood and colleagues (2002) previously reviewed several prospective methods used for the study of PMS and PMDD, including the Daily Rating Form (DRF) and the COPE. They also noted that the reliability and validity of diaries is not always well-established. This is important because diary length can influence compliance (Bolger et al., 2003) and study attrition rates (Budeiri et al., 1994).

While several studies used diaries that were specifically developed for assessing premenstrual symptoms, between studies there was limited overlap in the diary used (Table 2). This is problematic because it reduces the comparability of studies. Others have also discussed measurement issues in studying symptoms across the menstrual cycle. Romans et al. (2012) recently reviewed studies of cyclical mood changes in women with and without a premenstrual disorder. While most studies included a daily negative mood assessment, the authors reported the use of “a wide range of instruments, making an overall synthesis challenging”. Nevertheless, there are developments towards a more homogeneous assessment of premenstrual symptoms. One of the outcomes of the 2011 meeting of the International Society for Premenstrual Disorders was that the DRSP is considered the preferred instrument for prospective assessment (Nevatte et al., 2013). Consistent with this, we found that the DRSP was the most frequently used diary.

Finally, we noted that few studies reported the time of the day at which diaries were to be completed. As PMDD symptom severity may vary during the day (Landén et al., 2009; Steinberg et al., 2012), the time at which a diary is completed can influence the findings. In conclusion, we suggest that when designing future diary studies of PMDD, researchers should aim to (1) enhance methodological consensus with respect to the diary used by choosing a diary with established psychometric properties (e.g. the DRSP); (2) optimise participant compliance by considering diary length in relation to study length; and (3) report at which time of the day diaries were to be completed.

4.3. Data issues

We found that many studies extracted data from the premenstrual phase alone, ignoring other phases or only using them as comparison. Although data about the entire menstrual cycle were available in all reviewed studies, few studies included all cycle phases in the data analyses (Table 1). Not only does this limit the ability to draw conclusions about within-person processes (also see below), but also information about phasic changes may be missed. One study, in which the entire menstrual cycle was investigated, illustrates why not including all phases might be problematic (Marks et al., 1994). In this study, alcohol and nicotine consumption were found to be at their highest level during menses, rather than in the premenstrual phase as expected. One of the implications of this study is that studies not investigating the entire menstrual cycle might draw erroneous conclusions, such as assuming that the absence of a change in alcohol consumption from the premenstrual phase to the postmenstrual phase implies that alcohol consumption does not vary at all across the menstrual cycle (Rapkin et al., 1988). Using the full range of self-report data will also enhance insight into the temporal pattern of the menstrual cycle and associated somatic and psychological symptoms. For example, research in non-clinical samples suggests that the term ‘premenstrual’ symptoms might be misleading as symptom levels often decline only after the onset of menses (Angst et al., 2001; Romans et al., 2013). Exploring similar patterns in PMDD requires that all self-report data are included in analysis.

Across the reviewed studies, there was also variability in which rating days were considered part of a cycle phase. For instance, some studies defined the premenstrual phase as the seven days before menses, whereas others selected for each participant the five worst days out of the seven days before menses (Table 1). This variability makes comparisons between studies difficult, particularly because there appear to be indications of substantial interindividual and intra-individual variability in when symptoms are the worst (Pearlstein et al., 2005c). Moreover, between-study variability in the definition of the premenstrual phase might result in an underestimation of symptom severity. Mean symptom severity during the ‘premenstrual phase’ will be lower if this phase also includes symptom-free days, compared to when only days with symptoms (and functional impairment) are included.

