Assessment of premenstrual symptoms: validation of the Italian version of the Premenstrual Symptoms Screening Tool

Valutazione dei sintomi premestruali: affidabilità e validità della versione italiana del Premenstrual Symptoms Screening Tool

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SUMMARY. Purpose. The aim of this study was to provide an Italian validation of the Premenstrual Symptoms Screening Tool (PSST). The PSST is a retrospective questionnaire, originally developed in English language, used for the screening of Premenstrual Syndrome (PMS) and of Premenstrual Dysphoric Disorder (PMDD). PMDD and PMS are common, but are often not adequately recognized and treated, although they can heavily interfere on women's quality of life. **Methods.** An Italian version of the PSST from English was prepared using the "forward-backward" procedure, and submitted to a sample of 520 women over 18 years of age (mean age of 23.6; DS=±3.1). The content validity, the internal consistency, the test-retest reliability, and the convergent validity were evaluated. The factorial structure underlying the questionnaire was assessed with the use of both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). **Results.** Among the 520 participants to the study, 337 experienced no or mild premenstrual symptoms (64.8%), while 158 women evidenced a positive screening for moderate or severe PMS (30.4%), and 23 for PMDD (4.4%). The Italian PSST displayed adequate content validity and a very good internal consistency, with a Cronbach's alpha of 0.89. The test-retest reliability showed satisfactory results, with a Spearman's for the overall score of 0.80, and the intra-class correlation coefficient (ICC) of 0.810 (95% CI=0.761-0.862; p<0.001). The EFA was performed using the principal component analysis, followed by varimax rotation. The CFA was conducted on EFA results and supported a four-factor model, yielding the best fit indices [$\chi 2$/df=1.76; CFI=0.920; TLI=0.904; RMSEA=0.054 (0.043-0.065)]. The convergent validity, evaluated using the Spearman's correlation coefficient between the overall score of the Italian version of PSST and the Beck Depression Inventory (BDI) score showed a good value (ρ=0.647 p<0.001). **Conclusion.** Our results support the cross-cultural validity of the questionnaire, suggesting that the Italian version is a reliable and valid tool, as well as easy to use, to screen women in need of treatment for their premenstrual symptoms.

KEY WORDS: premenstrual syndrome, premenstrual dysphoric disorder, Premenstrual Symptoms Screening Tool, validation study.

RIASSUNTO. Scopo. Lo scopo di questo studio è stato quello di fornire una validazione della versione italiana del Premenstrual Symptoms Screening Tool (PSST). Il PSST è un questionario retrospettivo, originariamente sviluppato in lingua inglese, utilizzato per lo screening della sindrome premestruale (PMS) e del disturbo disforico premestruale (PMDD). Il PMDD e la PMS sono comuni, ma spesso non sono adeguatamente riconosciuti e trattati, sebbene possano interferire pesantemente sulla qualità di vita delle donne. **Metodi.** Una versione italiana del PSST è stata preparata dall'inglese utilizzando la procedura "forward-backward" e somministrata a un campione di 520 donne di età superiore ai 18 anni (età media di 23,6; DS=± 3,1). Sono state valutate la validità di contenuto, la coerenza interna, l'affidabilità e la validità convergente. La struttura fattoriale sottostante al questionario è stata analizzata con l'uso sia dell'Analisi Fattoriale Esplorativa (EFA) che dell'Analisi Fattoriale Confermativa (CFA). **Risultati.** Tra le 520 partecipanti allo studio, 337 hanno riferito nessuno o lievi sintomi premestruali (64,8%), mentre 158 donne hanno evidenziato uno screening positivo per la PMS da moderata a severa (30,4%) e 23 per il PMDD (4,4%). La versione Italiana del PSST ha mostrato un'adeguata validità di contenuto e una coerenza interna molto buona, con alfa di Cronbach pari a 0,89. L'affidabilità ha mostrato risultati soddisfacenti, con rho di Spearman pari a 0,80 per la scala complessiva e un coefficiente di correlazione intra-classe pari a 0,810 (95% CI=0,761-0,862; p<0,001). L'EFA è stata eseguita utilizzando l'analisi delle componenti principali, seguita da rotazione ortogonale varimax. La CFA condotta sui risultati dell'EFA ha supportato un modello a quattro fattori, che ha prodotto i migliori indici di adattamento [$\chi 2$/df=1,76; CFI=0,920; TLI=0,904; RMSEA=0,054 (0,043-0,065)]. La validità convergente, valutata utilizzando il coefficiente di correlazione di Spearman tra il punteggio complessivo della versione italiana del PSST e il punteggio ottenuto nel Beck Depression Inventory (BDI), ha mostrato un buon valore (ρ=0,647 p<0,001). **Conclusioni.** I nostri risultati supportano la validità transculturale del questionario, suggerendo che la versione italiana sia uno strumento affidabile e valido, oltre che facile da usare, per lo screening delle donne che necessitano di trattamento per i sintomi premestruali.

