Development of an Attitude Scale for Cancer Screening

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OBJECTIVE
This study aims to develop a scale to measure people's attitudes towards cancer screening and conduct a pilot study and validity-reliability study of the developed scale.

METHODS
This methodological study was conducted on 334 voluntary male and female relatives of patient who were between 30-70 years of age and attend family health centers at Meram district of Konya province. A sociodemographic form and a candidate scale were used for data collection. Data analysis was performed in a computer setting.

RESULTS
The study group of 334 participants consisted of 50% males and 50% females, and the mean age was 42.93±9.60 years. Four items with item score-scale score correlation less than ±0.200 were excluded from the 28-item candidate scale. Cronbach's alpha coefficient of the 24-item scale was calculated as 0.95. Face and content validity of the scale was evaluated with two different groups. Factor analysis that was used to assess the construct validity of the one-dimensional 24-item scale determined that explained the variance ratio was 52.62%.

CONCLUSION
As a result of our study, a new five-point Likert scale called “Attitude Scale for Cancer Screening” has been developed. Validity and reliability studies of the scale suggest that the scale is suitable for use in our society.

Keywords: Attitude; cancer screening; early diagnosis; scale development.

Introduction
Cancer is among the top ten causes of death worldwide.[1] According to global cancer data published in September 2018, there were 18.1 million new cancer diagnoses and 9.6 million deaths caused by cancer.[2] In Turkey, “Causes of Death Statistics” published in April 2018 reported that 39.7% of deaths arose from circulatory system diseases, 19.6% malignant and benign neoplasms, and 12% respiratory system diseases.[3]

Early diagnosis and treatment are possible in some forms of cancer, a public health concern faced by both the world and our country. Early diagnosis and treatment may increase the patient's life quality and prevent cancer-related death. These reasons increase the significance of cancer screening.[4] Various institutions and textbooks reported that screening must have made for breast, colorectal, cervix, endometrium, lung, prostate, liver, stomach, oral, and pharyngeal cancers.[5-10] The World Health Organization recommends screening for breast, colorectal, and cervix cancer.[10] The “National Cancer Screening Program” in Turkey consists...
of screening for three types of cancer, including breast cancer, cervix cancer, and colorectal cancer.\[11\]

To observe the benefits of community-based cancer screening programs, such as reducing cancer-specific mortality rate, cancer-specific fatality rate, and cancer-specific complication/sequela rate, preventing recurrence and metastasis, and increasing patients’ life quality, the individuals of the community must participate in screening programs.\[12\] To predict the behavior of individuals participating in or not participating in screening, attitudes need to be measured reliably.\[13\]

In a study conducted by Tekpinar et al.\[14\] on 752 people who applied to the family health center, the findings showed that 23.4% of the participants had cancer screening tests at least once before. In a study conducted with 380 people in Bingöl, 3% of women had mammography, 5.9% had a pap-smear test, 4.5% of women and men had a fecal occult blood test and 1.8% had a colonoscopy.\[15\] In a study conducted with 562 people in a family health center in Aydın, 7.7% of the participants had a fecal occult blood test, 3.6% of sigmoidoscopy and 5.4% of colonoscopy.\[16\] In a study conducted with 152 women in İzmir, 44.1% of women have never had mammography, 44.1% have never had a pap-smear test and 9.9% had a colonoscopy.\[17\]

When the national and international literature is examined, it is observed that there are scales developed for breast, cervical and colon cancer screenings through models, such as the health belief model, but a scale that would measure the general attitude towards cancer screenings is not available in the literature. It is important for the researchers to measure society’s general attitude towards cancer screening with a standard scale for cancer screenings that are currently being applied and are likely to be added recently. By accurately measuring the mentioned attitude, effective interventions can be planned for groups that show both positive and negative attitudes, and cancer screening rates can be increased.

This study aims to develop a scale to measure the attitude towards cancer screening, conduct a pilot application and validity-reliability study of the developed scale, and determine the characteristics that may be related to the scale score.

**Materials and Methods**

This study is a methodological type scale-development, validity, and reliability study. The study obtains ethical approval from Necmettin Erbakan University Meram Faculty of Medicine Ethics Committee (No: 2019/1733; Date: 15.02.2019).