Most of the reviewed studies considered differences between persons. This approach has helped reveal how women with PMDD differ from women without PMDD and which treatment regimens are likely to reduce menstrual complaints. However the sample sizes of the reviewed studies were highly variable (Table 1), resulting in between-study variation in statistical power to detect between-groups differences and in the likelihood to yield false-positive and false-negative results (Fraley and Vazire, 2014). Moreover, assessment of between-person differences is not suitable for revealing processes within persons. While several studies have used univariate repeated measures analysis to explore within-person variation in symptom levels across the various menstrual phases and across multiple cycles (Berger and Presser, 1994; Bloch et al., 1998, 1997; Eriksson et al., 2006; Marks et al., 1994; Marr et al., 2011a; Pearlstein et al., 2005c; Rapkin et al., 1998; Seippel and Bäckström, 1998; Sundblad et al., 1993; Wang et al., 1996), these studies only reveal mean symptom patterns within-persons, rather than individual patterns of symptom change across time. This is problematic, because results found at group level can only be generalised to the individual level under very strict conditions (Molenaar, 2004; Molenaar and Campbell, 2009), which are rarely met. To illustrate this, Sveinsdottir and Reame (1991) calculated both the mean pattern of symptom severity as well as the individual patterns of symptom severity in a sample of women diagnosed with PMS. The mean pattern did not apply to any of the individuals, due to substantial within-group variability.

The lack of generalisability from group findings to individuals of the same group highlights the importance of data analysis at an individual level. This can be done using time-series analysis. Univariate models can reveal dynamic symptom patterns that might not be shown using group-level analysis, and multivariate models can be used to determine potential causal associations between variables (Bos et al., 2012; Hoenders et al., 2011). A network approach to studying PMDD might also help increase insight into the
dynamics of symptoms and how they interact over time (Bringmann et al., 2013). These approaches are relevant in the context of personalised medicine, which aims to tailor healthcare to individual patients on the basis of having knowledge of person-specific symptom patterns and elicitors (Molenaar and Campbell, 2009). Thus, we recommend to: (1) include all data into analyses; (2) analyse data at the individual level; and (3) study within-person processes in addition to between-group differences.

4.4. Strengths and limitations of our review

This systematic review focused on how diaries have been used so far to answer empirical questions about the daily life experiences and treatment options for women with PMDD. Previous reviews have considered mood across the menstrual cycle but were not specifically focussed on PMDD (Rapkin et al., 1988; Schwartz et al., 2012), or considered premenstrual disorder but did not focus on diary methods (Allais et al., 2012; Freeman, 2004; Massill and O’Brien, 1987). One previous review investigated the use of diaries for assessing the efficacy of treatment for PMS and PMDD, but did not include studies on their phenomenology and biology (Budeiri et al., 1994). Together, these previous reviews are complementary to our review.

A possible limitation of our review is that we excluded diary studies conducted in women diagnosed with PMS, in women seeking treatment for premenstrual symptoms without a clear diagnosis, and in women without any significant premenstrual complaints. We had two reasons for focussing on PMDD alone. Firstly, PMDD was recently added to the Depressive disorders section of the DSM-5. As this will likely generate further diary research on PMDD, we felt that it was important to review how diaries have been used to study PMDD specifically. Secondly, a PMDD diagnosis requires two months of prospective daily ratings, and diary data may well be used to answer questions on the phenomenology, biology, and treatment of PMDD.

While we conducted this review in line with the PRISMA guidelines (Menzies, 2011; Moher et al., 2009), and read in full all papers (46 studies) that met our inclusion criteria, and checked the references of all initially selected studies for additional literature resulting in the inclusion of 29 additional studies, some studies may still have been missed. Nevertheless, we estimate the number of missed studies to be low.

Further, while conducting our review we found little consensus on how much the severity of symptoms would need to change from the postmenstrual phase to the premenstrual phase for a PMDD diagnosis to be made. In the reviewed studies, we found the required increase in symptoms from the postmenstrual to the premenstrual phase to vary from 30% to 200% (Table 1). This criterion not only varied among diaries, but also among studies using the same diary. Thus, a limitation of our review is that the criteria used to assess PMDD varied across studies. However, this is a limitation of research on PMDD in general. We recommend including the minimum required magnitude of symptom change into the diagnostic criteria for PMDD.