PAROLE CHIAVE: sindrome premestruale, disturbo disforico premestruale, Premenstrual Symptoms Screening Tool, studio di validazione.

INTRODUCTION

It is well known that cyclical hormonal changes during the menstrual cycle are not only related to reproduction, but can influence cognition and emotion, both in terms of physiological and pathological conditions[1-5]. In particular, the premenstrual days can be a period of psychological and physical vulnerability in the course of female reproductive age[6], since many epidemiological studies reported that 50-80% of women may suffer from at least some premenstrual discomfort[7-9]. The International Classification of Disease-11 (ICD-11), from the World Health Organization (WHO)[10], provides a liberal diagnostic criterion, without specifying severity, for "Premenstrual tension syndrome", with at least one symptom present. ICD-11 defined the most common psychological and emotional symptoms, including irritability, anxiety, tension, emotional lability, crying, anger, confusion, and the most common physical symptoms, including breast tenderness, abdominal swelling, headache, edema extremities, sense of fatigue, and changes in appetite.

These symptoms are usually fairly stable from menarche to menopause and, taken as a whole, are known as PMS[11]. In PMS, the symptoms are cyclical recurrent and occur during the luteal phase of the menstrual cycle only, to disappear a few days after menses[12]. Although the exact mechanism underlying PMS has not been identified, several studies show that female sex hormones play a key role in the pathogenesis of the symptoms[13]. In fact, they do not manifest itself during pregnancy and in anovulatory cycles, resolves with menopause and can be induced in postmenopause by administering sequential replacement therapy[14].

The severity of premenstrual manifestations varies from mild and moderate up to and including severe and disabling symptoms. In most women, the symptoms are mild and do not require treatment, while 25-50% experience moderate or severe symptoms (PMS). In 3-8% of women, the symptoms are clinically relevant and significantly affect their ability to work, social activities or interpersonal relationships: in these cases, the symptoms are as severe as in major depression, and meet the criteria for PMDD[15-17]. The diagnostic criteria for PMS and PMDD are published by the American Psychiatric Association in its Diagnostic and Statistical Manual (DSM) of Mental Disorders[18]. In DSM-5, PMDD is characterized by the presence of at least five symptoms, one of which should include one of four key affective symptoms (marked affective lability, persistent anger or irritability, significant depressive mood and marked anxiety or tension), in combination with four other symptoms. It is important that such symptoms must clearly increase in the week before menstruation, begin to improve within a few days of menstruation and have a remission a few days after menstrual bleeding begins. Moreover, these symptoms must be present for most of the menstrual cycles that occurred in the previous year. Steiner et al.[19] developed the PSST, a retrospective questionnaire which can help to identify both women who meet the criteria for PMDD in accordance with DSM-IV and women with clinically relevant PMS, but not sufficient for a PMDD diagnosis. In DSM-5, although PMDD was included as a nosographic category compared to DSM-IV [20], the diagnostic criteria remain the same, with changes in the order in which the affective core symptoms are listed, but which do not affect the overall criterion.

