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Research Article

Development and Psychometric Testing of the Fathers' Self-Efficacy Scale for Newborn Care

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SUMMARY

Purpose: Fathers' involvement in newborn care positively affects both work sharing between parents, newborn quality of life, and the relationship between father and newborn. However, there is no valid and reliable measurement tool to evaluate fathers' self-efficacy levels for newborn care. This study aimed to develop the fathers' self-efficacy scale for newborn care (FSSNC) and to examine its psychometric properties.

Methods: This study is an instrument development and validation study. After a comprehensive literature review, expert opinion, and pilot application stages, an item pool was developed. For validity and reliability analyses, data were collected between March and December 2022 from 442 individuals, including fathers with newborn babies and expectant fathers whose partners are pregnant. Validity assessments included content, exploratory and confirmatory factor analyses, and convergent validity. The scale was also evaluated for its internal consistency, and two-half-test reliability. In this study, the STROBE checklist was used as a guideline.

Results: The final version of the scale consisted of three subdimensions (hygiene, safety, and nutrition). The total number of items is 17. Confirmatory factor analysis results confirm the results of exploratory factor analysis. There was a strong correlation between the scale score and the participants' self-assessment score.

Conclusions: The study demonstrates that the FSSNC was a valid, reliable, and user-friendly measurement tool used to evaluate fathers' self-efficacy regarding hygiene, safety, and nutrition in newborn care.

Introduction

The newborn period includes the first 28 days of life after birth and is one of the most critical life stages requiring careful and sensitive care. During this period, mothers and fathers stated that they experienced intense stress regarding newborn care and that they needed the support of their relatives or healthcare professionals to improve their parenting roles in this regard [1–3]. Especially, fathers need more support than mothers in baby care. Because, fathers' parenting self-efficacy is lower than mothers [2,4,5]. Therefore, fathers express that they need more support from mothers in matters related to newborn care [6,7]. Studies have shown that fathers who receive support in newborn care increase their self-efficacy levels and participate more actively in care activities such as feeding and bathing their babies [8,9]. Therefore, nurses and midwiferies should understand the needs of fathers in newborn care and make it easier for them to adapt to their new roles [7,10]. In addition, fathers who are not experienced in baby care need social support from clinical professionals such as midwives and nurses, as well as from experienced people who have had children before, such as relatives and grandparents [7,11].

Recently, in parallel with the cultural, social, and economic changes in society, positive developments have been made in the roles and participation of fathers in newborn care [9,12,13]. Fathers' active involvement in newborn care increases their motivation for newborn care, positive father–infant interaction, and father–infant bonding [14,15]. In addition, the babies of fathers participating in care in the neonatal period have better social and cognitive

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development, lead a healthy and happy life, are more likely to play independently with their toys, and are stronger in the face of problems in the future [16]. Hence, fathers desire to participate in housework and baby care to the same extent as their wives [14,17]. Nonetheless, fathers report having low self-efficacy levels to care for a baby during the newborn period and inadequate access to information on infant care, indicating a need for support in newborn care [18,19].

Bandura's theory of self-efficacy guided the development of the Fathers' Self-Efficacy Scale for Newborn Care (FSSNC). According to Bandura (1977), self-efficacy refers to the belief that individuals hold about their capabilities in various situations [20]. Additionally, self-efficacy influences the maintenance of behavior in terms of how people think and motivate themselves. If people's self-efficacy is low, they will not find themselves sufficient in the situation they face and will not be able to do the job even if they are capable of doing it [21]. In this context, fathers' lack of self-efficacy and knowledge in newborn care negatively affect their participation. Therefore, the measurement tools for determining the knowledge and skills of fathers caring for newborns regarding the characteristics of the period are extremely important for determining the current situation. A limited number of scales in the literature can assess fathers' self-efficacy in newborn care. These scales are generally developed for situations such as fathers' young children (0–12 months) care and breastfeeding self-efficacy [9,22,23]. Although fathers are thought to be the biggest supporters of mothers who have babies during the newborn period, there is no scale developed specifically for fathers [22]. Scales developed for parents were mostly used to evaluate mothers' self-efficacy levels. When this scale was used for fathers, some items were removed and it decreased from 3 dimensions to 2 sub-dimensions. This shows us that mothers participate in more aspects of baby care than fathers [9,22]. For example, while mothers breastfeed the baby, fathers can only support mothers in breastfeeding [23]. For this reason, different scales used to evaluate the self-efficacy of mothers and fathers regarding baby care will yield more accurate results. However, no valid and reliable measurement tool focusing on fathers' newborn care has been found. This study was more specific than other scales in the literature and aimed only to examine fathers' self-efficacy in caring for newborn babies.

