

Perceived maternal parenting self-efficacy scale: Factor structure and psychometric properties among Portuguese postpartum women

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ABSTRACT

Objective: The aim of this study was to investigate the factor structure and psychometric properties of the Perceived Maternal Parenting Self-Efficacy (PMPS-E) Scale among Portuguese postpartum women.

Design: Quantitative cross-sectional study.

Setting: Data were collected through an online survey placed on social media websites targeting Portuguese adult women in the postpartum period (0–12 months after delivery).

Participants: The total sample consisted of 893 participants who gave birth after 37 weeks of gestation.

Results: After conducting exploratory and confirmatory factor analyses, our results revealed that a correlated three-factor model yielded a significantly better fit to the data than the original four-factor model. High reliability was found for the total scale ($\alpha = 0.95$) and for the three factors (α from 0.88 to 0.94). The PMPS-E presented significant and moderate to large correlations with other measures related to maternal self-efficacy. Participants who were multiparous, had older infants (>5 months old) and perceived their infant temperament as easy reported higher maternal parenting self-efficacy than those who were primiparous, had younger infants (≤ 5 months old) and perceived their infant temperament as difficult.

Conclusions: The results of this study showed that the European Portuguese version of the PMPS-E is a valid and reliable instrument for assessing maternal parenting self-efficacy among postpartum women.

Implications for practice: The PMPS-E may be a valuable instrument to detect parenting self-efficacy difficulties among postpartum women and thus contribute to strategies to improve women's overall psychological adjustment to the postpartum period, with a possible impact on the mother-infant relationship.

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Introduction

The postpartum period is a time of transition, learning and adjustment for women (Nelson, 2003). During the first postpartum year, women are faced with several challenges and must continuously learn new tasks, abilities and behaviors related to child-care. Because of the endless responsibilities mothers tackle when caring for their infants, maternal parenting self-efficacy, defined as the women's belief in her ability to deal with parenting situations (Hess et al., 2004; Jones and Prinz, 2005), is very important in facilitating a successful adjustment to the maternal role

(Mercer, 2004; Ngai et al., 2010). Indeed, research shows that believing in the ability to safeguard the infant's needs and provide care may be as important as having the skills to perform these tasks (Leahy-Warren and McCarthy, 2011).

Maternal parenting self-efficacy is a pertinent topic because of the significant impact it has on parenting practices, infant development and women's psychological health (Coleman and Karraker, 2000). Research has suggested that parenting self-efficacy is a central variable in infant development given its direct influence on child behavior (e.g., Coleman and Karraker, 2003), as well as its indirect influence through the mother-infant relationship (e.g., Gharaibeh and Hamlan, 2012) and through parenting practices. For instance, higher levels of parenting self-efficacy have been associated with more positive parenting practices (Coleman and Karraker, 1998; Dumka et al., 2010; Jones and Prinz, 2005) and parental competence (Jones and Prinz, 2005;

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Teti and Gelfand, 1991). In turn, according to self-efficacy theory (Bandura, 1997), parents with low parenting self-efficacy beliefs may be more inhibited to acquire new knowledge and skills and more prone to giving up when challenges arise. Consequently, struggles with parenting may confirm beliefs of low efficacy, leading to increased levels of psychopathological symptoms (Law et al., 2019).

When considering women's psychological health, low maternal parenting self-efficacy has been associated with an increased risk of postpartum depression, parenting dissatisfaction and maternal stress (Kohlhoff and Barnett, 2013; Law et al., 2019; Salonen et al., 2009). Other studies have highlighted the protective role of maternal parenting self-efficacy against socioeconomic adversity (Ardelt and Eccles, 2001) and against the impact of prenatal stress on emotional and behavioral regulation problems in the infants (Bolten et al., 2012). Moreover, considerable evidence has shown that the promotion of maternal self-efficacy is an important mechanism in the reduction of postpartum depressive symptomatology (Haslam et al., 2006; Mickelson et al., 2017). In line with these findings, a recent systematic review emphasized the beneficial influence of maternal self-efficacy against the detrimental effects of postpartum psychological distress on the health of both mothers and infants (Liyana Amin et al., 2018). Because maternal parenting self-efficacy can be improved (Bandura, 1997), it has been included as one of the target areas of intervention for mothers in the postpartum period (Perez-Blasco et al., 2013; Shorey et al., 2015). Therefore, considering the clinical implications that the promotion of maternal parenting self-efficacy may have, it seems essential to have valid and reliable instruments to assess this variable in the postpartum period.