However, the diagnostic criteria for PMDD described in the DMS-5 are highly stringent and they may not intercept all the clinically relevant premenstrual symptoms. In fact, even women experiencing fewer than five symptoms can have a worse quality of life, both at work and in the social sphere. Therefore, it is relevant to have a user-friendly screening tool that can differentiate between women with mild premenstrual symptoms that do not require treatment, and women with PMS or PMDD symptoms that do require treatment, and could therefore be assessed through a more in-depth diagnostic interview. In fact, the PSST is more practical than daily charting[21,22], since it rates the impact of PMS on working, personal and social spheres, without the necessity to fill in prospective charts throughout two cycles. The purpose of our study was to translate the PSST to be applied to an Italian population, to evaluate its reliability and validity in a sample of Italian women as an instrument to track premenstrual symptoms, and to analyse the factor structure underlying the questionnaire.

METHODS

Participants

Young women, all students of the University of L'Aquila, were invited to participate in this study between the beginning of November 2019 and the end of February 2020. During this period, we contacted 732 women, with 595 agreeing to be involved in the study, although 75 of them did not meet the inclusion criteria. Therefore, a final convenience sample of 520 subjects was selected.

The women who agreed to participate were submitted to a screening with the following inclusion criteria: Italian native speaker; aged between 18 and 45 years; menstrual cycle length from 25 to 35 days. Exclusion criteria were: menopause, pregnancy or absence of menses due to other causes; use of psychotropic treatments during the last three months; abuse of alcohol or illicit drugs.

All the procedures were conducted in accordance with the declaration of Helsinki, and with participants, who read and signed an informed consent before taking part in this research, having an adequate understanding of the study aims. The study was approved by the ethical Committee of the University of L'Aquila.

Questionnaire

The PSST, developed by Steiner et al.[19], is a screening tool which reflects and translates DSM-IV criteria for PMS and PMDD. It consists of 19 items divided into two domains: the first contains 14 items based on the psychological, physical and behavioral symptoms; the five items belonging to the second domain assess symptoms that interfere with normal activities in various functional areas (work, family, relationships or social activities and home responsibilities).

The PSST is a self-assessment tool with four possible answers, the severity of which is rated using a 4-point Likert scale, with 0= not at all, 1= mild, 2= moderate and 3= severe.

The items in the first domain are the following: 1) anger/irritability; 2) anxiety/tension; 3) tearful/increased sensitivity to re-

jection; 4) depressed mood/hopelessness; 5) decreased interest in work activities; 6) decreased interest in home activities; 7) decreased interest in social activities; 8) difficulty concentrating; 9) fatigue/lack of energy; 10) overeating/food cravings; 11) insomnia; 12) hypersomnia; 13) feeling overwhelmed or out of control; 14) physical symptoms.

The items comprising the second domain are: A) work efficiency or productivity; B) relationships with co-workers; C) relationship with family; D) social life activities; E) home responsibilities.

Translation and content validity

We used the standard "forward-backward" procedure to translate the PSST from English into Italian. The original version of the questionnaire was compared with the back-translated versions and discrepancies were examined and resolved to achieve the Italian adaptation.

The PSST was then submitted to semantic validation, in order to confirm the comprehension of the items and to check content validity. To this aim, 20 women, all University students of L'Aquila, agreed to fill in the questionnaire. They were asked to measure with a stopwatch the time they took to complete the questionnaire, and to indicate any words/terms/expressions that were ambiguous and/or difficult to understand. Finally, the PSST was revised, obtaining the final Italian version.

Data collection

The self-administered questionnaire was completed by 520 women. They were initially submitted to a screening interview during which demographic and medical data were collected [age, educational level, marital status, height and weight to calculate the body mass index (BMI), menstrual cycle length and regularity, hormonal contraception]. One hundred and seventy women agreed to fill out the questionnaire two weeks later and the data were used to perform the test-retest reliability.

According to the criteria by Steiner et al.[19], participants to the study were divided into three groups: 1) no/mild PMS; 2) moderate to severe PMS; 3) PMDD.

For the assessment of PMDD, at least one of the first four items of the first domain must be present as severe, in addition to at least another four from the same domain presenting as moderate to severe. Moreover, at least one item from the second domain must be severe. For the assessment of moderate to severe PMS, at least one of the first four items of the first domain must be from moderate to severe, in addition to at least four of the 14 items of the first domain presenting from moderate to severe, as well as at least one item in the second domain appearing from moderate to severe.

