Development of a screening instrument to assess premenstrual dysphoric disorder as conceptualized in DSM-5

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ABSTRACT

Objective: This study aimed at developing and validating a screening instrument to assess premenstrual dysphoric disorder (PMDD) based on DSM-5 criteria, which is not yet available.
Methods: The Premenstrual Dysphoric Disorder Questionnaire for DSM-5 (*Cuestionario del Trastorno Disfórico Premenstrual – DSM-5*), a 25-item questionnaire to assess PMDD was developed and completed in Spanish by 2820 women (Age $M = 23.43$; $SD = 7.87$). Exploratory factor analysis ($N = 1410$) and confirmatory factor analysis ($N = 1410$) were performed in randomly selected subsamples. Empirical evidence of construct validity was obtained via a multitrait-multimethod approach ($N = 118$). Additional validity evidence was provided by associating PMDD with Neuroticism. Internal consistency and test–retest reliability were checked.
Results: Exploratory and confirmatory factor analyses yielded a bi-dimensional structure. The first dimension, called Dysphoria, included dysphoric symptoms and weight gain; the second dimension, Apathy, referred to apathetic and physical symptoms. Both dimensions displayed good internal consistency coefficients (Dysphoria's ordinal alpha = 0.88; Apathy's ordinal alpha = 0.84), and moderate temporal stability. The multitrait-multimethod analysis showed that convergent coefficients were higher than discriminant coefficients. Furthermore, a positive relationship between Neuroticism and PMDD was observed.
Conclusion: These findings suggest that the instrument is valid and reliable to assess PMDD.

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1. Introduction

Before the release of the fifth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [1], premenstrual dysphoric disorder (PMDD) has been classified in DSM-IV-TR [2] as a Mood Disorder Not Otherwise Specified. According to DSM-IV-TR, 3–5% of women of menstrual age may suffer from the disorder. Of these women, 90.6% consider the symptoms to be normal (not pathological) and 18.7% seek professional help, although in some cases they receive an inadequate response [3]. Nevertheless, due to the salience of PMDD and almost 20 years of research, the disorder has now been recognized as a distinct diagnostic entity through its inclusion in the newly published DSM-5 [1]. This decision was supported by the work group of experts who examined the literature on PMDD and recommended the appropriate criteria for the disorder in DSM-5 [4]. Pearlstein [5], O'Brien et al. [6] and Epperson et al. [4] suggested that the new category would enhance the legitimacy of the disorder and encourage scientists to find more empirical evidence for PMDD and its treatment. This is essential for public health and reminds us of the urgent need to fill an obvious gap in health care provision.

The diagnosis of PMDD as described in DSM-5 is based on the fulfillment of seven (A to G) criteria. Criterion A refers to the existence of five items in most menstrual cycles and to stage-specificity of the cycle. Criterion B and Criterion C deal with the specific symptoms of the disorder (see Table 1). Criterion D underscores the clinical significance or interference of symptoms with daily-life activities. Criterion E deals with the specificity of PMDD as compared with mood and personality disorders. Criterion F requests the existence of two month's daily prospective ratings. Finally, Criterion G refers to the absence of a medical or drug-induced cause of the disorder.

According to DSM-5 [1], the 12-month prevalence rate of PMDD varies between 1.8% and 5.8% in menstruating women. Although effective treatment for these women is necessary, we first need to develop an appropriate assessment tool based on DSM-5 criteria to assess PMDD. While many prospective and retrospective instruments have been developed to evaluate premenstrual disorders, i.e., Endicott et al.'s [7] Daily Record of Severity of Problems (DRSP), De la Gándara's [8] *Escala de Trastorno Disfórico Premenstrual* (TDP), Steiner et al.'s [9] Premenstrual Symptoms Screening Tool (PSST), and Steiner et al.'s [10,11] Visual Analogue Scale-MOOD (VAS-MOOD), none of these tools addresses all the DSM-5 criteria for assessing PMDD, not even criteria of the

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Table 1
Correspondence of CTDP – DSM-5 items with the DSM-5 symptom groups.

