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# Reliability and validity of the reduced Spanish version of the Prenatal Breastfeeding Self-Efficacy Scale

José R. Silva-Tubio[1,2] | Antonio Oliver-Roig[2] | Juana Perpiñá-Galvañ[2] | Miguel Richart-Martínez[2]

[1]Department of Midwifery, Health District for Alicante, Hospital Vega Baja, Alicante, Spain

[2]Department of Nursing, University of Alicante, Alicante, Spain

**Correspondence**
Antonio Oliver-Roig, Department of Nursing, University of Alicante, Apdo de Correos 99, 03080, Alicante, Spain.
Email: Antonio.Oliver@ua.es

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## Abstract

Breastfeeding self-efficacy is a relevant predictor of exclusive breastfeeding during the first six months of life. The Prenatal Breastfeeding Self-Efficacy Scale (PBSES) is a 20-item tool developed to determine breastfeeding self-efficacy during pregnancy. Our study aimed to assess the structural validity and psychometric characteristics of the PBSES and to explore item reduction according to the statistical criteria for parsimony and incremental validity. In this study, conducted in six hospitals in eastern Spain, we recruited 1183 women with healthy, full-term, single-birth newborns. Data on sociodemographic, breastfeeding-related variables, and the PBSES, were obtained from self-administered questionnaires during the third trimester of pregnancy, at postpartum discharge, and 5 months postpartum, and from a phone survey 12 months postpartum. Item reduction was conducted after revising the PBSES item floor and ceiling effects, interitem correlations, and item–score relationships with breastfeeding-status variables during follow-up. The factorial structure of the short form of the PBSES (PBSES-SF) was tested using both exploratory and confirmatory approaches. After item reduction, the confirmatory factor analysis of the 12 remaining items of the PBSES-SF revealed adequate fit statistics for a three-factor structure and a second-order factor. Internal consistency was measured using the Cronbach's $\alpha$ coefficient of the PBSES-SF (0.86). We provided evidence on the discriminant validity of the PBSES-SF by comparing its scores between known groups, convergent validity by examining its correlations with other variables, and predictive validity by assessing the association of PBSES-SF scores with breastfeeding behavior at critical points in time during the first postpartum year.

**KEYWORDS**
breastfeeding, prenatal self-efficacy, psychometric properties, reliability, validity

## 1 | INTRODUCTION

The strong protective effect of breastfeeding for neonatal and maternal health is well recognized (Eidelman & Schanler, 2012; Victora et al., 2016). The World Health Organization (WHO) recommends exclusive breastfeeding during the first 6 months of a newborn's life, complemented with other appropriate foods, at least until the age of two (World Health Organization, 2019). Far from the WHO recommendations, the exclusive breastfeeding rates at 6 months postpartum are only around 39% in Spain (Ministerio de Sanidad Consumo y Bienestar Social, 2017).

Premature breastfeeding cessation has varied and complex origins. On an individual level, psychological factors such as postpartum depression, anxiety, maternal intention to breastfeed during pregnancy, and breastfeeding self-efficacy are critical (De Jager et al., 2013). Dennis defines breastfeeding self-efficacy as the confidence in, or self-perception of, a woman's ability to breastfeed (Dennis, 2003). Breastfeeding self-efficacy is mainly influenced by the mother's previous breastfeeding experience, learning by observation, physiological and affective conditions, and verbal persuasion (Dennis & Faux, 1999). In addition, breastfeeding self-efficacy is an important predictor of breastfeeding behavior during the first 6 months of a newborn's life. Women with low self-efficacy levels are less likely to start breastfeeding and to continue when they encounter difficulties (Minas & Ganga-Limando, 2016; Tuthill et al., 2016).

The 20-item Prenatal Breastfeeding Self-Efficacy Scale (PBSES) was developed as a tool for determining breastfeeding self-efficacy during pregnancy (Wells et al., 2006), when most women decide on their infant feeding method (Johnson et al., 2019). Thus, this tool can be useful for identifying risk groups and evaluating educational programs to promote breastfeeding. The PBSES considers the pregnant woman's confidence in getting information about breastfeeding from her social and health environment, in contrast to other tools designed for use during the postnatal period (Tuthill et al., 2016). The PBSES has been adapted into Spanish (Piñeiro-Albero et al., 2013) and Turkish (Aydin & Pasinlioglu, 2018; Hazar & Akca, 2018), demonstrating adequate internal consistency and evidence of discriminant and predictive validity. The PBSES scores are related to previous breastfeeding experience, breastfeeding intention during pregnancy, and breastfeeding initiation after childbirth (Piñeiro-Albero et al., 2013; Robinson & VandeVusse, 2011; Wells et al., 2006).

There is limited evidence regarding the structure of PBSES. A first exploratory analysis suggested a four-factor scale (Wells et al., 2006). However, later confirmatory factor analyses indicated marginal fit statistics for this structure even after modifying the composition of the factors or deleting one of the items (Hazar & Akca, 2018; Piñeiro-Albero et al., 2013). Further studies providing new evidence on the PBSES structure are recommended. The continuous improvement of existing measurement tools can be achieved using different approaches depending on the specific measurement objective. By choosing the most pertinent items to assure predictive validity, a criterion-keying strategy can be used for developing existing tools when the authors expect to have a high predictive value regarding a well-defined criterion (Smith et al., 2003), as in the case of the PBSES (Wells et al., 2006). Moreover, shorter tools are helpful in studies that require respondent adherence, such as those that use multiple measurement tools or require follow-up (Stanton et al., 2002). Thus, developing a more parsimonious version of the PBSES, that is, with the least amount of information necessary to achieve its measurement goal (Wieland et al., 2017), could increase response rates by reducing the burden on the respondent (Edwards et al., 2009). Therefore, in the current study, we aimed to assess the structural validity and psychometric characteristics of the PBSES after reducing its items according to the criteria for incremental validity and parsimony.

## 2 | METHODS

### 2.1 | Participants

This cross-sectional instrumental study with a longitudinal component was part of more extensive research on infant feeding conducted in six hospitals in eastern Spain. Two participating hospitals were designated as Baby Friendly Hospitals—a multilevel intervention aimed at promoting breastfeeding (World Health Organization, 2009).

A convenience sample of 1218 pregnant women in their third trimester, who completed the PBSES, was included. They all participated voluntarily and provided informed consent. All participants were able to read and speak Spanish and had no problems that could seriously complicate or contraindicate breastfeeding, such as previous breast surgery, human immunodeficiency virus infection, or congenital fetal pathology diagnosed during pregnancy. During the postpartum follow-up, women who had preterm or multiple births, or who had medical problems that prevented or seriously hindered breastfeeding, were excluded. Approval was obtained from the research ethics committees of the participating hospitals.

### 2.2 | Measures

To assess the relationships of the PBSES with theoretically related external criteria, as recommended for validation studies (Stanton et al., 2002), we obtained data from the variables and scales related to the construct measured. In addition to the PBSES, two additional measures of self-efficacy—one general and one specific—were included. In addition, we obtained data on maternal history related to breastfeeding and information on actual breastfeeding behavior after childbirth.

The PBSES is a scale designed to assess a woman's judgment of her capacity to organize and execute the actions required to perform breastfeeding behavior and to explore the role of prenatal self-efficacy in predicting breastfeeding (Wells et al., 2006). It includes 20 items, assessed with a 5-point Likert scale, ranging from 1 (*not at all sure*) to 5 (*completely sure*), and a total score ranging between 20 and 100. The structure proposed for the Spanish version of the scale (PBSES-e), used in this study, grouped the PBSES items into four dimensions with a second-order factor: Skills and demands required for breastfeeding (eight items), gathering information about breastfeeding (five items), breastfeeding around other people and feelings of embarrassment during breastfeeding

(four items), and social pressure when breastfeeding (three items). The scale had a Cronbach's $\alpha$ coefficient for internal consistency of 0.91 (Piñeiro-Albero et al., 2013). In this current work, the scale had internal consistency reliability of 0.89.

The Breastfeeding Self-Efficacy Scale-Short Form (BSES-SF; Dennis, 2003) is a one-dimensional 14-item scale developed to measure the mother's confidence in her ability to breastfeed after birth. All items are written in a positive wording and are completed using a 5-point Likert scale, where 1 indicates "not confident at all" and 5 indicates "very confident." In its Spanish version, the scale has good internal consistency with a Cronbach's $\alpha$ of 0.92 (Oliver-Roig et al., 2012). In this current work, the scale had internal consistency reliability of 0.93.