Statistical analysis

The work was a cross-sectional study and the sample-size was adequate in accordance with guidelines for the 30:1 respondent-to-item ratio, as defined by Pedhazur[23].

Descriptive statistical analyses of the sociodemographic and medical characteristics of the sample were presented using frequencies distribution for qualitative variables and mean and standard deviation for quantitative variables. Comparisons were performed through one-way ANOVA or Pearson's chi-square tests (χ^2). The percentages of women who reported mild to severe symptoms on each item were determined. A chi-square test was applied to compare each symptom among the three determined groups.

The internal consistency was evaluated using the Cronbach's alpha, considering acceptable a threshold of $\alpha>0.7$. The test-retest reliability of the Italian version of the questionnaire was evaluated using the Spearman's correlation coefficient and the Intra-Class Correlation (ICC). Spearman's $\rho>0.7$ was considered acceptable. ICC estimates and their 95% confident intervals were calculated based on absolute agreement, one-way random model. ICC values between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability.

The construct validity was analysed with the use of the Exploratory Factor Analysis (EFA) and the Confirmatory Factor Analysis (CFA). To this aim, the dataset (n=520) was randomly split into two halves, one of each was used to perform the EFA and the other to perform the CFA. The EFA was performed on all 19 items using the principal component analysis with varimax rotation. Data met the Kaiser-Meyer-Olkin's sample adequacy criteria for the appropriateness of using factorial models (KMO value >0.60). The eigenvalues higher than the 1.0 criteria and the scree plot were used to determine the number of factors to extract. Loadings higher than 0.40 were kept. Bartlett's test for sphericity was performed using a significance level of $p<0.05$. Communality was determined for each item as one uniqueness value less. The CFA was performed to determine the extent to which the obtained data fits into the assumed structure given by the EFA. Multiple indices were estimated: χ^2/df, comparative fit index (CFI), Tucker-Lewis index (TLI), and the root mean square of approximation (RMSEA) were calculated[24,25]. The following "rule of thumb" criteria were used: χ^2/df <3); CFI and TLI >0.90; RMSEA <0.06[24,26]. Cronbach's alpha, Spearman's correlation and ICC were calculated for all the extracted factors.

The convergent validity was also evaluated. The convergent validity was evaluated using the Spearman's correlation coefficient between the Italian version of the PSST and the Beck Depression Inventory (BDI)[27]. It was hypothesized to find a correlation between the PSST scores and the BDI scores.

All analyses were performed using SPSS version 25.0. The CFA was performed using Analysis of Moment Structures (AMOS) version 18.0. Data were presented as mean ± SD or percentages, and statistical significance was set at 5% ($p<0.05$).

RESULTS

Content validity

Once the questionnaire was translated, a sample of 20 women, all University students of L'Aquila, agreed to complete it to verify its content validity. They employed a mean time of 5.2 (±0.57) minutes to complete the questionnaire, whose results were not included in the final analysis. All the students agreed that the text was understandable, and did not include difficult or ambiguous terms.

Sociodemographic and medical characteristics

Five hundred and twenty women between the ages of 18 and 39 completed the PSST. The mean (± SD) age of participants was 23.6±3.1 years. A total of 337 (64.8%) women expe-

rienced no or mild symptoms of PMS, while 30.8% (160/520) of participants experienced PMS with moderate or severe effects on their everyday life. Twenty-three women (4.4%) reported symptoms consistent with PMDD. No statistical significance emerged among groups about sociodemographic and medical characteristics. Results were reported in Table 1.

Overall, the percentage of participants reporting symptoms for each of the 19 items increased according to the classification of women with no/mild PMS, to moderate/severe PMS, to PMDD. Anger/irritability, anxiety/tension, tear/increased sensibility to rejection, depressed mood/hopelessness, overeating/food craving, physical symptoms and relation with family were the most common manifestations among women of the PMDD group (more than 85%, Table 2). All 19 items reported statistically significant differences ($p<0.001$) among the three groups.