DSM-5 criteria	DSM-5 symptoms	CTDP – DSM-5 items
Criterion B	1) Affective lability	7. Sensation of being emotionally much more vulnerable (i.e., attacks of sadness, weeping, or greater sensitivity in the face of rejection)
	2) Irritability, anger or increased interpersonal conflicts	8. Intense and permanent annoyance
		9. Intense and permanent irritation
		10. Evident increase of intense and frequent conflicts with people
	3) Depressed mood, feelings of hopelessness, or self-deprecating thoughts	1. Very sad or depressed mood
		2. Intense feelings of hopelessness
		3. Very intense thoughts of self-disapproval
	4) Anxiety, tension, and/or feelings of being keyed up or on edge	4. Marked anxiety
		5. Marked tension
		6. Sensation of being overloaded or of being close "to the limit"
Criterion C	1) Decreased interest in usual activities	11. Evident loss of interest towards daily life activities (work, school/college)
		12. Evident loss of interest in hobbies or leisure activities
		13. Evident loss of interest in friends (breaks in social relations)
	2) Subjective difficulty in concentration	14. Considerable difficulty concentrating
	3) Lethargy, easy fatigability, or marked lack of energy	15. Acute sleepiness, much greater sensation of being sleepy during the day
		16. Much greater sensation of fatigue
		17. Evident lack of energy
	4) Marked change in appetite; overeating; or specific food cravings	18. Very significant changes in appetite; binges or whims regarding specific meals
	5) Hypersomnia or insomnia	19. Acute hypersomnia, that is to say, sleeping to excess without apparent cause
		20. Insomnia, that is to say, finding it really difficult to sleep, or waking up very frequently during the night
	6) A sense of being overwhelmed or out of control	21. Sensation of being overwhelmed or out of control
	7) Physical symptoms	22. Evident increase in breast size
		23. Discomfort in joints or muscles
		24. Strong sensation of bloating
		25. Clear gain in weight, with difficulty of fitting into clothes, footwear, or wearing rings

previous DSM IV-TR version [2]. The aim of the present study is, therefore, to develop and validate a screening instrument to adequately assess PMDD according to DSM-5.

2. Methods

2.1. Participants and procedure for the item development

The development of the Premenstrual Dysphoric Disorder Questionnaire for DSM-5 (in the original Spanish version: *Cuestionario del Trastorno Disfórico Premenstrual – DSM-5*, hereinafter the CTDP – DSM-5) followed a meticulous procedure in which five experts in clinical assessment and methodology participated. The process involved two phases.

In the first phase, the PMDD symptom set of DSM-5 was used as a reference for creating potential questionnaire items. Based on 11 sets of symptoms, 25 items were derived (see Table 1) and formulated in Spanish. In creating these items we generally retained words and phrases referring to symptoms, although certain changes were made; specifically, we followed Prieto and Delgado's [12] recommendations

regarding the wording of items, as well as the criteria established by Martínez et al. [13] (i.e., representativeness, comprehensibility, and avoiding acquiescence). A dichotomous answer format (Yes/No) was chosen to assess the 25 items in order to comply with the positive/negative approach traditionally used in clinical diagnosis. Furthermore, the instructions urged the respondent to answer *Yes* only if criteria A and D were met. Then, three experts were asked to examine the first version of the tool, and a number of changes were made as a result. Words that were difficult to understand were changed (e.g., '*somnolencia*' — 'drowsiness' — instead of '*letargia*' — 'lethargy' — term) or further specified (e.g., next to the word '*hipersomnia*' — 'hypersomnia' — its definition was added).

The preliminary version of the tool, composed of 25 dichotomous items, in its Spanish version, was then administered to a set of students and staff (N = 128) of a state university in Spain. The sample size considered for this data collection fulfilled Nunnally's [14] criterion of being composed at least by 5 participants per item. Participants were part of the target population but not of the sample of the experimental later stage. The women who participated in the preliminary and in the whole study voluntarily answered the assessment tools after their informed consent was obtained (as demanded by the Declaration of Helsinki); almost all women (98%[1]) were Spanish. This first study yielded a PMDD prevalence rate of 50%, which was considered too high, given that previous research had reported a frequency of 3–10% [1,2,8,15,16]. Furthermore, participants' questions, doubts and comments about items and instructions were reported in Spanish in a report-sheet during data collection, and they were qualitatively analyzed later. We, therefore, decided to undertake a second phase in order to refine the CTDP – DSM-5.

In this second phase, two new experts were informed about the outcome of the first phase and invited to analyze the preliminary version of the CTDP – DSM-5 in more detail (taking into account the items, response format, and instructions). Further changes were made following experts' advice. Words emphasizing high distress (i.e., 'very', 'marked', 'intense') were added; items worded as 'experience' were re-worded as 'symptoms'. A final table was also included, where respondents were asked (with instructions) to link the affirmatively responded items to certain situations that would cause disability or interference in daily life (e.g., 'reduced performance at school/college or at work'). The aim of this new section was to ensure the consistency of responses and to avoid social desirability and acceptance bias. This version of the tool was then administered to a small sample of 32 university students. This time, the estimated prevalence of PMDD was about 10%, and the instrument was deemed to have a greater capacity to discriminate between a positive and a negative diagnosis of PMDD. The next step was therefore to subject this version of the CTDP – DSM-5 to empirical validation.