General self-efficacy was assessed using the Spanish version of the General Self-Efficacy Scale (GSES-e). The GSES-e is a 10-item scale that determines participants' personal perception of adequately managing stressful situations in everyday life, with a Cronbach's $\alpha$ of 0.87 (Sanjuán et al., 2000). In this current work, the scale had internal consistency reliability of 0.88.

Sociodemographic and pregnancy variables concerning breastfeeding were obtained from a questionnaire that included age, educational level, marital status, family income, parity, previous experience of breastfeeding, duration of the previous breastfeeding, breastfeeding decision during pregnancy, and intention to breastfeed during pregnancy.

In addition, data were obtained on the moment when breastfed babies first received additional water-based fluids, breast milk substitutes, and complementary foods at least once a day, and on the moment of breastfeeding cessation. We used the following definitions of breastfeeding proposed by the WHO: Exclusive breastfeeding occurs when infants are fed solely on breast milk, although oral medications or rehydration solutions are allowed. Any breastfeeding is when infants receive any amount of breast milk, whether accompanied by other foods or liquids or not (World Health Organization, 2008).

## 2.3 | Data collection

Data were collected at four different time periods. First, during a pregnancy checkup at 28–42 weeks, participants were given a series of self-report questionnaires, including the PBSES-e and the GSES-e, along with the sociodemographic and pregnancy questionnaires.

Second, during postpartum hospitalization, participants completed a self-administered questionnaire between 2 and 4 days after birth, including the BSES-SF and data on the initiation and type of breastfeeding during their hospitalization. Information on obstetric variables was also obtained from clinical records.

Furthermore, to obtain breastfeeding data after discharge, we collected data at 5 and 12 months postpartum. Five months after delivery, a self-administered free postal questionnaire was sent to mothers breastfeeding their newborns at discharge. The questionnaire was sent up to three times, at 3-week intervals, to those participants who did not respond. Finally, at 12 months postpartum, we conducted a telephone survey with mothers who said they were breastfeeding in the 5-month questionnaire. The self-administered questionnaires and the telephone survey included questions about the time in months from birth that their babies were first offered nonnutritive liquids or foods other than breast milk at least once a day. If mothers were not breastfeeding on the survey day, we asked them when they had stopped breastfeeding.

## 2.4 | Data analysis

A descriptive analysis of the study variables was performed using frequencies and percentages for discrete variables, arithmetic means, and standard deviations for continuous variables. In addition, we explored the item reduction of the PBSES according to common statistical criteria. Finally, as recommended by Stanton et al. (2002), we developed a reliability assessment and a revalidation of the short form to assess the extent to which it replicated the relation patterns referred to in previous studies.

### 2.4.1 | Item reduction and the incremental validity strategy

We focused the item reduction on evaluating both internal and external item qualities (Stanton et al., 2002). We did not consider judgmental item quality criteria such as clarity, relevance, required reading level, and items' "face" validity, because these aspects were evaluated previously (Piñeiro-Albero et al., 2013).

The internal item qualities were assessed with reference to the scale itself (Stanton et al., 2002). We chose the ceiling effect (the proportion of responses for the highest score of 5) as a distributional criterion to increase variability and interitem correlations as a correlational criterion to decrease redundancy (Nunnally & Berstein, 1994; Terwee et al., 2007). A ceiling effect occurs when more than 15% of responses are for the highest score of a test or measurement (Terwee et al., 2007). Although there was no ceiling effect for the total PBSES scores, all items, except item 9, individually demonstrated a high ceiling effect (Piñeiro-Albero et al., 2013). Thus, as a norm-referenced criterion (Glass & Stanley, 1970), we eliminated items with a ceiling effect ≥60% above the upper quartile of the proportion of responses in the higher score for all items. Furthermore, we deleted one item from item pairs with interitem correlations above 0.80—a criterion indicating redundant content (Nunnally & Berstein, 1994). Finally, the usual criteria for maximizing internal consistency, such as corrected item-total correlations or Cronbach's $\alpha$ if an item was deleted (Stanton et al., 2002), were not applied, since no reliability problems were previously described for the PBSES.

In addition, regarding the external item qualities, as an incremental validity strategy, we chose the most pertinent items to maximize the PBSES's ability to predict relevant breastfeeding outcomes (Smith et al., 2003). Thus, we deleted those items whose scores did not demonstrate statistically significant differences in relevant breastfeeding status

variables indicating risk peaks for breastfeeding cessation in Spain (Oliver-Roig et al., 2008): initiation of breastfeeding, exclusive breastfeeding at discharge, exclusive breastfeeding at 1 month, exclusive breastfeeding at 5 months, any breastfeeding at 6 months, and any breastfeeding at 1 year.

### 2.4.2 | Factor analysis and structural validity

The sample was divided into two random cohorts for the analysis of the first reduced version structure. In the first half of the sample ($n = 609$), we performed an exploratory factorial analysis (EFA) using the unweighted LS method with a matrix of polychoric correlations and applying a promin rotation to achieve factor simplicity (Lorenzo-Seva, 1999). We also included a parallel analysis to determine the number of factors (Timmerman & Lorenzo-Seva, 2011). After performing the EFA, we deleted items with loadings less than 0.3, indicating a weak relationship between the item and the assigned factor (Stanton et al., 2002). Thus, we obtained a second reduced version of the scale (PBSES-SF), for which we conducted all of the following reliability and validity analyses.

In the second half of the sample ($n = 609$), a confirmatory factorial analysis (CFA) was performed using the least squares (LS) normal theory estimator based on the covariance matrix (Bentler, 2004). Four options were considered in the search for the model that best fitted the data: (1) the first model examined the four-factor structure with a second-order factor of the Spanish PBSES, including all the original items (Piñeiro-Albero et al., 2013); (2) the second model assessed the structure suggested by the parallel analysis including only the PBSES-SF items; (3) the third model explored the PBSES structure including only the PBSES-SF items; (4) and the fourth model explored the PBSES structure with a second-order factor, including only the PBSES-SF items. To calculate the fit indices of the CFA, we considered the factors as correlated. The models were assessed using the nonnormed fit index, goodness-of-fit index, comparative fit index, root mean squared error of approximation, and standardized root mean square residual (Hu & Bentler, 1999; Kline, 2015).

### 2.4.3 | Reliability and construct and predictive validity assessment

Reliability was evaluated through internal consistency analysis using Cronbach's $\alpha$. We also explored discriminant and convergent validity as two subtypes of construct validity. We expected similar or better validity evidence than the full-length scale. First, to assess discriminant validity, known group comparisons were conducted with the following hypotheses: (1) women who had previous breastfeeding experience and (2) those who chose to breastfeed their baby during pregnancy would have greater breastfeeding self-efficacy than women without experience or those who decided not to breastfeed their baby, respectively. Second, to assess convergent validity, we explored the relationship between PBSES-SF scores, (3) the expected time of breastfeeding, (4) the GSES scores, and (5) the BSES-SF scores at discharge.

Finally, predictive validity was evaluated by comparing the PBSES-SF scores of participants according to their breastfeeding status at follow-up cross-sections proposed for the incremental validity strategy (breastfeeding initiation, exclusive breastfeeding at discharge, exclusive breastfeeding at 1 month, exclusive breastfeeding at 5 months, any breastfeeding at 6 months, and any breastfeeding at 1 year postpartum). Additionally, we used receiver operating characteristic (ROC) curves to determine the overall predictive performance of the PBSES-SF and compare it to that of the PBSES, differentiating participants who wanted to breastfeed during pregnancy and those who actually breastfed after childbirth from those who did not. Youden's J statistic was also used to identify the optimal cutoff points when the area under the ROC curve (AUC) of the PBSES-SF or its factors were approximately 0.70, the value from which a classifier was deemed good (Staffa & Zurakowski, 2019).

We used Student's *t*-test and Pearson's correlations to evaluate the hypotheses and examine their assumptions. In the case of the Student's *t*-test, if the variances were unequal, we calculated the Welch method to adjust for degrees of freedom and repeated the analysis with Mann–Whitney's *U* test. In addition to Pearson's correlations, we calculated Spearman's correlations. In the case of discrepancies in the results, we described the nonparametric test results as recommended by Altman (1991). We calculated ROC curves based on a binomial distribution using maximum likelihood estimation and compared the AUC parameters using the $\chi^2$ test.

