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Reliability and validity study of the childbirth skills self-efficacy scale

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Abstract

This study aimed to develop a questionnaire scale to self-assess the normal childbirth skills. The study was designed as a cross-sectional and methodological. Participants were drawn from two universities in the Aegean region of western Turkey. The study sample consisted of 390 3rd- and 4th-year midwifery students. Data were collected using the Descriptive Information Form and the 36-item draft version of the Childbirth Skills Self-Efficacy Scale. Exploratory and confirmatory factor analysis was performed within the scope of validity. Reliability was evaluated with the Cronbach's alpha method and item-total correlations. A five-factor structure which explained 69.09% of the total variance was obtained by factor analysis. The dimensions indicated by the 5-factor structure were named as follows: delivery preparation and support (10 items), pelvic examination (3 items), vaginal examination (6 items), intervention during delivery (5 items), and postpartum management (10 items). Model fit indices were at an acceptable level. The Cronbach's alpha coefficient of the scale was 0.96. The Childbirth Skills Self-Efficacy Scale can provide an acceptable measurement tool for determining midwifery students' self-efficacy related to their childbirth skills. *(Afr J Reprod Health 2024; 28[11]:26-38).*

Keywords: Childbirth skills, midwifery, self-efficacy, validity, reliability, scale

Résumé

Cette étude visait à élaborer une échelle de questionnaire pour l'auto-évaluation des compétences en matière d'accouchement normal. L'étude a été conçue comme une étude transversale et méthodologique. Les participants provenaient de deux universités de la région égéenne de l'ouest de la Turquie. L'échantillon de l'étude était composé de 390 étudiantes sages-femmes de 3e et 4e année. Les données ont été recueillies à l'aide du formulaire d'information descriptive et de la version préliminaire de l'échelle d'auto-efficacité en matière de compétences d'accouchement (36 questions). Une analyse factorielle exploratoire et confirmatoire a été réalisée dans le cadre de la validité. La fiabilité a été évaluée à l'aide de la méthode alpha de Cronbach et des corrélations item-total. Une structure à cinq facteurs expliquant 69,09 % de la variance totale a été obtenue par l'analyse factorielle. Les dimensions indiquées par la structure à 5 facteurs ont été nommées comme suit : préparation et soutien à l'accouchement (10 items), examen du bassin (3 items), examen vaginal (6 items), intervention pendant l'accouchement (5 items) et gestion du post-partum (10 items). Les indices d'ajustement du modèle étaient à un niveau acceptable. Le coefficient alpha de Cronbach de l'échelle était de 0,96. L'échelle d'auto-efficacité en matière d'accouchement peut constituer un outil de mesure acceptable pour déterminer l'auto-efficacité des étudiantes sages-femmes en ce qui concerne leurs compétences en matière d'accouchement. *(Afr J Reprod Health 2024; 28 [11]: 26-38).*

Mots-clés: Compétences en matière d'accouchement, sage-femme, auto-efficacité, validité, fiabilité, échelle

Introduction

Self-efficacy is a concept whose importance is increasingly understood in almost every field. Bandura defined self-efficacy in terms of social-cognitive theory the belief with which a person can initiate an action and pursue that action until he or she accomplishes results[1,2]. Self-efficacy can be considered as both task-specific self-efficacy and general self-efficacy. General self-efficacy is the belief in one's competence to cope with a broad and stable sense of personal competence in various stressful situations. Task-specific self-efficacy is situation-specific, related to targeted behavior. Individuals with self-efficacy regarding targeted behavior can perform task-specific skills accurately and decisively, and when faced with negative or unexpected events, they display a confident approach to overcome them and to achieve results[2–4].

