North Clin Istanb 2024;11(1):18–26
doi: 10.14744/nci.2023.79989

Original Article PUBLIC HEALTH

Turkish validity and reliability of telemedicine awareness, knowledge, attitude and skills questionnaire

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ABSTRACT

OBJECTIVE: The aim of the study is to investigate the validity and reliability of the "Telemedicine Awareness, Knowledge, Attitude, and Skills (AKAS) of Telemedicine" questionnaire and to convert the questionnaire to Turkish.

METHODS: The study is methodological research conducted among medical faculty students and medical residents. For the validity and reliability analysis of the "AKAS of Telemedicine" questionnaire, 425 medical faculty students and medical residents were included in the study, and the sample was 7–10 times the number of questionnaire items. Exploratory factor analysis was performed for construct validity. The test-retest method was engaged to assess reliability. Cronbach's alpha reliability coefficient and the item-total correlation coefficient were calculated for internal consistency. Descriptive statistics were given as mean, standard deviation, median, and first and third quartile values for numerical variables, and numbers and percentages for categorical variables. The Mann-Whitney U test, the Kruskal–Wallis test, and Spearman's correlation coefficient were conducted to evaluate the correlation between variables.

RESULTS: The Cronbach alpha reliability coefficient of the "AKAS of Telemedicine" questionnaire was found to be 0.950, 0.851, 0.970, and 0.952 in the sub-areas, respectively. When an item was removed, the Cronbach alpha reliability coefficient values ranged between 0.826 and 0.969, and no significant difference was detected. As a result of test-retest reliability analysis, a strong positive correlation was found between the total scores (awareness r=0.848, knowledge r=0.792, attitude r=0.787, and skill r=0.816; p<0.001 for each score).

CONCLUSION: The Turkish form of the "AKAS of Telemedicine" questionnaire is a valid and reliable measurement tool that can be used to evaluate the level of AKAS among physicians. It was concluded that research using the "AKAS of Telemedicine" questionnaire would be useful to determine the telemedicine AKAS levels among Turkiye, particularly in health sector workers.

Keywords: Attitude; awareness; knowledge; skills; telemedicine.

Cite this article as: *Mutlu A, Onsuz MF, Kilinc A, Ozcan L, Tepetas M, Metintas S. Turkish validity and reliability of telemedicine awareness, knowledge, attitude and skills questionnaire. North Clin Istanb 2024;11(1):18–26.*

The World Health Organization describes telemedicine as "providing health services by all health-care professionals via using information and communication technologies in other fields for diagnosis, treatment, prevention of diseases and accidents, research, evaluation, health education, and health development when distance is critical" [1].

The increase in the use of information and communication technologies around the world has generated developments and changes in the provision of health services. It is acknowledged that telemedicine applications will facilitate health services for patients and health personnel [2].

Received: September 28, 2022 *Revised:* December 19, 2022 *Accepted:* February 17, 2023 *Online:* January 26, 2024

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Telemedicine could reduce health expenditures by minimizing the repetition of diagnosis and treatment practices and by increasing communication between health institutions. In addition, it improves the quality of medical care and supports in-service training for health personnel. Telemedicine lays the groundwork for international cooperation in the field of health [3]. For remote health service delivery to be integrated and widely used in a country's health system, it must be accepted by society. It is important to determine the awareness, attitude, knowledge, skills, and opinion of society regarding the provision of remote health services and to conduct studies to increase awareness in society [4].

It is important to be aware of the opinions of physicians and physician candidates, who shape society and are also a part of it, regarding telemedicine applications. The acceptance and implementation of telemedicine applications will be possible with the knowledge, positive attitudes, and skills of physicians and physician candidates relating to telemedicine. Zayapragassarazan and Kumar [5] developed the "AKAS of Telemedicine" questionnaire in 2016.

It was examined that objective measurement tools that can be used in the evaluation of awareness, knowledge, attitudes, and skills about telemedicine in Turkiye are not sufficient. This study aimed to convert the "AKAS of Telemedicine" questionnaire to the Turkish language and to verify the validity and reliability of the Turkish version.