2.2. Participants and procedure for the empirical validation of the instrument

The sample consisted of 2820 women aged between 18 and 60 years (M = 23.43; SD = 7.87) affiliated to the University of the Basque Country.[2] Women studying/working at the university were invited to voluntarily participate in the study. The CTDP – DSM-5 was administered to students in a classroom setting by previously trained research assistants, after having obtained institutional permission. In the case of

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faculty and staff, the questionnaire was sent to them by email.[3] Participants who followed specific pharmacological treatments (i.e. hormonal treatments, antidepressant or anxiolytic treatments) or who were pregnant in the last year were excluded from the study. Furthermore, women with missing values were excluded from the study.[4]

To assess the effect of the menstrual phase into the responses, all participants were asked to give the starting date of their last menses and the current date. They were classified into one of the four menstrual cycle phases (premenstrual, menstrual, postmenstrual and ovulatory), as established by the Society for Menstrual Cycle Research in 1986 [17], by considering the general regular length of the menstrual cycle; 338 of the women did not answer to this question and were excluded, the sample being composed of 2482 women.

A subsample of 118 women aged between 18 and 52 years ($M =$ 30.97; $SD = 11.18$) was interviewed six months later by a trained, female interviewer who was blind to the diagnosis made with the CTDP – DSM-5. The subsample consisted of women who were willing to continue participating in the study after the first administration of the instrument. Those who obtained a positive diagnosis in the CTDP – DSM-5 (262 women) and a randomly selected (by a blind researcher) subsample of women with negative diagnosis completed a list of 524 women. Out of all these women, those who agreed to participate again were interviewed. The Spanish version of the Structured Clinical Interview for DSM-IV Axis I Disorders – clinician version (SCID-I) [18] was used because a parallel instrument based on DSM-5 was not yet available in Spanish. In order to asses PMDD with the interview, a diagnostic algorithm was designed and approved by the SCID-I authors. The Spanish version of the PMDD algorithm was added to the interview. Additionally, the participants were asked to fill out a daily rating scale (*Escala de Registro Diario* or ERD) during a two-month period. In both cases, the aim was to obtain evidence of construct validity based on analyzing the convergent and discriminant validity coefficients via a multitrait-multimethod (MTMM) approach [19].

A further subsample comprising 111 of these 118 women, aged between 18 and 52 years ($M = 30.75$; $SD = 11.18$), answered the questionnaire for a second time to assess the test–retest reliability. Finally, along with the CTDP – DSM-5, we administered the Spanish version of the NEO-FFI Neuroticism subscale [20] in the whole sample to obtain evidence of validity based on the relationship between PMDD and Neuroticism. Previous research has linked PMDD to Neuroticism as a personality trait [21]: women suffering from PMDD have been found to present higher levels of Neuroticism than non-sufferers [22]. The interest of this study relied on how high levels of Neuroticism could predict a positive diagnosis on PMDD. For this reason, following Kelley's [23] criteria to divide a variable in upper and lower levels, three levels of Neuroticism ('High', 'Medium' and 'Low') were taken into account.

2.3. Instruments

2.3.1. Cuestionario del Trastorno Disfórico Premenstrual – DSM-5 (CTDP – DSM-5) or Premenstrual Dysphoric Disorder Questionnaire for DSM-5

This is a retrospective screening scale designed to assess PMDD according to DSM-5 criteria. It comprises 25 dichotomous (Yes/No) items (see Table 1).

2.3.2. Structured clinical interview for DSM-IV Axis I disorders – clinician version or SCID-I [18]

This retrospective interview was created by the authors of DSM-IV [24]. It is a reliable and valid instrument designed to assess Axis I disorders [18].

2.3.3. Escala de Registro Diario (ERD) or Daily Rating Scale

This scale was created in Spanish to register the symptoms of PMDD as described in the diagnostic criteria B and C of DSM-5. The scale consists of 11 items (i.e., the 11 symptom groups of DSM-5) to be answered daily (Yes/No format).

2.3.4. NEO Five-Factor Inventory (NEO-FFI, in its Spanish version) [20]

This scale taps the big five personality traits. In the present study, only the Neuroticism scale was administered to assess emotional (in) stability by means of 12 items rated on a 5-point Likert scale (1 = 'Very inaccurate', 5 = 'Very accurate'). Three levels of Neuroticism were taken into account for this study: 'High' (> percentile 73), 'Medium' (percentile 27–73), and 'Low' (< percentile 27).

2.4. Data analysis

Before starting with the analysis of the psychometric properties of the tool, the relationship between the PMDD scores obtained by the CTDP – DSM-5 and the menstrual phase in which this score was obtained, was analyzed. Specifically, the differences between premenstrual, menstrual, postmenstrual and ovulatory phases were examined with Kruskal–Wallis's non-parametric test using the SPSS v23 program.