Internal consistency and test-retest reliability

Cronbach's alpha of the overall Italian version of PSST was 0.89, indicating a very good internal consistency, and it was higher than the ones determined for each domain alone (domain I: $\alpha= 0.85$, domain II: $\alpha=0.76$). The test-retest reliability showed good values: Spearman's for the overall score was 0.80, while the intra-class correlation coefficient (ICC) was 0.810 (95% CI=0.761-0.862; $p<0.001$) (Table 3).

Factorial construct of the PSST

The EFA was carried out on the half of the sample and four factors to be extracted were identified, taking into account the examination of the eigenvalues higher than the 1.0 criteria and the scree plot. For the non-rotated solution, four components determined 54.3% of the total variance (factor 1: 33.4%, factor 2: 9.2%, factor 3: 6.4%, factor 4: 5.3%). Bartlett's test of sphericity indicated that the correlation matrix was significantly different from an identity matrix (χ^2=1647.856 df=171, $p<0.001$). The Kaiser-Meyer-Olkin (KMO) test confirmed the sample's adequacy (KMO=0.892). Higher factor loadings (>0.65) have been observed in "decreased interest in work activities", "difficulty concentrating", "anxiety/tension", "tear/increased sensibility to rejection", "depressed mood/hopelessness", "feeling overwhelmed or out of control", "social life activities", "home responsibilities", "hypersomnia", "insomnia" and "overeating/food craving". Given the EFA results, the first factor has been labelled "Decreased interest in daily activities", the second "Interference with normal function", the third "Instability of mood" and the fourth "Psychophysical distress". The EFA results were reported in Table 4a.

The CFA was performed on the other half of the sample, using the model derived from the EFA. The 19-item, four-factor model exhibited good model fit [2/df=1.76; CFI=0.920; TLI=0.904; RMSEA=0.054 (0.043-0.065)]. To confirm the appropriateness of the four-factor model we tested also the one-, two-, and three-factor models. The model fit statistics were reported in Table 4b and a progressive improvement of the fit indices can be observed in the transition from the one- to the four-factor model.

The internal consistency values for each factor were also satisfactory, varying from 0.71 for "Psychophysical distress" to 0.80 for "Decreased interest in daily activities" (Table 3). One hundred and seventy women accepted to fill out the questionnaire two weeks later, and the data were used to per-

Table 1. Sociodemographic and medical characteristics of the study sample.

Variable	Total valid n=520	No/mild PMS n=337 (64.8%)	Moderate to severe PMS n=160 (30.8%)	PMDD n=23 (4.4%)	χ^2	p-value
Age	23.62±3.14	23.82±3.1	23.25±3.2	23.22±2.5	33.050	0.139**
Educational level						
High School degree	412 (79.2)	261 (77.4)	131 (81.9)	20 (87)	2.165	0.339*
University degree	108 (20.8)	76 (22.6)	29 (18.1)	3 (13)		
Marital status						
Single	466 (89.6)	300 (89)	144 (90)	22 (95.7)	1.130	0.889*
Married	47 (9)	32 (9.5)	14 (8.8)	1 (4.3)		
Divorced	7 (1.3)	5 (1.5)	2 (1.3)	0 (0.0)		
BMI (Body mass index)	20.88±3.2	20.64±3.1	21.32±3.3	21.39±3.4	54.973	0.064**
Menstrual cycle regularity						
Regular	441 (84.2)	288 (85.5)	134 (83.8)	19 (82.6)	0.337	0.845*
Irregular	79 (15.2)	49 (14.5)	26 (16.3)	4 (17.4)		
Menstrual cycle length	28.66±3.7	28.65±3.8	28.71±3.4	28.3±2.9	37.108	0.883**
Hormonal contraception						
No	416 (80)	270 (80.1)	127 (79.4)	19 (82.6)	0.140	0.932*
Yes	104 (20)	67 (19.9)	33 (20.6)	4 (17.4)		

Age, cycle length and BMI are presented as mean ± SD, while the other data as (%).
** One-way analysis of variance (ANOVA)
*Pearson's chi-square test

Table 2. Percentage of women with moderate to severe symptoms evaluated in PSST for each group.