Since the newborn period requires special attention and care, fathers often feel inadequate in caring for their babies and need clinical supports [1,9,19]. Therefore, the proposed scale was designed to determine the self-efficacy levels of fathers regarding their issues in newborn care. Using this scale will help researchers, midwifery, and pediatric nursing determine the needs of fathers, plan educational activities and organizations related to newborn care, and increase fathers' participation in newborn baby care. This increase in participation might promote job sharing between parents, marital satisfaction, positive father–infant interaction, and father–infant attachment. Ultimately, such interventions might have a positive impact in terms of improving newborn quality of life.

Hence, this study aimed to develop a valid and reliable measurement tool with psychometric qualities for assessing the father's self-efficacy for newborn care.

Methods

Study design

This cross-sectional study, which aimed to investigate the psychometric properties of the FSSNC, was designed to be conducted in three stages in line with the suggestions by Boateng et al [24]. These stages were (1) item development, (2) scale development, and (3) scale evaluation (Figure 1).

Participants and setting

The sample for the study consisted of fathers with newborn babies and fathers whose partners are pregnant. It was suggested that a study group of 200 people would be sufficient for factor analysis, and both exploratory and confirmatory factor analyses should be performed in different sample groups [24–26]. Therefore, the aim was to reach at least 200 study groups for both exploratory factor analysis and confirmatory factor analysis.

The study group consisted of the husbands of women who presented for antenatal or postnatal check-ups at obstetric outpatient clinics between March and December, 2022, in a province in southern XXXX. Women presenting for antenatal check-ups were Q2 in their pregnancies, and their husbands were expectant fathers. Women who presented for postnatal check-ups had newborn babies, and their husbands were fathers. Fathers participating in the study were asked to have the following characteristics: their spouses had a healthy pregnancy and birth process, their babies did not have any congenital anomalies, they had not previously received training on newborn care, and they were willing to participate in the research voluntarily.

Convenience sampling method was used in the research. Research data were collected by the researchers from the participants using face-to-face interviews. The researchers first explained the study's purpose and inclusion and exclusion criteria and asked whether the participant had received neonatal care training prior to sharing the voluntary consent form. In the first stage, the data were collected from 219 individuals who agreed to participate in the study for exploratory factor analysis to determine the scale's factor structure. In the second stage, the data were collected from 223 individuals who agreed to participate in the study for confirmatory factor analysis to validate this structure. The data were collected from 442 participants.

Data collection tools

Sociodemographic questionnaire

This form consisted of eight items related to the father's age, educational status, income, occupation, social security, place of residence, paternity status (fathers with newborn babies or fathers whose partners are pregnant), and whether the pregnancy was planned or not. At the end of the data collection, participants were asked to evaluate their self-efficacy for newborn care with a single question: Considering the questions you answered earlier, how ready do you feel to care for a newborn baby? The participants were asked to rate this question on a scale of 1 to 10 (1 = I do not feel ready at all; 10 = I feel completely ready).

Fathers' self-efficacy scale for newborn care

Development of the scale

The FSSNC items were created based on the review of research articles from various databases, including PubMed, The Cochrane Library, Science Direct, Web of Science, Ebsco, and Scopus. As a result of this review, scale studies [9,22,27,28], qualitative, randomized, and descriptive studies on the subject were found [1,7,14,19,29–33].

After the 64-item pool stage, the draft scale was submitted to expert opinion in line with the Davis technique. Ten experts (three faculty members working in the field of pediatrics nursing for more than 20 years, two faculty members working in the field of neonatal nursing health and diseases for more than 25 years, three faculty