A cross-validation study was carried out to examine the dimensionality of the instrument. The first step involved conducting an exploratory factor analysis (EFA) for categorical variables in a randomly selected subsample of 1410 participants. The WLSMV estimation method, based on polychoric correlations, and the geomin oblique rotation method were applied to determine the factor structure. A confirmatory factor analysis (CFA) for categorical variables was then carried out on the polychoric correlation matrix in a subsample that included the remaining participants ($N = 1410$). Both analyses were performed with the Mplus program v7 [25].

In order to obtain evidence of construct validity of the tool, convergent and discriminant coefficients were analyzed via a MTMM approach [19], with the Mplus program v7 [25]. On the one hand, correlations between PMDD assessed by the CTDP – DSM-5, and the same trait assessed by the SCID-I, and the ERD, were estimated to obtain convergent validity coefficients (Monotrait Heteromethod correlations). On the other hand, correlations between PMDD assessed by the CTDP – DSM-5, and Mood-Anxiety Disorders and Other Disorders (the remaining disorders), both assessed by the SCID-I, were estimated to obtain discriminant validity coefficients (Heterotrait Heteromethod correlations). Finally, in order to obtain evidence of the construct validity of the CTDP – DSM-5, the difference between convergent and discriminant coefficients was calculated to know whether the mean of the 2 convergent validity coefficients was higher in the population than the mean of the 2 discriminant validity coefficients.

In addition, we used logistic regression for categorical variables to examine whether Neuroticism was related to PMDD. This analysis was carried out with SPSS (v23).

In order to analyze the internal consistency of the instrument, the rotated reliability of the factors of the CTDP – DSM-5 was estimated for the whole sample ($N = 2820$) following criteria given by Zumbo et al. [26] to estimate the ordinal alpha reliability coefficient. Finally, we administered the questionnaire twice over an eight-month interval to analyze the temporal stability or test–retest reliability. The Pearson correlation coefficient between the scores obtained at the two time points was estimated for its dimensions.

3. Results

The Kruskal–Wallis test showed not statistically significant differences in the CTDP – DSM-5 scores as a function of the menstrual phase in which the questionnaire was administered (K-W(3) = 0.78; $p = 0.85$). Effect sizes for all pairs of comparisons between menstrual phases were small (Hedges' *g* lower than 0.20).

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[3] A very small proportion of women completed the questionnaire while attending the university's medical service.

[4] At the beginning the sample consisted of 3960 women, but 1140 were excluded based on previously explained criteria.

3.1. Factor structure

First, an EFA was carried out yielding a two factor structure with reasonable good fit (RMSEA = 0.04; CFI = 0.92; TLI = 0.90). The first factor, called Dysphoria, included dysphoric symptoms (anxiety, depression, the symptoms linked to them, and gain in weight) and the second factor, named Apathy, referred to apathetic and physical symptoms (see Table 2). Both dimensions explained an important and similar amount of variance (21.71% for Dysphoria and 17.20% for Apathy). All items showed a loading higher than 0.30 on at least one factor, with two exceptions: item 18 (i.e., 'Very significant changes in appetite') and item 22 (i.e., 'Evident increase in breast size'). Moreover, a simple structure could not be attained for item 22 (i.e., 'Evident increase in breast size') and item 25 (i.e., 'Clear gain in weight') because they had similar loadings on both factors. In order to maintain the PMDD construct defined on DSM-5 [1], that is, to retain the symptoms included in this classification, we decided to include all items for the CFA and for all data analyses.

Secondly, a CFA was conducted to test the bi-dimensional structure derived from the EFA. The value of the chi-square statistic (χ^2 = 706.42; df = 274; p = 0.0001) indicated a lack of fit of the model, but since lower chi-square values indicate better fit, the results suggested that our model fitted much better than the baseline model (χ^2 = 5094.90; df = 300; p = 0.0001). Furthermore, the sensitivity of the chi-square statistic to the violation of the assumptions on which it is based and, specifically, its dependence on sample size means that the fit assessment should be based mainly on alternative indexes. The

values obtained for these indexes showed a reasonable good fit: RMSEA = 0.03; CFI = 0.91; and TLI = 0.90.