Within the scope of this study, 334 male and female patient relatives aged 30-70 years who provided oral and written consent to participate in this study and who did not have cognitive, visual, and orthopedic disabilities preventing them from completing the forms were included. The reason that patients’ relatives were preferred instead of patients is that patients might be more prone to health care use. Bias was tried to be avoided by including patients’ relatives instead of patients. Age range was specified as 30-70 since the minimum age requirement for the “National Cancer Screening Program” was 30 (for cervix cancer) and the maximum age requirement was 70 (for colorectal cancer). The national values of the relevant society can be taken as a basis for using the scale in other societies. The literature indicates that 50 people are very inadequate, 100 inadequate, 200 moderately adequate, 300 adequate, and 500 people are very adequate for conducting scale-development, validity and reliability studies.\[18\] In pilot studies conducted before the validity and reliability studies, 50 participants are recommended when the number of items on the scale is less than 30 and two or three times more participants are recommended when there are 30 or more items.\[19\] In this regard, at least 50 participants are intended for the pilot study and at least 300 for the validity-reliability study. Care is taken to ensure there was an equal number of male and female participants so that the scale could be reliably used in both men and women. This study was conducted at the family health centers of the Meram district of Konya province between the dates of 01/03/2019-01/06/2019. The reason for this study to be conducted in family health centers is to want to reach society easily.

The data collection form used in this study was developed after reviewing the literature related to scale-development and cancer screening. The data collection form consisted of two sections, including a 15-question sociodemographic data form and a 28-item candidate scale. The five-point Likert type candidate scale includes 16 negative and 12 positive statements. The candidate scale required answers on a scale of 1-5 (5: completely agree, 4: partially agree, 3: neither agree nor disagree, 2: partially disagree, 1: completely disagree). The 28 items of the candidate scale were designed to accommodate a one-dimensional scale. In the data collection process, participants completed the forms by themselves under supervision. Each form was completed in about 20 minutes.
Statistical Analysis
Data input, statistical analysis, and report writing were performed in computer settings. Numerical data were expressed as $x \pm sd$, median (min-max) values, while categorical data were expressed as frequency distributions (n) and percentages (%). In the reliability study of the candidate scale, item score-scale score correlation coefficient, item analysis based on the difference of 27% sub-upper group means, Split-Half reliability method and Cronbach's alpha coefficient are used. For the validity study of the candidate scale, face validity, scope validity, and explanatory factor analysis for construct validity were performed.

After performing validity-reliability studies of the scale, when the relations between score and certain characteristics of the participants provided normality criteria, they were compared using Independent-samples t-test, one-way analysis of variance, and Pearson's correlation coefficient; when they do not provide normality criteria, nonparametric equivalents of the same tests are used for comparison. Values-based on statistical analysis are presented in Table 1 and the stages of the scale’s development process are demonstrated in Figure 1.

Results
Sociodemographic Characteristics
Mean participant age was 42.93±9.60 years and the median age was 42 (30-70). The 334 people within the

