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Original research article

Self-efficacy of mothers in breastfeeding and psychometric properties of the Slovak version of the BSES-SF

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Abstract
Introduction: Self-efficacy is considered one of the key components of breastfeeding success and thus is important to explore. However, this requires reliable measuring tools.
Goal: The aim of the study was to evaluate the psychometric properties of the BSES-SF as a measure of confidence in breastfeeding among Slovak mothers, and to determine the self-efficacy of mothers in breastfeeding and its related factors.
Methods: The research was designed as a quantitative cross-sectional study. The sample consisted of 678 women who were on the 3rd–4th day after delivery. A Slovak version of the 14-item Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) was used to assess breastfeeding self-efficacy.
Results: Cronbach's alpha of the Slovak version of the BSES-SF was 0.812. CFA has shown that the four-factor model of the BSES-SF offered the best fit for Slovak data.
Education ($p < 0.001$), previous breastfeeding experience ($p = 0.015$), and skin-to-skin contact ($p < 0.001$) were shown to be statistically significant factors related to breastfeeding self-efficacy of mothers.
Conclusion: The Slovak version of the BSES-SF has shown good psychometric properties and it can be recommended to assess the breastfeeding self-efficacy of mothers in Slovakia. The proven factors related to self-efficacy show the need for individual help, especially for women with higher education, women with a previous negative experience with breastfeeding, and the importance of skin-to-skin contact support.

Keywords: Breastfeeding; Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF); Related factors; Self-efficacy; Validity

Introduction

Breastfeeding is beneficial for the health of mothers and infants in both the short and long term, and improves their quality of life (Dieterich et al., 2013). A complex of nutritional, environmental, socioeconomic, psychological, as well as genetic interactions estabilishes numerous benefits through which breastfeeding positively influences the health status of both the infant and the mother. Early initiation of breastfeeding in the first hour of life is the basis for optimal breastfeeding, facilitates the emotional connection between mother and infant (bonding), and has a highly positive effect on the duration of exclusive breastfeeding (Liben and Yesuf, 2016; Mazúchová et al., 2021).

Although breastfeeding should be a natural and normal practice, many women report difficulties with breastfeeding and find initial breastfeeding a painful, difficult, and challenging experience (Morns et al., 2023). Breastfeeding failure results from the problems faced by mothers and infants and is often related to feelings of guilt, a decrease in maternal self-confidence (Awaliyah et al., 2019), and depression (Bánovčinová et al., 2019).

The support, protection, and promotion of breastfeeding is an important area of public health and health prevention (Dorazilová, 2020).

A significant variable used to predict maternal breastfeeding is self-efficacy (BSE). Breastfeeding self-efficacy theory is a social cognitive theory pioneered by Albert Bandura (1977, 1986) and adapted by Dennis and Faux (1999). BSE is defined as the mother's confidence in her ability to breastfeed her infant. It predicts whether the mother chooses to breastfeed or not, how much effort she will exert, and how emotionally she will react to breastfeeding difficulties. Bandura (1977) also defines self-efficacy as the belief in one's own competence and the ability to have things "under control", as well as the belief

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that we can achieve the goals we set for ourselves. It also affects the activities performed, the mobilization of effort, endurance, thinking, or the degree of stress due to the demands of the environment. Self-efficacy can provide a foundation for motivation, well-being, and personal achievement.

For self-efficacy in breastfeeding, awareness is needed, and it is important to begin this in antenatal care. The Quality of Discharge Teaching scale (QDTS) can also be used to assess the quality of readiness for discharge of maternity ward patients (Nagórska and Darmochwał-Kolarz, 2021).

Several studies have shown that mothers' BSE is a predictive factor, not only for the initiation and duration of breastfeeding but also for exclusive breastfeeding (de Jager et al., 2015; McCarter-Spaulding and Dennis, 2010; Pavicic Bosnjak et al., 2012).

The Breastfeeding Self-Efficacy Scale (BSES) was developed by Dennis and Faux (1999) to assess breastfeeding confidence. Later, the BSES was revised from 33 to 14 items and renamed the BSES-Short Form (BSES-SF) (Dennis, 2003).