## 3 | RESULTS

### 3.1 | Sample

Of the 1218 participants recruited during pregnancy, 35 (2.9%) were excluded due to preterm deliveries. Figure 1 illustrates the evolution of the follow-up period. Table 1 illustrates the characteristics of the initial sample and the information obtained regarding breastfeeding status at the babies' different ages. We obtained complete information during the first year postpartum on the total duration of exclusive breastfeeding for 993 (83.9%) participants and any breastfeeding for 659 (55.7%) participants, including women who did not initiate breastfeeding. The mean age of the sample was 31.74 years (SD = 4.77). The main characteristics of the study participants are listed in Table 1. Descriptive data of the PBSES-e are presented in Table 2.

Statistically significant differences were observed between women who participated and those who did not participate in the follow-up after delivery. Women who did not participate were younger, $t(220{,}7) = 4.26$, $p < 0.01$; had lower educational status, $\chi^2(1, N = 1078) = 17.032$, $p < 0.01$; and decided not to breastfeed during the third trimester of pregnancy to a greater extent, $\chi^2(2, N = 1074) = 14.29$, $p < 0.01$. No statistically significant differences were observed between those participating and those not participating in the follow-up regarding having previous

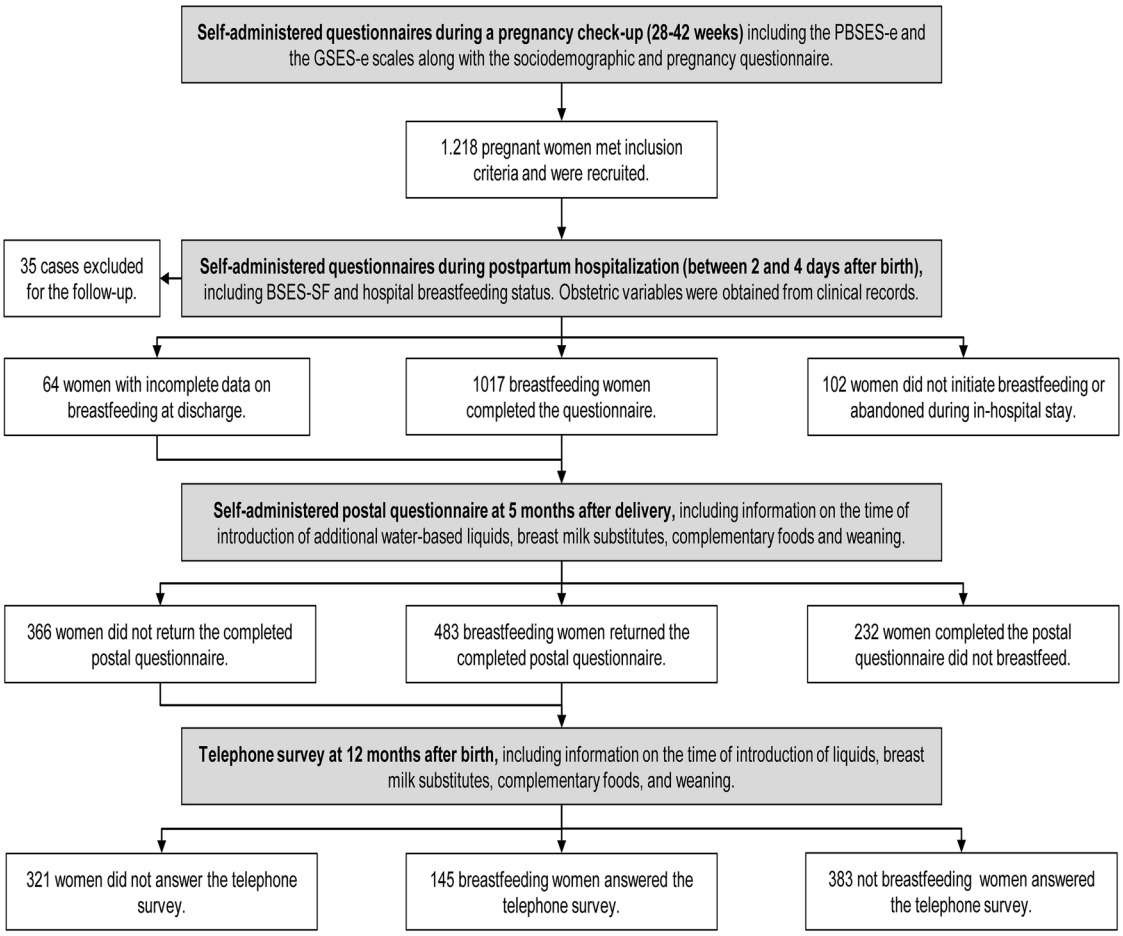


**FIGURE 1** Flow chart of the study

children, $\chi^2(1, N = 1083) = 0.59$; marital status, $\chi^2(1, N = 1077) = 2.07$; birth method, $\chi^2(1, N = 900) = 1.78$; having babies born in a Baby Friendly Hospital, $\chi^2(1, N = 1084) = 0.90$; and GSES ($U = 73{,}804.0$), and PBSES-e scores ($U = 73{,}006.0$).

## 3.2 | Item reduction

We eliminated items 4, 14, 18, and 19 due to a ceiling effect ≥ 60% (Table 2) and items 10 and 11 because there was no relationship between any of the proposed breastfeeding status variables after childbirth (Table 3). We also found an interitem correlation above 0.80 between items 1 and 2 and eliminated item 2 because it was less predictive.

## 3.3 | Factor analysis

The parallel analysis made for the first half of the sample included the 13 items remaining after item reduction and suggested a unifactorial structure that explained 46.3% of the variance. In addition, we explored a three-factor structure given that all items included in the factor "pressure when breastfeeding" in the original scale had been eliminated in the previous step. All the remaining items had saturations more than 0.4 in their corresponding factor, except item 20, with a saturation less than 0.3. Thus, item 20 was excluded from the PBSES-SF. Factors that resulted from EFA were Factor 1 (F1; including items 13, 15, and 16 on confidence regarding breastfeeding around other people and feelings of embarrassment during breastfeeding), Factor 2 (F2; including items 1, 3, 5, and 17 about confidence regarding gathering information about how to breastfeed), and Factor 3 (F3; including items 6, 7, 8, 9, and 12 on confidence regarding the skills and demands required for breastfeeding). Correlations between factors were 0.50 between F1 and F2, 0.45 between F2 and F3, and 0.58 between F1 and F3.

The CFA made for the second half of the sample indicated that the 12-item PBSES-SF with a three-factor structure and a second-order factor fitted the data better (Table 4). The full PBSES-SF scale is shown in the Supporting Information Material.

## 3.4 | Reliability and validity assessment of the PBSES-SF

Cronbach's $\alpha$ results for the PBSES-SF and Factors 1, 2, and 3 were 0.86, 0.81, 0.73, and 0.73, respectively. The correlations of