It is vital for midwives to have a high level of task-specific self-efficacy regarding vaginal delivery management to make the right decisions during labor and reliably display appropriate behaviors to perform interventions. Therefore, developing this kind of self-efficacy is an important goal of midwifery education[4,5]. Guidelines recommend that midwifery students learn the skills for delivering vaginal births during their undergraduate education and deliver 40 vaginal births before graduation[6,7]. It is important for midwifery students to develop normal delivery-related self-efficacy through education if they are to provide high quality care in their clinical practice and manage deliveries safely. Educators therefore play an important role in increasing midwifery students' self-efficacy regarding normal delivery[5,8,9]. Several studies have shown that midwifery students' self-efficacy levels can be improved by providing vaginal birth skills training[4,10–14]. One of the leading goals of midwifery education programs is to provide students with the necessary competence in managing vaginal birth. Educators use various methods to evaluate midwifery students' post-training proficiency in vaginal birth skills, such as checklists, observations, and simulation applications[5,10,13,15]. However, students' self-perceptions and self-evaluations regarding their vaginal birth skills have been overlooked. If midwifery students' normal delivery skills-related self-efficacy can be measured, then they and their educators can be guided in which skills need further development. Based on this, a tailored skills-training plan can be created in line with the students' needs, strategies to facilitate their learning can be developed, and measures can be taken to eliminate factors that reduce self-efficacy[5,10,13]. It is important for midwifery students to evaluate their competencies specific to vaginal delivery from their own perspective because making the right decision during labor and displaying reliable and appropriate behaviors to perform interventions. Accordingly, the present study was conducted to develop a measurement tool for self-assessment of student midwives' self-efficacy related to vaginal birth skills.

Methods

Design

A descriptive, quantitative research design was used in this study.

Setting and sample

The present study was conducted between May and June 2022 with midwifery students attending two universities in the Aegean region of western Turkey. University midwifery programs in Turkey last 4 years (8 semesters), with vaginal birth skills training provided during the fifth semester[7]. The study sample consisted of 3rd- and 4th-year midwifery students who had completed both their theoretical and practical training on vaginal birth skills. For scale development studies, the sample size should be five to ten times larger than the number of the items in the scale[16,17]. Hence, we calculated to include 360 people, representing 10 times the number of scale items. We also targeted

additional participants considering the possibility of losses during the study, resulting in a sample size of 390.

Data collection

Data were collected using two instruments.

Descriptive Information Form: This form was used to collect the following demographic and other information: which university the students attended, their age, university year level, whether they chose the midwifery department of their own free will, and how much they liked midwifery as a profession (min=1, max=10)[4,8,10].

Childbirth Skills Self-Efficacy Scale (CSSES): The 36-item draft form of the scale was used to collect data. After initial analysis, a 34-item tool with five dimensions was then used to assess the students' birth skills-related self-efficacy. The dimensions were delivery preparation and support, pelvic examination, vaginal examination, intervention during delivery, and postpartum management, measured by 10, 3, 6, 5, and 10 items, respectively. The responses were rated on a 4-point Likert-type scale, ranging from 1 to 4 (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree). No item was reverse scored. Thus, the minimum and maximum possible scores were 34 and 136, respectively, with higher scores representing higher vaginal birth-related self-efficacy.

Data analysis

The data were analyzed using SPSS Statistics (Statistical Package for Social Sciences) for Windows, Version 25.0, and AMOS (Analysis of Moment Structures) 22.0. First, descriptive statistics (frequencies, percentage, arithmetic means, and standard deviations) were calculated. Then, item total score analysis and Cronbach's alpha coefficients were used, to evaluate the internal consistency of the overall scale and its dimensions. Bartlett's test of sphericity was used to determine the data's suitability for factor analysis. While the Kaiser-Meyer-Olkin (KMO) test was used to assess sample adequacy, principal component analysis with varimax rotation was used to determine the scale's factor structure. Exploratory factor analysis (EFA) was used to check the scale's construct validity of the scale. Finally, to test the confirmability of the construct resulting from the EFA, confirmatory factor analysis (CFA) was performed in IBM SPSS AMOS 22.0 program.

Ethical approval

The present study was carried out in accordance with the principles of the Declaration of Helsinki and approved by the Clinical Research Ethics Committee of Manisa Celal Bayar University Faculty of Medicine (April 30, 2022, No. 20.478.486). Institutional approval to collect data for the study was obtained from the midwifery

departments of the two universities' health sciences faculties. Information about the objective and scope of the study was provided to the midwifery students who participated in the study, and their written informed consent was obtained.

Results

Validity

Language validity

Questionnaire development followed a three-stage approach. In the first stage, the researchers, who are experienced in midwifery education, created an item pool and a draft scale to assess vaginal birth skills self-efficacy perceptions in line with the relevant literature[5,10,13–18]. In the second stage, the 36 items included in the draft scale were presented to eight midwifery lecturers who provide vaginal birth skills training, and seven midwives who work in delivery rooms. They were asked to review the initial item bank and evaluate the items for content validity.

