



ORIGINAL ARTICLE

Psychometric properties of the Turkish version of the Cervical Cancer Knowledge Scale

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Abstract

Aim: This study aimed to investigate the psychometric properties of the Turkish adaptation of The Cervical Cancer Knowledge Scale (CCKS-T). This scale was designed for the assessment of cervical cancer knowledge levels among women in the screening period.

Methods: Research was conducted with 307 women aged 21–65 years, who satisfied the eligibility criteria and agreed to participate. Data were collected via an online survey conducted during July and August 2023, utilizing both a Descriptive Information Form and the CCKS-T. To confirm the validity of the scale, language and content validity assessments were conducted, in addition to confirmatory factor analysis. The scale's reliability was evaluated using Cronbach's alpha, item-total correlation analysis, and a test–retest analysis. The scale consisted of eight items.

Results: The content validity index of the scale items was found to be 1.0 with excellent sensitivity. Confirmatory factor analysis showed that the item factor loadings varied between 0.31 and 0.81 and the model had a good fit ($\chi^2/df = 2.200$; GFI = 0.96; CFI = 0.96; RMSEA = 0.063). Cronbach's alpha of the Turkish version of the scale was found to be 0.80.

Conclusion: The CCKS-T demonstrates both validity and reliability as an instrument for the assessment of Turkish women's knowledge about cervical cancer.

KEYWORDS

cervical cancer, gynecologic cancer, psychometric measurement, reliability, validity

INTRODUCTION

In 2020, cervical cancer ranked as the fourth most prevalent malignancy among women globally, with an estimated 604 000 new cases and 342 000 associated deaths.¹ In Turkey, it is the ninth most prevalent malignancy among women.² In 2020, it was reported that approximately 90% of new cases and deaths worldwide occurred in low- and middle-income countries.¹ Certain strains of the human papillomavirus (HPV) have been associated with high-grade cervical pre-cancers, with HPV 16 and 18 accounting for approximately 50% of such cases.³ HPV is largely transmitted via sexual contact, with the majority of HPV infections manifesting shortly after the initiation of sexual activity. Furthermore, cervical malignancy is associated with various additional risk factors, including smoking, more than one sexual partner, sexually transmitted infections (HSV, etc.), early

intercourse (<16 years), poor hygiene, lack of information, and low socioeconomic status.^{4,5} Although cervical cancer has high mortality rates, it is a type of cancer that is easily treatable with screening and early diagnosis methods.⁶ Cervical cancer screening and vaccination against HPV are the two most effective methods to prevent cervical cancer, however, it is extremely important to identify and manage other risk factors.⁷ In high-income nations, opportunities for cervical cancer prevention include the vaccination of both girls and boys against Human Papillomavirus (HPV), women's active participation in routine cancer screening initiatives, and the enhancement of treatment modalities. Nevertheless, in low- and middle-income nations, access to these preventative interventions remains severely constrained. Therefore, cervical cancer that is not detected early in these countries is associated with higher mortality and morbidity rates. In addition, in these countries, the level

of knowledge about cancer and prevention is also insufficient.^{1,8}

WHO recognizes cervical cancer as a public health problem and aims to create a global strategy for its elimination. In this direction, it primarily aims to raise awareness in low- and middle-income nations where levels of knowledge about cancer are low. By developing guidelines and tools on the subject, WHO emphasizes the goal of developing vaccination, screening, and treatment programs for cervical cancer worldwide in line with the 90-70-90 strategy by 2030. In this direction, it states that health services of countries need support and cooperation in line with the global strategy plan.⁹

In low-income countries with a high incidence of cervical malignancy, lack of knowledge about cervical cancer and its screening has been reported as a crucial factor, in addition to other constraints such as limited access to screening resources.^{10,11} Studies show that cervical cancer knowledge levels are insufficient in our country, and low knowledge levels negatively affect participation in screening programs.^{12,13} In the academic literature, several measurement tools have been developed to assess levels of knowledge and awareness regarding cervical cancer.¹⁴ In our country, there are also measurement tools that evaluate awareness and attitude toward cervical cancer.^{15,16} Within the scope of this research, the objective was to assess the psychometric properties of the Cervical Cancer Knowledge Scale (CCKS), originally developed by Haward et al. (2022), for the purpose of evaluating cervical malignancy knowledge among women in the screening period and determine its suitability to the Turkish female population.