4.5. Future research

In the recently published DSM-5, PMDD is classified as a depressive disorder. Major depressive disorder (MDD), another depressive disorder in which symptoms are not overtly linked to the menstrual cycle, is characterised by increased levels of negative affect (NA) and reduced levels of positive affect (PA) (Bylsma et al., 2011). In PMDD there are indications that these alterations in NA and PA are cyclical (Sundström et al., 1999). However, most diaries do not assess PA (Table 2), including the DRSP. By adding PA items to the diaries, it will for example be possible to study the core PMDD symptom of affective lability in more detail. Further, affective reactivity to emotional events has not been studied in PMDD. Since MDD patients and controls have been found to differ in affective reactivity (Bylsma et al., 2011), it might be worthwhile to investigate this in PMDD patients as well.

The diagnostic criteria for PMDD require that “symptoms are associated with clinically significant distress or interference with work, school, usual social activities or relationships with others” (American Psychiatric Association, 2013). There are indications that functional impairment is strongly related to physical and mood symptoms (Bloch et al., 1997) and that functional impairment decreases when PMDD is treated with oral contraceptives (Marr et al., 2011a). However, functional impairment was not systematically assessed across the studies we reviewed (Table 2). Indeed, except for the DRSP and PMTS-SR, no diary includes items for assessing functional impairment (Table 2). Further, there is no consensus about the minimum required magnitude of symptom change from the premenstrual to the postmenstrual phase (Table 1 and see above). Furthermore, to our knowledge it is unknown to what extent symptoms need to change to trigger functional impairment. Therefore we recommend including items assessing functional impairment in all PMDD diaries.

With the increasing personal availability of laptops, smartphones, and tablets, participants can be asked to complete diaries on their own electronic devices instead of on paper. A major advantage of this approach is that compliance with the diary instructions can be easily assessed (Bolger et al., 2003). To prevent backfilling it is even possible to establish a time window during which the diary can be completed. A final advantage is that as electronic forms do not need to be returned by mail or in person, online administration of diaries can reduce participant burden. Hence, future studies could benefit from using electronic devices to assess PMDD.

As there are indications that premenstrual symptoms are not stable throughout the day (Landén et al., 2009; Steinberg et al., 2012), multiple assessments per day might also help gain more insight in PMDD. Experience sampling methods (ESM) (Csikszentmihalyi and Larson, 1992), also known as ecological momentary assessment (EMA) (Shiffman et al., 2008), provide an alternative to daily ratings. Diaries are in some respect still retrospective, as they ask people to summarise symptoms experienced in the past 24 h. In ESM/EMA studies, data on current states are collected repeatedly within and across days (Shiffman et al., 2008). This intensive approach to data collection allows for the detection of frequencies and patterns of certain behaviours and experiences can be detected as they occur in daily life (Aan het Rot et al., 2012; Shiffman et al., 2008). Thus, ESM/EMA can help to contribute to our understanding of PMDD. For example, research on MDD has found that depressed patients and controls report a comparable frequency of negative events, but patients report fewer positive events, and patients experience both negative and positive events as more unpleasant and more stressful (Peeters et al., 2003). Extending this research to PMDD can increase insight in how premenstrual symptoms are experienced over the course of the month and in relation to daily hassles and uplifts.