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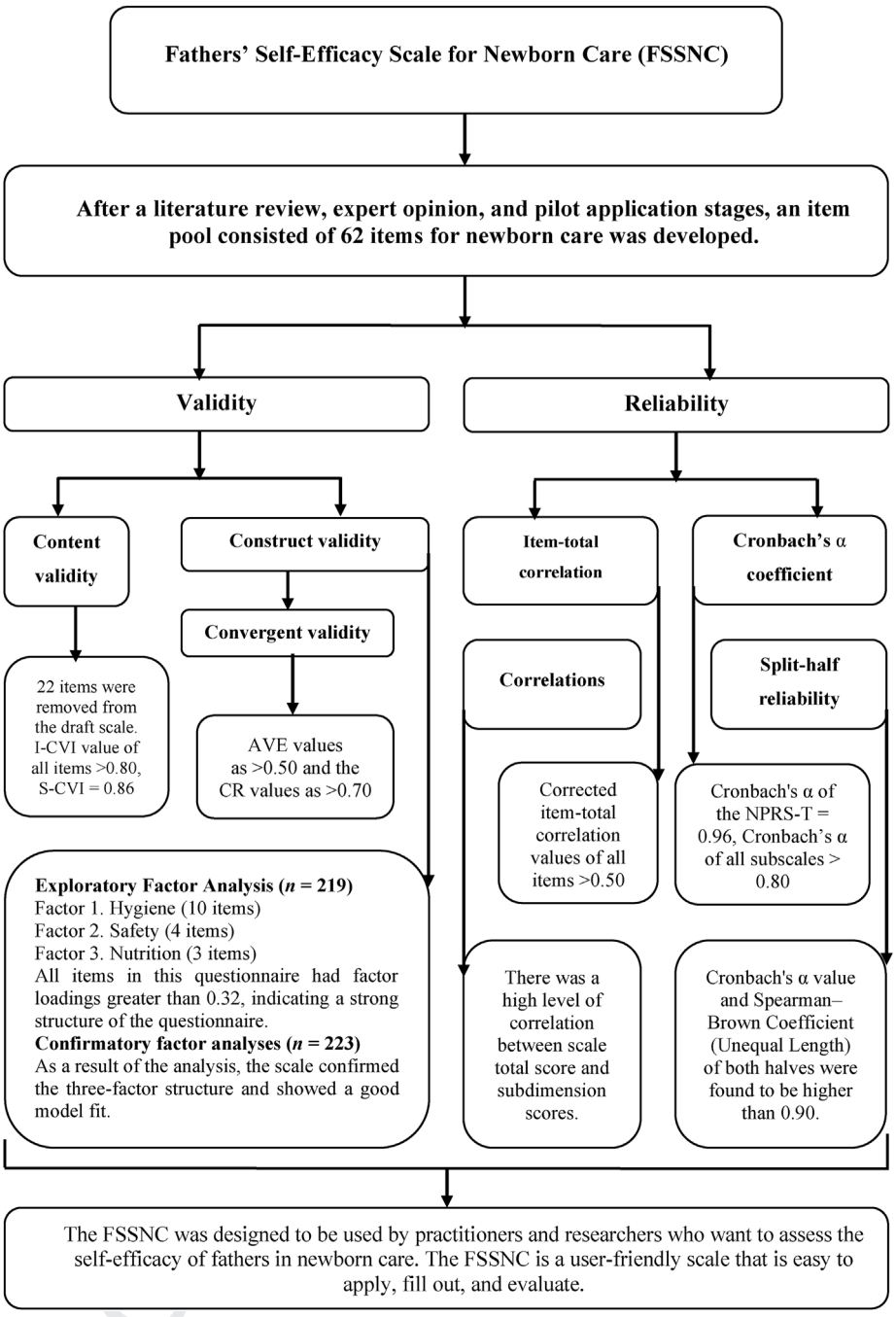

Figure 1. Scale development process of the Fathers' Self-Efficacy Scale for Newborn Care (FSSNC).

members working in the field of obstetrics and gynecology in midwifery department for more than 15 years, and two specialist nurses working in the neonatal service) evaluated the draft scale items in terms of comprehensibility and relevance (1 = not relevant; 2 = relevant to some extent; 3 = relevant; 4 = completely relevant) [34].

After obtaining expert opinions, a pilot study was conducted with 30 participants who met the criteria for participation in the study. The comprehensibility of the questions and the time taken by the participants to complete the draft scale were evaluated during the piloting process. Participants reported that the questions were understandable, and they completed the form in an average of 10 min. Participants who participated in the pilot study were excluded from the study sample. After the expert opinion and pilot application process, the draft scale consisting of 42 items and a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) was applied to the entire sample group.

Data analysis

The data were analyzed using SPSS 27 and AMOS 21 programs. The demographic characteristics of fathers were presented as frequency and percentage for categorical variables and as the mean and standard deviation for continuous variables. Content validity was used to assess whether the items in the scale adequately reflected the concepts explored and assessed with the content

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validity index (CVI). For the Item Content Validity Index (I-CVI), the reference minimum value considered acceptable was 0.80 [34]. The construct validity of the scale was examined using factor analysis. The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed in two different sample groups. EFA was performed using principal axis factoring and direct oblimin rotation factor analysis methods to create the potential factor structure of the scale. Prior toproceeding, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were conducted to assess the appropriateness of the data for factor analysis. If the KMO value is above 0.80, it indicates that the sample size is suitable for factor analysis. Additionally, a statistically significant result in Bartlett's test of sphericity ($p < .05$) demonstrates that the dataset is appropriate for factor analysis [35]. The factor structure obtained with EFA was confirmed with CFA. While a cutoff value of 0.40 is recommended for factor loadings in EFA results, the minimum factor loading accepted is 0.32. Typically, factors with eigenvalues of 1.0 and above are considered significant and retained in the model. A component with an eigenvalue less than 1 can usually be discounted [35].