METHOD

Sample and design

This research is a methodological and descriptive inquiry with the primary objective of evaluating the validity and reliability of the CCKS-T. The research was conducted online using Google Forms on various social media platforms in July and August 2023. The study's sample comprised female participants between the ages of 21–65, ($n = 307$). Women were included if they were in the cervical cancer screening period, had a cervix, were able to understand and speak Turkish, and agreed to participate in the research, but excluded if they had previously been diagnosed with cervical cancer. Recommendations within the scholarly literature propose determining the sample size to be 5–10 times the number of items within the measurement tool.¹⁷ Moreover, the literature often categorizes sample sizes for psychometric research as follows: inadequate (≤ 100), moderate (101–200), good (201–300), very good (301–500), and excellent (> 501).^{18,19} The research sample consisted of 307 female participants,

according to the inclusion criteria, and provided their informed consent.

Instruments

Descriptive information form

The researchers developed a descriptive information form in line with the literature on women's socio-demographic characteristics such as age, income level, education level, and health-related behaviors including cervical cancer screening habits.^{15,20}

The Cervical Cancer Knowledge Scale

Haward et al. (2022) developed the scale with the aim of assessing the knowledge levels of women eligible for cancer screening concerning cervical cancer. The scale consists of eight items. The statements are complete sentences in the form, answered on a three-point Likert scale (True/False/I don't know). There are seven true statements and one false statement. Items that are marked as correct are evaluated as one point, and items marked as incorrect or don't know, as zero. In this context, only one item (item 1) is reverse scored. The reported Cronbach's alpha for the scale was 0.76. The original language of the CCKS was English.

Translation of the instrument

In scale adaptation, the use of the most appropriate sentence structures, idioms, and phrases in the target language is extremely important for the comprehensibility of the scale and its adaptation to the target culture.^{18,19} For this purpose, in order to assess the scale's content validity, it was translated into Turkish by a bilingual and bicultural linguist. Subsequently, the scale was translated back into English by a second bilingual and bicultural language expert who was blinded to the original version and possessed specialized knowledge in health terminology. The final version of the scale was determined through a comprehensive assessment to ascertain whether any alterations in meaning were present when compared to the original scale.

Data collection process

Data collection tools were shared by the researchers on their personal social media accounts using Google Forms. All participants provided informed consent to participate via a shared online link. Participants whose informed consent was obtained were able to see the descriptive information form and the CCKS-T delivered

via Google Forms. A total of 307 women responded to the scale items.

Data analysis

Obtained data were analyzed using the SPSS 26.0 package program (SPSS Inc., Chicago, Illinois, USA) and SPSS Amos (Analysis of Moment Structures) v.26.0 program. The presentation of sociodemographic information involved the use of descriptive statistics, including frequency, percentage, and mean values. Content and construct validity assessments were carried out to establish the instrument's validity in Turkish. For the content validity of the scale, expert consensus on content validity was evaluated using the Polit-Beck Content Validity Index (CVI). Confirmatory factor analysis (CFA) was employed to assess the construct validity, determining whether the scale items sufficiently account for the original scale structure. CFA was conducted based on the Chi-square test, comparative fit index (CFI), degrees of freedom, root mean square error of approximation (RMSEA), and goodness of fit index (GFI).

Reliability analysis involved the utilization of test-retest analysis, item-total score analysis, and Cronbach's alpha coefficient. The intraclass correlation coefficient (ICC) was computed via test-retest analysis to evaluate the temporal invariance. Cronbach's alpha reliability coefficient was computed for the evaluation of internal consistency. Pearson correlation analysis was utilized for item-total score analysis, with statistical significance set at a level of $p < 0.01$.