| Table 1. Statistical values-based on analysis | Acceptance Level |
|---------------------------------------------|------------------|
| Item-Scale Correlation Coefficients          | $>\pm 0.200 \ [19,20,21]$ |
| Spearman-Brown Split Half Coefficient       | $>0.70 \ [19,21]$ |
| Guttman Split Half Coefficient               | $>0.70 \ [19,21]$ |
| Cronbach’s Alpha Coefficient                | $>0.90$ Excellent |
| Content Validity                             | 0.80-0.90 Good |
|                                              | 0.70-0.80 Acceptable |
|                                              | 0.60-0.70 Moderate |
|                                              | 0.50-0.60 Weak |
|                                              | $<0.50$ Unacceptable \ [22] |
| Kaiser-Meyer-Olkin (KMO) Test for Sampling Adequacy | $>0.90$ Excellent |
|                                              | 0.80-0.90 Good |
|                                              | 0.70-0.80 Acceptable |
|                                              | 0.60-0.70 Moderate |
|                                              | 0.50-0.60 Weak |
|                                              | $<0.50$ Unacceptable \ [13,22] |
| Bartlett’s Test for Sphericity               | The test is based on Chi-square statistics. P-value less than 0.05 indicates the relevant data are adequate for factor analysis.\ [13] |
| Factor Loading                               | 0.30 should be accepted as the smallest factor load in exploratory factor analysis.\ [21,23,25,26] |
| Pearson and Spearman Correlation Coefficients | 0.00-0.19 Negligible |
|                                              | 0.20-0.39 Weak correlation |
|                                              | 0.40-0.69 Moderate correlation |
|                                              | 0.70-0.89 Strong correlation |
|                                              | 0.90-1.00 Very strong correlation |
|                                              | Positive correlation coefficients indicate that both variables increase or decrease together, while negative correlation coefficients indicate that as one variable increases, so the other decreases, and vice versa.\ [23] |
| P-Value for Statistical Significance         | $<0.05$ |
posed to accommodate a one-dimensional design in the writing stage, this was assessed with factor analysis. Factor loadings according to the “Principal Component Analysis” factor analysis method of the one-dimensional scale, which was reduced to 24 items as a result of reliability analyses are presented in Table 4.

Features of the Developed “Attitude Scale for Cancer Screening”
The five-point Likert-type scale consisted of 24 items and one dimension. The items were answered on a scale from 5 to 1 [5: completely agree, 4: partially agree, 3: neither agree nor disagree, 2: partially disagree, 1: completely disagree].

The scale is suitable for use in males and females between 30-70 years of age, who are at least literate and do not have cognitive, visual, or orthopedic disabilities, impeding them from completing the form.

Application of the scale is as follows: The participant reads and answers the scale items by themselves while under supervision by the researcher. The scale can be applied with a proper sampling and application method in any situation where it is needed to measure attitude towards cancer screening.

The minimum score of the scale is 24 and the maximum score is 120. Since the scale is an attitude scale, no specific cut-off point was established. Scores near 24 indicate negative attitude, while scores near 120 indicate a positive attitude towards cancer screening. When calculating scores, 13 items with statements of negative meaning (Items 9, 12, 14-24) should be inversely coded. The order of the items is not important. The researchers may use a mixed order for the items.

Attitude Scale for Cancer Screening-Short Form
Given that researchers may require a shorter form during conducting their studies, a short form consisting of 15 items from the original 24-item Attitude Scale for Cancer Screening was also developed.

The short form is as follows: The lowest score that can be obtained from the scale is 15 and the highest score is 75. Since the scale is an attitude scale, no specific cut-off point was established. Scores near 24 indicate negative attitude, while scores near 120 indicate a positive attitude towards cancer screening. When calculating scores, 6 items with “reverse” statements of negative meaning (Items 9, 12, 14-24) should be inversely coded. The order of the items is not important. The researchers may use a mixed order for the items.

Reliability of the Scale
Item score-scale score correlation, 27% sub-upper group analysis, Cronbach’s alpha coefficient, Spearman-Brown and Guttman Split-Half coefficients for the 28-item candidate scale are presented in Table 3.

Construct Validity of the Scale
Before performing the explanatory factor analysis for construct validity, the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and Bartlett’s test for sphericity were conducted to determine whether or not the study group was suitable for factor analysis. The KMO value of the study group was calculated as 0.96. Bartlett’s test for sphericity yielded significant results (Chi-square = 6764.30; p<0.001).

Explanatory factor analysis was used to determine the construct validity of the candidate form. Since the items of the 28-item candidate scale were initially compos-
who smoked at any point in their life had significantly higher scores. Variables that affected scale scores are presented in Table 6.