3.2. Construct validity

The convergent validity of the CTDP – DSM-5 was estimated at 0.53 [95% CI = (0.43, 0.64)] based on the correlation between the scores obtained in PMDD assessed by the CTDP – DSM-5 and by the SCID-I; and at 0.55 [95% CI = (0.44, 0.65)] based on the correlation between the scores of the CTDP – DSM-5 and the ERD. Regarding discriminant validity, a low correlation was found between PMDD assessed by the CTDP – DSM-5 and Mood and Anxiety Disorders assessed by the SCID-I [r = 0.25; 95% CI = (0.10, 0.39)]. Additionally, a negative correlation was found between PMDD assessed by the CTDP – DSM-5 and Other Disorders assessed by the SCID-I [r = −0.05; 95% CI = (−0.20, 0.11)]. The resulting 95% CI for the difference between the convergent and discriminant validity coefficients was (0.33, 0.56). This result suggests, with high confidence, that in the population the convergent validity coefficients exceed on average the discriminant validity coefficients by an amount that could be as low as 0.33 and as high as 0.56. This finding is consistent with theoretical expectations, given that convergent validity coefficients reflect relationships between different measures of the same trait, whereas discriminant validity coefficients reflect considerably weaker relationships between different indicators of different traits [19].

3.3. Relationship between PMDD and Neuroticism

Results showed that there was a significantly lower probability of obtaining a positive diagnosis of PMDD with the CTDP – DSM-5 when the level of Neuroticism was low (B = −0.957; df = 1; p = 0.0001; OR = 0.384) or medium (B = −0.471; df = 1; p = 0.001; OR = 0.625) than when it was high. This result allows us to support PMDD's validity based on its link to Neuroticism.

3.4. Reliability

Both factors, Dysphoria (Ordinal Alpha = 0.88) and Apathy (Ordinal Alpha = 0.84), have good internal consistency. The temporal stability over an eight-month interval was moderate (Pearson correlation index for the two time points for Dysphoria = 0.44 and for Apathy = 0.64; p < 0.0001).

4. Discussion

The aim of this study was to develop a new retrospective questionnaire with adequate psychometric properties to assess PMDD according to DSM-5 criteria. The two factor structure of the Premenstrual Dysphoric Disorder Questionnaire for DSM-5 (CTDP – DSM-5), referring to Dysphoria (dysphoric symptoms and weight gain) and Apathy (apathetic and physical symptoms), is in accordance with the available literature on this construct. In fact, Dysphoria corresponds to Criterion B in DSM-5 and Apathy to Criterion C (with the exceptions of items 18, 21 and 25). Concerning reliability, both factors showed good internal consistency coefficients and moderate temporal stability. In terms of its construct validity, the questionnaire showed greater convergent than discriminant validity coefficients in the population. The observed relationship between Neuroticism and PMDD further supports its validity.

The CTDP – DSM-5 has a factor structure with two factors: Dysphoria concerns symptoms linked to anxiety, mood and weight gain; Apathy refers to apathetic or physical symptoms. The presence of the symptom weight gain in the first dimension, Dysphoria, may be explained through the relationship found between the symptom and Neuroticism. This enduring personality trait has been shown to be linked to somatic complaints, as well as to distress proneness in general [27]. In the clinical field, patients experiencing a difficult condition had reported higher

Table 2
Rotated factor structure of the CTDP – DSM-5.

Item	Factor loadings	
	Dysphoria	Apathy
1. Very sad or depressed mood	.51	
2. Intense feelings of hopelessness	.52	
3. Very intense thoughts of self-disapproval	.62	
4. Marked anxiety	.69	
5. Marked tension	.73	
6. Sensation of being overloaded or of being close "to the limit"	.65	
7. Sensation of being emotionally much more vulnerable (i.e., attacks of sadness, weeping, or greater sensitivity in the face of rejection)	.62	
8. Intense and permanent annoyance	.81	
9. Intense and permanent irritation	.82	
10. Evident increase of intense and frequent conflicts with people	.76	
11. Evident loss of interest towards daily life activities (work, school/college)		.82
12. Evident loss of interest in hobbies or leisure activities		.78
13. Evident loss of interest in friends (breaks in social relations)		.50
14. Considerable difficulty concentrating		.54
15. Acute sleepiness, much greater sensation of being sleepy during the day		.57
16. Much greater sensation of fatigue		.67
17. Evident lack of energy		.82
18. Very significant changes in appetite; binges or whims regarding specific meals	**.26**	
19. Acute hypersomnia, "that is to say, sleeping to excess without apparent cause"		.48
20. Insomnia, that is to say, finding it really difficult to sleep, or waking up very frequently during the night		.38
21. Sensation of being overwhelmed or out of control	.60	
22. Evident increase in breast size	.25[a]	**.26**[a]
23. Discomfort in joints or muscles		.41
24. Strong sensation of bloating		.37
25. Clear gain in weight, with difficulty of fitting into clothes, footwear, or wearing rings	**.33**[a]	.28[a]
Percentage of explained variance	21.71	17.20
Eigenvalue	5.43	4.30

Note. [a]Items 22 and 25 show similar factor loadings on both dimensions; these items' content fall within the domain of the second dimension.

scores on mood symptoms when they scored high on Neuroticism [28]. Thus, it may be expected that women diagnosed with PMDD, with higher levels of Neuroticism, may display a general disposition to experience a greater than the real weight gain, or even a greater increase of the mammary size. This means that physical symptoms in PMDD may translate both as a dysphoric and as an apathetic component.