Ethical consideration

Before adapting the scale to the Turkish context and evaluating its validity and reliability, permission was first obtained from the author who developed the scale (Haward et al., 2022) via e-mail. All procedures performed in this study were in accordance with the ethical standards of Dokuz Eylul University Non-Interventional Clinical Research Ethics Committee (Reference no: 2023/17-02 and date April 15, 2023) and with the 1964 Helsinki Declaration.

RESULTS

Table 1 shows the sociodemographic features and data on women's screening habits for cervical cancer. The mean age was 33.51 ± 10.96 years, and the majority of the women (83.1%) were married (50.2%) with university and higher education. 56% were employed and 50.2% stated that income was equal to expenses. The majority (84.7%) had no one in their immediate family who had

TABLE 1 Demographic features of the women ($n = 307$).

Features	Mean	Standard deviation
Age (years)	33.51	10.96
	<i>n</i> (307)	%
Educational status		
Primary school	14	4.6
High school	38	12.4
University	255	83.1
Working status		
Employed full time	172	56.0
Employed part time	24	7.8
Unemployed	93	30.3
Retired	18	5.9
Financial status		
Income lower than expenses	81	26.4
Income equal to expenses	154	50.2
Income higher than expenses	72	23.5
Relationship status		
Married	154	50.2
Dating	83	27.0
Single	70	22.8
Having relatives with cervical cancer		
Yes	47	15.3
No	260	84.7
Having had a Pap smear test before		
Yes	135	44.0
No	172	56.0
Having had a HPV DNA test before		
Yes	49	16.0
No	258	84.0

had cervical cancer. 56% of women had no prior experience with a pap smear test, and 84% had never undergone an HPV DNA test.

Content validity

Following the linguistic validation of the scale in terms of content validity, it was submitted to the expert opinion of six nurse academicians, four nurse academicians specialized in obstetrics and gynecology, and one physician specialized in gynecologic oncology. Expert opinions were evaluated using the Polit-Beck Content Validity Index. The experts conducted a comparative assessment of the original and draft versions of the scale, providing evaluations of the appropriateness of scale items on a 1–4 point rating scale (1: not appropriate, 2: somewhat appropriate, 3: appropriate, 4: very appropriate). The Item Content Validity Index (I-CVI) was computed for each

individual item within the scale, while the Scale Content Validity Index (S-CVI) was calculated for the scale in its entirety. The Scale Content Validity Index (S-CVI) is determined as the percentage of total items scored between 1 and 4. A CVI score exceeding 90% signifies a high level of agreement (Polit & Beck, 2020). The agreement between the experts was calculated as 1.0 for each item (I-CVI) and the whole scale (S-CVI).

Pilot study

In the literature, it is recommended to conduct a pilot study with a small group that reflects the characteristics sample group to test the comprehensibility of the scale items.¹⁹ The scale, which was finalized after expert opinions, was applied to 20 women with characteristics representative of the women to be included in the study, taking into account the number of scale items and sample size in line with the literature. The women's opinions on the scale were recorded.

Construct validity

The CFA applied to the single-factor CCKS-T, as a measure of construct validity, revealed factor loadings within the range of 0.31–0.81. The Confirmatory Factor Analysis diagram is given in Figure 1. The model fit indices of the CCKS-T were found as chi-square (χ^2) = 43.994, degrees of freedom (df) = 20, chi-square/degree of freedom (χ^2/df) = 2.200, goodness of fit index (GFI) = 0.96, comparative fit index (CFI) = 0.96 and root mean square error of approximation (RMSEA) = 0.063. The single-factor scale was found to support construct validity. Model fit indices for confirmatory factor analysis are given in Table 2.

Item analysis

Item-total score correlation analysis was conducted to assess the discriminative capability of scale items. The results indicated that the item-total score correlation coefficients of the scale ranged from 0.441 to 0.776, demonstrating a positive and statistically significant relationship between item scores and total scale scores ($p < 0.001$). CCKS-T item total score correlation coefficients are presented in Table 3.