Highlight key points

- The "AKAS of Telemedicine" questionnaire is a valid and reliable measurement tool to evaluate the level of AKAS in physicians.
- The Cronbach alpha reliability coefficient of the "AKAS of Telemedicine" questionnaire was found to be 0.950, 0.851, 0.970 and 0.952 in the sub-areas, respectively.
- The "AKAS of Telemedicine" survey will contribute to the research on the determination of AKAS levels in healthcare workers in Turkiye.

MATERIALS AND METHODS

The study is methodological research conducted among medical faculty students and medical residents of Eskisehir Osmangazi University during the 2020–2021 academic year.

Study Procedure and Sampling

In this study, a two-stage method, which was performed in adaptation of measurement tools from different languages and cultures, was implemented. In the first stage of the study, the language and content validity of the "AKAS of Telemedicine" questionnaire were confirmed. To ensure language validity, the questionnaire was translated into Turkish by two independent foreign language experts using the back translation method, and the Turkish form that was created by a joint decision of the two experts was then translated back into English by another language expert. All forms were compared, and the Turkish form of the questionnaire was created. The questionnaire was finalized in Turkish by considering expert opinions relating to Turkish grammar.

In order to evaluate the content validity of the "AKAS of Telemedicine" questionnaire, 10 experts (eight public health specialists, one pediatrician, and one emergency specialist) evaluated the intelligibility of the questionnaire items. Afterwards, the content validity rate (CVR) of each questionnaire item and the content validity index (CGI) value for the four sub-areas of the "AKAS of Telemedicine" questionnaire were calculated. The CVR values of the questionnaire items were between 0.8 and 1.0, and the CGI values were between 0.90 and 0.98. It was observed that the value calculated was greater than the cut-off CGI value required for 10 specialists, and the questionnaire was determined to provide content validity [6]. After the language and content validity stages, the second stage of the study was started.

In the second phase of the study, the validity and reliability of the "AKAS of Telemedicine" questionnaire were analyzed. In order to implement this phase, a minimum sample size was determined. In the questionnaire adaptation studies, it was recommended to reach 7–10 times the number of survey items [7].

The study was thus conducted with 425 medical faculty students and medical residents. In order to evaluate the test-retest reliability of the questionnaire, it was administered twice (with a 2-week break between the applications) to 30 students sampled from the University of Eskisehir Osmangazi, Faculty of Medicine, and medical residents who participated in the first round of the study. The relationship between the test-retest scores of the students was evaluated via Spearman's correlation analysis.

Ethical Considerations

The study was approved by the Non-interventional Clinical Research Ethics Committee of the University of Eskisehir Osmangazi (Approval No. 50, Date: June 01, 2021). In addition, the necessary permissions were obtained from the author of the questionnaire to conduct and use the Turkish validity and reliability study of the questionnaire and from official institutions to conduct the study. The study was conducted according to the guidelines presented in the Declaration of Helsinki.

Questionnaire

The questionnaire form used in the study consisted of two sections. The first section included some propositions regarding socio-demographic characteristics and the AKAS levels of the participants, and the second section consisted of the "AKAS of Telemedicine" questionnaire.

The "AKAS of Telemedicine" questionnaire, which was used to determine the level of telemedicine awareness, knowledge, attitude, and skill, consisted of 47 propositions. The questionnaire comprised four sub-areas: Telemedicine Awareness Level (12 propositions), Telemedicine Knowledge Level (11 propositions), Attitudes towards Telemedicine (11 propositions), and Skills in Telemedicine (13 propositions).

In the Telemedicine Awareness Level sub-area of the "AKAS of Telemedicine" questionnaire, there were 12 statements where the answers were scored as "I don't know=0 points, I just heard=1 point, I know=2 points." There were no reverse propositions, and the total score that could be obtained varied between 0 and 24. In the Telemedicine Knowledge Level sub-area, there were 11 propositions where the answers were scored as "no=0 points, and yes=1 point," there were no reversed propositions, and the total score that could be obtained varied between 0 and 11. In the Attitude towards Telemedicine sub-area, there were 11 propositions with the answers "strongly disagree=0 points, disagree=1 point, undecided=2 points, agree=3 points, and totally agree=4 points," there were no reversed items, and the total score that could be obtained ranged from 0 to 44. There were 13 propositions in the Skills in Telemedicine sub-area with answers of "unsatisfactory=0 points, medium=1 point, good=2 points, and very good=3 points," there were no reverse items, and the total score that could be obtained varied between 0 and 39 [5].