A considerable amount of reliability and validity evidence supports its use to measure self-efficacy in breastfeeding. The reliability and validity of this instrument was found to be satisfactory in USA (McCarter-Spaulding and Dennis, 2010), Turkey (Aluş Tokat et al., 2010), Canada (Dennis et al., 2011), Brazil (Dodt et al., 2012), Croatia (Pavicic Bosnjak et al., 2012), Spain (Oliver-Roig et al., 2012), Sweden (Gerhardsson et al., 2014), Japan (Nanishi et al., 2015), Italy (Petrozzi and Gagliardi, 2016), China (Ip et al., 2016), Malaysia (Husin et al., 2017), Portugal (Brandão et al., 2018), Iran (Amini et al., 2019; Asgarian et al., 2020), Greece (Economou et al., 2021), United Arab Emirates (Radwan et al., 2022), and Malawi (Chipojola et al., 2023).

Concerning the importance of supporting breastfeeding mothers in Slovakia with an emphasis on self-efficacy, we considered it necessary to explore the psychometric properties of the Slovak version of the BSES-SF with the aim of using it in strategies to improve breastfeeding rates.

The aim of the study was to evaluate the psychometric properties of the BSES-SF as a measure of confidence in breastfeeding among Slovak mothers, and to determine the self-efficacy of mothers in breastfeeding and its related factors.

Materials and methods

The research was designed as a cross-sectional study. Research data were collected from three Slovak hospitals in gynaecology and obstetrics departments, between February 2019 and January 2020. The sample group consisted of women who met the following inclusion criteria: postpartum women with a gestation of 37 weeks or more, with the intention of breastfeeding, with a singleton pregnancy. The research participants were addressed on the third and fourth day after delivery. Convenience sampling was used to select respondents.

Participants

The sample group consisted of 678 women aged 18 to 45 years (mean age 29.25 ± 5.06). The characteristics of the research sample group are presented in Table 2.

Instruments

The Breastfeeding Self-Efficacy Scale – Short Form (BSES-SF) was used to assess breastfeeding self-efficacy (Dennis, 2003; Dennis and Faux, 1999). BSES-SF, designed to evaluate mother's self-efficacy in breastfeeding, is a 14-item instrument adapted from the original 33-point BSES. The 5-point Likert scale was chosen to record and measure responses from 1 ("not at all confident") to 5 ("always confident"). The total scores of the scale can range from 14 to 70. Higher scores indicate higher levels of self-efficacy in breastfeeding.

The BSSES-SF scale was supplemented with self-constructed questions focused on basic demographic and obstetric characteristics (mother's age, educational level, parity, type of delivery method), as well as other factors that could be related to a mother's self-efficacy in breastfeeding (previous experience with breastfeeding, postpartum skin-to-skin contact).

Translation procedures

The original English version of the BSES-SF was translated into Slovak using the standard procedure of back-translation by competent linguistic experts in both the English and the Slovak languages. No changes were made to the BSES-SF items (no deletion nor reformulation of items). The accuracy of the content and the appropriateness of the terms used in the Slovak version of BSES-SF was assessed by two experts in the field of breastfeeding. Subsequently, the clarity of the questionnaire was verified by a pilot study with 4 women who were addressed based on personal contacts and who met the inclusion criteria. Based on the piloting, minimal stylistic changes were made to the questionnaire.

Data collection

Before the research, requests for consent to carry out the research were sent to the hospital ethics committees and the hospital management. The questionnaires were personally distributed to the gynaecology and obstetrics departments of the Hospital Zvolen, to the F. D. Roosevelt Faculty Hospital in Banská Bystrica and to the University Hospital in Bratislava – Hospital of Sts. Cyril and Methodius. The choice of hospitals was deliberate, determined by the available options and also by the consent obtained from the addressed heads of the gynaecological and obstetrics departments.

Out of the 720 personally distributed questionnaires, 690 questionnaires were returned completed, equating to a response rate of 95.83%. Out of the 690 completed questionnaires, 12 were excluded due to incorrect or incomplete responses. All participants received complete information about the nature and goals of the research, as well as about the details related to their participation in the study. Data collection was voluntary and anonymous. To ensure anonymity, respondents handed over the completed paper questionnaires to a marked collection box designated for this purpose.

