Research Square

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Development and Psychometric Validation of the Tubal Ligation Knowledge Scale: A Methodological Study among Reproductive-Age Women

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Abstract

Introduction:

Tubal ligation is a widely used permanent contraceptive method, and adequate knowledge is essential for informed reproductive decision-making and effective family planning counselling. However, the absence of a validated instrument specifically assessing women's knowledge of tubal ligation limits the identification of knowledge gaps and educational needs. This study aimed to develop the Tubal Ligation Knowledge Scale (TLKS) and evaluate its validity and reliability among women of reproductive age.

Methods

This methodological study was conducted between March and September 2025 with 209 women aged 18–49 years. An initial 21-item instrument was developed based on a literature review and evaluated by 12 experts for content validity. Data were collected using an online questionnaire. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to assess construct validity, while Cronbach's alpha coefficient and test–retest analysis were used to evaluate reliability.

Results

The TLKS demonstrated a two-factor structure explaining 79.8% of the total variance. Confirmatory factor analysis indicated acceptable model fit ($\chi^2/df = 2.61$, CFI = 0.982, GFI = 0.949, RMSEA = 0.078, SRMR = 0.030). The scale demonstrated excellent internal consistency (Cronbach's $\alpha = 0.923$) and strong test–retest reliability (ICC = 0.891, $p < 0.001$). Notably, 89.5% of participants reported receiving no previous education about tubal ligation.

Discussion

The findings suggest that the TLKS is a promising instrument for assessing tubal ligation knowledge among reproductive-age women. Its psychometric properties support its potential application in reproductive health research and family planning counselling. The high proportion of women without prior education on tubal ligation further emphasizes the importance of identifying knowledge gaps and providing targeted reproductive health education. The TLKS may assist midwives, nurses, and other healthcare professionals in tailoring contraceptive counselling and supporting informed reproductive choices. Further validation in larger and more diverse populations is recommended.

Introduction

Family planning (FP) is defined as the ability of individuals to have children when they want, in the number they want, and to determine the spacing between pregnancies. FP services are included in the

Sustainable Development Goals as part of achieving universal access to sexual and reproductive health services by 2030[1].

In Turkish society, sexuality and FP are considered taboo topics and are difficult to discuss because they cannot be talked about freely[2,3]. Health professionals should provide contraception counseling to enable women to discuss their sexual lives and decide on contraception methods with their partners, taking into account the effects of contraception methods on sexual life during the decision-making process[2,4].

In general, contraceptive methods are classified as modern and traditional methods, female-specific and male-specific methods, or reversible and irreversible methods[5]. Modern methods include hormonal contraceptives, barrier methods, intrauterine devices, and surgical sterilization methods such as tubal ligation and vasectomy; traditional methods include withdrawal, vaginal douching, the calendar method, and lactational amenorrhea[1, 5].

According to 2019 United Nations data, 44% of women aged 15–49 worldwide who use contraceptive methods use modern methods, while 4% use traditional methods. Among modern methods, the most commonly used contraceptive method is female surgical sterilization (tubal ligation), accounting for 24% [6]. According to the 2018 Turkey Demographic and Health Survey, the rate of tubal ligation among all women is 10% [7]. Tubal ligation (TL) is the surgical occlusion of both fallopian tubes to permanently terminate fertility in women. Its effectiveness is approximately 99.9%[8].

When previous studies are examined, issues such as reasons for choosing contraceptive methods, attitudes toward contraception, and knowledge levels regarding surgical sterilization methods have been investigated[9–12]. However, no psychometrically validated scale specifically measuring women’s knowledge of tubal ligation has been identified [13–15]

Therefore, the present study aimed to develop the Tubal Ligation Knowledge Scale and evaluate its validity and reliability.

Method

Type of Research

This research was conducted methodologically to develop the "Tubal Ligation Knowledge Scale" and evaluate its validity and reliability in Turkish.