In CFA analysis, the goodness-of-fit index (GFI), adjustment goodness-of-fit index (AGFI), comparative fit index (CFI), root mean square error of approximation (RMSEA), normed fit index (NFI), and Tucker–Lewis index (TLI) were calculated. Guidelines for interpreting goodness-of-fit indices are a subject of considerable debate within the statistical community. Debates often center on questions such as which indices should be utilized and what cutoff criteria should be applied to differentiate between good and poor model fits. For instance, it is generally recommended that if the root mean square error of approximation (RMSEA) is greater than or equal to 0.1, the model should be rejected as it indicates a poor fit. Conversely, an RMSEA value less than 0.05 is often considered indicative of a good fit. Moreover, RMSEA values between 0.05 and 0.1 are typically seen as indicating an acceptable fit, suggesting that while the model may not perfectly represent the data, it is still reasonably accurate [35].

Convergent validity is a type of validity that indicates a significant correlation between measures of theoretically similar concepts. Commonly used indicators of convergent validity were average variance extracted (AVE) and construct reliability (CR). The convergent validity is good when the AVE value is greater than 0.50 and the CR value is greater than 0.70 [26].

The reliability of the scale was examined with Cronbach α coefficient, two-half-test reliability, and item-total score correlation. The relationship between the scale and its subdimensions and self-assessment scores was examined by Pearson correlation analysis. The normal distribution of the total scale score was examined by calculating the kurtosis and skewness values. For all analyses, a p value <.05 indicated statistical significance.

Ethical approval

The study design process started in October 2021, and the researchers collected data after receiving ethics committee approval (decision no: 1XXX) on March 29, 2022. The research permission (no: 9XXX) was granted by a hospital. All participants provided written informed consent. The study was completed on December 14, 2022.

Results

The demographic characteristics of the participants are presented in Table 1. The mean age of the participants was 31.23 ± 5.02 years (min = 20, max = 47). It was determined that 62.0% of the participants were university graduates, 90% had social security, 46.6% had income equal to expenses, and 79.9% lived in the city center. Further, 57.9% of the participants were fathers with newborn babies, and 42.1% were expectant fathers whose wives were pregnant. Also, 79.9% of the participants stated that their wives' pregnancies were planned. The mean self-assessment score of the participants was 6.16 ± 2.55 (min = 1, max = 10).

Table 1 *Demographic Characteristics of the Participants (n = 442).*

Descriptive characteristics	Mean	SD (Min–Max)
Age	31.23	5.02 (20–47)
	n	**%**
Education level		
Primary school	88	19.9
High school	80	18.1
University	274	62.0
Social security		
Yes	398	90.0
No	44	10.0
Income status		
Income less than expenditure	140	31.7
Income equals expenditure	206	46.6
Income more than expenditure	96	21.7
Your residential location		
District	67	15.2
Village	22	5.0
City	353	79.9
Paternity status		
Fathers with newborn babies	186	42.1
Fathers whose partners are pregnant	256	57.9
Pregnancy planning		
It was planned	353	79.9
It was not planned	89	20.1

In developing the item pool, the researchers first searched various academic databases to collect relevant publications and conducted a comprehensive literature review on the topic. This rigorous process involved identifying and reviewing relevant scales, descriptive studies, randomized controlled trials, and qualitative studies. Thanks to this review of the existing literature, the researchers created the item pool required for the scale topic. The item pool consisted of a total of 64 items.

Item development and tool development stage

Validity analysis

Content validity

Following expert reviews of the items, CVIs were calculated for 64 items. As a result of these evaluations, 22 items which were based on CVI below 0.80, as required by the Davis technique, were removed from the draft scale. The remaining 42 items of the draft scale had a CVI of 0.91. The item-based content validity indices ranged between 0.88 and 1.00. After expert opinions were incorporated into the pilot sample group, the 42-item draft scale was obtained and its comprehensibility was evaluated.

Exploratory factor analysis (n = 219)

The exploratory and confirmatory factor analyses were conducted on different sample groups. For construct validity, the EFA was first conducted using the data of 219 participants. Bartlett's test of sphericity was significant ($\chi^2 = 6356.277$, $df = 171$, $p < .001$), indicating that factor analysis was appropriate for the data. The KMO statistic was 0.96 (>0.80), indicating that the data were suitable for factor analysis. The 25 items with factor loadings below 0.30 were removed. The final scale consisted of 17 items. According to the EFA results, three factors had initial eigenvalues greater than

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one. The first factor, the hygiene subscale, consisted of 10 items with factor loadings ranging from 0.515 to 0.947. The second factor, the safety subscale, consisted of four items with factor loadings ranging from 0.623 to 0.905. The third factor, the nutrition subscale, consisted of three items with factor loadings ranging from 0.329 to 0.949. The total scale explained 70.632% of the total variance. The results of the factor analysis are presented in Table 2.