Content validity

"Davis technique'' was used to calculate the content validity index (CVI) of the scale. In the Davis technique, the experts evaluate the items with four degrees (item is appropriate, item should be slightly revised", "item should be seriously revised" and "item is not appropriate"). The number of experts who rated the items as "appropriate" and "the item should be slightly revised" is divided by the total number of experts to obtain the "CVI" for the item. It is recommended that an item should be removed from a scale if its content validity index (CVI) is below 0.80[19–21]. In our study, none of the items had CVIs below 0.87; thus, no item was removed. In the third stage, a questionnaire form containing the 36 items was pilot tested with 10 students studying in the midwifery departments of two universities in western Turkey to determine whether the scale was understandable. The data obtained from the pilot test are not included in the analyses in this paper. Based on the pilot test results, all 36 items were included in the draft scale (Table 1).

Participant attributes

The mean age of the participants was 21.91±1.50 years. Of these, 53.6% were students at 1. University and 46.4% were students at 2. University, 54.1% were the 3rd-year and 45.9% were 4th-year students, 77.4% chose the midwifery department of their own free will. The average level of liking the midwifery profession was 7.64±1.70. Their academic grade point average was 3.22±0.30 (Table 2)

Exploratory factor analysis (EFA) and factor naming

Before the EFA was performed, the KMO test value was calculated to evaluate the adequacy of the sample size. The value was 0.953. The Bartlett's test of sphericity's chi-square value was $\chi^2(561)=11105.820$, $p<0.01$. These results indicated that the data had a multivariate normal distribution. Regarding factor loadings, 0.40 was accepted as an acceptable value.

Table 1: Draft scale

1. I can ensure environmental safety and privacy during labor.
2. I can use personal protective equipment during labor (gloves, glasses, mask, apron, etc.)
3. I can inform the woman about practices during labor.
4. I can adapt the woman's companion to the birth process.
5. I can evaluate the woman's pelvic inlet by vaginal examination.
6. I can evaluate the woman's pelvic cavity (mid pelvis) by vaginal examination.
7. I can evaluate the woman's pelvic outlet by vaginal examination.
8. I can check the fetal heart rate.
9. I can evaluate the cervix dilation by vaginal examination.
10. I can evaluate cervical effacement by vaginal examination.
11. I can evaluate the presenting part (head, breech) by vaginal examination.
12. I can evaluate the position of the presenting part by vaginal examination.
13. I can evaluate the level of the presenting part by vaginal examination.
14. I can evaluate whether the amniotic membranes are intact by vaginal examination.
15. I can perform amniotomy when necessary.
16. I can assess the frequency, duration, and severity of contractions.
17. I can fill in the partograph during labor.
18. I can help the woman to cope with contractions during labor.
19. I know when a woman should push during labor.
20. I can verbally support the woman to push in birth.
21. I can prepare the birthing equipment.
22. I can prepare the newborn care equipment.
23. I can give local anesthesia to the perineum for an episiotomy.
24. I can perform an episiotomy at birth if necessary.
25. I can do the Ritgen maneuver to protect the perineum at birth.
26. I can hold the baby securely.
27. I can provide skin-to-skin contact after birth.
28. I can clamp and cut the umbilical cord after birth.
29. I can do the first care of the newborn.
30. I can assess if the placenta has separated.
31. I can have the placenta be delivered.
32. I can check whether the placenta and membranes are complete.
33. I can administer uterotonic drugs after birth.
34. I can check the uterine tone by palpation after birth.
35. I can check the vulva, vagina, and cervix for laceration.
36. I can repair an episiotomy / laceration.

Table 2: Characteristics of participants

Variables		N (%)
University	1. University	209 (53.6)
	2. University	181 (46.4)
Age	≤21 years	142 (36.4)
($\bar{X}$±SD, 21.91±1.50)	>21 years	248 (63.6)
University level	3rd year	211 (54.1)
	4th year	179 (45.9)
Choosing midwifery	Yes	302 (77.4)
of own free will	No	88 (22.6)
Level of liking the	≤7	167 (42.8)
midwifery profession	≥8	223 (57.2)
(Min=1 - Max=10)		
($\bar{X}$±SD, 7.64±1.70)		
Total		**390 (100.0)**

Based on this, the factor analysis indicated a 5-factor structure with 34 items, which explained 69.093% of the total variance. Two overlapping items (items 16 and 17) were excluded from further analysis because their factor loading values were too close to distinguish one from the other (Table 3). The dimensions indicated by the 5-factor structure were named as follows: delivery preparation and support (10 items), pelvic examination (3 items), vaginal examination (6 items), intervention during delivery (5 items), and postpartum management (10 items).