Location and Time of the Study

The research was conducted online using a survey created via Google Forms. Participants were reached through social media platforms (eFacebook, Instagram, Twitter, etc.). The research was conducted between March 1, 2025, and September 30, 2025.

Research Population and Sample

Participants were recruited through an online survey distributed via social media; consequently, the sampling approach was nonprobability convenience sampling. In scale development studies, it is recommended that the sample size be 5–10 times the number of items[15]. Furthermore, it is emphasized that 300–500 participants are needed to reveal the ideal structure of the scale[16 Accordingly, 209 women were included in the study, which is 10 times the number of items in the draft form. Women aged 18–49 who could communicate in Turkish and were willing to participate in the study were included; those who were infertile, in menopause, or had previously undergone tubal ligation were excluded.

Data Collection Tools and Materials

Data were collected using a researcher-developed demographic information form and the draft Tubal Ligation Knowledge Scale.

Demographic Information Form

Developed by the researcher, this form consists of a total of 5 questions designed to determine the participants' sociodemographic characteristics.

Tubal Ligation Knowledge Scale (TLKS): This scale was developed as part of the present research, originally reported in a 2025 master's thesis [42]. An initial 21-item pool was generated from the literature and professional experience and assessed by 12 experts. The five-point Likert response options ranged from strongly disagree (1) to strongly agree (5). Following exploratory and confirmatory factor analyses, the final TLKS comprised eight items in two subscales: effect of the method (five items) and implementation of the method (three items). The complete English translation of the final TLKS is provided in Supplementary File 1; the instrument was originally validated in Turkish.

Data Collection

The data collection process involved sharing an online survey form, designed for individuals meeting the inclusion criteria for the study, via social media platforms. The online survey method was chosen due to the widespread use of social media and to avoid limiting the study to Istanbul province only. After providing participants with explanatory information about the study, the data collection process began once participants gave their consent to participate.

Data Evaluation

In this study, the psychometric properties of the newly developed Turkish Tubal Ligation Knowledge Scale were evaluated. In the first stage, Exploratory Factor Analysis (EFA) was applied to determine the

factor structure of the scale, followed by Confirmatory Factor Analysis (CFA) to test the validity of the model. The reliability of the scale was examined using various statistical methods. During the analysis process, SPSS 29.0 software was used for EFA and reliability tests, while AMOS 26.0 was used for CFA procedures. All statistical calculations were performed based on a significance level of 0.05.

Ethical Aspect of the Research

Before the study began, an application was made to the Ethics Committee of a university in Istanbul, and ethical approval was obtained at the meeting dated 12.02.2025, numbered 2025/186. The ethical principles of the Helsinki Declaration were strictly observed during the study process. Informed consent to participate was obtained from all participants electronically through the online survey form before data collection commenced.They were informed that the research findings would only be used for scientific purposes and that their identity information would not be shared. In the online survey form, they were given the option to confirm their consent to participate in the study.

Limitations of the Research

The research data was collected via an online survey through social networking sites; therefore, individuals who do not use social media could not be included in the research. In addition, the relatively low number of participants with primary and high school education is one of the limitations of the research.

Table 1. Distribution of Expert Opinions and Obtaining Content Validity Indices

Article No.	(d) Not applicable	(c) Needs to be brought into compliance	(b) Suitable but minor changes are required	(a) Highly suitable	KGİ
Article 1	0	1	4	7	0.92
Article 2	0	1	0	11	0.92
Article 3	0	1	4	7	0.92
Article 4	0	0	2	10	1.00
Article 5	0	1	3	8	0.92
Article 6	0	2	1	9	0.83
Article 7	0	2	2	8	0.83
Article 8	1	0	3	8	0.92
Article 9	0	0	3	9	1.00
Article 10	0	2	2	8	0.83
Article 11	0	1	2	9	0.92
Article 12	0	0	2	10	1.00
Article 13	0	0	0	12	1.00
Article 14	0	1	3	8	0.92
Article 15	0	0	1	11	1.00
Article 16	0	0	2	10	1.00
Article 17	0	0	0	12	1.00
Article 18	0	0	3	9	1.00
Article 19	0	1	4	7	0.92
Article 20	0	0	2	10	1.00
Article 21	0	0	2	10	1.00

CVI = Content Validity Index

Result

50.2% of the women who participated in the study are in the 21–34 age group. Furthermore, the mean age and standard deviation of the participants is 34.06 ± 7.09 years. 50.2% have a university degree or higher. 65.6% are employed. 78% have an income equal to their expenses. 89.5% have not received education on tubal ligation.