Assessing maternal parenting self-efficacy: The perceived maternal parenting self-efficacy scale

A recent systematic review assessing the psychometric qualities of parenting self-efficacy self-report measures has considered the Perceived Maternal Parenting Self-Efficacy Scale (PMPS-E; Barnes and Adamson-Macedo, 2007) as one of the most appropriate questionnaires for measuring parenting self-efficacy (Wittkowski et al., 2017). The PMPS-E is a self-report questionnaire that was originally developed to assess maternal parenting self-efficacy among mothers of hospitalized preterm infants (Barnes and Adamson-Macedo, 2007). It was developed according to Bandura's self-efficacy theory (Bandura, 1997) as it combines the assessment of specific parenting tasks or activities within the broader domain of parenting. The PMPS-E comprises 20 items divided into four dimensions: care taking procedures (four items; e.g., "I am good at changing my baby"), evoking behaviors (seven items; e.g., "I am good at soothing my baby when he/she continually cries"), reading behaviors (six items; e.g., "I can tell when my baby is sick") and situational beliefs (three items, e.g., "I can show affection to my baby"). The items and subscales of the PMPS-E were theorized from the self-efficacy theory, similar relevant scales and the original authors' expertise and specialist knowledge. The results of the exploratory factor analysis from the original study were congruent with the four theorized subscales. However, no confirmatory factor analysis was conducted to confidently support the four-factor structure. Acceptable values of internal consistency and temporal stability were also demonstrated (Barnes and Adamson-Macedo, 2007).

The PMPS-E has been translated and validated in other countries, such as Italy (Pedrini et al., 2019), Colombia (Vargas-Porras et al., 2020) and Brazil (Tristão et al., 2015), among samples of postpartum women with both preterm and term infants. All validation studies supported the four-factor structure of the PMPS-E, although only the factor structure of the Italian version

was examined using a confirmatory factor analysis (Pedrini et al., 2019). Nonetheless, the results from all three studies showed that the items of the PMPS-E loaded onto different factors than those in the original study. This may reflect the different settings in which the PMPS-E was validated, but it also suggests that the factor structure of the PMPS-E needs further examination. Regarding reliability, good reliable indices were found in all validation studies.

Taking into account the lack of a reliable measure of maternal parenting self-efficacy among Portuguese postpartum women, the present study aimed to adapt the European Portuguese version of the PMPS-E, explore its factor structure, and assess its psychometric properties, specifically concerning validity (convergent and known groups) and reliability.

Methods

Procedure

Data were collected through an online survey placed on the website of the host institution, and a link to the survey was posted on social media websites. Women aged 18 years or older in the postpartum period (0–12 months after delivery) who delivered a healthy infant after 37 weeks of gestation were invited to participate in a study about mental health in the postpartum period. Study enrollment occurred between August and November 2018. Informed consent was obtained from all participants (by clicking on the option "I understand and accept the conditions of the study") after information was given about the study's goals and the voluntary and anonymous aspects of participation. The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the [blind for review].

Translation process

The translation of the PMPS-E to European Portuguese was developed in several steps through a forward-backward translation procedure. First, after obtaining authorization from the authors of the original version to translate and validate the scale, two bilingual Portuguese researchers independently translated the items. The two translated versions were compared, and after discussing and analyzing their similarities/differences, both researchers agreed on a single reconciled version. Second, a third bilingual and independent translator, who was not familiar with the scale, conducted the back translation of this reconciled version. Finally, the original and the back-translated versions were compared, and translation difficulties were analyzed and resolved between translators to obtain a comprehensible measure that was conceptually consistent with the original.

Measures

Sociodemographic (e.g., age, marital status, education), health (e.g., prior history of psychopathological problems) and infant-related data (e.g., infant's age, gestational weeks at birth, perceived temperament) were collected through a self-report questionnaire developed by the authors. More specifically, infant's temperament as perceived by the mother was assessed through a self-report item, answered on a four-point scale that ranged from 0 (*very difficult*) to 3 (*very easy*).

The women's perception of self-efficacy in the mothering role was assessed using the PMPS-E (Barnes and Adamson-Macedo, 2007). This measure comprises 20 items (e.g., "I am good at understanding what my baby wants") rated with a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Higher

scores indicate higher levels of perceived maternal parenting self-efficacy (total score ranges from 20 to 80).

General self-efficacy was assessed with the General Self-Efficacy Scale (GSE; Schwarzer and Jerusalem, 1995; Portuguese version [PV]: Araújo and Moura, 2011). The GSE comprises 10 items (e.g., "I am confident that I could deal efficiently with unexpected events") rated with a four-point scale ranging from 1 (*not at all true*) to 4 (*exactly true*). The total score on the GSE ranges from 10 to 40, with higher scores indicating higher general self-efficacy. In the present sample, the Cronbach's alpha was 0.90.

The Resilience Scale (RS14; Wagnild, 2009; PV: Pinheiro and Matos, 2013), was used to assess resilience. This scale comprised 14 items (e.g., "I feel like that I can handle many things at a time") scored on a seven-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Higher scores indicate a greater ability to respond with resilience, and the total score ranges from 14 to 98. In our sample, the Cronbach's alpha was 0.92.

Maternal confidence was measured with the Maternal Confidence Questionnaire (MCQ; Parker and Zahr, 1985; PV: Nazaré et al., 2013). The MCQ comprises 13 items (e.g., "I feel satisfied with my role as a mother") answered on a five-point response scale ranging from 1 (*never*) to 5 (*always*). Higher scores indicate higher maternal confidence (total score ranges from 13 to 65). In our sample, the Cronbach's alpha was 0.84.