**TABLE 1** Characteristics of the validation sample: Qualitative variables ($N = 1218$)[a]

| Variable | *n* | % |
|---|---|---|
| Educational status | | |
| Primary school or lower | 568 | 46.9 |
| High school | 256 | 21.1 |
| University degree | 388 | 32.4 |
| Marital status | | |
| De facto or married | 1081 | 89.2 |
| Single/divorced | 130 | 10.7 |
| Widow | 1 | 0.1 |
| Family annual income | | |
| <18.000 €/year | 648 | 57.4 |
| >18.000 €/year | 480 | 42.6 |
| First child | | |
| Yes | 648 | 53.4 |
| No | 569 | 46.8 |
| Previous breastfeeding experience | | |
| Yes | 479 | 39.5 |
| No (including participants without a previous child) | 733 | 60.5 |
| Duration of the previous breastfeeding | | |
| 5 months or less | 178 | 37.2 |
| More than 5 months | 300 | 62.8 |
| Decision on infant feeding method during pregnancy | | |
| Breastfeeding | 1094 | 90.6 |
| Bottle feeding | 61 | 5.0 |
| Not decided | 53 | 4.4 |
| Time planned to breastfeed during pregnancy[b] | | |
| 5 months or less | 122 | 21.0 |
| 6–11 months | 252 | 43.4 |
| 12 months or more | 202 | 35.6 |
| Attended in a Baby Friendly Hospital | | |
| Yes | 283 | 23.2 |
| No | 935 | 76.8 |
| Birth method[c] | | |
| Vaginal | 753 | 75.8 |
| Cesarean | 241 | 24.2 |
| Initiation of breastfeeding | | |
| Yes | 1054 | 91.4 |
| No | 99 | 8.6 |
| Type of breastfeeding at postpartum discharge[c] | | |
| Exclusive breastfeeding[d] | 618 | 64.9 |
| Predominant breastfeeding[e] | 9 | 0.9 |
| Partially breastfeeding[f] | 223 | 23.4 |
| Formula feeding | 102 | 10.7 |
| Exclusive breastfeeding at 1 month[c,g] | | |
| Yes | 783 | 82.5 |
| No | 166 | 17.5 |
| Exclusive breastfeeding at 5 months[c,g] | | |
| Yes | 338 | 35.7 |
| No | 608 | 64.3 |
| Any breastfeeding at 6 months[c,g] | | |
| Yes | 432 | 56.5 |
| No | 332 | 43.5 |
| Any breastfeeding at 12 months[c,g] | | |
| Yes | 180 | 25.6 |
| No | 523 | 74.4 |

[a]Numbers may not add up to total because of missing data.
[b]Only if decided to breastfeed.
[c]Excluding recruited participants with premature childbirths ($n = 1183$).
[d]Exclusive breastfeeding was considered if infants had only received human milk during the follow-up.
[e]Predominant breastfeeding was considered if infants had only received human milk and rehydration solutions, drops, or syrups, during the follow-up.
[f]Breast milk and formula feeding.
[g]Data after discharge period, excluding participants that not initiated breastfeeding ($n = 1054$).

each item with the questionnaire's total score were higher than 0.43, and in all cases, the corrected $\alpha$ was not greater than 0.84 if any item was removed.

We confirmed the expected hypothesis regarding discriminant validity. (1) The average total PBSES-SF score was 46.2 (SD = 8.67) for participants who had breastfed a previous child, and 41.5 (SD = 8.03) for those who had not breastfed before; these differences were statistically significant, $t(937.2) = 9.22$, $p < 0.01$. (2) The average total PBSES-SF score was 43.9 (SD = 8.39) for women who wanted to breastfeed their infant during the third trimester of pregnancy, and 37.8 (SD = 8.23) for those who decided to give their infant formula; these differences were also statistically significant, $t(1119) = 5.44$, $p < 0.01$. Concerning convergent validity results, the PBSES-SF scores were positively correlated with (3) the expected breastfeeding duration during pregnancy, $r = 0.25$, $p < 0.01$; and (4) the GSES scores, $r = 0.37$, $p < 0.01$.

Regarding the predictive hypothesis proposed, the PBSES-SF scores were positively correlated with (5) the BSES-SF scores, $r = 0.48$, $p < 0.01$. As for the breastfeeding status during follow-up (Table 3), we found differences in the total PBSES-SF and Factor 1

**TABLE 2** Floor and ceiling effects of the PBSES, *M*, and SD ($n = 1218$)

| Ítem | Floor[a] (%1) | Ceiling[b] (%5) | *M* | SD |
|---|---|---|---|---|
| 1. I can find the information I need about problems I have breastfeeding my baby | 0.9 | 25.1 | 3.61 | 0.98 |
| 2. I can find out what I need to know about breastfeeding my baby | 0.2 | 29.9 | 3.79 | 0.94 |
| 3. I know who to ask if I have any questions about breastfeeding my baby | 1.0 | 35.3 | 3.89 | 1.00 |
| 4. I can talk to my partner about the importance of breastfeeding my baby | 1.6 | 65.5 | 4.40 | 0.96 |
| 5. I can talk to my health care provider about breastfeeding my baby | 0.2 | 58.0 | 4.37 | 0.85 |
| 6. I can schedule my day around the breastfeeding of my baby | 4.4 | 21.0 | 3.37 | 1.12 |
| 7. I can make the time to breastfeed my baby even when I feel busy | 2.5 | 31.6 | 3.66 | 1.14 |
| 8. I can breastfeed my baby even when I am tired | 1.1 | 37.1 | 3.85 | 1.07 |
| 9. I can breastfeed my baby when I am upset | 10.7 | 12.2 | 2.72 | 1.17 |
| 10. I can use a breast pump to obtain milk | 4.2 | 29.7 | 3.60 | 1.15 |
| 11. I can prepare breast milk so others can breastfeed my baby | 8.9 | 25.4 | 3.36 | 1.27 |
| 12. I can breastfeed my baby even if it causes mild discomfort | 3.3 | 25.6 | 3.51 | 1.13 |
| 13. I can breastfeed my baby without feeling embarrassed | 3.0 | 46.4 | 3.93 | 1.19 |
| 14. I can breastfeed my baby when my partner is with me | 0.4 | 80.5 | 4.72 | 0.64 |
| 15. I can breastfeed my baby when my family or friends are with me | 3.5 | 50.7 | 3.99 | 1.21 |
| 16. I can breastfeed my baby around people I do not know | 15.4 | 29.5 | 3.18 | 1.46 |
| 17. I can call a lactation counselor if I have problems breastfeeding | 7.6 | 25.0 | 3.30 | 1.26 |
| 18. I can choose to breastfeed my baby even if my partner does not want me to | 0.8 | 64.4 | 4.44 | 0.85 |
| 19. I can choose to breastfeed my baby even if my family does not want me to | 0.7 | 70.3 | 4.54 | 0.79 |
| 20. I can breastfeed my baby for 1 year | 10.6 | 32.8 | 3.32 | 1.41 |
| PBSES[c] | 0.1 | 1.2 | 75.54 | 12.57 |
| PBSES-SF[d] | 0.1 | 1.6 | 43.37 | 8.58 |

Abbreviations: *M*, mean; PBSES, Prenatal Breastfeeding Self-Efficacy Scale; PBSES-SF, short form of the PBSES; SD, standard deviation.

[a]Proportion of women responding to the item with 1 (not at all sure).

[b]Proportion of women responding to the item with 5 (completely).

[c]20-Item Spanish version of the Prenatal Breastfeeding Self-Efficacy Scale.

[d]12-Item Spanish version of the Prenatal Breastfeeding Self-Efficacy Scale.

scores depending on the breastfeeding status for all the proposed points in time during follow-up. In addition, we found differences in Factors 2 and 3 scores depending on the breastfeeding status for at least two of the proposed points in time during follow-up. The AUCs for the PBSES and PBSES-SF to correctly classify participants according to their decision on infant feeding during pregnancy and breastfeeding initiation after childbirth are illustrated in Table 5. The overall PBSES-SF and Factor 3 scores had significantly higher AUCs than their PBSES equivalents. No significant differences were observed between the remaining scores. According to the Youden index, the cutoff point for maximum performance for predicting breastfeeding intention during pregnancy was 40 points for the overall PBSES-SF scores and 14 points for F3 scores. Above these cutoff points, sensitivity was 64% and 63%, and specificity was 65% and 74% for the overall PBSES-SF and F3 scores, respectively. The cutoff point for maximum performance for predicting breastfeeding initiation after childbirth was 15 points for F3 scores, with a sensitivity of 66% and a specificity of 63%.

## 4 | DISCUSSION

We developed a reduced version of the PBSES by applying a strategy based on incremental validity and parsimony criteria. We also provided evidence on the reliability, discriminant, convergent, and predictive validity of the PBSES-SF by exploring the accomplishment of diverse theoretical hypotheses. Finally, we provided evidence of an improvement in the scale's value as a predictor of women's decisions on infant feeding during pregnancy and breastfeeding initiation after childbirth, following the incremental validity strategy.