Confirmatory factor analyses (n = 223)

The CFA was conducted using the data of the remaining 223 participants to confirm the three-factor structure identified based on the results of the exploratory factor analysis. The correlations among error variances were allowed to improve model fit based on the modification indices generated using the AMOS program. The analysis confirmed the three-factor structure of the scale and showed a good model fit. According to CFA, $\chi^2/df = 2.665$, GFI = 0.865, AGFI = 0.815, CFI = 0.935, RMSEA = 0.087, NFI = 0.900, and TLI = 0.921. The path diagram showing the factor loadings drawn using the AMOS program is presented in Figure 2. The factor loadings of the first subdimension were between 0.66 and 0.82, the factor loadings of the second subdimension ranged between 0.70 and 0.88, and the factor loadings of the third subdimension ranged between 0.83 and 0.91 (Figure 2).

Convergent validity

The AVE estimates for the three subdimensions of the FSSNC were 0.55, 0.62, and 0.77, and the CR values were 0.92, 0.87, and 0.91. The convergence validity of the FSSNC was considered acceptable.

Reliability analysis

Cronbach α coefficient for the whole scale was 0.964. The Cronbach α coefficients of the subdimensions were 0.946 for hygiene, 0.884 for safety, and 0.919 for nutrition. The corrected item-total correlations ranged from 0.637 to 0.846, indicating that the items were fairly homogeneous. Table 3 presents the item mean scores, item-total correlations, and Cronbach α coefficient with the item deleted for each item in the scale.

A statistically significant positive and extremely strong linear relationship was found between the total scale score and the hygiene subscale ($r = .979$, $p < .001$). Further, a statistically significant positive and strong linear relationship was observed between the total scale score and the safety subscale ($r = .878$, $p < .001$). Moreover, a statistically significant positive and extremely strong linear relationship was noted between the total scale score and the nutrition subscale ($r = .902$, $p < .001$). Also, a statistically significant positive linear relationship was found between the fathers' self-assessment score and the total scale score at a strong level ($r = .822$, $p < .001$), between the hygiene subscale at a strong level ($r = .790$, $p < .001$), between the safety subscale at a strong level ($r = .724$, $p < .001$), and between the nutrition subscale at a strong level ($r = .783$, $p < .001$).

Within the scope of split-half reliability, the scale was divided into two halves according to the odd–even rule. The Cronbach α coefficient of the first half, which included odd-numbered items in each subscale, was calculated as 0.928, and the Cronbach α

Table 2 *Factor Loading of the Fathers' Self-Efficacy Scale for Newborn Care (FSSNC).*

Item No		Factor		
		Hygiene	Safety	Nutrition
h1	I can help my partner give my baby a bath (adjusting the temperature of the bath water. preparing the bath tools. etc.).	**0.755**	0.186	−0.030
h2	I can take care of my baby when cradle cap/seborrheic dermatitis (yellowish crusty flakes on the scalp) occurs.	**0.947**	−0.014	−0.106
h3	I can care for my baby's eyes when pus, discharge, redness, etc. occurs.	**0.895**	0.026	0.003
h4	I can care for my baby's mouth when canker, thrush, redness, etc. occurs.	**0.849**	0.000	0.092
h5	I can care for my baby's ears when discharge, wax, etc. occurs.	**0.826**	0.021	0.054
h6	I can care for my baby's nose with the tools used in nose cleaning (nasal aspirator, etc.) when discharge, congestion, etc. occurs.	**0.811**	−0.045	0.054
h7	I can keep the navel area of my baby dry and clean and care for it in case of discharge, redness, etc. until the umbilical cord falls off.	**0.876**	−0.104	−0.001
h8	I can cut my baby's nails appropriately (fingernails round, toenails flat).	**0.686**	0.043	0.045
h9	I can do diaper care (cleaning, diaper rash control, diaper change, etc.) when my baby's diaper is dirty.	**0.527**	0.014	0.167
h10	I can change my baby's clothes.	**0.515**	0.346	0.031
s11	I can ensure my baby's environmental safety (a flat floor where they will not fall, a suitable position where they can breathe easily, etc.).	−0.080	**0.905**	0.046
s12	I can hold my baby safely (by supporting their head, shoulders, and waist).	0.208	**0.808**	−0.154
s13	I can carry my baby in the appropriate position with baby carriers (kangaroo bag, stroller, bag-type carrier, etc.).	−0.095	**0.875**	0.087
s14	I can safely burp my baby in the appropriate position (on my lap, with their head resting on my shoulder, patting their back).	0.210	**0.623**	0.098
n15	If their mother is unable to breastfeed, I can prepare the right amount of formula at the right temperature when my baby is hungry.	0.166	0.415	**0.329**
n16	If their mother is unable to breastfeed, I can feed my baby correctly with the appropriate bottle or spoon when my baby is hungry.	0.063	−0.024	**0.949**
n17	If their mother cannot breastfeed, I can understand when my baby is full when I feed them formula.	0.039	0.054	**0.758**
Rotation Sums of Squared Loadings Total		*8.936*	*6.308*	*5.428*
Initial Eigenvalues (Total)		*9.952*	*1.734*	*1.083*

Extraction method: Principal axis factoring.
Rotation method: Oblimin with Kaiser normalization.
h = hygiene; s = security; n = nutrition.