The structure that emerged from our analysis is close to that of other instruments such as the Premenstrual Dysphoric Disorder Scale developed by De la Gándara [8], where a primary factor called "Dysphoria" and a secondary factor called "Psycho-physical distress" emerged (instead of only a "physical" factor), and Steiner et al.'s [10,11] Visual Analogue Scales, where the total scale included a sub-scale called "VAS-Mood".

In short, our results suggest that within the PMDD construct, the dysphoric aspect prevails somewhat. It should be kept in mind that the concept of PMDD as a psychiatric disorder was developed on the basis of the notion of premenstrual syndrome (PMS), which emerged from a biomedical perspective. Thus, DSM-III-R [29] details both physical and emotional changes when describing the symptoms of this disorder. However, it should be emphasized that dysphoric symptoms acquired greater importance in the conceptual shift from PMS to PMDD, and this is reflected in the PMDD criteria that are set out in DSM-IV and DSM-5. This conceptual shift has clear implications for future investigation and treatment of the disorder, and should lead to the development of research and approaches to clinical assessment that consider the whole structure and the two sub-dimensions of PMDD.

Regarding the instrument's test–retest reliability, there are a number of possible reasons for the finding of moderate temporal stability. First, there was an interval of eight months between the administrations of the questionnaire, and the results may therefore have been influenced by personal changes occurring during this period (emotional, social, financial, etc.) or by the fact that participants responded to the questionnaire under different circumstances (for instance, during exam periods vs. the holiday season); both aspects could affect the results. Furthermore, the second administration of the CTDP – DSM-5 took place two months after administering the SCID-I and the ERD, which could also have influenced the results (i.e., through a consecutive effect). All these aspects need to be taken into account in future research. In any case, it should be noted that a test–retest analysis of the sort carried out here has been largely absent from previous research in this field. In fact, this type of analysis has only been conducted for two retrospective questionnaires, the Menstrual Distress Questionnaire (MDQ) [30] and the shortened Premenstrual Assessment Form (PAF) [31]. The analysis of the MDQ [30] was carried out with a small sample ($N = 15$) over two consecutive menstrual cycles (one-month interval) and found moderate correlations ($r = 0.57$–0.95; $p = 0.01$–0.05). The analysis of the PAF [31] involved a sample of 217 women who completed two versions of the tool (the long one with 20 items, and the short one with 10 items), over a six-month interval, and also found similar correlations to the ones obtained in the present study ($r = 0.60$–0.70; $p = 0.001$). Therefore, there is no evidence to suggest that other retrospective questionnaires show better test–retest reliability than that observed for the CTDP – DSM-5.

Regarding construct validity, we found that the CTDP – DSM-5 converged with other measures (SCID-I and ERD) of the same trait, while it was able to distinguish PMDD from other Axis I disorders. To the best of our knowledge, this is the first screening instrument for PMDD for which convergent and discriminant validity have been analyzed. Our results confirm that the CTDP – DSM-5 has greater convergent validity coefficients than discriminant validity coefficients and, therefore, that it shows construct validity. This complies with Landén and Eriksson's [32] conceptualization by considering PMDD as a distinct entity rather than a subtype of depression or anxiety. Similar findings were reported by Payne et al. [33], who observed that premenstrual symptomatology was different from both bipolar disorder and major depressive disorder.

The DSM-5 criteria for diagnosing PMDD state that the remaining Axis I disorders must be excluded to ensure that symptoms are not due to other disorders, a requirement that is fulfilled by the CTDP – DSM-5. In order to provide further evidence of its discriminant validity, however, it could be suggested to analyze whether the instrument distinguishes between PMDD and reproduction-related disorders (primarily dysmenorrhea).

However, this study is not without limitations. The long interval between the first administration of the CTDP – DSM-5 and the subsequent administration of the SCID-I, the ERD and the second administration of the CTDP – DSM-5 implied experimental mortality. This could have contributed to the somewhat moderate test–retest reliability, which was assessed over an eight-month interval, longer than would commonly be used with this type of instrument. In addition, the instrument has been developed and validated in the Spanish population; the adaptation into other languages/cultures would be necessary to generalize its validity to other cultures and/or nationalities.

Despite these shortcomings, the CTDP – DSM-5 is able to provide a pre-diagnosis of PMDD, which can then be confirmed subsequently using data from daily rating forms of symptomatology across two menstrual cycles. We believe that this study constitutes a step forward in research into premenstrual dysphoric disorder because it helps to strengthen the theoretical basis of the concept and makes an important applied and methodological contribution to the assessment of the disorder. The results should serve as a platform for future research in the clinical field.