Maternal bonding was measured with the Maternal Attachment Inventory (MAI; Müller, 1994; PV: Galvão, 2006). The MAI comprises 26 items (e.g., "I feel warm and happy with my baby") answered on a four-point response scale ranging from 1 (*almost never*) to 4 (*almost always*). The total score ranges from 26 to 104, and higher scores denote higher maternal bonding. In our sample, the Cronbach's alpha was 0.95.

The Edinburgh Postnatal Depression Scale (EPDS, Cox et al., 1987; PV: Areias et al., 1996) is a 10-item self-report questionnaire of depressive symptoms in the perinatal period. In each item, participants are asked to indicate one of four individualized responses that are rated from 0 to 3. The total score ranges between 0 and 30, and higher scores are indicative of more severe depressive symptoms. In our sample, the Cronbach's alpha was 0.89.

Data analysis

Statistical analyses were performed with the *Statistical Package for the Social Sciences* (IBM SPSS, version 23.0) and with AMOS 22 (IBM Corporation, Meadville, PA, USA). Descriptive statistics were first calculated to explore the sample's sociodemographic, health- and infant-related characteristics. Each item's descriptive statistics, distribution and floor and ceiling effects were computed to examine the item's characteristics. Skewness values < 3 and kurtosis values < 8 were considered to not pose a considerable bias to a normal distribution (Kline, 2016). Floor or ceiling effects were considered to be present if more than 15% of respondents achieved the lowest or highest possible score, respectively (Terwee et al., 2007). A confirmatory factor analysis (CFA) using maximum likelihood estimation was conducted to test the factor structure shown in the original validation study (Barnes and Adamson-Macedo, 2007). To indicate a good fit, the chi-square index (χ^2) should be nonsignificant, which is rarely obtained when the sample is large (Van de Schoot et al., 2012). Thus, the following indices were also used to assess goodness of fit of the CFA model: comparative fit index (CFI), Tucker Lewis index (TLI), root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR). The model was considered to have a good fit when CFI/TLI \geq 0.95, RMSEA \leq 0.06 and SRMR \leq 0.08 (Hu and Bentler, 1999) and an acceptable fit when CFI/TLI > 0.90 and RMSEA < 0.10 (Marôco, 2014).

Because a good model fit was not achieved with the original factor structure, exploratory factor analysis (EFA) followed by CFA was conducted. The total sample was randomly divided into two subsamples (subsample one: $n = 448$ and subsample two: $n = 445$). In subsample 1, an EFA using a principal component analysis with Oblimin oblique rotation was conducted to identify the factor structure of the European Portuguese version of the PMPS-E. Factor extraction was determined through Kaiser's criterion (eigenvalues \geq 1) followed by parallel analysis (Hayton et al., 2004). The factor loadings threshold of 0.40 was used to indicate that the item contributed sufficiently to the factor. In subsample 2, two CFAs were performed: one with the three-factor structure obtained from the EFA and another with the original four-factor structure. The assessment of fit was based on the abovementioned indices. To compare the models, $\Delta\chi^2$ (with a significant difference between the χ^2 scores indicating that the model with the lowest χ^2 presents a better fit) and Akaike information criterion values (with the lowest values being indicative of a better fit; Kline, 2016) were used.

The Cronbach's alpha coefficient was computed to examine the internal consistency of the PMPS-E. Cronbach's alpha coefficients were calculated for both the total and the PMPS-E factors, and values above 0.70 were indicative of good reliability. Pearson correlations were conducted to provide evidence of the validity of the PMPS-E total and factor scores in relation to other measures related to maternal self-efficacy (small effect: $r = 0.10$; medium effect: $r = 0.30$; large effect: $r = 0.50$; Cohen, 1992). Finally, known-groups validity was examined by comparing the PMPS-E scales across groups expected to differ in this construct. Multivariate analyses of variance (MANOVA) were conducted to compare the PMPS-E scores according to parity (primiparous vs. multiparous), perceived infant temperament (difficult vs. easy), infant care responsibilities (shared between the mother and the father vs. belonging exclusively to the mother), and infant age (using infant's median age as the cutoff). A p -value of 0.05 was set as the significance cut-off point.

Results

Characteristics of the participants

The total sample of this cross-sectional study consisted of 893 Portuguese postpartum women with a mean age of 31.98 years ($SD = 4.78$; range 18–45). Infants were aged between zero and 12 months old (M mean = 5.56, $SD = 3.34$; $Mdn = 5$, $IQR = 5$), and this was the first child for most women ($n = 575$; 64.4%). The majority of women were married/cohabiting ($n = 794$; 88.9%), were employed ($n = 726$; 81.3%), had completed university studies (bachelor's degree or postgraduate studies; $n = 567$; 63.5%), lived in an urban area ($n = 660$; 73.8%) and had a household monthly income between 1000€ and 2000€ ($n = 517$; 57.9%). Table 1 shows the sociodemographic, health- and infant-related characteristics of the total sample and of the subsamples used in the EFA (subsample 1) and the CFA (subsample 2). No significant differences regarding sociodemographic, health- and infant-related characteristics were found between the subsamples.