Confirmatory factor analysis (CFA)

Confirmatory factor analysis was performed based on the 5 dimensions determined by EFA.

The results of the model fit test (Table 4, Figure 1), performed by specifying standardized item loadings for each dimension, revealed that all the goodness of fit values of the scale were above the minimum acceptable limits [CMIN/df (3.342), RMSEA (0.078), CFI (0.890), TLI (0.880), IFI (0.891), RFI (0.836), NFI (0.851), and SRMR (0.056)]

Investigation of reliability

Cronbach's Alpha reliability coefficients were calculated to assess the internal consistency of the overall scale and its 5 dimensions, and item-total score correlations were also examined. The reliability coefficient for the overall scale was 0.965 while those for the dimensions were as follows: 0.939 for delivery preparation and support, 0.925 for pelvic examination, 0.914 for vaginal examination, 0.865 for intervention during delivery, and 0.912 for postpartum management (Table 3).

The item with the highest mean score was "I can evaluate the pelvic cavity (mid pelvis) by examination", and the item with the lowest mean score was "I can do the Ritgen maneuver to protect the perineum at birth".

Analysis of the correlations between the variables indicated that the factor loadings of all items were above 0.40 and all correlations were significant. The item-total test correlation values varied between 0.639 (25th item) and 0.903 (6th itm). The scale's Cronbach's alpha values did not change when an item was deleted (Table 5)

Table 3: Exploratory factor analysis

	Factors					
Statements	**F1:** Postpartum management	**F2:** Delivery preparation and support	**F3:** Vaginal examination	**F4:** Intervention during delivery	**F5:** Pelvis examination	**Item total correlation**
CSSES30	0.748					0.822
CSSES31	0.734					0.829
CSSES28	0.733					0.783
CSSES27	0.715					0.715
CSSES32	0.704					0.797
CSSES29	0.692					0.745
CSSES34	0.678					0.771
CSSES33	0.606					0.746
CSSES26	0.598					0.708
CSSES35	0.523					0.691
CSSES2		0.753				0.704
CSSES3		0.747				0.735
CSSES1		0.729				0.723
CSSES8		0.714				0.746
CSSES4		0.711				0.685
CSSES20		0.684				0.796
CSSES18		0.655				0.753
CSSES21		0.587				0.725
CSSES22		0.543				0.646
CSSES19		0.530				0.679
CSSES10			0.782			0.805
CSSES9			0.756			0.772
CSSES11			0.697			0.762
CSSES13			0.654			0.765
CSSES12			0.652			0.755
CSSES14			0.590			0.709
CSSES24				0.743		0.793
CSSES23				0.731		0.737
CSSES15				0.657		0.623
CSSES36				0.650		0.701
CSSES25				0.552		0.587

CSSES6					0.768	0.840
CSSES7					0.767	0.830
CSSES5					0.705	0.801
Reliability (Cronbach's alpha)	0.939	0.925	0.914	0.865	0.912	0.965
Explained variance (%)	18.290	17.522	12.904	12.4327	7.939	69.093
KMO* =0.953; χ2(561) =11105.820; Bartlett's Test of Sphericity (p) = 0.000						

* KMO: Kaiser-Meyer-Olkin

Table 4: Confirmatory factor analysis (Goodness-of-fit values of the scale structural model)

	Structural model values	**Recommended values**
CMIN/DF	3.342	≤5
RMSEA	0.078	≤0.08
CFI	0.890	≥0.80
TLI	0.880	≥0.80
IFI	0.891	≥0.80
RFI	0.836	≥0.80
NFI	0.851	≥0.80
SRMR	0.056	≤0.10

Discussion

One of the leading professional duties of midwives is to perform vaginal delivery under their own responsibility. Undergraduate midwifery programs therefore aim to give midwifery students the relevant skills and competence. Moreover, it is essential that midwifery students also feel competent about performing a vaginal delivery if they are to intervene correctly, act decisively, and provide high-quality care while managing the birth. It is therefore important for midwifery students to be able to self-evaluate their competencies. Accordingly, we carried out the present study to develop a measurement tool to enable student midwives to assess their own self-efficacy regarding vaginal birth skills.

Validity is an important criterion for evaluating whether a data collection tool covers or reflects the components related to the theory, concept, or variable it is intended to investigate[21,22]. In the present study, the scale's content and construct validity was evaluated. Content validity studies are performed to determine whether scale items are suitable for the scale's purpose[16,21,23].