Data Collection

The questionnaire form, which was prepared as a data collection tool in the study, was transferred to the online environment using Google Forms and delivered to medical faculty and medical residents via the WhatsApp mobile application. Among the students to whom the questionnaire was sent, the students who completed the questionnaire were deemed to have accepted to participate in the study.

Data Analysis

The IBM SPSS (Version 15) software program was used for the analysis of the data. Exploratory factor analysis (EFA) was performed for construct validity. The test-retest method was used to assess reliability. The Cronbach alpha reliability coefficient and the item-total correlation coefficient were calculated for internal consistency. In the analysis of the data, a test of conformity to a normal distribution was performed. Descriptive statistics were given as mean, standard deviation, median, and first and third quartile values for numerical variables, and numbers and percentages for categorical variables. The Mann–Whitney U test, the Kruskal–Wallis test, and Spearman's correlation coefficient were executed to evaluate the correlation between variables.

RESULTS

The study group consisted of 425 participants, comprising 225 females (52.9%) and 200 males (47.1%). Their ages were in the range of 18–56 years, with a mean of 24.2±5.6 years. The Eskisehir Osmangazi University Faculty of Medicine students comprised 78.1% (n=332) of the sample, and 21.9% (n=93) were medical residents.

Validity Analysis

EFA

The Kaiser-Meyer-Olkin value, which measures the adequacy of the sample size for factor analysis, was found to be 0.951, 0.902, 0.961, and 0.942 for the awareness, knowledge, attitude, and skill sub-areas, and Barlett's test was measured as $p<0.001$ for all the sub-areas. The results indicated that the data were suitable for factor analysis, and EFA was performed. It was found that the factor loads of the questionnaire items in the EFA were >0.200 and ranged from 0.234 to 0.909. Factor loads higher than 0.200 indicated an acceptable factor load [8]. In the "AKAS of Telemedicine" questionnaire, consisting of 47 items, the total variance in the sub-areas was found to be 64.936%, 44.426%, 77.112%, and 63.988%, respectively.

Table 1. The correlation between the scores of the study group from the sub-areas of the "AKAS of Telemedicine" Questionnaire

Sub-Areas of the "AKAS of Telemedicine" Questionnaire	Awareness	Knowledge	Attitude	Skills
Awareness		r=0.290*	r= 0.445*	r=0.386*
Knowledge	r=0.290*		r=0.366*	r=0.119
Attitude	r= 0.445*	r=0.366*		r=0.269*
Skills	r=0.386*	r=0.119	r=0.269*	

*: P<0.001.

Reliability Analysis

The Cronbach alpha reliability coefficient of the "AKAS of Telemedicine" questionnaire was found to be 0.950, 0.851, 0.970, and 0.952 in the sub-areas, respectively. When an item was removed, the Cronbach alpha values ranged between 0.826 and 0.969, and no significant difference was detected. The factor loads, total item correlations, and Cronbach's alpha coefficients when an item was removed are demonstrated in Appendix 1.

A positive moderate correlation was found between the scores obtained from the sub-areas of awareness and attitude, awareness and skills, and knowledge and attitude of the "AKAS of Telemedicine" questionnaire, and a weak positive correlation was detected between the sub-areas of awareness and knowledge and attitude and skills. The correlation between the scores of the study group from the sub-areas of the "AKAS of Telemedicine" questionnaire is indicated in Table 1.

Test-Retest Analysis

For the test-retest reliability of the "AKAS of Telemedicine" questionnaire, 30 participants answered the questionnaire again 2 weeks after completing the first round of the study. The median (1st and 3rd quarter) scores of the participants in their first evaluation were 17 (12–22), 9 (8–10), 34 (30–39.25), and 22.5 (14.75–27.75), respectively, for the sub-areas of AKAS; and the median (1st and 3rd quarter) scores in the second evaluation were 16.5 (13.75–21.25), 9 (7.75–10), 35 (31.50–39.75), and 22 (17.50–26.75), respectively.