**Discussion**

**Determining Reliability with Cronbach's Alpha Coefficient**
The most commonly used method to test the reliability of a scale is Cronbach's alpha coefficient. The Alpha coefficient method, developed by Cronbach in 1951,
is suitable for use when items are scored in more than two categories. Reliability coefficient varies between 0 and 1, in which values closer to 1 have higher reliability. According to Nunnally (1998), the alpha reliability value must be greater than 0.70. George and Mallery (2003) evaluated alpha value greater than 0.90 as excellent, 0.80-0.90 as good, 0.70-0.80 acceptable, 0.60-0.70 moderate, 0.50-0.60 weak, and <0.50 as unacceptable. Cronbach's alpha coefficients for the six sub-dimensions in the colorectal cancer screening belief scale that Özsoy et al. adapted for the Turkish language and society are between 0.54-0.88. In Güvenç's cervical cancer and pap smear test health belief model scale, the alpha value is between 0.62 and 0.86 for five sub-dimensions, and the alpha coefficient for cervical cancer early diagnosis scale that is Özmen's doctoral thesis is 0.89.

In the adaptation of Gözüm's breast cancer screening scale, Cronbach's alpha is between 0.69 and 0.83 for eight sub-dimensions. Cronbach's alpha coefficient of the 24-item scale developed by the researchers is calculated as 0.95, considered “excellent” according to the literature. Based on this value, the 24-item Attitude Scale for Cancer Screening Scale may be considered reliable.

### Content Validity

Content validity refers to the extent to which the scale as a whole and each item of the scale serves the purpose of the construct. The most commonly used...
Construct Validity

Factor analysis is performed to determine the construct validity of the scale and the smallest factor load was 0.33 for the original form and the smallest factor load was 0.71 for the short form. It is stated in the literature that 0.30 should be accepted as the smallest factor load in factor analysis. It is recommended to exclude items below this value from the scale.\[21,23,25,26\] The smallest factor load is 0.41 in Özsoy et al.’s colorectal cancer screening belief scale;\[29\] is calculated by 0.30 in Gözüm’s breast cancer screening scale;\[32\] is found by 0.30 in Güvenç’s cervical cancer and pap smear test method to ensure content validity is expert consultation. The expert panel is recommended to consist of 5–40 people.\[23, 24\] It is recommended that the expert panel be composed of people who have sufficient qualifications and knowledge in the subject area, who understand the importance of the study, and are able to allocate sufficient time to the study.\[24\] Within the scope of this study, a panel of 17 experts was consulted to review the validity of the scale. The opinions and suggestions of each expert were carefully evaluated and some items were removed from the scale or corrected.

Table 4. Factor loadings of the scale

| Item Number | Scale Items* | Factor Loading |
|-------------|--------------|----------------|
| 1           | I want to undergo cancer screening at regular intervals. | 0.888 |
| 2           | I want to undergo cancer screening soon. | 0.801 |
| 3           | I want to receive information about cancer screening tests. | 0.865 |
| 4           | If there is anything I wonder about cancer screening, I will research it to find out. | 0.844 |
| 5           | When I undergo a cancer screening test, I will follow the results. | 0.885 |
| 6           | I encourage people around me to undergo cancer screening. | 0.862 |
| 7           | Giving information about cancer screenings on television, on the internet and in the newspaper has a positive effect on my screening. | 0.779 |
| 8           | Cancer screening recommendation by a health worker increases my likelihood of being screened. | 0.852 |
| 9           | If someone close to me is diagnosed with cancer, it doesn’t increase the chance of undergoing cancer screening. (Reverse item) | 0.372 |
| 10          | When I undergo a cancer screening, I think that I’m doing something good for myself. | 0.909 |
| 11          | I only undergo cancer screening tests because I want to. | 0.627 |
| 12          | I don’t want to undergo cancer screening because I’m afraid of bad test results. (Reverse item) | 0.542 |
| 13          | Even if I don’t have any complaints, I would undergo cancer screening. | 0.514 |
| 14          | When the center of cancer screening is too far away to go, I don’t undergo screening. (Reverse item) | 0.333 |
| 15          | I can’t find time for to undergo cancer screening. (Reverse item) | 0.493 |
| 16          | I forget to apply for cancer screening. (Reverse item) | 0.536 |
| 17          | I think it’s unnecessary to undergo cancer screening. (Reverse item) | 0.878 |
| 18          | I think that I’m not the right age for cancer screening. (Reverse item) | 0.731 |
| 19          | I’m afraid cancer screening tests will hurt me. (Reverse item) | 0.455 |
| 20          | I’m concerned about the side effects of cancer screening tests. (Reverse item) | 0.399 |
| 21          | I think the procedures of cancer screening are embarrassing. (Reverse item) | 0.761 |
| 22          | I don’t trust the results of cancer screening tests. (Reverse item) | 0.809 |
| 23          | I don’t need to undergo cancer screening because I think that cancer won’t happen to me. (Reverse item) | 0.857 |
| 24          | I have more important things to do than cancer screening. (Reverse item) | 0.846 |