Preliminary analysis

Skewness and kurtosis values showed that the items did not reveal severe deviations from the normal distribution (Kline, 2016). Skewness values ranged between -2.09 and -0.05 , and kurtosis values ranged between -0.96 and 2.38 . There were ceiling effects for all items. All descriptive and item analyses are displayed in Table 2.

Table 1
Sociodemographic, health and infant-related characteristics of the total and subsamples.

	Total (n = 893)	Subsample 1 (n = 448)	Subsample 2 (n = 445)	t / χ^2
Age M (SD)	31.98 (4.78)	31.77 (4.75)	32.18 (4.81)	-1.29
Marital status n (%)				2.63
Married/cohabiting	794 (88.9)	391 (87.3)	403 (90.6)	
In a relationship (without living together)	16 (1.8)	10 (2.2)	6 (1.3)	
Single	67 (7.5)	38 (8.5)	29 (6.5)	
Separated/divorced	16 (1.8)	9 (2.0)	7 (1.6)	
Employment status n (%)				0.67
Employed	726 (81.3)	369 (82.4)	357 (80.2)	
Not currently working	167 (18.7)	79 (17.6)	88 (19.8)	
Educational level n (%)				2.45
Up to the 9th grade	57 (6.4)	31 (6.9)	26 (5.8)	
High school	269 (30.1)	139 (31.0)	130 (29.2)	
Bachelor's degree	351 (39.3)	165 (36.8)	186 (41.8)	
Postgraduate studies	216 (24.2)	113 (25.2)	103 (23.1)	
Household monthly income n (%)				1.24
<500€	9 (1.0)	3 (0.7)	6 (1.3)	
500€–1000€	169 (18.9)	83 (18.5)	86 (19.3)	
1000€–2000€	517 (57.9)	263 (58.7)	254 (57.1)	
2000€–3500€	163 (18.3)	81 (18.1)	82 (18.4)	
>3500€	35 (3.9)	18 (4.0)	17 (3.8)	
Residence n (%)				0.03
Urban	660 (73.9)	330 (73.7)	330 (74.2)	
Rural	233 (26.1)	118 (26.3)	115 (25.8)	
Physical health problems n (%)				1.21
Yes	54 (6.0)	31 (6.9)	23 (5.2)	
No	839 (94.0)	417 (93.1)	422 (94.8)	
History of psychological problems n (%)				0.27
Yes	224 (25.1)	109 (24.3)	115 (25.8)	
No	669 (74.9)	339 (75.7)	330 (74.2)	
Infant's age M (SD)	5.56 (3.34)	5.57 (3.34)	5.54 (3.35)	0.12
Primiparous n (%)				0.04
Yes	575 (64.4)	287 (64.1)	288 (64.7)	
No	318 (35.6)	161 (35.9)	157 (35.3)	
Currently breastfeeding n (%)				0.05
Yes	609 (68.2)	304 (67.9)	305 (68.5)	
No	284 (31.8)	144 (32.1)	140 (31.5)	
Infant care responsibilities n (%)				0.02
Belong exclusively to the mother	337 (37.7)	170 (37.9)	167 (37.5)	
Shared between the mother and the father	556 (62.3)	278 (62.1)	278 (62.5)	

Table 2
European Portuguese version of the PMPS-E: Descriptive and item analyses.

Item no.	Item	M (SD)	Skewness	Kurtosis	Floor (%)	Ceiling (%)
1	I believe that I can tell when my baby is tired and needs to sleep	3.61 (0.55)	-1.31	2.07	0.7	64.2
2	I believe that I have control over my baby	3.63 (0.50)	-0.78	-0.88	0.9	64.4
3	I can tell when my baby is sick	3.48 (0.53)	-0.32	-0.88	0.1	49.9
4	I can read my baby's cues	3.38 (0.55)	-0.29	0.16	0.4	40.8
5	I can make my baby happy	3.63 (0.52)	-1.00	0.44	0.2	64.4
6	I believe that my baby responds well to me	3.66 (0.50)	-1.01	0.09	0.1	66.9
7	I believe that my baby and I have a good interaction with each other	3.72 (0.47)	-1.23	0.15	0.9	72.7
8	I can make my baby calm when he/she has been crying	3.55 (0.55)	-0.78	0.01	0.2	57.4
9	I am good at soothing my baby when he/she becomes upset	3.51 (0.57)	-0.64	-0.39	0.1	54.1
10	I am good at soothing my baby when he/she becomes fussy	3.43 (0.60)	-0.55	-0.44	0.1	48.4
11	I am good at soothing my baby when he/she continually cries	3.35 (0.66)	-0.58	-0.33	0.3	44.6
12	I am good at soothing my baby when he/she becomes more restless	3.42 (0.58)	-0.42	-0.72	0.0	47.1
13	I am good at understanding what my baby wants	3.31 (0.57)	-0.27	0.21	0.4	35.9
14	I am good at getting my baby's attention	3.52 (0.55)	-0.65	0.07	0.3	54.1
15	I am good at knowing what activities my baby does not enjoy	3.38 (0.54)	-0.05	-0.96	0.0	40.9
16	I am good at keeping my baby occupied	3.20 (0.58)	-0.08	-0.15	0.1	28.6
17	I am good at feeding my baby	3.61 (0.54)	-1.04	0.54	0.2	63.2
18	I am good at changing my baby	3.73 (0.47)	-1.36	1.05	0.1	73.6
19	I am good at bathing my baby	3.61 (0.58)	-1.29	1.24	0.3	65.6
20	I can show affection to my baby	3.86 (0.35)	-2.09	2.38	0.0	86.1