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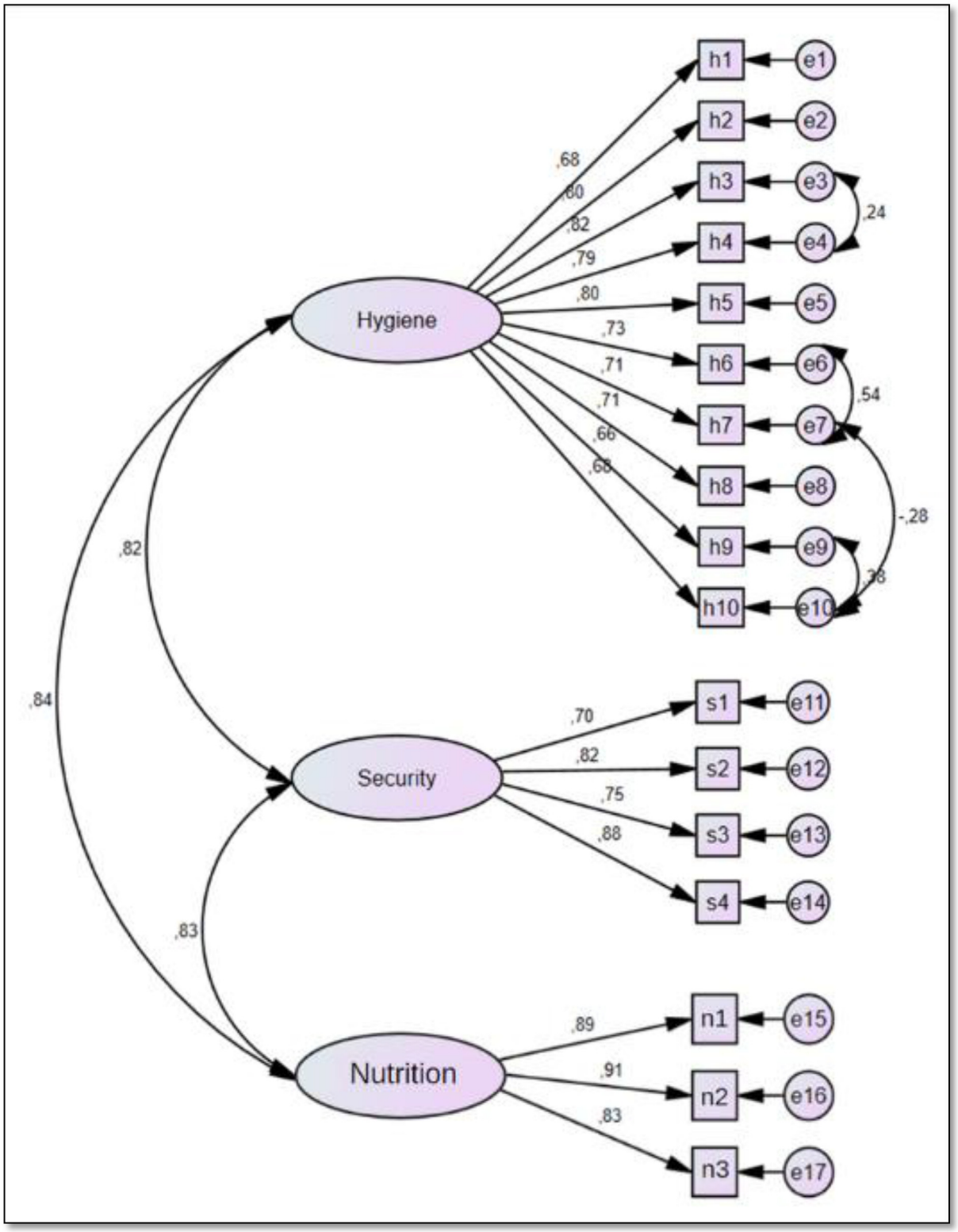

Figure 2. Confirmatory Factor Analysis of Fathers' Self-Efficacy Scale for Newborn Care (FSSNC).

coefficient of the first half, which included even-numbered items, was calculated as 0.932. The correlation coefficient between the two halves was 0.938. Spearman–Brown coefficient (unequal length) value was 0.968, and the Guttman split-half coefficient value was 0.968.