**TABLE 3** Prenatal Breastfeeding Self-Efficacy Scale and its Short-Form

| | ABF initiation | | | | EBF at discharge | | | | EBF 1 month | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item/scale | Yes M | SD | No M | SD | Yes M | SD | No M | SD | Yes M | SD | No M | SD |
| Item 1 | 3.63 | 0.98 | 3.47 | 0.98 | 3.63 | 1.01 | 3.55 | 0.92 | 3.68 | 0.97 | 3.52 | 0.98 |
| Item 2 | 3.80 | 0.94 | 3.68 | 0.93 | 3.82 | 0.94 | 3.72 | 0.92 | 3.85 | 0.92 | 3.75 | 0.97 |
| Item 3 | 3.91 | 1.00 | 3.75 | 0.99 | 3.91 | 0.98 | 3.80 | 1.04 | 3.95 | 0.98 | 3.86 | 1.04 |
| Item 4 | 4.40 | 0.96 | 4.41 | 0.96 | 4.38 | 0.96 | 4.39 | 0.92 | 4.44 | 0.92 | 4.36 | 0.99 |
| Item 5 | 4.38 | 0.84 | 4.30 | 0.86 | 4.36 | 0.87 | 4.32 | 0.81 | 4.40 | 0.82 | 4.36 | 0.83 |
| Item 6 | 3.43 | 1.10[a] | 2.85 | 1.16 | 3.46 | 1.08 | 3.32 | 1.11 | 3.45 | 1.08 | 3.28 | 1.16 |
| Item 7 | 7.73 | 1.11[a] | 2.95 | 1.20 | 3.79 | 1.09[a] | 3.55 | 1.18 | 3.71 | 1.10 | 3.70 | 1.19 |
| Item 8 | 3.91 | 1.04[b] | 3.12 | 1.05 | 3.97 | 1.02[b] | 3.77 | 1.12 | 3.96 | 1.04[a] | 3.74 | 1.09 |
| Item 9 | 2.77 | 1.18[b] | 2.26 | 1.05 | 2.83 | 1.21[a] | 2.60 | 1.14 | 2.83 | 1.17[a] | 2.50 | 1.12 |
| Item 10 | 3.60 | 1.15 | 3.54 | 1.16 | 3.60 | 1.13 | 3.58 | 1.18 | 3.62 | 1.14 | 3.60 | 1.19 |
| Item 11 | 3.35 | 1.26 | 3.37 | 1.34 | 3.34 | 1.27 | 3.27 | 1.24 | 3.38 | 1.25 | 3.24 | 1.27 |
| Item 12 | 3.56 | 1.12[b] | 3.06 | 1.07 | 3.59 | 1.12[a] | 3.41 | 1.14 | 3.59 | 1.11[a] | 3.40 | 1.10 |
| Item 13 | 3.96 | 1.17[a] | 3.54 | 1.29 | 4.04 | 1.11[b] | 3.80 | 1.29 | 4.02 | 1.14[b] | 3.62 | 1.32 |
| Item 14 | 4.73 | 0.63[b] | 4.56 | 0.78 | 4.73 | 0.63 | 4.74 | 0.63 | 4.77 | 0.57 | 4.65 | 0.78 |
| Item 15 | 4.01 | 1.20[b] | 3.68 | 1.36 | 4.10 | 1.11[b] | 3.77 | 1.36 | 4.10 | 1.14[b] | 3.58 | 1.37 |
| Item 16 | 3.22 | 1.45[a] | 2.64 | 1.47 | 3.32 | 1.45[a] | 3.02 | 1.49 | 3.27 | 1.44[a] | 2.89 | 1.43 |
| Item 17 | 3.31 | 1.25 | 3.14 | 1.30 | 3.35 | 1.25[a] | 3.13 | 1.28 | 3.35 | 1.23[a] | 3.10 | 1.31 |
| Item 18 | 4.45 | 0.85 | 4.33 | 0.86 | 4.45 | 0.84 | 4.48 | 0.85 | 4.46 | 0.85 | 4.39 | 0.86 |
| Item 19 | 4.55 | 0.79 | 4.42 | 0.82 | 4.54 | 0.78 | 4.55 | 0.82 | 4.58 | 0.77 | 4.45 | 0.88 |
| Item 20 | 3.35 | 1.41[a] | 2.87 | 1.42 | 3.46 | 1.41[a] | 3.14 | 1.43 | 3.41 | 1.40[a] | 3.13 | 1.43 |
| PBSES-SF | 43.80 | 8.54[a] | 38.75 | 7.90 | 44.35 | 8.43[a] | 42.05 | 8.74 | 44.30 | 8.48[a] | 41.55 | 8.61 |
| PBSES-SF-F1 | 11.18 | 3.40[a] | 9.85 | 3.64 | 11.46 | 3.24[b] | 10.60 | 3.70 | 11.40 | 3.29[a] | 10.09 | 3.69 |
| PBSES-SF-F2 | 15.22 | 3.06 | 14.67 | 2.92 | 15.25 | 3.06 | 14.80 | 3.04 | 15.37 | 3.04[a] | 14.84 | 3.13 |
| PBSES-SF-F3 | 17.39 | 4.19[a] | 14.24 | 4.19 | 17.64 | 4.14[a] | 16.64 | 4.36 | 17.53 | 4.21[a] | 16.62 | 4.07 |
| | EBF 5 months | | | | ABF 6 months | | | | ABF 1 year | | | |
| Item/scale | Yes M | SD | No M | SD | Yes M | SD | No M | SD | Yes M | SD | No M | SD |
| Item 1 | 3.80 | 0.99[b] | 3.57 | 0.96 | 3.69 | 0.97[a] | 3.52 | 0.97 | 3.71 | 0.95 | 3.56 | 0.97[a] |
| Item 2 | 3.97 | 0.94[b] | 3.77 | 0.91 | 3.84 | 0.91 | 3.78 | 0.92 | 3.82 | 0.89 | 3.80 | 0.91 |
| Item 3 | 4.05 | 0.96[b] | 3.88 | 1.00 | 3.93 | 0.98 | 3.93 | 0.99 | 3.94 | 0.95 | 3.92 | 0.99 |
| Item 4 | 4.53 | 0.87[b] | 4.37 | 0.96 | 4.47 | 0.88 | 4.35 | 1.05 | 4.39 | 0.98 | 4.40 | 0.98 |
| Item 5 | 4.48 | 0.79[b] | 4.35 | 0.84 | 4.38 | 0.84 | 4.42 | 0.76 | 4.38 | 0.85 | 4.40 | 0.80 |
| Item 6 | 3.54 | 1.07[a] | 3.35 | 1.11 | 3.41 | 1.10 | 3.39 | 1.10 | 3.51 | 1.12 | 3.35 | 1.09 |
| Item 7 | 3.78 | 1.04 | 3.67 | 1.15 | 3.72 | 1.10 | 3.69 | 1.15 | 3.76 | 1.11 | 3.67 | 1.13 |
| Item 8 | 4.03 | 1.02[a] | 3.85 | 1.06 | 3.96 | 1.05 | 3.82 | 1.07 | 3.93 | 1.11 | 3.85 | 1.05 |
| Item 9 | 2.96 | 1.20[a] | 2.67 | 1.14 | 2.80 | 1.18 | 2.68 | 1.15 | 2.87 | 1.20[a] | 2.68 | 1.14 |
| Item 10 | 3.56 | 1.18 | 3.65 | 1.12 | 3.58 | 1.16 | 3.57 | 1.10 | 3.53 | 1.18 | 3.59 | 1.12 |
| Item 11 | 3.33 | 1.26 | 3.37 | 1.25 | 3.35 | 1.24 | 3.31 | 1.28 | 3.40 | 1.20 | 3.30 | 1.27 |
| Item 12 | 3.74 | 1.11[a] | 3.46 | 1.10 | 3.62 | 1.12[a] | 3.43 | 1.10 | 3.58 | 1.13 | 3.48 | 1.10[a] |