Symptoms	No/mild PMS	Moderate tosevere PMS	PMDD	χ^2
Anger/irritability	48.4	83.8	91.3	106.296
Anxiety/tension	27.9	70.0	86.9	114.196
Tear/increased sensibility to rejection	43.3	81.2	87.0	99.971
Depressed mood/hopelessness	30.6	66.3	95.7	103.578
Decreased interest in work activities	15.7	43.8	69.6	86.789
Decreased interest in home activities	18.4	45.6	73.9	103.203
Decreased interest in social activities	19.5	34.4	47.8	33.632
Difficulty concentrating	21.9	50.6	65.2	78.258
Fatigue/lack of energy	51.1	80.0	82.6	62.271
Overeating/food craving	36.2	81.3	95.6	182.809
Insomnia	12.8	33.1	52.1	74.270
Hypersomnia	20.8	39.4	65.2	56.894
Feeling overwhelmed or out of control	12,8	34.4	39.1	223.459
Physical symptoms	48.6	88.1	91.3	222.550
Work efficiency or productivity	4.8	31.9	63.5	104.779
Relationship with coworkers	3.0	18.8	39.1	255.246
Relationship with family	16.3	65.6	93.9	296.792
Social life activities	6.2	45.0	85.2	519.538
Home responsabilities	3.6	30.0	65.2	428.789

Data are presented as %. χ^2: p-values were calculated using the Pearson's chi-square test and were for all symptoms <0.001.

Table 3. Internal consistency and Test-retest reliability of the PSST questionnaire.

PSST	Cronbach's α	ρ	ICC	95% CI
	n=520	n=170	n=170	n=170
Overall score	0.89	0.800 (p<0.001)	0.817	0.761-0.862
Domain 1	0.85	0.840 (p<0.001)	0.849	0.800-0.886
Domain 2	0.76	0.879 (p<0.001)	0.893	0.858-0.920
Factor 1 Decreased interest in daily activity	0.80	0.817 (p<0.001)	0.808	0.748-0.854
Factor 2 Interference with normal function	0.76	0.846 (p<0.001)	0.867	0.824-0.900
Factor 3 Instability of mood	0.76	0.767 (p<0.001)	0.774	0.706-0.828
Factor 4 Psychophysical distress	0.71	0.834 (p<0.001)	0.817	0.761-0.862

ρ= Spearman's correlation test; ICC= intra-class correlation; 95% CI=confidence interval.

form the test-retest reliability. All the four factors had an ICC greater than 0.75, varying from 0.867 for "Instability of mood" to 0.774 for "Interference with normal function", and a Spearman's greater than 0.75, indicating a good reliability (Table 3).

Convergent validity

The Italian version of the PSST displayed an adequate convergent validity. The BDI[27] is one of the most used scales to assess depressive symptoms. Items are rated using a 4-Lik-

Table 4a. Exploratory Factor Analysis of the Italian PSST.

Item	Symptoms	h^2	F1	F2	F3	F4	Mean	SD	Cronbach's α if item deleted
1	*Anger/irritability*	0.455			0.539		1.72	0.76	0.880
2	*Anxiety/tension*	0.562			0.686		1.32	0.91	0.879
3	*Tear/increased sensibility to rejection*	0.578			0.733		1.69	0.92	0.881
4	*Depressed mood/hopelessness*	0.573			0.696		1.41	0.85	0.880
5	*Decreased interest in work activities*	0.626	0.701				0.99	0.87	0.877
6	*Decreased interest in home activities*	0.625	0.613				1.10	0.91	0.875
7	*Decreased interest in social activities*	0.450	0.536				1.10	0.86	0.881
8	*Difficulty concentrating*	0.543	0.671				1.29	0.82	0.878
9	*Fatigue/lack of energy*	0.534	0.639				1.76	0.86	0.879
10	*Overeating/food craving*	0.591				0.727	1.50	0.98	0.883
11	*Insomnia*	0.568				0.690	0.95	0.85	0.881
12	*Hypersomnia*	0.480	0.659				0.99	0.92	0.884
13	*Feeling overwhelmed or out of control*	0.526			0.668		0.74	0.88	0.881
14	*Physical symptoms*	0.495				0.573	1.57	0.98	0.879
A	*Work efficiency or productivity*	0.443		0.568			1.03	0.75	0.881
B	*Relationship with co-workers*	0.453		0.616			0.62	0.67	0.881
C	*Relationship with family*	0.524		0.490			1.14	0.78	0.873
D	*Social life activities*	0.646		0.711			1.01	0.82	0.876
E	*Home responsibilities*	0.641		0.703			0.84	0.79	0.877
	Eigenvalues		6.342	1.740	1.218	1.011			
	% of Variance explained*		33.4%	9.2%	6.4%	5.3%			