Discussion

In this study, a valid and reliable new scale that could be used to assess fathers' self-efficacy for newborn care was developed. The researchers followed the validity and reliability steps

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Table 3 *Fathers' Self-Efficacy Scale for Newborn Care (FSSNC) Item Mean Scores, Item Corrected Total Correlations, and Subscale Cronbach α Coefficient.*

	Mean ± SD	Corrected item-total correlations	Cronbach α Coefficient
Hygiene	37.04 ± 10.87		0.946
h1	4.22 ± 1.04	0.657	
h2	3.44 ± 1.40	0.831	
h3	3.86 ± 1.13	0.831	
h4	3.56 ± 1.39	0.846	
h5	3.94 ± 1.05	0.789	
h6	3.52 ± 1.47	0.824	
h7	3.22 ± 1.59	0.813	
h8	3.57 ± 1.40	0.739	
h9	3.67 ± 1.34	0.709	
h10	4.05 ± 1.28	0.745	
Security	17.51 ± 3.37		0.884
s1	4.67 ± 0.69	0.637	
s2	4.50 ± 0.83	0.756	
s3	4.18 ± 1.17	0.735	
s4	4.17 ± 1.13	0.823	
Nutrition	11.25 ± 3.74		0.919
n1	3.92 ± 1.33	0.835	
n2	3.81 ± 1.26	0.806	
n3	3.52 ± 1.43	0.795	
Total scale	65.81 ± 16.98		0.964

recommended by Boateng et al [24] during the scale development process.

Validity of the scale

Content validity

The content validity assesses the extent to which an instrument measures its intended constructs, including the sufficiency and distribution of its items [36]. The content validity values were found to be high at both the scale and item levels. These results revealed that the scale had sufficient content validity [34]. In addition, in the pilot study, the participants did not report any serious problems regarding the comprehensibility of the scale items.

Construct validity

The construct validity assesses the extent to which the scale corresponds to the test results and explains whether the structure of the scale is consistent with its theoretical concept and structure [37]. Factor analysis is commonly used to assess construct validity, and this technique categorizes highly correlated observed variables into groups based on specific rules, with each group sharing a common factor representing the underlying structure of the scale. Q5 AFA is an extremely useful analytical method that can empirically determine how many constructs, latent variables, or factors underlie a set of items [25]. The construct validity of the questionnaire was evaluated by factor analysis and convergent validity. The loading value obtained in factor analysis is the critical value that determines whether an item belongs to a particular subfactor or not. Generally, items with factor loadings <0.30 should be removed from the questionnaire [38]. All items in this questionnaire had factor loadings greater than 0.30, indicating a strong structure of the questionnaire. The 25 items with factor loadings below 0.30 were removed. The final scale consisted of 17 items. Finally, according to the final exploratory factor analysis results, the 17 items grouped under three factors explained 70.632% of the total variance. CFA confirmed the three-factor structure determined by EFA in different sample groups. In the CFA analysis, the factor loading values of all items were calculated to be above 0.50. Calculating the AVE values as >0.50 and the CR values as >0.70 indicates that convergent validity has been achieved [26,35]. No international standard exists on which fit indices should be reported after CFA analysis [39]. In this study, the values of χ^2/df, GFI, AGFI, CFI, RMSEA, NFI, and TLI were calculated within acceptable limits [25,39,40].

Reliability of the scale

The Cronbach α coefficient of the scale was 0.964, and the Cronbach α coefficients of all subdimensions were higher than 0.80. In addition, the corrected item-total correlation values of all the items were higher than 0.50 [41,42]. These results confirmed that the internal consistency of the scale was high. Thus, it was interpreted that the items of the scale had a homogeneous structure within themselves. Within the scope of split-half reliability, Cronbach α coefficient and Spearman–Brown coefficient (unequal length) of both halves were calculated to be higher than 0.90 [25,26]. The results obtained from all reliability analyses revealed that the scale was reliable.

Statistically significant correlations were expected between the total scores of the scale and subdimensions measuring the same construct. The scale's total score was highly correlated with the total scores of the subdimensions. At the end of the data collection form, participants were asked to evaluate their self-efficacy toward newborn care with a single question. Participants scored this question between 1 and 10 (1 = I do not feel ready at all; 10 = I feel completely ready). A strong correlation was found between the participants' self-efficacy assessment score for neonatal care and the total scale score. These results showed that the developed scale was compatible with itself. In addition, the participants' self-assessment scores and the scores they obtained from the scale showed a high level of parallelism.

The FSSNC was developed as a self-efficacy questionnaire that used a 5-point Likert scale across 17 items. The measure consisted of three factors: hygiene (1), safety (2), and nutrition (3). The first factor in the FSSNC dealt with the self-efficacy of fathers in taking care of their babies' eyes, ears, nose, mouth, face, belly, nails, and head, to what extent they could help their wives while bathing their babies, and to what extent they could change diapers and dirty clothes. In many studies conducted with fathers on newborn care, it was observed that fathers mostly lacked skills and self-confidence in bathing their babies. It was found that fathers generally could not wash their babies alone; they washed them with their spouses or helped their spouses while washing their babies [14,19]. In addition, many fathers expressed the need for mothers' support in various aspects of newborn care. Mothers generally handled tasks such as changing diapers and did not want to involve fathers in other caregiving practices [19]. The initial factor structure of the FSSNC investigated which hygienic practices fathers found inadequate to perform in baby care. Practical training sessions should be organized by midwives and nurses to address these issues in which fathers may lack confidence. Further, both parents should participate in these trainings together.