In the present study, the Davis technique based on expert opinions was used[19], which recommends that the item CVI scores should be 0.80 or higher[19-21]. In the present study, the CVI scores of all scale items were 0.87 and above. Therefore, no item was removed from the scale after expert evaluations. Construct validity means that the items in the measurement tool are closely related to the phenomenon to be measured and that the relationships between the factors are in line with the theory underlying the measurement tool[24].

Table 5: Item analysis results

Factors	Statements	Factor loadings	Standard error	T values	P values
F1: Postpartum management	CSSES30	0.836	-	-	-
	CSSES31	0.852	0.040	26.320	***
	CSSES28	0.810	0.043	19.364	***
	CSSES27	0.739	0.039	16.877	***
	CSSES32	0.818	0.051	19.680	***
	CSSES29	0.782	0.042	18.375	***
	CSSES34	0.767	0.054	17.822	***
	CSSES33	0.752	0.058	17.304	***
	CSSES26	0.746	0.053	17.135	***
	CSSES35	0.719	0.066	16.265	***
F2: Delivery preparation and support	CSSES2	0.690	-	-	-
	CSSES3	0.739	0.087	13.640	***
	CSSES1	0.710	0.059	18.355	***
	CSSES8	0.768	0.077	14.150	***
	CSSES4	0.685	0.098	12.709	***
	CSSES20	0.848	0.085	15.492	***
	CSSES18	0.807	0.090	14.798	***
	CSSES21	0.780	0.107	14.345	***
	CSSES22	0.684	0.094	12.695	***
	CSSES19	0.744	0.105	13.731	***
F3: Vaginal examination	CSSES10	0.792	-	-	-
	CSSES9	0.757	0.034	25.713	***
	CSSES11	0.804	0.050	17.402	***
	CSSES13	0.815	0.059	17.725	***
	CSSES12	0.822	0.057	17.919	***
	CSSES14	0.768	0.063	16.416	***
F4:Intervention during delivery	CSSES24	0.872	-	-	-
	CSSES23	0.825	0.047	20.289	***
	CSSES15	0.658	0.055	14.501	***
	CSSES36	0.786	0.050	18.796	***
	CSSES25	0.639	0.056	13.947	***
F5: Pelvic examination	CSSES6	0.903	-	-	-
	CSSES7	0.885	0.038	24.877	***
	CSSES5	0.857	0.041	23.434	***