An expert opinion form was prepared to evaluate the comprehensibility of the scale's statements. The experts examined the items of the scale in terms of comprehensibility, suitability for purpose, discriminability, and cultural appropriateness, and reported their opinions by evaluating each item as a=Very suitable, b=Suitable (Minor changes required), c=Somewhat suitable (Should be made suitable), d = Not suitable. In line with the experts' opinions, the Davis method was used to calculate the Content Validity Index (CVI) values of the scale. The Content Validity Index (CVI) value for each item was calculated by dividing the number of experts who marked options a and b for the items on the scale by the total number of experts. A value of 0.80 is accepted as the criterion for the obtained value.

The statistical data for the scores given by the experts to the items of the Tubal Ligation Knowledge Level Scale are presented in Table. Accordingly, when the results are examined, it is seen that the content validity indices of all items are greater than 0.80.

The analysis results in Table 2 show that the Kaiser-Meyer-Olkin (KMO) coefficient, which evaluates sample adequacy, is 0.776. In addition, Bartlett's Sphericity Test revealed that the data are suitable for factor analysis and that there are strong relationships between the variables at a significant level (p<0.001).

Table 2
KMO Value and Bartlett Sphericity Test Results for the Tubal Ligation Knowledge Level Scale

Kaiser Meyer Olkin (KMO)		**0.776**
Bartlett Sphericity Test	X^2	1988.746
	sd	36
	p; Significance level	**0.000*****
****: p<0.001*		

Exploratory factor analysis was applied to the Tubal Ligation Knowledge Level Scale using the Varimax rotation method of Principal Component Analysis. The 21-item scale was initially divided into 5 sub-

dimensions, but since some items loaded strongly on more than one factor and some items formed a factor on their own, these items were excluded from the structure. The items excluded from the structure were items 2, 4, 5, 6, 7, 8, 9, 10, 11, 14, 17, and 18. As a result, after removing 12 items, the structure became appropriate with 9 items and 2 factors (Table 3). This nine-item solution represented the exploratory factor analysis stage, not the final validated form.

Table 3
Variance Explanation Table of the Tubal Ligation Knowledge Level Scale

Factor	Results Without Rotation			Results with Varimax Rotation		
	Eigenvalue	Explained Variance %	Cumulative %	Eigenvalue	Explained Variance %	Cumulative %
Factor 1	5,992	66,574	66,574	4,323	48,031	48,031
Factor 2	1,188	13,205	79,779	2,857	31,748	79,779

Table 4 shows that there are two factors with an initial eigenvalue greater than 1. It is suggested that eigenvalues can be used to determine factor structures and that there may be as many factor structures as there are eigenvalues greater than 1. The explained variance ratio indicates the strength of the scale's factor structure. Factor 1, consisting of 6 items, explains 48.031% of the total structure, while Factor 2, consisting of 3 items, explains 31.748%. These 2 factors and 9 items explain 79.779% of the total variance (Table 5). Subsequent confirmatory factor analysis resulted in a final eight-item, two-factor scale, as documented in the original thesis [42].