In order to ensure test-retest reliability, the correlation coefficient was expected to be >0.70 [9]. As a result of test-retest reliability, a strong positive correlation was found between the total scores (awareness r=0.848, knowledge r=0.792, attitude r=0.787, and skill r=0.816; p<0.001 for each score). It was confirmed that the "AKAS of Telemedicine" questionnaire provided test-retest reliability. The median scores (min-max) for the sub-areas of the "AKAS of Telemedicine" questionnaire were 12 (0–24), 9 (0–11), 31 (0–44), and 26 (0–39) for the sub-areas of AKAS, respectively. The socio-demographic characteristics of the participants and the distribution of the telemedicine-related variables from the "AKAS of Telemedicine" questionnaire are demonstrated in Table 2.

DISCUSSION

In this study, the validity and reliability of the Turkish version of the "AKAS of Telemedicine" questionnaire were evaluated. The results of the study presented that the "AKAS of Telemedicine" questionnaire had strong measurement features, which made it a reliable and valid questionnaire for physicians in Turkiye for research and application areas of AKAS.

Factor loadings define the weight of the related variable on that factor. In order to explain the structure, factor loads between 0.300 and 0.400 are generally defined as the lowest acceptable load; loads of 0.500 and above are meaningful to apply; and loads of 0.700 and above represent loads that can explain the structure well. In the factor analysis, it is considered "sufficient" that the explained variant ranged between 0.500 and 0.700 [10]. In survey studies, factor loads in EFA are expected to be over 0.200 [8]. It was found that the factor loads of the questionnaire items in the EFA were >0.200 and ranged from 0.234 to 0.909.

In EFA, the questionnaire consisted of four sub-areas. Each sub-area formed a single-factor structure. It was noticed that the total variance of the single factor structure explained 64.936%, 44.426%, 77.112%, and 63.988% in

Table 2. Comparison of the sociodemographic characteristics of the participants, their distribution according to the telemedicine-related variables and their scores from the telemedicine awareness, knowledge, attitudes and skills questionnaire

Socio-demographic characteristics and Telemedicine-related variables	Number (n)	Percent	Awareness Median (Min–Max)	Knowledge Median (Min–Max)	Attitude Median (Min–Max)	Skills Median (Min–Max)
Age (in years)						
18–21	119	28.0	11 (0–24)	9 (1–11)	32 (0–44)	24 (0–39)
22–23	146	34.4	12 (0–24)	9 (0–11)	31 (0–44)	26 (0–39)
24+	160	37.6	13 (0–24)**	9 (0–11)	30 (0–44)	25 (0–39)
Gender						
Female	225	52.9	12 (0–24)	9 (0–11)	31 (0–44)	23 (0–39)
Male	200	47.1	12 (0–24)	9 (0–11)	31 (0–44)	26 (0–39)**
Faculty of medicine student/medical resident						
Faculty of medicine student	332	78.1	12 (0–24)	9 (0–11)	31 (0–44)	25 (0–39)
Medical resident	93	21.9	17 (0–24)*	9 (0–11)	31 (0–44)	26 (7–39)
Grade (n=332)						
1-2-3 (pre-clinic)	144	55.8	11 (0–24)	9 (1–11)	31.5 (0–44)	25.5 (1–39)
4-5-6 (clinic)	188	44.2	12 (0–24)**	9 (0–11)	30 (0–44)	23.5 (0–39)
Working time in the profession (n=93)						
Less than 5 years	49	11.5	16 (0–24)	9 (0–11)	31 (0–449	26 (7–39)
5 years and above	44	10.4	18 (0–24)	9 (1–11)	31 (0–44)	26 (7–39)
Marital status						
Married	59	13.9	16 (0–24)*	9 (1–11)	32 (0–44)	26 (8–39)*
Single	366	86.1	12 (0–24)	9 (0–11)	31 (0–44)	25 (0–39)
Family income status						
Good	83	19.5	16 (0–24)*	9 (1–11)	32 (2–44)**	28 (8–39)*
Medium	376	74.4	12 (0–24)	9 (0–11)	31 (0–44)	25 (0–39)
Bad	26	6.1	12 (0–22)	8 (0–11)	23 (1–44)	18.5 (0–39)
Computer internet knowledge level						
Beginning	22	5.2	11 (0–19)	8.5 (0–11)	30.5 (4–44)	13 (0–27)*
Medium	291	68.5	12 (0–24)	9 (0–11)	31 (0–44)	23 (0–39)*
Advanced	112	26.4	13 (0–24)**	9 (0–11)	30 (0–44)	36 (0–39)*
Daily internet usage time						
0–3 h	108	25.4	12 (0–24)	9 (0–11)	31 (0–44)	22 (0–39)
4–7 h	182	42.8	12 (0–24)	9 (0–11)	30 (0–44)	24 (0–39)
8 h and above	135	31.8	12 (0–24)**	10 (0–11)	33 (0–44)	26 (0–39)
Telemedicine education status						
Yes	9	2.1	22 (12–24)**	9 (0–11)	42 (5–44)**	39 (14–39)**
No	416	97.9	12 (0–24)	8 (0–11)	31 (0–44)	25.5 (0–39)
Request to join the telemedicine education program						
Yes	306	72.0	12 (0–24)*	9 (0–11)	32 (0–44)*	26 (0–39)*
No	119	28.0	11 (0–24)	9 (0–11)	26 (0–42)	23 (0–39)
Total	**425**	**100.0**	**12 (0–24)**	**9 (0–11)**	**31 (0–44)**	**26 (0–39)**