Factor structure of the European Portuguese PMPS-E

First, to evaluate the goodness of fit of the correlated four-factor structure originally proposed by the authors of the PMPS-E (Barnes and Adamson-Macedo, 2007), a CFA was conducted. The results obtained indicated that a correlated four-factor structure

did not show a good fit to the data: $\chi^2_{(164)} = 1585.46 p < .001$; CFI = 0.885; TLI = 0.867; RMSEA = 0.099 (0.94–0.103, $p < 0.001$); SRMR = 0.077.

Following the poor fit of the original four-factor structure and to explore the factor structure of the European Portuguese PMPS-E,

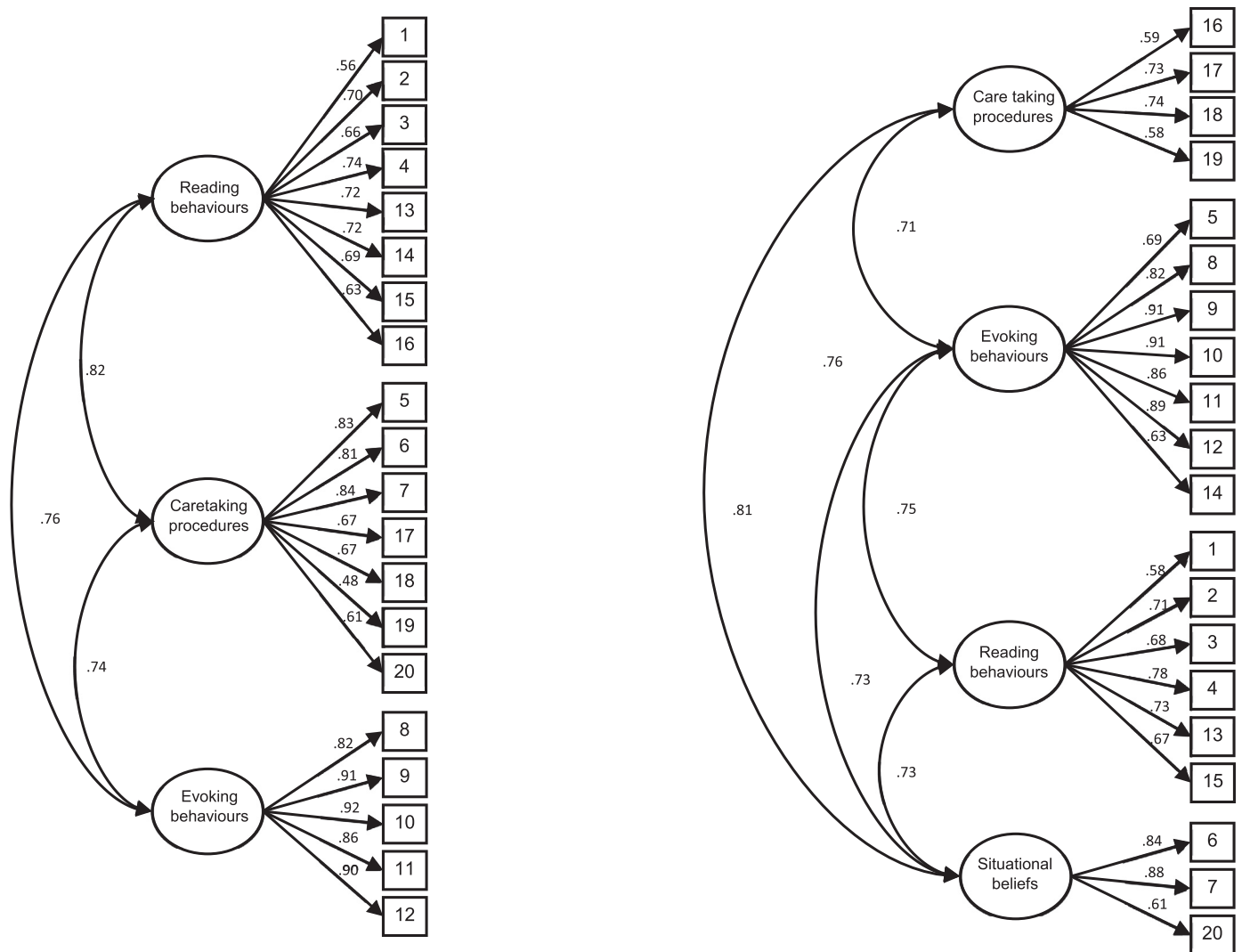


Fig. 1. Confirmatory factor analyses of the correlated three-factor model and the correlated four-factor model.

an EFA followed by CFA was conducted in the two randomly generated subsamples.