Statistical analysis

Data were explored and analyzed using Jamovi, version 2.3., with the aid of R (R Core Team, 2021), libraries psych (Revelle, 2019), lavaan (Rosseel et al., 2018), and semPlot (Epskamp, 2017). Data were summarized by the minimal, maximal values, the mean, median, standard deviation, and the number of missing observations. Exploratory Factor Analysis (EFA) was used to determine the number of factors and their composition. Minimum residuals extraction method was used in combination with the oblimin rotation. Parallel analysis was applied to determine the number of factors, with an eye on eigenvalues. Cutoff 0.3 was applied on loadings. Bartlett's test of sphericity and KMO measures of sampling adequacy were computed. Confirmatory Factor Analysis was performed with the factor composition obtained from EFA using the Full information maximum likelihood method to estimate the model parameters. Estimates with 95% confidence intervals as well

as the standardized estimates were obtained together with their p-values. Model fit was assessed by the chi-squared test. Multiple goodness-of-fit tests were used to evaluate the models: The Comparative Fit Index (CFI) greater than 0.90 was employed as an indicator of an acceptable fit to the data, and a CFI equal to or greater than 0.95 indicated a good fit. The root mean squared error of approximation (RMSEA) with values of less than 0.08 was a threshold for an acceptable fit to the data, and RMSEA values of less than 0.05 also indicated a good fit. Tucker–Lewis index (TLI) values greater than 0.90 were considered the threshold for a good model fit. In the reliability analysis, Cronbach's alpha, mean and standard deviation of scale, were computed. Item reliability was assessed by the item-rest correlation and Cronbach's alpha for item dropped. The null hypothesis of equality of the median in two subpopulations was tested by the Wilcoxon–Mann–Whitney two sample test, which followed explorations of the distribution of total score, using boxplot overlaid with swarm plot, quantile-quantile plot, and density plot. Findings with *p*-value below 0.05 were considered statistically significant; all tests were with two-sided alternative. No correction for multiple hypothesis testing was applied.

Results

Internal consistency

Cronbach's alpha for the Slovak version of the BSES-SF was 0.81, which showed good internal consistency of the short version of the BSES scale in Slovak language version.

Exploratory factor analysis (EFA) of the data

The Kaiser–Meyer–Olkin sampling adequacy measure for the data was 0.80, and the result of Bartlett's sphericity test was significant (*p*-value less than 0.001), indicating that the collected data were suitable for factor analysis.

A four-factor solution was suggested by the EFA. This solution contained the first factor (items 11–14), the second-factor comprising items 1–4, the third factor with items 5–7, and the fourth factor (items 8–10). Item 4 loaded significantly on factors 1 and 2, with higher loading on factor 2. Item 5 loaded significantly on all factors 2 and 3, with a higher loading on factor 3. The combination of four factors explained 55.9% of the variance, and the correlation between factors ranged from 0.04 to 0.53. The internal reliability of the first factor was 0.81, 0.70 for the second factor, 0.77 for the third factor, and 0.73 for the fourth factor. The results of the EFA are reported in Table 1 and Diagram 1.

The first step in the CFA was the evaluation of the multidimensional structural model of EFA (four-factor solution). However, the structure of the four-factor model of the Slovak version of the BSES-SF was not found to have a good fit to the data. In the confirmatory factor analysis, the CFI, TLI, and RMSEA values did not meet the threshold for acceptable fit to the data ($\chi^2_{(df = 71)} = 709$, $p < 0.001$; CFI = 0.84, RMSEA = 0.115, TLI = 0.79).

As a second step in CFA, an alternative one-factor model of the BSES-SF was evaluated (proposed in previous validation studies (18, 26). We have found that a single factor model of the BSES-SF had a poor fit to the Slovak data ($\chi^2_{(df = 77)} = 1829$, $p < 0.001$, CFI = 0.55, RMSEA = 0.183, TLI = 0.46).