Table 4
Exploratory Factor Analysis Factor Loadings of the Final 9-Item Scale

Items	Factor 1	Factor 2
Item 16	0.859	
Item 12	0.848	
Item 3	0.848	
Item 1	0.793	
Item 13	0.784	
Item 15	0.783	
Item 20		0.876
Item 19		0.869
Item 21		0.866

Table 5
Recommended Goodness-of-Fit Index Threshold Values for Confirmatory Factor Analysis

Index	Good fit	Acceptable fit
χ^2/df	≤ 3	4–5
GFI	≥ 0.90	0.85–0.89
AGFI	≥ 0.90	0.85–0.89
NFI	≥ 0.95	0.90–0.94
TLI (NNFI)	≥ 0.95	0.90–0.94
CFI	≥ 0.95	≥ 0.90
RMSEA	≤ 0.05	0.06–0.08
SRMR	≤ 0.05	0.06–0.08

Table 6
Factor Load Values of the Items of the Tubal Ligation Knowledge Level Scale After Confirmatory Factor Analysis

Items	Factor 1	Factor 2
Item_1	0.811	
Item_3	0.895	
Item_12	0.917	
Article_16	0.854	
Article_13	0.831	
Article_21		0.845
Article_19		0.814
Article_20		0.999

Confirmatory factor analysis (CFA) was conducted following the exploratory nine-item solution. The final model retained eight items across two factors, as reported in the original thesis [42]. The fit indices were χ^2/df = 2.610, GFI = 0.949, AGFI = 0.893, CFI = 0.982, RMSEA = 0.078, and SRMR = 0.030. The final instrument is reproduced in English in Supplementary File 1.

The confirmatory factor analysis path diagram illustrating the two-factor measurement model of the Tubal Ligation Knowledge Scale is presented in Fig. 1. The model comprises eight observed items

distributed across two correlated latent factors. Standardized factor loadings range from 0.81 to 0.92 for Factor 1 and from 0.81 to 1.00 for Factor 2. The correlation between the two latent factors is 0.66 (Fig. 1).

The reliability analysis results of the Tubal Ligation Knowledge Scale indicate that the scale has a highly reliable structure overall (α = 0.923). When examining the subscales, Factor 1 was found to be highly reliable (α = 0.925) and Factor 2 was also highly reliable (α = 0.914).

To evaluate the scale's time-dependent consistency, the Tubal Ligation Knowledge Level Scale was administered to 209 participants, and then the same scale was re-administered to 33 randomly selected participants after a certain period of time. The Intraclass Correlation Coefficient (ICC) was calculated to examine the agreement between the first and second applications, and the results obtained showed a high level of agreement in the participants' responses to the repeated items. This finding demonstrates that the scale maintains its reliability over time and that the measurement results are consistent (p<0.001) (Table 7).

Table 7
Intraclass Correlation Coefficient Between Test-Retest Scores of the Tubal Ligation Knowledge Level Scale

Tubal Ligation Knowledge Level Scale	**ICC**	**p**
	0.891	**0.000***
Factor 1: Effect of the method	0.876	**0.000***
Factor 2: Application of the method	0.792	**0.000***
**: p < 0.001*		
ICC=Intraclass Correlation Coefficients		
p=Significance Level		

Discussion

The average age of participants in the study conducted to develop the Tubal Ligation Knowledge Scale was 34.06 ± 7.09, and 89.5% of participants had not received any education on tubal ligation. Family planning plays a critical role in many areas directly related to maternal, infant, and public health, such as preventing unwanted pregnancies, reducing the resulting increase in abortion, curettage, and maternal mortality rates, and preventing sexually transmitted diseases [17] According to World Health Organization (WHO) data, approximately 270 million women in developing countries have unmet family planning needs[18]. The literature indicates that there are various barriers to accessing family planning services. These barriers include limited methods, restrictions on access to services for young people, the poor, and unmarried individuals, fear of side effects, cultural and religious barriers, poor service quality, prejudices against certain methods, and gender-based barriers to Access[19].

Appropriate family planning counseling can enable women to choose the method most suitable for them without leaving the postpartum health facility, thereby preventing unplanned or closely spaced pregnancies[20]. Birth control methods are classified into two groups: traditional and modern methods. The most effective modern methods are voluntary surgical sterilization methods. These methods involve surgically closing the fallopian tubes in women and the vas deferens in men and are widely preferred, especially in developed countries[21].