Competing interests declaration

The authors have no competing interests to report.

Acknowledgments

References

[1] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders: DSM-5, fifth ed. American Psychiatric Association, Arlington, 2013.
[2] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders: DSM-IV-TR, fourth ed. American Psychiatric Association, Washington, 2000.
[3] I. Lete, J.L. Dueñas, I. Serrano, J.L. Doval, J. Martínez-Salmeán, C. Coll, E. Pérez-Campos, A. Arbat, Attitudes of Spanish women toward premenstrual symptoms, premenstrual syndrome and premenstrual dysphoric disorder: results of a nationwide survey, Eur. J. Obstet. Gynecol. Reprod. Biol. 159 (2011) 115–118, http://dx.doi.org/10.1016/j.ejogrb.2011.06.041.
[4] C.N. Epperson, M. Steiner, S.A. Hartlage, E. Eriksson, P.J. Schmidt, I. Jones, K.A. Yonkers, Premenstrual dysphoric disorder: evidence for a new category for DSM-5, Am. J. Psychiatry 169 (2012) 465–475, http://dx.doi.org/10.1176/appi.ajp.2012.11081302.
[5] T. Pearlstein, Premenstrual dysphoric disorder: out of the appendix, Arch. Womens Ment. Health 13 (2010) 21–23, http://dx.doi.org/10.1007/s00737-009-0111-4.
[6] P.M.S. O'Brien, T. Bäckström, C. Brown, L. Dennerstein, J. Endicott, C.N. Epperson, E. Eriksson, E. Freeman, U. Halbreich, K.M.K. Ismail, N. Panay, T. Pearlstein, A. Rapkin, R. Reid, P. Schmidt, M. Steiner, J. Studd, K. Yonkers, Towards a consensus on diagnostic criteria, measurement and trial design of the premenstrual disorders: the ISPMD Montreal consensus, Arch. Womens Ment. Health 14 (2011) 13–21, http://dx.doi.org/10.1007/s00737-010-0201-3.
[7] J. Endicott, J. Nee, W. Harrison, Daily record of severity of problems (DRSP): reliability and validity, Arch. Womens Ment. Health 9 (2006) 41–49, http://dx.doi.org/10.1007/s00737-005-0103-y.
[8] J.J. De la Gándara, Síndrome Premenstrual [Premenstrual Syndrome], Cauce, Madrid, 1996.
[9] M. Steiner, M. MacDougall, E. Brown, The premenstrual symptoms screening tool (PSST) for clinicians, Arch. Womens Ment. Health 6 (2003) 203–209, http://dx.doi.org/10.1007/s00737-003-0018-4.
[10] M. Steiner, D.L. Streiner, S. Steinberg, D. Stewart, D. Carter, C. Berger, R. Reid, D. Grover, The measurement of premenstrual mood symptoms, J. Affect. Disord. 53 (1999) 269–273, http://dx.doi.org/10.1016/S0165-0327(98)00121-9.

[11] M. Steiner, D.L. Streiner, B. Pham, Validation of a revised visual analogue scale for premenstrual mood symptoms: results from prospective and retrospective trials, Can. J. Psychiatry 50 (2005) 327–332.

[12] G. Prieto, A.R. Delgado, Construcción de los Items [Item Development], in: J. Muñiz (Ed.), Psicometría, (Psychometrics), Universitas, Madrid 1996, pp. 105–138.

[13] R. Martínez, R. Moreno, J. Muñiz, Construcción de los Items (Item Development), in: J. Muñiz, A.M. Fidalgo, E. Gª-Cueto, R. Martínez, R. Moreno (Eds.), Análisis de los Items, (Item Analysis), La Muralla, Madrid 2005, pp. 9–52.

[14] J.C. Nunnally, Psychometric Theory, second ed. McGraw-Hill, New York, 1978.

[15] P.A. Deuster, T. Adera, J. South-Paul, Biological, social, and behavioral factors associated with premenstrual syndrome, Arch. Fam. Med. 8 (1999) 122–128, http://dx.doi.org/10.1001/archfami.8.2.122.

[16] T. Pearlstein, Prevalence, Impact on Morbidity, and Disease Burden, in: P.M.S. O'Brien, A.J. Rapkin, P.J. Schmidt (Eds.), The Premenstrual Syndromes: PMS and PMDD, Informa Healthcare, London 2007, pp. 37–45.

[17] C. Borrás, F.J. Pérez-Pareja, El Síndrome Premenstrual (Premenstrual Syndrome), UNED-FUE, Madrid, 1999.