Average scores of BSES-SF

The average total score of the Slovak version of the 14-item BSES-SF was 55.02 ± 9.396, with the lowest value of 23 and the highest value 69. The mode was 62 and the median 58. A BSES-SF score <50 is recommended as a cut off value when identifying at-risk mothers who need an increased intervention to support breastfeeding (21). A threshold score ≤50 was recorded in 179 (26.40%) at-risk mothers.

The average score achieved in BSE was higher in women younger than 35 years, and lower in women over 35 years. No statistically significant differences were found in BSE between the age groups ($p = 0.587$).

Table 1. Factor matrix for the BSES- SF in a Slovak sample (exploratory factor analysis with oblimin rotation)

Item no.	Four factor solution – factor loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
Item 1		0.598		
Item 2		0.700		
Item 3		0.767		
Item 4	0.400	0.419		
Item 5		0.400	0.471	
Item 6			0.858	
Item 7			0.671	
Item 8			0.315	0.434
Item 9				0.936
Item 10				0.617
Item 11	0.618			
Item 12	0.832			
Item 13	0.838			
Item 14	0.576			

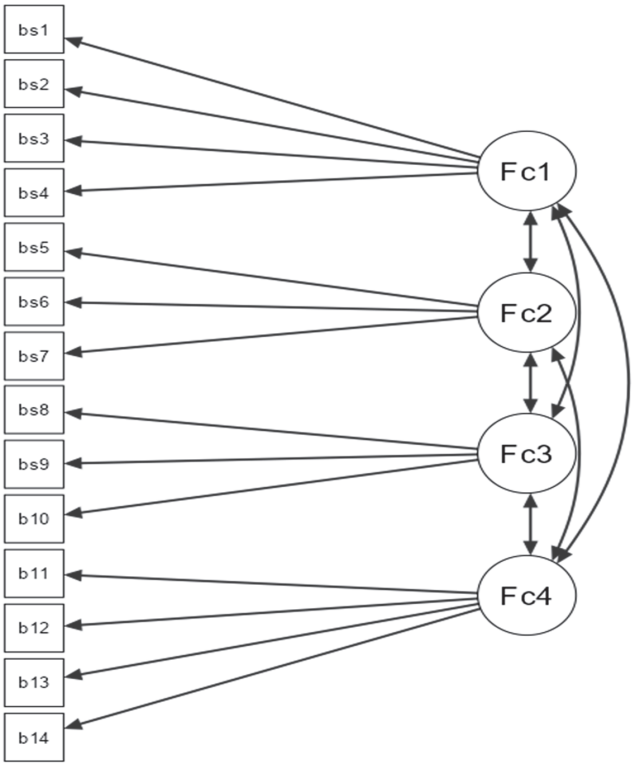

Diagram 1. Confirmatory factor analysis – 4-factor model of the BSES-SF-m Slovak version – path diagram

Table 2. Results of the demographic and obstetric characteristics of the respondents and their relation to mothers' breastfeeding self-efficacy

	N = 678		BSES-SF	
	n	%	Average score ± SD	*p*
Age				
Younger ≥35	362	53.39	55.40 ± 8.88	0.576
Older ≤36	316	46.61	54.59 ± 9.95	
Missing	1			
Education level				
Primary/secondary	382	56.34	55.40 ± 8.88	<0.001
University degree	296	43.66	54.59 ± 9.95	
Missing	1			
Parity				
Primiparous	117	17.26	53.26 ± 10.69	0.113
Multiparous	561	82.74	55.39 ± 9.07	
Missing	1			
Delivery method				
Vaginal	522	76.99	55.00 ± 9.35	0.888
Caesarean section	156	23.01	55.09 ± 9.59	
Missing	1			
Previous experience				
Positive	417	74.21	55.99 ± 8.74	0.015
Negative	145	28.80	53.69 ± 9.69	
Missing	1			
SSC support				
Yes	350	51.62	56.84 ± 8.71	<0.001
No	328	48.38	53.08 ± 9.85	

Note: BSES-SF – Breastfeeding Self-Efficacy Scale – Short Form, SD – standard deviation, *p* – level of statistical significance ($p \leq 0.05$).

The average score achieved in BSE was higher in women with lower education, and lower in women with higher education. Statistically significant differences in BSE were found between the groups according to education ($p < 0.001$).