Tubal ligation (TL) is a permanent birth control method that can affect women's lives both positively and negatively. Among birth control methods in developing countries, TL is the most widely used method at 44%, while in developed countries this rate is 18%[22]. TL has significant advantages for women; in addition to eliminating the need for long-term birth control pill use, it contributes to the prevention of unwanted pregnancies and a decrease in the incidence of endometrial and ovarian cancers[23, 24]. However, it should not be forgotten that postpartum care is also an integral part of reproductive health services. Postpartum visits allow for the assessment of individuals' physical and mental health, the provision of education and individualized support, and the discussion of birth control plans. However, it is reported that approximately 40% of individuals do not attend postpartum visits[25]. This is particularly critical for individuals with opioid use disorder (OUD), as this group requires regular healthcare and addiction support to reduce relapse and mortality risks, ensure effective pain management, and offer birth control options. Although the American College of Obstetricians and Gynecologists (ACOG) recommends that all women attend at least one postpartum visit within six weeks after delivery, participation rates remain low in the United States[25, 26].

Research on postpartum birth control counseling is quite limited. A cohort study conducted in Texas showed that birth control counseling among postpartum women is associated with variables such as ethnicity, language, education level, income, and history of prenatal counseling[27]. These findings reveal that birth control services are influenced not only by clinical factors but also by socio-demographic factors. Similarly, a qualitative study conducted in Brazil reported that young Black women faced class- and race-based barriers to accessing TL, and that poor women were excluded from sterilization services[28]. Furthermore, Iris Lopez's ethnographic research on Puerto Rican women living in New York shows that sterilization preferences are shaped by colonial legacies, socioeconomic hardships, and medical racism[12].

Obtaining expert opinion is highlighted as one of the most effective qualitative methods for assessing the content validity of a scale, increasing the comprehensibility of scale items, and eliminating inappropriate items[29].Sources indicate that at least 5 and at most 40 experts should be consulted in content validity index (CVI) calculations[30 Criteria and techniques frequently used in content validity studies based on expert opinions include the Lawshe technique, Content Validity Index (CVI), and Davis technique[31, 32].

Additionally, before proceeding to the construct validity analyses of the scale, the adequacy of the sample size was also evaluated. A KMO value in the range of 0.50–0.59 is considered insufficient, 0.60–

0.69 moderate, 0.70–0.79 good, 0.80–0.89 very good, and above 0.90 excellent[33, 34]. In our study, the KMO coefficient being above 0.70 indicates that the sample size was statistically adequate for factor analysis.

In scale studies, it is generally recommended to work with a sample size at least five times the number of items and to collect data from approximately 300 participants in order to obtain reliable results[35, 36]. The Bartlett Sphericity test results also showed that the data were suitable for factor analysis[37, 38].

The degree to which a measurement tool can accurately measure the targeted characteristic without mixing it with other factors and without error is expressed by the concept of validity[39]. Construct validity indicates the degree to which the items prepared on the scale accurately measure the desired characteristic[40,41].

Conclusion

The Tubal Ligation Knowledge Scale (TLKS) developed in the underlying thesis research and reported in this study was found to be a valid and reliable measurement tool consisting of 8 items and 2 subscales. The scale's high internal consistency (α = 0.923) and stable structure over time (ICC = 0.891) were supported by the findings. The results obtained indicate that the TLIS can be used as a standard tool for assessing the tubal ligation knowledge level of women of reproductive age.

The TLKS can be used as a decision support tool during family planning counseling in clinical practice. Thus, by measuring women's current level of knowledge, gaps or misconceptions can be addressed through targeted education and counseling. Integrating the scale into digital platforms and mobile health applications could facilitate reaching wider audiences and provide real-time feedback to health professionals.

Adaptation and validity studies conducted in different cultural contexts and among more diverse socio-demographic groups will increase the scale's generalizability on an international scale. Further studies using the scale may enable more in-depth analyses of women's sterilization decision-making processes and contribute to the development of health policies.