**TABLE 3** (Continued)

| Item/scale | EBF 5 months | | | | ABF 6 months | | | | ABF 1 year | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes M | SD | No M | SD | Yes M | SD | No M | SD | Yes M | SD | No M | SD |
| Item 13 | 4.17 | 1.06[b] | 3.83 | 1.23 | 4.00 | 1.14 | 3.86 | 1.21 | 3.97 | 1.20 | 3.90 | 1.17 |
| Item 14 | 4.80 | 0.55[b] | 4.72 | 0.64 | 4.76 | 0.57 | 4.73 | 0.68 | 4.78 | 0.55 | 4.73 | 0.65 |
| Item 15 | 4.25 | 1.06[b] | 3.87 | 1.26 | 4.15 | 1.10[a] | 3.90 | 1.27 | 4.21 | 1.14[a] | 3.97 | 1.21[a] |
| Item 16 | 3.49 | 1.42[a] | 3.04 | 1.43 | 3.30 | 1.41[a] | 3.05 | 1.46 | 3.42 | 1.47[a] | 3.08 | 1.42[a] |
| Item 17 | 3.49 | 1.24[a] | 3.21 | 1.25 | 3.36 | 1.22 | 3.18 | 1.25 | 3.29 | 1.19 | 3.26 | 1.25 |
| Item 18 | 4.53 | 0.82[b] | 4.40 | 0.87 | 4.49 | 0.83 | 4.40 | 0.87 | 4.57 | 0.81[a] | 4.40 | 0.87 |
| Item 19 | 4.63 | 0.75[b] | 4.51 | 0.81 | 4.62 | 0.73 | 4.52 | 0.81 | 4.68 | 0.70[a] | 4.51 | 0.80 |
| Item 20 | 3.60 | 1.39[a] | 3.22 | 1.40 | 3.44 | 1.39[a] | 3.16 | 1.39 | 3.63 | 1.34[a] | 3.16 | 1.39[a] |
| PBSES-SF | 45.77 | 8.34[a] | 42.75 | 8.52 | 44.31 | 8.44[a] | 42.89 | 8.68 | 44.58 | 8.83[a] | 43.12 | 8.47[a] |
| PBSES-SF-F1 | 11.91 | 3.17[b] | 10.74 | 3.46 | 11.45 | 3.26[a] | 10.82 | 3.48 | 11.59 | 3.50[a] | 10.95 | 3.34[a] |
| PBSES-SF-F2 | 15.81 | 2.95[a] | 15.01 | 3.08 | 15.36 | 3.10 | 15.06 | 2.95 | 15.33 | 3.09 | 15.15 | 3.01 |
| PBSES-SF-F3 | 18.04 | 4.22[a] | 17.00 | 4.15 | 17.51 | 4.22 | 17.01 | 4.25 | 17.65 | 4.44 | 17.02 | 4.15 |

*Note:* Predictive validity by item and total scores.

Abbreviations: ABF, any breastfeeding; EBF, exclusive breastfeeding; No M, mean of items/scale for respondents that were not breastfeeding at each breastfeeding status point; PBSES-SF, 12-Item Prenatal Breastfeeding Self-Efficacy Scale Short-Form; PBSES-SF-F1, Factor 1 of the Prenatal Breastfeeding Self-Efficacy Scale Short-Form; PBSES-SF-F2, Factor 2 of the Prenatal Breastfeeding Self-Efficacy Scale Short-Form; PBSES-SF-F3, Factor 3 of the Prenatal Breastfeeding Self-Efficacy Scale Short-Form; SD, standard deviation; Yes M, mean of items/scale for respondents that were breastfeeding at each breastfeeding status point.

[a]Significative differences between the "Yes" and "No" groups by the Student's *t* test ($p < 0.05$).

[b]Significative differences between the "Yes" and "No" by adjusted analysis by the Welch method ($p < 0.05$).

Many of the items discarded in the PBSES-SF during the item reduction process presented problems in the scale's previous versions. First, the same items removed from the PBSES-SF due to the ceiling effect (4, 14, 18, and 19) also recorded high response rates in the best possible score in a previous study using the Spanish version of the PBSES (Piñeiro-Albero et al., 2013). Three of these ceiling effect items (4, 18, and 19) that were removed in the PBSES-SF were part of the "social pressure when breastfeeding" factor in the original scale, and probably indicated a limited content validity for this factor in the original scale (Terwee et al., 2007). In general, the floor and ceiling effects indicate a lack of items to differentiate respondents in the extreme scores of a scale, and this decreases the reliability and responsiveness of a tool (Terwee et al., 2007). We had no information regarding the ceiling effect of the PBSES items in other versions, except for item 4 in the original English version (Wells et al., 2006). Item 4 was also removed in the Turkish version because of the overlapping of different factors (Hazar & Akca, 2018). In line with our results, item 20 had insufficient loading in the PBSES factors of the original scale (Wells et al., 2006).

However, previous studies lacked information on the interitem correlations of the PBSES that led us to discard item 2 in the PBSES-SF. It should be noted that high correlations between items indicate that the items are redundant and lack parsimony (Terwee et al., 2007). Finally, exploring all the PBSES item relationships through predictive validity criteria, that led us to eliminate items 10 and 11, has not been done before with all the PBSES items.

Our findings on the structural validity of the questionnaire revealed adequate fit statistics for the PBSES-SF with a three-factor structure and a second-order factor, compatible with the four-factor structure of the original version. Most of the 12 items remaining in the PBSES-SF were grouped into the same factors as in the previous English (Wells et al., 2006), Spanish (Piñeiro-Albero et al., 2013), and Turkish (Hazar & Akca, 2018) versions. Only items 12 and 17 were grouped into different factors in the 19-item Turkish version of the scale.

Our results suggested that the PBSES-SF and its factors had adequate internal consistency (above 0.70; Terwee et al., 2007). Despite the elimination of eight items, the reliability analysis of the PBSES-SF indicated a Cronbach's $\alpha$ of 0.86, close to between 0.89 and 0.91 as described in previous studies using the PBSES (Aydin & Pasinlioglu, 2018; Hazar & Akca, 2018; Piñeiro-Albero et al., 2013; Wells et al., 2006).

All the validity hypotheses that were proposed in previous studies using the PBSES (Piñeiro-Albero et al., 2013; Robinson & VandeVusse, 2011; Wells et al., 2006) were confirmed for the PBSES-SF. First, we found that mothers who had previous experience in breastfeeding had higher PBSES-SF scores, as performance accomplishment was a powerful source of self-efficacy (Bandura, 1986). In addition, mothers who chose to breastfeed

**TABLE 4** Confirmatory factor analysis fit indexes of the Prenatal Breastfeeding Self-Efficacy Scale and its Short-Form ($n$ = 609)

| Fit indexes | Model 1[a] | Model 2[b] | Model 3[c] | Model 4[d] |
|---|---|---|---|---|
| $\chi^2$ | 1260 | 1001 | 610.7 | 129.7 |
| *df* | 146 | 54 | 54 | 39 |
| $\chi^2/df$ | 8.6 | 18.53 | 11.3 | 3.32 |
| GFI | 0.98 | 0.94 | 0.73 | 0.99 |
| CFI | 0.94 | 0.75 | 0.00 | 0.99 |
| RMSEA | 0.062 | 0.140 | 0.340 | 0.035 |
| SRMR | 0.071 | 0.100 | 0.220 | 0.030 |

*Note:* For the conduct of the factorial analysis, the study sample was randomly divided into two parts from 609 women. With the second part, a confirmatory factorial analysis was performed (results present in this table). CFI with values more than 0.90 indicating acceptable fit and those greater than 0.95 indicating good fit (Hu & Bentler, 1999); RMSEA value ≤ 0.06 indicating a good fit and ≤0.1 representing an acceptable fit (Hu & Bentler, 1999); SRMR values less than 0.08 indicating a good fit and ≤0.1 an acceptable fit (Hu & Bentler, 1999).

Abbreviations: $\chi^2$, Chi-square; CFI, comparative fit index; GFI, goodness-of-fit statistic goodness-of-fit index; RMSEA, root mean squared error of approximation; SRMR, standardized root mean square residual values.

[a]PBSES four-factor structure with a second-order factor, including all the original items (F1: 13, 14, 15, 16; F2: 1, 2, 3, 5; F3: 6, 7, 8, 9, 10, 11, 12, 20; F4: 4, 18, 19).

[b]One-factor model including only the PBSES-SF items; (F1: 1, 3, 5, 6, 7, 8, 9, 12, 13, 15, 16, 17).

[c]PBSES structure including only the PBSES-SF items (F1: 13, 15, 16; F2: 1, 3, 5, 17; F3: 6, 7, 8, 9, 12).

[d]PBSES structure with a second-order factor, including only the PBSES-SF items (F1: 13, 15, 16; F2: 1, 3, 5, 17; F3: 6, 7, 8, 9, 12).

during pregnancy and expected to breastfeed for longer had higher PBSES-SF scores than mothers who did not. People with higher self-efficacy had higher expectations about their ability, choose to breastfeed more frequently, and set more difficult challenges for themselves (Dennis, 1999). Moreover, as evidence of convergent validity, there was evidence that the PBSES-SF scores positively correlated with the scores of other scales measuring similar constructs, such as the BSES-SF and the GSE.