The average score achieved in BSE was higher in multiparous women and lower in primiparous women. No statistically significant differences were found in BSE between the groups according to parity ($p = 0.100$).

The average score achieved in BSE was nearly the same in women after vaginal delivery and in women after Caesarean section. No statistically significant differences in BSE were found between the groups according to the type of delivery method ($p = 0.740$).

The average score achieved in BSE was higher in women with a positive previous experience with breastfeeding and lower in women with a negative previous experience. Statistically significant differences were found in BSE between the groups according to previous breastfeeding experience ($p = 0.015$).

The average score achieved in BSE was higher in women who had had postpartum skin-to-skin contact and lower in those who had not experienced it. Statistically significant differences were found in BSE between the groups according to postpartum skin-to-skin contact ($p < 0.001$).

Discussion

Various studies provide evidence that the BSES-SF scale may be internationally applicable and could assist health professionals in the care of breastfeeding women (Dennis et al., 2011). This study has provided evidence that the translated version of the BSES-SF may be a valid and reliable measure of self-efficacy in breastfeeding among a perinatal sample in Slovakia. As a result, it can serve to identify women who need help in the breastfeeding process and thus reduce the number of women with premature termination of breastfeeding.

Based on the results of exploratory and confirmatory factor analysis, we can conclude that our results were different from previous validation studies from Iran (Amini et al., 2019), Spain (Oliver-Roig et al., 2012), and Malawi (Chipojola et al., 2023), where one-factor structure of the BSES-SF was found. The results of the confirmatory factor analysis did not confirm that a one-factor solution was a good fit to the data in our Slovak sample. It seems that a four-dimensional model of the BSES better represents the factor structure of the Slovak version of the BSES-SF. However, the threshold for an acceptable fit was not met by either of the tested models. In the future, the structural equation modelling approach might be beneficial in analysing the factor structure of the Slovak version of the BSES-SF.

Self-efficacy is considered one of the most influential factors in the success of maternal breastfeeding, and as a result, it is highly important to explore it. The average total BSES-SF score in our study (55.02 ± 9.396) is comparable to studies conducted in Sweden (Gerhardsson et al., 2014), Turkey (Aluş Tokat et al., 2010), and Croatia (Pavicic Bosnjak et al., 2012). However, it is higher than in the research scores from Japan (Nanishi et al., 2015), China (Ip et al., 2016), or Iran (Amini et al, 2019). Based on the cut off score (BSES-SF ≤50) (Nanishi et al., 2015), up to 26.4% of at-risk mothers were identified in our research, assuming that this set of women would not practice exclusive breastfeeding after discharge from the hospital and would need a special intervention to support breastfeeding.

Good communication on the part of healthcare professionals is important (Poliaková and Boledovičová, 2010).

The purpose of further analysis was to identify the factors related to a mother's self-efficacy in breastfeeding.

When examining age, higher self-efficacy was identified in younger women compared to older women, However, no statistically significant differences were found between them. Our findings are consistent with previous research (Chrásková and Hrach, 2018; Nursan et al., 2014; Oliver-Roig et al., 2012).

A statistically significant association was demonstrated between a mother's self-efficacy in breastfeeding and education ($p < 0.001$). Higher self-efficacy was found in women with secondary and primary education, compared to women with university education. We assume that women with higher education are better informed about breastfeeding, more determined to breastfeed, and experience breastfeeding more sensitively. All these affect their level of self-confidence and self-assurance, which tend to be lower due to their high demands on themselves. Similar results were found in the studies by Santos et al. (2016). Education was also shown to be statistically significant in the research of Aluş Tokat et al. (2010), but there – contrary to our results – the higher the education, the higher the self-efficacy in breastfeeding. In other studies that also implemented the BSES-SF, no relationship was found between self-efficacy in breastfeeding and education (Dennis et al., 2011; Gerhardsson et al., 2014).

When parity was examined, higher self-efficacy was revealed in multiparous women compared to primiparous women, with no statistically significant differences between them. Similarly, in other studies (Amini et al., 2019; Chrásková and Hrach, 2018) no statistically significant differences were found in BSE according to parity. However, some studies showed statistically significant differences according to parity, with multiparous women having higher BSE than primiparous women (Hasri et al., 2023; Marco Alegría et al., 2014).