[18] M.B. First, R.L. Spitzer, M. Gibbon, J.B.W. Williams, Entrevista Clínica Estructurada para los Trastornos del Eje I del DSM-IV–versión clínica (SCID-I) (Structured Clinical Interview for DSM Disorders), Masson, Barcelona, 1999.

[19] T. Raykov, Evaluation of convergent and discriminant validity with multitrait-multimethod correlations, Br. J. Math. Stat. Psychol. 64 (2011) 38–52, http://dx.doi.org/10.1348/000711009X478616.

[20] A. Cordero, A. Pamos, N. Seisdedos, Inventario de Personalidad NEO Revisado (NEO PI-R): Inventario NEO Reducido de Cinco Factores (NEO-FFI) [Revised NEO Personality Inventory: NEO Five-Factor Inventory], TEA, Madrid, 2002.

[21] A. Miller, H. Vo, L. Huo, C. Roca, P.J. Schmidt, D.R. Rubinow, Estrogen receptor alpha (ESR-1) associations with psychological traits in women with PMDD and controls, J. Psychiatr. Res. 44 (2010) 788–794, http://dx.doi.org/10.1016/j.jpsychires.2010.01.013.

[22] A.O. Adewuya, O.M. Loto, T.A. Adewumi, Premenstrual dysphoric disorder amongst Nigerian university students: prevalence, comorbid conditions, and correlates, Arch. Womens Ment. Health 11 (2008) 13–18, http://dx.doi.org/10.1007/s00737-008-0213-4.

[23] T.L. Kelley, The selection of upper and lower groups for the validation of test items, J. Educ. Psychol. 30 (1939) 17–24, http://dx.doi.org/10.1037/h0057123.

[24] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders: DSM-IV, fourth ed. American Psychiatric Association, Washington, 1994.

[25] L.K. Muthén, B.O. Muthén, Mplus User's Guide, seventh ed. Los Angeles, Muthén & Muthén, 1998-2012.

[26] B.D. Zumbo, A.M. Gadermann, C. Zeisser, Ordinal versions of coefficients alpha and theta for Likert rating scales, J. Mod. Appl. Stat. Methods 6 (2007) 21–29 Available from: http://digitalcommons.wayne.edu/jmasm/vol6/iss1/4.

[27] P.H. Blaney, R.F. Krueger, T. Millon (Eds.), Oxford Textbook of Psychopathology, third ed.Oxford University Press, New York, 2015.

[28] B.L. Den Oudsten, G.L. Van Heck, A.F.W. Van Der Steeg, J.A. Roukema, J. De Vries, Predictors of depressive symptoms 12 months after surgical treatment of early-stage breast cancer, Psychooncology 18 (2009) 1230–1237, http://dx.doi.org/10.1002/pon1518.

[29] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders: DSM-III-R, third ed. American Psychiatric Association, Washington, 1987.

[30] R.H. Moos, The development of the Menstrual Distress Questionnaire, Psychosom. Med. 30 (1968) 853–867, http://dx.doi.org/10.1097/00006842-196811000-00006.

[31] S.S. Allen, C.M. McBride, P.L. Pirie, The shortened premenstrual assessment form, J. Reprod. Med. 36 (1991) 769–772.

[32] M. Landén, E. Eriksson, How does premenstrual dysphoric disorder relate to depression and anxiety disorders? Depress. Anxiety 17 (2003) 122–129, http://dx.doi.org/10.1002/da.1008.

[33] J.L. Payne, S.R. Klein, R.B. Zamoiski, P.P. Zandi, O.J. Bienvenu, D.F. MacKinnon, F.M. Mondimore, B. Schweizer, K.L. Swartz, R.P. Crowe, W.A. Scheftner, M.M. Weissman, D.F. Levinson, J.R. DePaulo, J.B. Potash, Premenstrual mood symptoms: study of familiarity and personality correlates in mood disorder pedigrees, Arch. Womens Ment. Health 12 (2009) 27–34, http://dx.doi.org/10.1007/s00737-008-0043-4.

[34] Ministerio de Educación, Cultura y Deportes. Estadística de Estudiantes Universitarios. Curso 2014/2015 [Statistics of University Students: 2014–2015], 2016. Available from: http://www.mecd.gob.es/educacion-mecd/areas-educacion/universidades/estadisticas-informes/estadisticas.html (accessed 01.07.16).

[35] Instituto Nacional de Estadística. Estadística de la Enseñanza Universitaria en España: Curso 2010–2011 [Statistics of University Teaching in Spain: 2010–2011], 2011. Available from: http://www.ine.es/jaxi/menu.do?type=pcaxis&file=pcaxis&path=%2Ft13%2Fp405%2F%2Fa2010-2011 (accessed 01.07.16).