Eigenvalue=12.66
Explained variance=52.62%

*The scale, whose original language is Turkish, has been translated from Turkish to English by three different translators, and the translations have been combined.
Table 5. Characteristics of the attitude scale for cancer screening-short form

| Item Number | Scale Items* | Item score-scale score correlation | Factor loading |
|-------------|--------------|------------------------------------|----------------|
| 1           | I want to undergo cancer screening at regular intervals. | 0.884 | 0.902 |
| 2           | I want to undergo cancer screening soon. | 0.789 | 0.818 |
| 3           | I want to receive information about cancer screening tests. | 0.867 | 0.888 |
| 4           | If there is anything I wonder about cancer screening, I will research it to find out. | 0.826 | 0.851 |
| 5           | When I undergo a cancer screening test, I will follow the results. | 0.880 | 0.900 |
| 6           | I encourage people around me to undergo cancer screening. | 0.850 | 0.873 |
| 7           | Giving information about cancer screenings on television, on the internet and in the newspaper has a positive effect on my screening. | 0.773 | 0.805 |
| 8           | Cancer screening recommendation by a health worker increases my likelihood of being screened. | 0.850 | 0.873 |
| 10          | When I undergo a cancer screening, I think that I'm doing something good for myself. | 0.911 | 0.926 |
| 17          | I think it's unnecessary to undergo cancer screening. (Reverse item) | 0.866 | 0.886 |
| 18          | I think that I'm not the right age for cancer screening. (Reverse item) | 0.682 | 0.716 |
| 21          | I think the procedures of cancer screening are embarrassing. (Reverse item) | 0.715 | 0.748 |
| 22          | I don't trust the results of cancer screening tests. (Reverse item) | 0.778 | 0.806 |
| 23          | I don't need to undergo cancer screening because I think that cancer won't happen to me. (Reverse item) | 0.829 | 0.852 |
| 24          | I have more important things to do than cancer screening. (Reverse item) | 0.811 | 0.835 |

Cronbach's Alpha Coefficient=0.97
%27 Sub-Upper Group Analysis= all 15 items yielded p<0.001
Spearman-Brown Split-Half Coefficient=0.94
Guttman Split-Half Coefficient=0.94
Kaiser-Meyer-Olkin (KMO) Test for Sampling Adequacy=0.96
Bartlett's Test for Sphericity: Chi-square=5423.69; p<0.001
Eigenvalue=10.76
Explained Variance=71.76%

*The scale, whose original language is Turkish, has been translated from Turkish to English by three different translators, and the translations have been combined.

health belief model scale [31] and is 0.36 in cervical cancer early diagnosis scale that is Özmen’s doctoral thesis.[30]

It is stated in the literature that the explained variance rate of scale should be 67% at least, but it is not easy to achieve this ratio [21,23,26] and when the scale consists of one dimension, it will be sufficient to have 40% variance rate.[23] In the study, the explained variance rate of the original form is 52% and that of the short form is 72%. The explained variance rate is 48% in Özsøy at all’s colorectal cancer screening belief scale. [29] It is 45% in Gözüm’s breast cancer screening scale, [32] 46% in Güvenç’s cervical cancer and pap smear test health belief model scale,[31] 44% in Özmen’s cervical cancer early diagnosis scale [30] and 71% in testicular cancer screening scale.[34]

Relationship between Scale Score and Gender, Education Level, and Cancer Presence Variables

Men scored higher than women. Women had a significantly more negative attitude towards cancer screening compared to men. Tekpinar et al. conducted a study in Antalya and reported that a higher rate of women participated in cancer screening compared to men.[14] In a
study conducted with 380 people in the 20-60 age group in Bingöl, it was reported that cancer screening rates were low in both women and men.[15] In a systematic review by Woolf et al., Women were less likely to participate in screening than men.[35] There have been studies in the literature showing that screening attitudes and behaviors are higher in females than males, similar to males, and at lower rates than males. These different results can be explained by other characteristics and differences of working groups other than gender.