When examining the correlation of delivery method with mother's self-efficacy in breastfeeding, the self-efficacy of women after vaginal delivery and women after Caesarean section was almost the same, and no significant differences were found between them. These findings are consistent with the results of Dennis et al. (2011), Nursan et al. (2014), and Wheeler and Dennis (2013). Contrary to the above, other studies revealed the association between BSE and the delivery method, stating that mothers with vaginal delivery demonstrated higher levels of BSE (Aluş Tokat et al., 2010; Economou et al., 2021; Ngo et al., 2019).

A statistically significant association was demonstrated between a mother's self-efficacy in breastfeeding and skin-to-skin contact support ($p < 0.001$). Higher self-efficacy was revealed in women who had experienced postpartum skin-to-skin contact with an infant compared to those who had not. It should be noted that the group of women who experienced skin-to-skin contact included not only women with full bonding support according to the recommended procedures but also women with partial bonding support. These were in direct contact with an infant only for a short time after birth, which, however, cannot be considered as bonding support in the true sense of the word. However, we assumed that even minimal contact is better than no contact. Similarly, the study by Aghdas et al. (2014) showed that skin-to-skin contact support was positively associated with higher levels of breastfeeding self-efficacy. The separation of mother and infant at birth was also shown to lead to a decrease in mother-infant interaction and self-efficacy of maternal breastfeeding (Karimi et al., 2014). Syam et al. (2019) found a statistically significant difference between mothers who had immediate and delayed contact with an infant. Mothers who had immediate skin-to-skin contact were able to breastfeed more effectively and showed higher self-efficacy in breastfeeding. Later, these mothers were able to cope with and overcome difficult breastfeeding challenges, thus increasing their breastfeeding success.

A statistically significant association was demonstrated between a mother's self-efficacy in breastfeeding and previous breastfeeding experience ($p = 0.015$). Self-efficacy was higher in women with positive previous breastfeeding experiences compared to those with negative previous experiences. Additionally, there is other evidence that confirms the influence of previous breastfeeding experience on subsequent breastfeeding (Colombo et al., 2018; Huang et al., 2018). Studies provide evidence that the BSES-SF scale may be internationally applicable and can be used to assist health professionals in the care of breastfeeding women (Dennis et al., 2011).

BSE in lactating women can be increased by educational and psychological interventions, as found in studies by Nourizadeh et al. (2023). Focusing on the woman's psychological state should be one of the priorities of midwives (Ďuríčeková et al., 2021).

Limitations

One limitation of the study is the convenience sample, which allows conclusions to be interpreted and generalized only to the selected research sample. The results of our study may also be influenced and positively distorted by the fact that those women who intended to breastfeed were asked to participate in the research. The intention to breastfeed is one of the important factors that often predicts success in breastfeeding. We are aware that in addition to the investigated related factors, other factors may also be related to self-efficacy (such as mother's employment, existing health problems, postpartum depression, partner support, *etc.*). However, despite these limitations, we believe that the study has brought compelling results.

Conclusion

The Slovak version of the BSES-SF shows good psychometric properties and can serve as an effective screening tool to identify mothers who have a chance of overcoming breastfeeding problems, are at risk of early breastfeeding termination, need further education and help in the breastfeeding process, and who need further support aimed at increasing their self-efficacy – thereby improving the overall rate, efficiency, and length of breastfeeding. The confirmed factors related to self-efficacy show the need for individual women-oriented help, particularly for women with higher education and a previous negative breastfeeding experience. They also highlight the importance of skin-to-skin contact support.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the F. D. Roosevelt Faculty Hospital in Banská Bystrica, University Hospital in Bratislava – Hospital of Sts. Cyril and Methodius, and Hospital Zvolen.

All participants received full information about the nature and goals of the research, as well as about the details connected with their involvement in the study. Data collection was anonymous, and all participants expressed their willingness to be included in the study by providing informed consent.

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Conflict of interest
The authors have no conflict of interest to declare.

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