Declarations

Ethical Approval and Consent to Participate

Ethical approval for the implementation of the study was obtained from the Ethics Committee of Istanbul Okan University (Decision No: 2025/186; Date: 12 February 2025). The study was conducted in full accordance with the ethical principles of the Declaration of Helsinki. Informed consent to participate was obtained from all participants electronically through the online survey form before data collection

commenced. They were also informed that all collected data would remain completely anonymous and that the results would be used solely for scientific purposes.

Consent for Publication

Not applicable.

Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval and Consent to Participate

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Publication Permission

Not applicable.

Conflict of Interest

The authors declare no conflict of interest.

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Author Contributions

MÇ, KDB and AYK made significant contributions to the writing of the methods, discussion, summary, and abstract sections of the article, and also played a role in the overall writing process and final checks. The analysis and interpretation of the research data were performed by MÇ, KDB and AYK. They also actively participated in writing the introduction and discussion sections of the article. MÇ contributed significantly to the data collection process. All authors read and approved the final version of the article.

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Author Contribution

MÇ, KDB, and AYK made substantial contributions to the writing of the methods, discussion, conclusion, and abstract sections of the manuscript and contributed to the overall writing process and final revision of the article. The analysis and interpretation of the research data were performed by MÇ, KDB, and AYK. They also actively participated in the preparation of the introduction and discussion sections. MÇ made a substantial contribution to the data collection process. All authors read and approved the final version of the manuscript.

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No

Availability of Data and Materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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References

1. World Health Organization. Family planning/contraception methods, Geneva WHO, Kaplan E, Zeyneloğlu S. Determining the effect of withdrawal method on women's sexual satisfaction and marital adjustment. Necmettin Erbakan Univ Fac Health Sci J. 2018;1:10-17. 3., Oskay U, Dissiz M. Effect of contraceptive methods on female sexual function. Int J Caring Sci. 2017;10(1):366–376.
2. Gölbaşı Z, Şentürk Erenel A, Turan Z. Determining sexual dysfunction in women using contraceptive methods. Gazi Health Sci J. 2017;2(1):9–17.
3. Ministry of Health of the Republic of Turkey. Family planning counseling participant book. Ankara: General Directorate of Mother and Child Health and Family Planning. 2009. 6. United Nations Department of Economic and Social Affairs, Population Division. World contraceptive use estimates and projections of family planning. New York: United Nations; 2019. 7. Hacettepe University Institute of Population Studies. 2018 Turkey Demographic and Health Survey. Ankara: Hacettepe University; 2019.