The Kaiser-Meyer-Olkin test ($KMO = 0.96$) and Bartlett's test of sphericity [$\chi^2_{(190)} = 6610.46, p < .001$] confirmed the adequacy of subsample 1 for principal component analyses. The EFA indicated three factors with eigenvalues greater than one, which accounted for 66.57% of the total variance. This was further confirmed after conducting a parallel analysis (Hayton et al., 2004). The first factor, with eight items that accounted for 52.80% of the variance, assessed the mothers' perceptions of their ability to understand and identify changes in their baby's behavior (e.g., "I believe that I can tell when my baby is tired and needs to sleep"). Consistent with the original designation, this factor was labeled reading behaviors. The second factor, with seven items explaining 7.9% of the variance, assessed mothers' perceptions of their ability to perform tasks related to infant care related to physical or emotional needs (e.g., "I am good at feeding my baby" or "I can show affection to my baby"). Similar to the original version, this factor was labeled caretaking procedures. Finally, the third factor, with five items that explained 5.9% of the variance, assessed the mothers' perceptions of their ability to elicit a change in the infant's behavior (e.g., "I am good at soothing my baby when he/she becomes upset"). This factor was labeled evoking behaviors. Item factor loadings ranged from 0.43 (item 14) to 0.83 (item 3) in the reading behaviors factor,

from 0.51 (item 5) to 0.86 (item 18) in the caretaking procedures factor, and from 0.76 (item 8) to 0.92 (item 11) in the evoking behaviors factor.

Because the EFA-derived factor solution differed from the originally proposed factor structure of the PMPS-E, two CFAs were performed on subsample two: 1) the correlated four-factor model proposed by Barnes and Adamson-Macedo (2007) and 2) the correlated three-factor model previously identified by the EFA. Fig. 1 displays the factor structure and factor loadings of both competing models. Our results showed that the correlated four-factor model did not present a good fit to the data ($\chi^2_{(164)} = 857.45, p < .001$; CFI = 0.883; TLI = 0.864; RMSEA (90% CI) = 0.098 (0.091–0.104); SRMR = 0.076; AIC = 949.45), while the correlated three-factor model presented an acceptable fit to the data ($\chi^2_{(167)} = 660.00, p < .001$; CFI = 0.917; TLI = 0.905; RMSEA (90% CI) = 0.082 (0.075–0.088); SRMR = 0.052; AIC = 746.00). The comparison between the two models ($\Delta\chi^2_{(3)} = 197.45, p < .001$) suggested that the three-factor model presented a better fit to the data.

Reliability

Considering the whole sample, a high reliability was found for the total scale ($\alpha = 0.95$). For the three factors, the alphas ob-

Table 3
Pearson's bivariate correlations between the PMPS-E total and subscales scores and other variables related to maternal self-efficacy.

	PMPS-E total	PMPS-EReading behaviors	PMPS-ECaretaking procedures	PMPS-EEvoking behaviours
General self-efficacy (GSE)	.32***	.31***	.27***	.27***
Maternal bonding (MAI)	.31***	.28***	.25***	.30***
Postpartum depressive symptoms (EPDS)	−0.27***	−0.22***	−0.25***	−0.26***
Maternal confidence (MCQ)	.70***	.68***	.60***	.57***
Resilience (RS14)	.42***	.40***	.39***	.33***

*** $p < .001$.

Note. PMPS-E = Perceived Maternal Parenting Self-Efficacy; GSE = General Self-Efficacy Scale; MAI = Maternal Attachment Inventory; EPDS = Edinburgh Postnatal Depression Scale; MCQ = Maternal Confidence Questionnaire; RS14 = Resilience Scale-14.

tained also revealed good internal consistency (reading behaviors, $\alpha = 0.88$; caretaking procedures, $\alpha = 0.88$; evoking behaviors, $\alpha = 0.94$). Cronbach's α if item deleted ranged from 0.94 to 0.95 considering the total scale. The item-total correlation ranged from 0.53 to 0.71 in the evoking behaviors factor, from 0.52 to 0.74 in the caretaking procedures factor and from 0.73 to 0.80 in the evoking behaviors factor.

Association with other measures

As shown in Table 3, the PMPS-E total and subscale scores were significantly and positively correlated with general self-efficacy, maternal bonding, maternal confidence and resilience and significantly and negatively correlated with postpartum depressive symptoms. The results revealed moderate correlations with all the measures, except for a large correlation with the measure of maternal confidence.

Known-groups validity

When analyzing differences between primiparous and multiparous mothers, a marginally significant multivariate effect of group was found (Wilks' Lambda = 0.99, $F(3889) = 2.50$, $p = .059$, $\eta_p^2 = 0.008$). As presented in Table 4, subsequent univariate tests indicated that compared to women with more children, primiparous mothers reported significantly lower scores in the total score, and in the reading behaviors and evoking behaviors factors.

Regarding perceived infant temperament, the results indicated a significant multivariate effect of group (Wilks' Lambda = 0.93, $F(3889) = 22.56$, $p < .001$, $\eta_p^2 = 0.071$). Follow-up tests revealed that women who perceived their infant's temperament as difficult reported significantly lower scores in the PMPS-E total and in all three factors than women who perceived their infant's temperament as easy.