Finally, ESM/EMA can be used to assess the social interactions of women with PMDD. This is relevant because a majority of women with PMDD report affective lability and irritability as core symptoms (Pearlstein et al., 2005c). As others in their social environment are generally not aware of the women’s menstrual status (Haselton and Gildersleeve, 2011), they might perceive the mood and interpersonal behaviour of women with PMDD as unpredictable. This might result in a negative appraisal of women with PMDD by others, who might over time avoid and reject them, thus making social interaction more stressful for women with PMDD. A validated, event-based ESM/EMA approach is available to
investigate the social interactions of women with PMDD. This approach, also known as event-contingent recording (ECR) (Moscowitz and Sadikaj, 2012), is designed to measure how people feel and behave during their social interactions and has previously been used to measure variability in positive affect, negative affect, quarrelsome ness, agreeableness, dominance, and submissiveness (Aan het Rot et al., 2006; Moscowitz, 1994). Relevant for PMDD is that quarrelsome ness is considered the behavioural component of irritability (Moscowitz, 2010). Individuals with quarrelsome traits show enhanced behavioural reactivity when they perceive quarrel some ness in others and reduced affective reactivity when they engage in quarrel some ness themselves (Moscowitz, 2010). Further, measures of positive and negative affect can be used to assess affective liability in social interactions (Watson and Tellegen, 1985). Thus, ECR can be used to gain insight into how women feel during social interactions and whether their feelings are also reflected in their social behaviour.

5. Conclusion

To date, diaries have been used to investigate several aspects of PMDD. Insight has been gained into the aetiology and phenomenology, underlying biological mechanisms, and efficacy of treatment. Nevertheless, we observed low consistency among the diaries used, and found that the magnitude of symptom change between the postmenstrual and premenstrual week required for a PMDD diagnosis varied substantially. Future studies might focus on optimising data use and data analysis, and explore more advanced methods such as ESM/EMA.

Role of funding source

The funding source was not involved in the conduct of the review, or in the preparation of the article.

Acknowledgements

This work was supported by the Innovation Research Incentives Scheme Veni of the Netherlands Organisation for Scientific Research (NWO) (Grant no. 451-09-013) via a grant awarded to Dr. aan het Rot.

References


Rapkin, A.J., Mikacich, J.A., Moatakef-Imani, B., Raasong, N., 2002. The clinical nature and formal diagnosis of premenstrual, postpartum, and perimenopausal affec-
http://dx.doi.org/10.1016/j.gendem.2012.07.003.
Royal College of Obstetricians and Gynaecologists, 2007. Management of pre-
Steiner, M., Hackett, R.F., Carroll, B.J., 1980. Premenstrual tension syndrome: the development of research diagnostic criteria and new rating scales. Acta Psy-
Steiner, M., Ravindran, A.V., LeMelleo, J-M., Carter, D., Huang, J.O., chuk, A.M., Simpson, S.D., 2008. Luteal phase administration of paroxetine for the treat-
ment of premenstrual dysphoric disorder: a randomized, double-blind, placebo-
Steiner, M., Romano, S.J., Babcock, S., Dillon, J., Shuler, C., Berger, C.P., Carter, D., Reid, R., Stewart, D.E., Steinberg, S., Judge, R., 2001. The efficacy of fluoxetine in improving physical symptoms associated with premenstrual dysphoric disor-
Sundblad, C., Hedberg, M.A., Eriksson, E., 1993. Clomipramine administered during the luteal phase reduces the symptoms of premenstrual syndrome: a placebo-
controlled trial. Neuropsychopharmacology 9, 133–145.
Sundström, I., Nyberg, S., Bäckström, T., 1997. Patients with premenstrual syndrome have reduced sensitivity to midazolam compared to control subjects. Neu-
ropsychopharmacology 17, 370–381.
Wang, M., Seipel, L., Purdy, R.H., Bäckström, T., 1996. Relationship between symptom severity and steroid variation in women with premenstrual syn-
drome: study on serum pregnenolone, pregnenolone sulfate, Salpha-pregn-
Wu, K.-Y., Liu, C.-Y., Hsiao, M.-C., 2008. Six-month paroxetine treatment of premenstrual dysphoric disorder: continuous versus intermittent treatment pro-
J.1440-1819.2007.01785.x.
Yonkers, K.A., White, K., 1992. Premenstrual exacerbation of depression: one pro-
Young, S.A., Hurt, P.H., Benedek, D.M., Howard, R.S., 1998. Treatment of pre-
menstrual dysphoric disorder with sertraline during the luteal phase: a ran-