4. Ateş MC. Evaluation of the effect of bilateral salpingectomy and bilateral tubal ligation on ovarian reserve [medical specialty thesis]. Ankara: Health Sciences University; 2018.
5. Çayan A. The relationship between attitudes towards family planning methods among married women aged 15–49 and their use of contraceptive methods [master's thesis]. Aydın: Adnan Menderes University; 2009.
6. Gür Çalışkan B, Doğan B, Güngör Olçum G. The effect of age and education on family planning method preferences among women living in rural areas. Turk J Fam Med. 2014;18(4):189–94.
7. Dönmez S, Gümüşsoy S, Koçak SH. Examining the views of Turkish and Syrian women from two different cultures on tubal ligation. Ankara Med J., Borrero S, Schwarz EB, Creinin M, Ibrahim S. The impact of race and ethnicity on receipt of family planning services in the United States. J Womens Health. 2009;18(1):91–96.
8. Curtis KM, Tepper NK, Jatlaoui TC, et al. U.S. medical eligibility criteria for contraceptive use, 2016. MMWR Recomm Rep. 2016;65(3):1–103.
9. Shobeiri MJ, Atashkhoii S. The risk of menstrual abnormalities after tubal sterilization: A case control study. BMC Womens Health. 2005;5(1):5.
10. Akgül A. Statistical analysis techniques in medical research: SPSS applications. 2nd ed. Ankara: Emek Ofset; 2005.
11. Sousa VD, Rojjanasrirat W. Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. J Eval Clin Pract. 2011;17(2):268–74.
12. Seyrek SG, Çakıroğlu MM, İncekara N. Family planning and contraceptive methods. Turk Health Lit J. 2021;2(3):184–90.
13. World. Health Organization. Contraception. Geneva: WHO; 2019.
14. World Health Organization. Family planning access barriers and unmet needs. Geneva: WHO; 2025.
15. Gaffield ME, Egan S, Temmerman M. It's about time: WHO and partners release programming strategies for postpartum family planning. Glob Health Sci Pract. 2014;2(1):4–9.
16. Conk Z. Contraceptive methods. Ege Univ Sch Nurs J. 1987;3(1):72–80.
17. Loghmani L, Saedi N, Omani-Samani R, et al. Tubal ligation and endometrial cancer risk: a global systematic review and meta-analysis. BMC Cancer. 2019;19(1):942.
18. McNamara C, Abbott SE, Bandera EV, et al. Tubal ligation and ovarian cancer risk in African American women. Cancer Causes Control. 2017;28(10):1033–41.
19. American College of Obstetricians and Gynecologists. Optimizing postpartum care. Obstet Gynecol. 2018;131(5):e140–50.
20. Coleman-Minahan K, Aiken ARA, Potter JE. Prevalence and predictors of prenatal and postpartum contraceptive counseling in two Texas cities. Womens Health Issues. 2017;27(6):707–14.
21. Jahanian Sadatmahalleh S, Ziaei S, Kazemnejad A, Mohamadi E. Menstrual pattern following tubal ligation: a historical cohort study. Int J Fertil Steril. 2016;9(4):477–82.

22. Morgado FFR, Meireles JFF, Neves CM, Amaral ACS, Ferreira MEC. Scale development: ten main limitations and recommendations to improve future research practices. Psicol Reflex Crit. 2017;30(1):3.
23. Kaya G. Determining nursing students' perceptions of stigmatization: a scale development study [doctoral thesis]. Samsun: Ondokuz Mayıs University; 2022.
24. Özbudak E. Nurses' attitudes towards preventing falls: a scale development study [doctoral thesis]. Samsun: Ondokuz Mayıs University; 2023.
25. Kıyıcı N. Determining nurses' attention control levels: a scale development study [doctoral thesis]. Samsun: Ondokuz Mayıs University; 2022.
26. Seçer İ. Psychological test development and adaptation process: SPSS and LISREL applications. 2nd ed. Ankara: Anı Publishing; 2018.
27. Bursal M. Basic data analysis with SPSS. 2nd ed. Ankara: Anı Yayıncılık; 2019.
28. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. Front Public Health. 2018;6:149.
29. Çapık C, Gözüm S, Aksayan S. Cross-cultural scale adaptation stages: language and cultural adaptation. Florence Nightingale J Nurs. 2018;26:199–210.
30. Karagöz Y, Bardakçı S. Measurement tools used in scientific research and scale development. Ankara: Nobel Academic Publishing; 2020.
31. Özdamar K. Scale and test development in education, health, and behavioral sciences: structural equation modeling. Eskişehir: Sözkesen Printing; 2017.
32. Büyüköztürk Ş. Data analysis handbook for social sciences. 27th ed. Ankara: Pegem Akademi; 2020.
33. Ercan İ, Kan İ. Reliability and validity in surveys. Uludağ Univ Med J., Abramovitz S. A. Tubal ligation. In: StatPearls. Treasure Island: StatPearls Publishing; 2021.
34. Zeyneloğlu S, Kısa S, Delibaş L. Determinants of family planning use among Turkish married men living in southeastern Turkey. Am J Mens Health. 2013;7(3):255-264. 42. Çamok M. Tüp Ligasyon Bilgi Ölçeği Geliştirme Çalışması [master’s thesis]. Istanbul: Istanbul Okan University; 2025.