Breastfeeding self-efficacy encourages the mother to be fully involved in the breastfeeding process, positively affecting her effort and persistence in overcoming problems and difficulties, and inducing thought patterns and emotional reactions that enhance performance (Dennis, 1999). Thus, as evidenced by the PBSES-SF predictive validity, our results indicated that the scores were significantly associated with breastfeeding behavior at critical points in time during the first postpartum year, as was also partly indicated by the PBSES (Piñeiro-Albero et al., 2013). Moreover, the AUC values for predicting breastfeeding intention during pregnancy and breastfeeding initiation after childbirth indicated a fair to good accuracy for the total PBSES-SF and Factor 3 scores (Staffa & Zurakowski, 2019). The total PBSES-SF and Factor 3 scores had higher AUCs than their PBSES equivalents, suggesting that our approach in selecting the most predictive items to improve predictive validity was successful.

Our study suggests the usefulness of the PBSES-SF in identifying mothers at risk of not initiating breastfeeding due to lack of breastfeeding self-efficacy, and who might need extra support during pregnancy. Specifically, mothers with scores of 40 points or less on the total PBSES-SF score, or 14 points or less on the factor of "skills and demands required for breastfeeding," could benefit from targeted support interventions known to effectively improve breastfeeding outcomes (Araban et al., 2018; Liu et al., 2017).

## 4.1 | Limitations

The use of a convenience sample is a limitation of this study, and the generalization of our results should be made cautiously. In addition, the postpartum follow-up sample had characteristics favorable to breastfeeding, such as a higher age and educational status, or less breastfeeding intention (Rollins et al., 2016). However, we did not identify differences in PBSES scores among women who did not participate in the follow-up after delivery. Future studies need to obtain more representative samples and include specific risk groups associated with premature breastfeeding cessation.

In the present study, considering both the predictive measurement goal of the PBSES and the need to revise the PBSES structure, we opted for a criterion-keying strategy to depurate the PBSES instead of a deductive or inductive approach (Smith et al., 2003). The criterion-keying approach is a data-driven strategy focused on the practical value of prediction, rather than the theoretical value of enhancing the understanding of constructs. By creating a shortened version of the PBSES, we developed an alternative tool to measure prenatal self-efficacy for breastfeeding, with narrower content. Although reducing items from 20 to 12 is a threat to content and construct validity, a short version of the PBSES with adequate reliability and incremental validity over the original version to better predict breastfeeding behavior was identified. In addition, the PBSES-SF replicates the pattern of relationships established for the PBSES within the nomological self-efficacy network.

Most items deleted from the PBSES in this study had weaknesses that affected the validity, reliability, or parsimony of the scale. We removed content regarding self-efficacy related to social pressure when breastfeeding, breastfeeding for 1 year, using a breast pump and preparing breast milk, finding information about breastfeeding, or breastfeeding the baby when the partner was present. Future research to improve the theoretical value of the scale could aim to replace deleted items with suitable new items to cover the removed content. Finally, the PBSES-SF was developed from a Spanish version of the PBSES, and further studies are necessary to

**TABLE 5** The area under the receiver operating characteristics curves for PBSES and PBSES-SF and their factors to correctly classify participants who did not want to breastfeed during pregnancy and did not breastfeed after childbirth ($n = 1218$)

| | Participants who did not want to breastfeed during pregnancy[a] | | | | | | Participants who did not initiate breastfeeding after childbirth[b] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Score | PBSES AUC | 95% CI | PBSES-SF AUC | 95% CI | $\chi^2$ Values | *p* Value | PBSES AUC | 95% CI | PBSES-SF AUC | 95% CI | $\chi^2$ Values | *p* Value |
| Overall scores[c] | 0.66 | 0.58–0.72 | 0.70 | 0.63–0.76 | 10.51 | $p < 0.01$ | 0.64 | 0.59–0.69 | 0.67 | 0.62–0.72 | 8.62 | $p = 0.01$ |
| Factor 1[d] | 0.60 | 0.51–0.67 | 0.58 | 0.50–0.66 | 3.15 | $p = 0.21$ | 0.61 | 0.55–0.67 | 0.61 | 0.55–0.67 | 0.74 | $p = 0.69$ |
| Factor 2[e] | 0.55 | 0.47–0.61 | 0.55 | 0.47–0.61 | 0.88 | $p = 0.99$ | 0.55 | 0.49–0.60 | 0.56 | 0.49–0.61 | 1.94 | $p = 0.37$ |
| Factor 3[f] | 0.68 | 0.61–0.76 | 0.75 | 0.67–0.81 | 15.69 | $p < 0.01$ | 0.67 | 0.61–0.72 | 0.70 | 0.65–0.75 | 6.79 | $p = 0.03$ |
| Factor 4[g] | 0.56 | 0.47–0.64 | – | – | – | – | 0.54 | 0.48–0.61 | – | – | – | – |

Abbreviations: 95% CI, 95% confidence interval; AUC, area under the receiver operating characteristics curves; PBSES, Prenatal Breastfeeding Self-Efficacy Scale; PBSES-SF, the Reduced Spanish Version of the Prenatal Breastfeeding Self-Efficacy Scale.

[a]Includes 61 positive cases and 1094 negative cases.

[b]Includes 99 positive cases and 1054 negative cases.

[c]Factor including items on confidence regarding breastfeeding around other people and feelings of embarrassment during breastfeeding.

[d]Factor including items about confidence regarding breastfeeding around other people and feelings of embarrassment during breastfeeding.

[e]Factor including items on confidence regarding gathering information about how to breastfeed.

[f]Factor including items on confidence regarding the skills and demands required for breastfeeding.

[g]Factor including items on social pressure when breastfeeding.

determine if the new proposed structure is also suitable for other versions, such as the English and Turkish versions.

## 5 | CONCLUSION

We developed a short form of the PBSES, including 12 items grouped into three dimensions and a second-order factor, and with better predictive utility, to determine breastfeeding self-efficacy during the antenatal period. We have also provided evidence of the reliability, construct, and predictive validity of the PBSES-SF. The PBSES-SF scores had a fair to good accuracy in predicting breastfeeding intention during pregnancy and initiation and were related to breastfeeding indicators up to at least 12 months postpartum.

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### CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

### AUTHOR CONTRIBUTIONS

Miguel Richart-Martínez and Antonio Oliver-Roig: Conceptualization; Software; Formal analysis; Writing- Reviewing and Editing. José R. Silva-Tubio and Juana Perpiñá-Galvañ: Formal analysis; Writing- Reviewing and Editing

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### ORCID

*José R. Silva-Tubio* https://orcid.org/0000-0003-3448-4894
*Antonio Oliver-Roig* http://orcid.org/0000-0001-9171-820X
*Juana Perpiñá-Galvañ* https://orcid.org/0000-0002-5260-9745
*Miguel Richart-Martínez* http://orcid.org/0000-0001-6890-3001

### REFERENCES

Altman, D. G. (1991). *Practical statistics for medical research*. Chapman & Hall.

Araban, M., Karimian, Z., Karimian Kakolaki, Z., McQueen, K. A., & Dennis, C. L. (2018). Randomized controlled trial of a prenatal breastfeeding self-efficacy intervention in primiparous women in Iran. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *47*(2), 173–183. https://doi.org/10.1016/j.jogn.2018.01.005

Aydin, A., & Pasinlioglu, T. (2018). Reliability and validity of a Turkish version of the Prenatal Breastfeeding Self-Efficacy Scale. *Midwifery*, *64*, 11–16. https://doi.org/10.1016/j.midw.2018.05.007

Bandura, A. (1986). *Social foundations of thought and action*. Prentice-Hall.

Bentler, P. M. (2004). *EQS. 6*. A beginner's guide to structural equation modeling. Multivariate Software, Inc.