In this study, it was observed that the scale score decreased significantly as the education level increased. In a study conducted with a group of 380 men and women in Bingöl, there was no relationship between screening and education level.[15] In the study conducted by Tekpınar et al., it was found that those with high education level had a low desire to participate in cancer screenings.[14] One study conducted on 562 men and women in Aydın found that the illiterate group had the highest willingness to participate in cancer screening.[16] As education level increases, positive attitudes towards cancer screenings weaken. This situation can be explained by that educated people are less concerned about health, their high self-confidence levels of the education they receive, seeing themselves above health problems, incomplete and even misuse of the research and information access process brought about by education, and some and/or misinformation of some subjects that are thought to be known correctly.

Scale scores were found to be lower in participants with cancer than participants without cancer. This finding may be due to the belief that people with cancer that they will not acquire cancer again. However, there is information in the literature that multiple cancers in the same individual may occur simultaneously and in different time periods.[8] Açıkgöz et al.[17] conducted a study on women in İzmir and did not find an association between cancer presence and participation in cancer screening. Another study on 586 healthcare workers in Ankara yielded different results from our study and reported that rates of participation in cancer screening in people with cancer and/or relatives with cancer were significantly higher compared to those without cancer and/or relatives with cancer.[36]

### Conclusion

As a result of this study, a new assessment instrument called the “Attitude Scale for Cancer Screening” has been developed. The scale’s validity and reliability studies have been conducted. The developed scale is a five-point Likert-type, 24-item, one-dimensional scale. Explained variance ratio of the scale is 52.62%. The scale is a valid and reliable assessment tool to measure the general attitude towards cancer screening. The scale can be used to determine the attitude towards cancer screening of male and female adult individuals between the ages of 30-70 years. The short-form version of the scale is also developed in addition to the scale’s original form.

The study group, consisting of a total of 334 people, has a mean score of $60.51 \pm 27.80$ in a wide range from the minimum to the maximum score. Age, gender, education level, smoking status, and presence of cancer in the individual are determined to be variables related to scale score.

| Table 6. Results related to variables affecting scale scores |
|---------------------------------|----------------|----------------|----------------|----------------|
| Dependent variable | Independent variables | Mean/median of the study group | Test Statistics | P-Value |
| Scale score | Age | 60.51±27.80 | Pearson r=0.347 | 0.001 |
| | Gender | Female | 50.71±23.05 | t=-6.876 | 0.001 |
| | | Male | 70.31±28.74 | |
| Education level | Elementary | 81.75±29.33 | Welch=16.092 | 0.001 |
| | Middle school | 75.48±26.32 | |
| | High school | 65.24±31.48 | |
| | University | 54.94±25.73 | |
| | Master/Doctorate | 48.92±16.59 | |
| Smoking at any period of life | Yes | 63.93±28.51 | t=2.710 | 0.007 |
| | No | 55.77±26.16 | |
| Presence of cancer | Yes | 48.80±31.84 | z=-2.021 | 0.043 |
| | No | 60.75±27.60 | |
Widespread use of the scale in the field will have many benefits. Conducting informational studies on cancer screenings in areas with low attitude and breaking the negative attitude towards screenings as well as conducting new screening studies in collaboration with Provincial Health Directorates, District Health Directorates, and early cancer diagnosis and screening centers (KETEM in Turkey) in areas with positive attitude are among a few of the benefits of measuring attitude towards cancer screening with a standard assessment tool. Since this scale may be used to identify other variables related to scale scores, it is recommended that future studies should be conducted in different locations, in different samplings, or even as multi-center studies.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** The authors declared that they have no conflict interests.

**Ethics Committee Approval:** This study is a methodological type scale-development, validity, and reliability study. The study obtains ethical approval from Necmettin Erbakan University Meram Faculty of Medicine Ethics Committee (No: 2019/1733; Date: 15.02.2019).

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