Figures

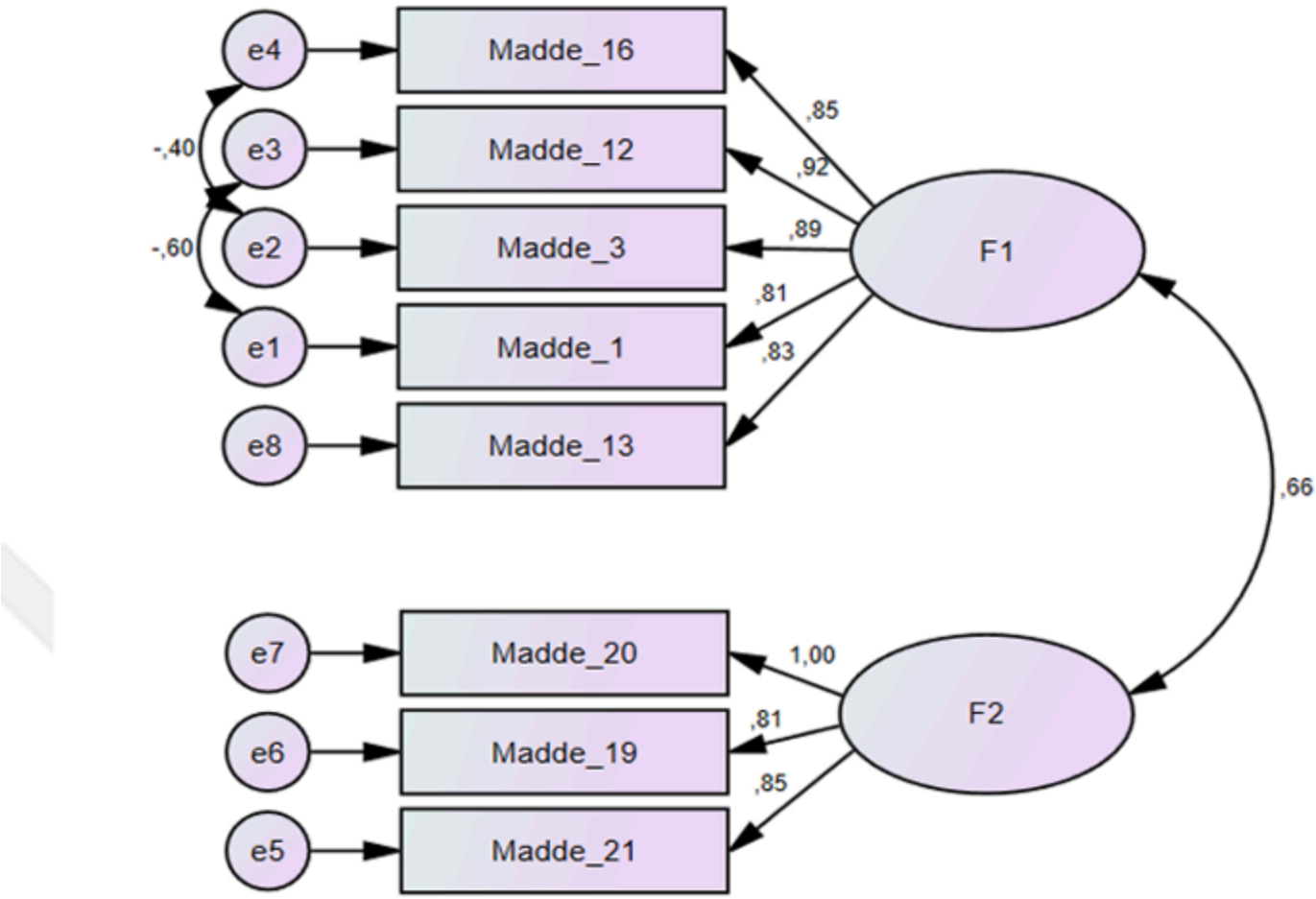


Figure 1

Confirmatory factor analysis path diagram of the two-factor Tubal Ligation Knowledge Scale (TLKS).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryFile1EnglishTLKS.docx