The second factor in the FSSNC was security. It included items that evaluated fathers' self-efficacy regarding providing a safe environment for their babies, carrying them in appropriate positions with carrier materials, holding them in their arms safely, and burping the baby. In a study, fathers were hesitant to safely hold, carry, and touch babies because babies were sensitive and fragile [30]. It stated that especially those who would become fathers for the first time needed more support and training on these issues [1,2], and that real babies should be used instead of artificial babies to learn these practices [19]. In addition, a comparative study conducted with young and adult first-time fathers found that adult

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fathers were better at care practices, such as holding the baby and burping the baby, compared with young fathers [31]. Young fathers who become fathers for the first time should be given more detailed information about ensuring the baby's safety.

The third factor in the FSSNC consisted of items addressing fathers' self-efficacy regarding preparing formula if breast milk was not available, understanding when the baby should be fed, and recognizing when the baby was full. It was found that breastfeeding and feeding the baby were among the topics that fathers found themselves inadequate in baby care and needed more information [9,14,22]. As breastfeeding the newborn baby is of great significance, fathers' breastfeeding self-efficacy should be developed and supported [17,23]. However, in some cases where the mother cannot breastfeed, fathers should prepare the formula if the breast milk is not readily available. They should discern whether their babies are hungry and full.

The scale developed for parents in the literature consists of 3 sub-dimensions and 15 items. Additionally, this scale is related to the care of babies between 0 and 12 months [22]. When this scale was adapted only to fathers with 0–4 year old children, a two-factor structure emerged. Additionally, two items from this scale were removed and the number of scale items became 13 [9].

The FSSNC we have only developed for fathers is more specific than the scales developed for parents and fathers, focuses only on neonatal care, and consists of three sub-dimensions: "hygiene", "safety", and "nutrition". In addition, although there are a few items on the baby's nutrition in these two developed scales, there are no items on hygienic care and safety. Identifying fathers' shortcomings in this area and providing essential support are crucial to increase their participation in newborn care. The FSSNC is expected to play an essential role in this process.

Limitations

The scale proposed in this study had several limitations. First, the development of the scale was based on a sample of a specific geographical region in XXXX. This has raised the questions of its validity and reliability in other regions or among fathers from different cultural or socioeconomic backgrounds. Second, the perception of self-efficacy is a subjective concept, and participants are likely to modify their responses based on social desirability or other individual factors. This may limit the scale's ability to measure self-efficacy accurately. Additionally, although the scale addresses some self-efficacy elements in newborn care, it is possible that other important elements may be left out. Further studies are needed to determine whether the scope of the scale fully covers all facets of self-efficacy in newborn care.

Conclusions

The authors of this study anticipated that the FSSNC might be useful for assessing fathers' self-efficacy for newborn care. This scale was designed to be used by practitioners and researchers who wanted to evaluate the self-efficacy of expectant fathers whose spouses were pregnant and those with newborn babies. The FSSNC is an easily implemented and user-friendly scale. Furthermore, the scale can be used to evaluate the effectiveness of different educational programs and interventions to improve practice skills by comparing FSSNC scores before and after any intervention for newborn care. In addition, the FSSNC can be used to investigate the factors affecting a father's self-efficacy toward newborn care. In conclusion, the FSSNC is a valid and reliable measurement tool that can be used to assess fathers' self-efficacy for newborn care. At the end of the evaluation, nurses and midwives should determine the issues related to newborn care that fathers need in the clinic, support them, and facilitate their adaptation to their new roles.

Ethic approval

The study design process started in October 2021, and the researchers collected data after receiving ethics committee approval (decision no: 100) on March 29, 2022. The research permission (no: 932) was granted by a hospital. All participants provided written informed consent. The study was completed on December 14, 2022.

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Author contribution

Sevilay Ergün Arslanlı: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Validation; Resources; Wititng-original draft; Review & Editing. **Ayda Çelebioğlu:** Conceptualization; Data curation; Formal analysis; Investigation; Project administration; Supervision; Review & Editing). **İsa Çelik**: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Resources; Writitng-original draft; Review & Editing. **Nezaket Bilge Uzun:** Conceptualization; Data curation; Formal analysis: Supervision; Review & Editing.

Conflict of interest

The authors declare no conflicts of interest.

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Appendix A. Supplementary data

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