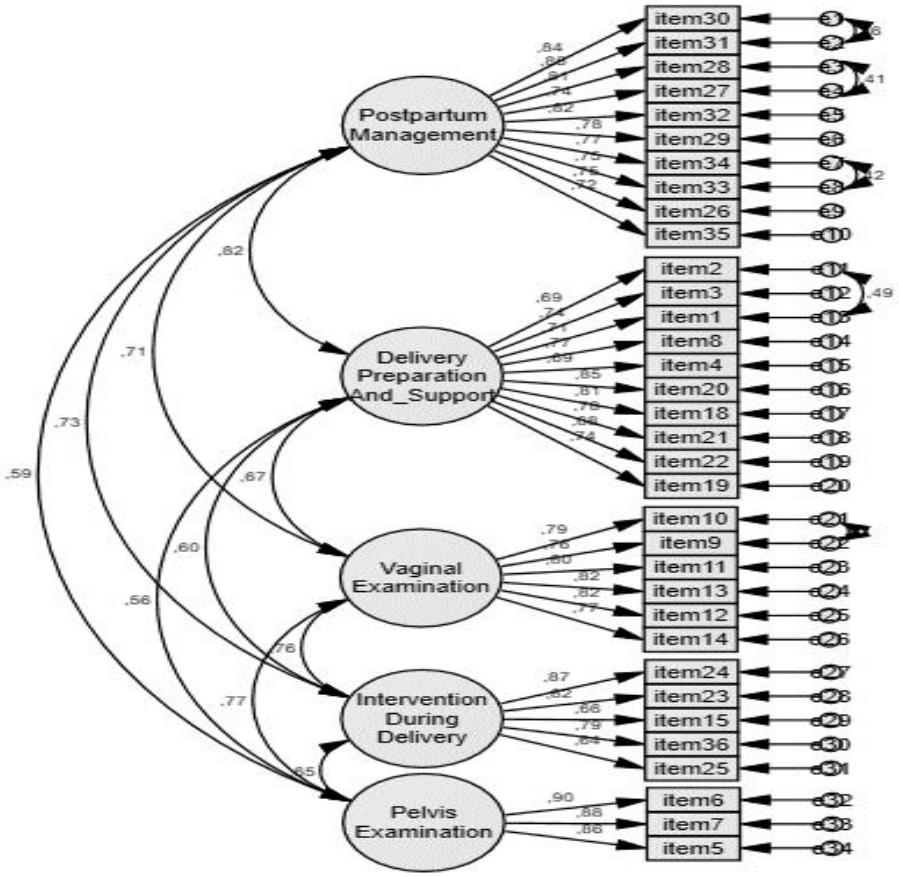

Figure 1: Model of first-level multi-factor CFA

Construct validity can be assessed by EFA once the suitability of the sample size has been evaluated. In the present study, this was confirmed with the KMO test. In the present study, the KMO value 0.95, which is greater than the minimum value of 0.6 recommended for performing factor analysis[16,17]. The Bartlett's test of sphericity result was highly significant ($X2=11105.820$; $p<0.01$), which also indicated that the sample size was sufficient to perform factor analysis. Based on the EFA of draft

form of the CSSES, two items with factor loading values below 0.40 were removed.

The analysis with 34 items confirmed a 5-factor structure, which accounted for 69.093% of the total variance. An explained variance above 50% is considered sufficient for multifactorial designs. Based on the items comprising the 5 identified factors, the CSSES dimensions were named delivery preparation and support, pelvic examination, vaginal examination, intervention during delivery, and postpartum management.

Following EFA, CFA is recommended to test the validity of the scale structure[16,25]. CFA tests whether relationship between the determined factors is sufficient and whether the factors explain the model adequately[3,16]. In the present study, the modification indices of the model of the statements in the scale were improved in the CFA. While the scale was improved, the variables that reduced the model fit were identified, and a new covariance was created for those with high covariance among the residual values. The values of the model obtained after the modification fell within acceptable limits. The acceptable value for CMIN/df, one of the criteria for testing the model's compatibility with the data, is ≤5[26,27]. The RMSEA value should not exceed 0.10[27]. CFI and GFI values greater than or equal to 0.90 indicate fit. The AGFI value, which ranges between 0 and 1, indicates a good fit as it gets closer to 1[26]. The CSSES CFA results regarding the construct validity of the indicated that the model fitted the data and confirmed the 5-factor structure. It also demonstrated the items and scale dimensions were related to the overall scale, and that the items in each dimension adequately defined their own factor. Taken together, these results suggest that the CSSES is a valid tool for measuring midwifery students' self-efficacy regarding vaginal delivery skills.

Regarding scale reliability, the Cronbach's alpha reliability coefficient should be at least 0.70[17,28,29]. In the present study, the values were above 0.90, indicating that a high degree of reliability. The item analysis was based on correlations and the item discrimination index. Item-total correlation coefficients should be positive and greater than 0.30. The higher the correlation coefficient, the higher the correlation of that item with the phenomenon to be measured[27,30]. In the present study, the item-total score correlation coefficients for the 34-item scale ranged between 0.639 and 0.903. No correlation coefficient was below 0.30 or had a negative value, which showed that the scale has quite high internal consistency, indicating high reliability. This result shows that the scale is a reliable measure of students' self-efficacy regarding vaginal birthing skills

Conclusion

Based on these findings, we conclude that the CSSES is a valid and reliable measurement tool. After student midwives receive training on vaginal birth skills, the CSSES can be used to assess the effectiveness of midwifery education programs and determine midwifery students' self-efficacy related to vaginal birth skills before graduation. The CSSES can also be administered to determine the vaginal birth skills-related self-efficacy of midwives who have been unable to practice their skills since graduating, work in non-maternity units, or have become unsure over time about their proficiency. We recommend that the CSSES should be administered to midwifery students in other universities too, and that scale adaptation studies should be carried out to use it in different countries**.**

Conflict of interest

The authors declare that there is no conflict of interest.

Contribution of authors

SİÇ and AH contributed to the conception and design of this study. SİÇ and AH contributed to the acquisition data for the work. SİÇ and AH contributed to the interpretation of the data. A service was purchased for data analysis. The control of data analyses was performed by the SİÇ and the

AH. SİÇ and AH wrote the first draft. All authors critically reviewed the manuscript and approved the version for submission

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