Internal consistency reliability coefficient

In the reliability analysis of the CCKS-T, the assessment of internal consistency was held to a Cronbach's alpha (α) value of 0.80.

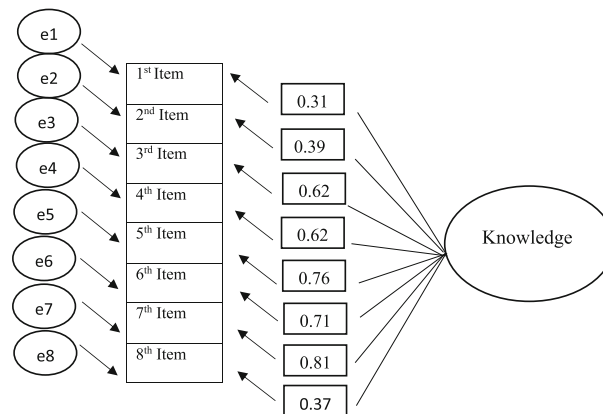


FIGURE 1 Confirmatory factor analysis diagram.

Test–retest

Test–retest analysis was applied to test the time invariance of the CCKS adapted into Turkish. The scale was reapplied to 30 women participating in the study at three-week intervals. The evaluation of the test–retest method was performed using two-way random effect models and absolute agreement with the interclass correlation coefficient (ICC). The ICC value for the total score, 0.798, indicates that the Turkish version possesses a commendable level of reliability.

DISCUSSION

It has been reported that lack of knowledge about cervical cancer and its screening is an important factor in the high incidence in low- and middle-income countries.^{10,11} Studies show that cervical cancer knowledge levels are insufficient in our country and low knowledge levels negatively affect participation in screening programs^{12,13}; accordingly, it is of great importance to increase the level of knowledge and raise awareness about cervical cancer and screening programs. In this study, the psychometric properties of the Turkish form of the scale were examined.

During the initial phase, an assessment of the scale's content validity was conducted. Regarding the validation procedures, language validity was confirmed through the utilization of the translation and back-translation methods. Following the translation of the scale into Turkish, the psychometric properties of the final version, which had been revised by the research team, were subsequently tested with a sample of Turkish women. Eleven experts were engaged to assess the scale's linguistic and cultural appropriateness. The Polit-Beck Content Validity Index was independently calculated for both individual items and the scale as a whole, resulting in a score of 1.00 for each. The content validity analysis demonstrated a remarkable consensus among the experts, indicating a

TABLE 2 Model fit indices for confirmatory factor analysis.

Factor	X^2	df ^a	X^2/df	RMSEA ^b	GFI ^c	CFI ^d
Cervical Cancer Knowledge Scale	43.994	20	2.200	0.063	0.96	0.96

^aDegree of freedom.^bRoot mean square error of approximation.^cGoodness of Fit Index.^dComparative Fit Index.**TABLE 3** Item correlation coefficients of the Cervical Cancer Knowledge Scale.

Items	Item correlation coefficients	
	<i>r</i>	<i>p</i>
A woman is at lower risk for developing cervical cancer if she smokes	0.441	<0.001
A woman is at higher risk of developing cervical cancer if she has had more than five sexual partners in her lifetime	0.546	<0.001
Vaginal bleeding between periods can be a sign of cervical cancer	0.688	<0.001
Persistent vaginal discharge that smells unpleasant can be a sign of cervical cancer	0.684	<0.001
Discomfort or pain during sex can be a sign of cervical cancer	0.752	<0.001
Vaginal bleeding after menopause can be a sign of cervical cancer	0.738	<0.001
Vaginal bleeding during or after sex can be a sign of cervical cancer	0.776	<0.001
The Pap test can detect abnormal cells of the cervix before they become cancer	0.534	<0.001

high level of agreement regarding the alignment of the items with the original version. This robust consensus, representing perfect agreement, constitutes significant support for content validity.²¹ The Turkish adaptation of the CCKS clearly exhibits a coherent language structure and content, effectively measuring the intended domain of knowledge.