*Non-rotated solution – h^2= final communality estimates F1= Decreased interest in daily activities; F2= Interference with normal function; F3= Instability of mood; F4= Psychophysical distress.

Table 4b. Confirmatory Factor Analysis - Fit indices for the 1F, 2F, 3F and 4F models of PSST.

Factor	χ^2	χ^2/df	CFI	TLI	RMSEA (Low_{90} - Hi_{90})
1	χ^2= 444.158; df=152, p<0.001	2.92	0.786	0.759	0.086 (0.077-0.086)
2	χ^2= 378.298; df=151, p<0.001	2.50	0.833	0.811	0.076 (0.066-0.085)
3	χ^2= 296.446; df=149, p<0.001	1.98	0.892	0.876	0.061 (0.051-0.072)
4	χ^2= 257.048; df=146, p<0.001	1.76	0.920	0.904	0.054 (0.043-0.065)

χ^2= chi-quadro value; df= degrees of freedom; CFI= Comparative Fix Index; TLI= Tucker-Lewis index; RMSEA= Root mean squared error of approximation; Low_{90} - Hi_{90}= 90% lower and upper bound.

ert scale from zero to three to reflect their intensity and are summed linearly to create a score which ranges from 0 to 63. Data showed a moderate correlation between the PSST overall scores and overall BDI scores (ρ=0.647 p<0.001). Good coefficients of correlation were also found for the three groups (no/PMS: ρ=0.515; p<0.001; moderate to severe PMS: ρ=0.524; p<0.001; PMDD: ρ=0.563; p<0.005). Moreover, the severity of depressive symptoms was significantly

different between the three groups (H_2=141.941; p<0.001), with higher score in PMS group, compared to no/mild PMS group (U=10481.5; Z=-11.028; p<0.001), and higher score in PMDD group, compared to PMS group (U=1376.0; Z=-1.957; p<0.05).

DISCUSSION AND CONCLUSIONS

Many epidemiological and clinical studies have evidenced that a large number of women experience at least some distressing symptoms during the premenstrual period. The most severe form of premenstrual disorders, the PMDD, is characterized by a pattern of symptoms that is peculiar and distinct from other disorders because they recur cyclically and occur after the mid-luteal phase of the menstrual cycle, to disappear a few days after menses. Therefore, considering the importance of screening the premenstrual disorders, this study makes available the first translation and validation of the PSST in the Italian language. Our translation/validation highlights its cross-cultural validity and makes available an instrument of rapid administration. In fact, Italian women found it easy to understand and complete, as determined by the very short time taken to complete the survey (5.2±0.57 min). Moreover, this study supports a four-factor structure for the PSST, covering all the core symptoms of premenstrual disorders indicated both in DSM-IV and DSM-5.

The internal consistency, measured with Cronbach's alpha, displayed good values, both for the overall coefficient (0.89) and for each of the two subscales (domain I: α=0.85, domain II: α=0.76). The internal consistency value for each factor was higher than 0.70, showing a good level of internal consistency. The test-retest reliability was performed 15 days later to include two different phases of the menstrual cycle, thus avoiding possible bias in the answers due, in particular, to the manifestation of symptoms during the premenstrual phase. A good agreement was found for the total score, with an ICC of 0.817 (95% CI=0.761-0.862) and a Spearman's of 0.80.