A significant multivariate effect of group was also found for infant age (Wilks' Lambda = 0.98, $F(3889) = 7.53$, $p < .001$, $\eta_p^2 = 0.025$). Univariate tests showed that women with younger infants (\leq five months old) reported significantly lower scores in the three factors and total score of the PMPS-E than women whose infants were older than five months.

No significant multivariate effects were found regarding infant care responsibilities (Wilks' Lambda = 1.00, $F(3889) = 0.26$, $p = .855$, $\eta_p^2 = 0.001$).

Discussion

The main goal of the present study was to provide evidence of the reliability and validity of the European Portuguese version of the PMPS-E, thus making available to the Portuguese postpartum population an instrument that includes task-specific items to assess maternal parenting self-efficacy. Given the previous inconsistent findings regarding the structure of the PMPS-E, we also aimed to examine its factor structure, and this is one of the first

studies to analyze it via CFA. Overall, our main results showed that the original four-factor structure did not acceptably fit the data and that a three-factor structure provided a better fit. Our results also demonstrated that the PMPS-E is a valid and reliable measure of maternal parenting self-efficacy among Portuguese postpartum women.

Contrary to the original study of the PMPS-E and subsequent validation studies in other cultures, the results from our EFA indicated a three-factor structure, which was additionally corroborated through a CFA using a different sample. Although all previous validation studies of the PMPS-E suggested a four-factor structure, the results of those EFAs demonstrated that the items of the instrument had different factorial organizations in each version of the instrument. Indeed, in the case of the validation study in Brazil (Tristão et al., 2015), the EFA proposed a different organization of the items compared with the original structure, but the authors decided to keep the original structure for conceptual reasons. Conversely, the Italian (Pedrini et al., 2019) and Colombian (Vargas-Porras et al., 2020) versions of the PMPS-E recommended the different item organization obtained in the EFA and, in the case of the Italian version, this was confirmed via CFA (Pedrini et al., 2019). In both versions, and similar to our findings, no support was found for the situational beliefs factor. In our study, the three items that originally belonged to this factor loaded onto the caretaking procedures factor. Along with item 5 ("I can make my baby happy"), which originally belonged to the evoking behaviors factor, these items seem to refer to the mother's perception of her capability to care for the infant's emotional needs (item 6: "I believe that my baby responds well to me"; item 7: "I believe that my baby and I have a good interaction with each other"; item 20: "I can show affection to my baby"). Additionally, contrary to the original version, our results showed that items 14 ("I am good at getting my baby's attention") and 16 ("I am good at keeping my baby occupied") belonged to the reading behaviors factor. Theoretically, it is reasonable that these items represent the same dimension as they are related to the mother's perception of her ability to recognize and understand the infant's behavior and responses to environmental stimuli.

The different results found in our study compared to other studies could be explained by cultural differences but also by the characteristics of the samples used. Our sample was composed of postpartum women (0–12 months after delivery) who delivered a healthy baby after 37 weeks of gestation, including both primiparous and multiparous mothers. Previous psychometric studies of the PMPS-E have used only primiparous mothers (Vargas-Porras et al., 2020) or only mothers of preterm infants (Pedrini et al., 2019). Additionally, most studies used samples in the immediate postpartum period, with only one study examining the PMPS-E factor structure and psychometric properties in a sample of postpartum women from 0 to 6 months after delivery (Vargas-Porras et al., 2020). Assessing the validity of maternal parenting self-efficacy measures beyond the immediate postpartum period and among multiparous mothers and those who deliver full-term infants is relevant, as each infant is different and de-

Table 4
Descriptive statistics and multivariate analysis of variance on parity and perceived infant temperament.

	Parity PrimiparousM (SD)	MultiparousM (SD)	F	p	η_p^2
PMPS-E Total	70.18 (7.73)	71.31 (7.47)	4.49	.034	.005
Reading behaviors	27.32 (3.29)	27.87 (3.12)	5.94	.015	.007
Caretaking procedures	25.74 (2.66)	25.94 (2.63)	1.16	.281	.001
Evoking behaviors	17.12 (2.74)	17.50 (2.54)	4.21	.040	.005
	Perceived infant temperament				
	Difficult M (SD)	Easy M (SD)	F	p	η_p^2
PMPS-E Total	67.06 (8.32)	71.50 (7.73)	52.23	<0.001	.055
Reading behaviors	26.31 (3.46)	27.83 (3.10)	5.94	<0.001	.036
Caretaking procedures	24.89 (2.90)	26.05 (2.52)	1.16	<0.001	.032
Evoking behaviors	15.86 (3.03)	17.62 (2.45)	4.21	<0.001	.071
	Infant care responsibilities				
	Exclusively mother M (SD)	Shared with father M (SD)	F	p	η_p^2
PMPS-E Total	70.82 (7.76)	70.44 (7.60)	0.50	.478	.001
Reading behaviors	27.59 (3.35)	27.47 (3.17)	0.33	.568	.000
Caretaking procedures	25.91 (2.62)	25.75 (2.66)	0.76	.384	.001
Evoking behaviors	17.31 (2.62)	17.22 (2.71)	0.23	.632	.000
	Infant's age				
	≤5 months M (SD)	>5 months M (SD)	F	p	η_p^2
PMPS-E Total	69.70 (7.70)	71.65 (7.47)	14.52	<0.001	.016
Reading behaviors	27.09 (3.22)	28.03 (3.18)	18.92	<0.001	.021
Caretaking procedures	25.64 (2.75)	26.01 (2.50)	4.37	.037	.005
Evoking behaviors	16.97 (2.68)	17.61 (2.64)	12.79	<0.001	.014

manding developmental tasks and infant care challenges also arise as the infant ages.