In order to assess whether the items within the single-factor construct of the CCKS-T adequately reflected the scale's dimensions, a confirmatory factor analysis (CFA) was conducted, and the resulting model fit indices were carefully examined. According to the CFA, the factor loadings of the scale items were found to exceed 0.30. Factor loading indicates the strength of the correlation between an item and the underlying factor. A factor loading greater than 0.30 typically signifies a moderate correlation between the item and the factor, which aligns with recommendations from the literature.²² In our research, factor loadings ranged from 0.31 to 0.81, consistent with the existing literature.

Following the CFA, the appropriateness of the model structure to the data was assessed through model fit indices.¹⁸ The scale's model fit indices were determined as

follows: $x^2/df = 2.200$, GFI = 0.96, CFI = 0.96, and RMSEA = 0.063. These results demonstrate that the data align well with the model, affirming the one-factor structure, and indicating that the scale's items are positively associated with the scale and effectively represent the construct. Notably, the model fit indices for the Turkish adaptation of the scale closely resemble those of the original scale ($x^2/df = 0.04$, CFI = 1.00, RMSEA < 0.001). This suggests that the Turkish version maintains a similar structural integrity to the original scale. These CFA results provide strong support for the construct validity of the scale.

For the reliability analysis, a combination of test-retest analysis, item-total score analysis, and Cronbach's alpha coefficient were employed. Cronbach's alpha, a critical indicator of internal consistency in measurement instruments, was calculated at 0.80 for the CCKS-T. In the original scale, the value was determined to be 0.76. This coefficient, which reflects the internal consistency of the items, gauges the extent to which the items measure a common attribute. According to the literature, the range of 0.60–0.80 signifies an acceptable level of reliability, and the range of 0.80–1.00, is a high level.^{23,24} These findings affirm the scale's similarity to the original version and demonstrate its high level of reliability.

In this research, the scale's item-total score correlation coefficients ranged between 0.441 and 0.776. All correlation coefficients were determined to hold statistical significance at a level of $p < 0.001$. Based on these outcomes, it was determined that every item within the scale holds significant value for the construct it represents.

To assess the CCKS-T's reliability concerning stability, the test-retest method was employed. The scale was administered to 30 women, who constituted the sample, at three-week intervals. The Intraclass Correlation Coefficient (ICC), computed using a two-way random effects and absolute agreement, was employed to assess the test-retest method and determine the scale's reliability. In the literature, ICC values less than 0.5 are generally characterized as indicative of poor reliability, while values falling between 0.5 and 0.75 are commonly regarded as moderate, and those ranging from 0.75 to 0.90 are considered a sign of good reliability.²⁵

The findings of this study affirm the Turkish adaptation of the CCKS as a valid and reliable assessment tool for measuring knowledge levels. It stands as a valuable instrument for assessing the efficacy of cervical cancer educational interventions. Thus, this scale holds potential

for the early identification of those with insufficient knowledge of cervical cancer prevention.

Limitations

The present study employed an online approach utilizing a non-probability sampling method. This approach exhibits limitations, particularly concerning the potential exclusion of individuals without internet access, thereby potentially constraining the generalizability of the study's findings to the broader population. Furthermore, the scarcity of investigations exploring the scale's validity and reliability across various languages hindered cross-cultural comparisons.

AUTHOR CONTRIBUTIONS

Selcan Zeynep Ergöz Aksoy: opinion, methodology, study design, literature review, data collection, data analysis, and manuscript writing; Dilek Bilgiç: methodology, study design, critical review, manuscript review, and editing.

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The author(s) reported there is no funding associated with the work featured in this article.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The author confirms that a big part data that supports the findings of this study is available in the article. The complete data that support the findings of this study are available from the lead author with permission.

CONSENT TO PARTICIPATE

Informed consent was obtained from all individual participants included in the study. After obtaining the necessary permissions, the researchers explained the purpose of the study to the participants. The online survey began with information about of the study's objectives. Participant's consent was obtained prior to responding to the items in the data collection tools.

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