De Jager, E., Skouteris, H., Broadbent, J., Amir, L., & Mellor, K. (2013). Psychosocial correlates of exclusive breastfeeding: a systematic review. *Midwifery*, *29*(5), 506–518. https://doi.org/10.1016/j.midw.2012.04.009

Dennis, C. L. (1999). Theoretical underpinnings of breastfeeding confidence: A self-efficacy framework. *Journal of Human Lactation*, *15*(3), 195–201. https://doi.org/10.1177/089033449901500303

Dennis, C. L. (2003). The breastfeeding self-efficacy scale: Psychometric assessment of the short form. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, *32*(6), 734–744. https://doi.org/10.1177/0884217503258459

Dennis, C. L., & Faux, S. (1999). Development and psychometric testing of the Breastfeeding Self-Efficacy Scale. *Research in Nursing & Health*, *22*(5), 399–409. https://doi.org/10.1002/(sici)1098-240x(199910)22:5<399:aid-nur6>3.0.co;2-4

Edwards, P. J., Roberts, I., Clarke, M. J., Diguiseppi, C., Wentz, R., Kwan, I., Cooper, R., Felix, L. M., & Pratap, S. (2009). Methods to increase response to postal and electronic questionnaires. *The Cochrane Database of Systematic Reviews*, *3*, MR000008. https://doi.org/10.1002/14651858.MR000008.pub4

Eidelman, A., & Schanler, R. (2012). Breastfeeding and the use of human milk. *Pediatrics*, *129*(3), e827–e841. https://doi.org/10.1542/peds.2011-3552

Glass, G. V., & Stanley, J. C. (1970). *Statistical methods in education and psychology*. Prentice-Hall.

Hazar, H. U., & Akca, E. U. (2018). Prenatal Breastfeeding Self-Efficacy Scale: Validity and reliability study. *Türk Pediatri Arşivi*, *53*(4), 222–230. https://doi.org/10.5152/TurkPediatriArs.2018.18114

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Johnson, N. A., Wysong, E. F., Tossone, K., & Furman, L. (2019). Associations between prenatal intention and postpartum choice: Infant feeding and contraception decisions among inner-city women. *Breastfeeding Medicine*, *14*(7), 456–464. https://doi.org/10.1089/bfm.2018.0248

Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). The Guilford Press.

Liu, L., Zhu, J., Yang, J., Wu, M., & Ye, B. (2017). The effect of a perinatal breastfeeding support program on breastfeeding outcomes in primiparous mothers. *Western Journal of Nursing Research*, *39*(7), 906–923. https://doi.org/10.1177/0193945916670645

Lorenzo-Seva, U. (1999). Promin: A method for oblique factor rotation. *Multivariate Behavioral Research*, *34*(3), 347–365. https://doi.org/10.1207/S15327906MBR3403_3

Minas, A. G., & Ganga-Limando, M. (2016). Social-cognitive predictors of exclusive breastfeeding among primiparous mothers in Addis Ababa, Ethiopia. *PLoS One*, *11*(10), e0164128. https://doi.org/10.1371/journal.pone.0164128

Ministerio de Sanidad, Consumo y Bienestar Social 2017. *Encuesta Nacional de Salud de España 2017*. Madrid (España). Ministry of Health, Consumer Affairs and Social Welfare 2017. Spanish National Health Survey 2017. https://www.mscbs.gob.es/estadEstudios/estadisticas/encuestaNacional/encuestaNac2017/ENSE17_pres_web.pdf

Nunnally, J. C., & Berstein, I. (1994). *Psychometric theory 3E*. Tata McGraw-Hill Education.

Oliver-Roig, A., Chulvi-Alabort, V., López-Valero, F., Salud Lozano-Dura, M., Seva-Soler, C., & Pérez-Hoyos, S. (2008). Momentos críticos de abandono de la lactancia materna en un seguimiento de 6 meses. *Enfermería Clínica*, *18*(6), 317–320. https://doi.org/10.1016/S1130-8621(08)75854-6

Oliver-Roig, A., d'Anglade-González, M. L., García-García, B., Silva-Tubio, J. R., Richart-Martínez, M., & Dennis, C. L. (2012). The Spanish version of the Breastfeeding Self-Efficacy Scale-Short Form: Reliability and validity assessment. *International Journal of Nursing*

*Studies*, *49*(2), 169–173. https://doi.org/10.1016/j.ijnurstu.2011.08.005

Piñeiro-Albero, R. M., Ramos-Pichardo, J. D., Oliver-Roig, A., Velandrino-Nicolás, A., Richart-Martínez, M., García-de-León-González, R., & Wells, K. J. (2013). The Spanish version of the Prenatal Breastfeeding Self-Efficacy Scale: Reliability and validity assessment. *International Journal of Nursing Studies*, *50*(10), 1385–1390. https://doi.org/10.1016/j.ijnurstu.2012.12.010

Robinson, K. M., & VandeVusse, L. (2011). African American women's infant feeding choices. *The Journal of Perinatal & Neonatal Nursing*, *25*(4), 320–328. https://doi.org/10.1097/JPN.0b013e31821072fb

Rollins, N. C., Bhandari, N., Hajeebhoy, N., Horton, S., Lutter, C. K., Martines, J. C., Piwoz, E. G., Richter, L. M., & Victora, C. G., The Lancet Breastfeeding Series Group. (2016). Why invest, and what it will take to improve breastfeeding practices. *Lancet*, *387*(10017), 491–504. https://doi.org/10.1016/S0140-6736(15)01044-2

Sanjuán, P., Pérez, A. M., & Bermúdez, J. (2000). Escala de autoeficacia general: Datos psicométricos de la adaptación para población española. *Psicothema*, *12*(Su2), 509–513. http://www.psicothema.com/pdf/615.pdf

Smith, G. T., Fischer, S., & Fister, S. M. (2003). Incremental validity principles in test construction. *Psychological Assessment*, *15*(4), 467–477. https://doi.org/10.1037/1040-3590.15.4.467

Staffa, S. J., & Zurakowski, D. (2019). Statistical evaluation of diagnostic tests: A primer for pediatric surgeons. *Journal of Pediatric Surgery*, *54*(4), 799–804. https://doi.org/10.1016/j.jpedsurg.2018.06.010

Stanton, J. M., Sinar, E. F., Balzer, W. K., & Smith, P. C. (2002). Issues and strategies for reducing the length of self-report scales. *Personnel Psychology*, *55*(1), 167–194. https://doi.org/10.1111/j.1744-6570.2002.tb00108.x

Terwee, C. B., Bot, S. D., de Boer, M. R., van der Windt, D. A., Knol, D. L., Dekker, J., Bouter, L. M., & de Vet, H. C. (2007). Quality criteria were proposed for measurement properties of health status questionnaires. *Journal of Clinical Epidemiology*, *60*(1), 34–42. https://doi.org/10.1016/j.jclinepi.2006.03.012

Timmerman, M. E., & Lorenzo-Seva, U. (2011). Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychological Methods*, *16*(2), 209–220. https://doi.org/10.1037/a0023353

Tuthill, E. L., McGrath, J. M., Graber, M., Cusson, R. M., & Young, S. L. (2016). Breastfeeding self-efficacy: A critical review of available instruments. *Journal of Human Lactation*, *32*(1), 35–45. https://doi.org/10.1177/0890334415599533

Victora, C. G., Bahl, R., Barros, A. J., França, G. V., Horton, S., Krasevec, J., Murch, S., Sankar, M. J., Walker, N., & Rollins, N. C., Lancet Breastfeeding Series Group. (2016). Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. *Lancet*, *387*(10017), 475–490. https://doi.org/10.1016/S0140-6736(15)01024-7

Wells, K. J., Thompson, N. J., & Kloeblen-Tarver, A. S. (2006). Development and psychometric testing of the Prenatal Breastfeeding Self-Efficacy Scale. *American Journal of Health Behavior*, *30*(2), 177–187. https://doi.org/10.5555/ajhb.2006.30.2.177

Wieland, A., Durach, C. F., Kembro, J., & Treiblmaier, H. (2017). Statistical and judgmental criteria for scale purification. *Supply Chain Management: An International Journal*, *22*(4), 321–328. https://doi.org/10.1108/SCM-07-2016-0230

World Health Organization. (2008). Indicators for assessing infant and young child feeding practices: Conclusions of a consensus meeting held 6–8 November 2007 in Washington D.C., USA: Switzerland. WHO press. https://www.who.int/maternal_child_adolescent/documents/9789241596664/en/

World Health Organization (2009). Baby-Friendly Hospital Initiative. Revised, updated, and expanded for integrated care. https://www.who.int/nutrition/publications/infantfeeding/bfhi_trainingcourse/en/

World Health Organization (2019). Exclusive breastfeeding for optimal growth, development and health of infants. http://www.who.int/elena/titles/exclusive_breastfeeding/en/

## SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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