Although the differences in the structure of the instrument are theoretically justified, future studies are needed to investigate the replicability of the three-factor model. In fact, the results from the CFA showed that a three-factor structure only provided an acceptable fit to the data. Thus, we consider that some caution is needed when differentiating between the factors of the PMPS-E and that an overall score of the PMPS-E should preferably be used, as recommended by the original author of the instrument (Barnes and Adamson-Macedo, 2007).

Regarding reliability, and consistent with previous findings, our results showed very good internal consistency (and above the threshold of 0.70; Nunnally, 1978) for the total score and for the factors of the PMPS-E. At the item level, all items appeared to be worthy of retention, and the values of item-total correlations indicated the items' adequacy to the construct the PMPS-E intends to assess. There was a tendency for ceiling effects in all items, which has been reported in other validation studies (Barnes and Adamson-Macedo, 2007; Tristão et al., 2015). The inclusion of postpartum women up to 12 months after delivery who delivered a healthy full-term infant may have potentially accentuated the ceiling effects. Moreover, the online recruitment could have led to an over-representation of women with higher education and income, which could have also contributed to these results.

Supporting the convergent validity of the scale, the results of the correlation analyses showed positive associations between the PMPS-E total and subscale scores and general self-efficacy, ma-

ternal bonding, maternal confidence and resilience, corroborating previous literature (e.g., Pedrini et al., 2019; Seigny and Loutzenhiser, 2010). In addition, significant and negative correlations between the PMPS-E subscales and total scores and postpartum depressive symptoms were found. This result is consistent with previous studies showing a negative association between maternal self-efficacy and depressive symptoms (e.g., Albanese et al., 2019; Leahy-Warren et al., 2012) and corroborates the assumption that higher maternal parenting self-efficacy is associated with a better psychological adjustment of mothers.

As additional support for the construct validity of the scale, specifically its known-groups validity, we found that multiparous mothers, those with older infants (>5 months old) and those who perceived their infant's temperament as easy presented significantly higher levels of maternal parenting self-efficacy than those who were primiparous, those who had younger infants (≤5 months old) and those who perceived their infant's temperament as difficult. These results are consistent with previous literature (e.g., Barnes and Adamson-Macedo, 2007; Botha et al., 2020; Verhage et al., 2015; Zheng et al., 2018) and suggest that increasing childcare experience may be associated with higher levels of maternal parenting self-efficacy and that interpreting infant signals more negatively may also impact the perception of parenting performance, both consistent with Bandura's self-efficacy theory (Bandura, 1997).

This study has some limitations that should be noted. First, potential limitations imposed by the sample, the sampling strategy and the study design should be acknowledged. Online recruitment

could increase the likelihood of self-selection bias. Furthermore, the representativeness of the sample may have been compromised by the high and disproportionate number of participants who had completed a university degree and were employed, which could have also resulted from the online recruitment. This, together with the cross-sectional design, suggests the need for caution in interpreting and generalizing these findings to all women in the postpartum period. Second, the test-retest reliability was not determined. Therefore, further test-retest and sensitivity to change studies should be conducted.

Despite these limitations, the present study contributes to the narrow literature on PMPS-E performance. This was one of the first studies to test the factor structure of the PMPS-E through CFA. As the PMPS-E has been considered one of the most robust measures to assess maternal parenting self-efficacy (Wittkowski et al., 2017), further evidence of its factor structure through CFA is warranted. Specifically, our results demonstrated that a three-factor model showed a better fit to the data than the original four-factor model. Additional research is required to extend and replicate these findings. In addition, the results of this study provide a reliable and valid measure of maternal parenting self-efficacy for clinical practice and research among the Portuguese postpartum population. Specifically, the PMPS-E may be used to assess perceived difficulties among mothers and to provide a more comprehensive understanding of women's psychosocial adjustment to this period. Given the association between maternal parenting self-efficacy and infant outcomes, the PMPS-E could be of great value when assessing the efficacy of interventions targeting the improvement of maternal self-efficacy.

Ethical approval

Ethical approval was obtained from the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra.

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Declaration of competing interest

The authors declare no conflict of interest.

CRediT authorship contribution statement

Fabiana Monteiro: Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft. **Ana Fonseca:** Conceptualization, Supervision, Methodology, Writing – review & editing. **Marco Pereira:** Conceptualization, Supervision, Methodology, Writing – review & editing. **Maria Cristina Canavarro:** Conceptualization, Supervision, Writing – review & editing.

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