The prevalence of women who experienced no or mild symptoms was 64.8%, while 30.8% of participants experienced PMS with moderate or severe effects on their everyday life, and 4.4% of women reported symptoms seen in PMDD diagnoses. These frequencies are in agreement with DSM-5 and with previous epidemiological studies conducted in different countries[7,28,29].

The CFA supported the four-dimension structure of the questionnaire evidenced in the EFA. According to the pre-established threshold of the ^{2}/df, the CFI, the Tucker-Lewis index, and the RMSEA, the four-factor model could be considered satisfactory. The four factors had an ICC varying from 0.774 and 0.867 and a Spearman's greater than 0.75, indicating a good reliability. To the best of our knowledge, only Mahfoud et al.[30] analysed the factor structure of the PSST, which was not evaluated by other authors who translated/validated the questionnaire[31-33]. They identified five factors using a principal component analysis, but did not conduct a CFA afterwards, so their model was not confirmed. The present study is the only one to date to have performed a CFA to analyse the factorial structure of the PSST. Our evidences suggest that the PSST is multifactorial and includes four factors, namely "Decreased interest in daily activities", "Interference with normal functions", "Instability of mood" and "Psychophysical distress". This four-factor model explained 54.3% of the total variance and should be considered the core symptoms described in DSM, both IV and 5. The first domain explained 33.4% of the total variance and grouped the items related to a diminished interest in daily activities, with higher factor loadings in decreased interest in work activities. The second factor explained 9.2%, involves various dimensions in women's functions, and is related to work efficiency and productivity, relationship with co-workers and family members, social life activity and home responsibilities. The third factor explained 6.4% of variance, and is related to affective symptoms, in particular with the higher item loading observed in tearful/increased sensibility to rejection. It is interesting to note that this item is the first symptom indicated in the list proposed in DSM-5. The fourth factor explained 5.3% of variance and grouped items related to psychophysical symptoms, with the higher loading for "overeating/food craving". Altogether, these four factors supported the symptoms most commonly related to PMS and PMDD, which lead to significant interferences in women's usual activities or in functioning at work, school and/or in interpersonal relationships, and affective symptoms.

The correlations obtained in the present study between PSST and the BDI for depressive symptom scores (ρ=0.647; p<0.001) indicate that the PSST has acceptable convergent validity, as many studies evidenced a relationship between premenstrual disorders and depression[34,35]. Comparable results were found by Câmara et al.[32] in their validation of the Brazilian/Portuguese version of the PSST, using a different questionnaire to explore depressive symptoms.

The results of convergent validation were in agreement with those concerning the percentage of participants reporting symptoms, that significantly increased according to the classification of women in the three different groups.

The principal limitation of this study was due to the recruitment method used. In fact, the participants were all university students, so that the sample analysed was constituted predominantly by young women with a medium-high level of education. We preferred the homogeneity of the sample regarding the educational level of the individuals, because this point is relevant for the factorial analysis, since participants must have a similar profile for a more accurate determination of domains in a specific construct. However, further studies are needed to assess whether the same factorial structure can be considered valid in populations with different characteristics (e.g. adolescents, people with different background of education).

Another limitation is that the PSST is based on DSM-IV. Although sufficient empirical evidences supported the development in the DSM-5 for PMDD as a distinct category in the mood disorders section[20], this change did not affect the diagnostic criteria. Therefore, in our opinion, the PSST is also valid according to the criteria indicated in the DSM-5, but it could be useful to evolve the tool in the future, possibly integrating it so that it can be more specifically based on the DSM-5.

Taken together, our findings, even in the light of these limitations, suggest that the Italian version of the PSST is a valid instrument to track premenstrual symptoms and to identify women who need a more in-depth diagnostic interview. Since the evaluation of premenstrual problems is a fundamental question in the safeguarding of the physical, psycho-

logical and social health of women, we consider PSST to be a useful tool not only in clinical settings, but also in the field of research. In fact, data collection with PSST could allow researchers to measure PMS and PMDD symptoms in the general population of women, as this is an instrument of easy administration also in large sample.

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