*: P<0.001; **: P<0.05.

the sub-areas of "AKAS of Telemedicine," respectively. Thirty percent of the total variance was reported as an adequate value in scale adaptation studies [11].

Reliability is defined as a measure of invariance over time. The Cronbach alpha reliability coefficient determines whether k questions in a questionnaire form a

whole to explain a homogeneous structure. It is interpreted that the higher the alpha coefficient value," the more items in the questionnaire are consistent with each other or all the items work together to that extent'. Cronbach's alpha value of a questionnaire being above 0.60 indicates that it is highly reliable, and its internal consistency is achieved [10]. The Cronbach alpha reliability coefficient of the "AKAS of Telemedicine" questionnaire, consisting of 47 items, was found to be 0.943, 0.840, 0.967, and 0.948 in the sub-areas of "AKAS of Telemedicine," respectively. When an item in the questionnaire was removed, it was noticed that the Cronbach alpha reliability coefficient did not increase significantly. Similarly, in a study by Elhadi et al. [10] in Libya, it was reported that the Cronbach alpha reliability coefficient of the "AKAS of Telemedicine" questionnaire was found to be 0.823 for awareness, 0.735 for knowledge, 0.910 for attitude, and 0.950 for skill.

In the study, the telemedicine awareness of participants with an advanced level of computer internet knowledge was found to be higher than that of participants with a beginner or intermediate level. In the study of Elhadi et al., [10] it was reported that the telemedicine awareness of physicians with professional computer skills was high. It can be interpreted as having a high level of computer and internet knowledge and the ability to use them to accelerate and facilitate access to information and data.

In the study, the awareness scores of participants who received telemedicine training and participants who wanted to participate in telemedicine training programs were found to be high. In a study conducted with physicians working in Libya, it was reported that most of the participants (78%) participated in a telemedicine training program [10].

In another study conducted with health professionals, it was stated that none of the respondents had received any formal training in telemedicine, and 91% of them desired to receive training [5]. It can be commented that since health professionals who are interested and curious about information and communication technology subjects are also ambitious about increasing their level of knowledge about telemedicine, their awareness level is found to be higher dependently.

Strengths and Limitations of the Study

The study has some limitations. Firstly, the study was conducted at a single medical school. Secondly, there was no equivalent scale that could be used for correlation at the time of the study. In addition to these limitations, the study also has several strengths. Firstly, as far as the authors were aware at the time of this study, the questionnaire developed in this study is the first Turkish validity and reliability questionnaire for telemedicine awareness, knowledge, attitudes, and skills. In addition, further strengths of the scale are that it evaluates the main areas of telemedicine knowledge and is easy to implement.

Conclusion

The Turkish form of the "AKAS of Telemedicine" questionnaire is a valid and reliable measurement tool that can be used to evaluate the level of AKAS among physicians. It was concluded that research using the "AKAS of Telemedicine" questionnaire would be useful to determine the AKAS levels in Turkiye, particularly among health sector workers. As a result of this research, it was concluded that the training and application programs that could be planned according to AKAS levels would be beneficial in increasing the AKAS levels of physicians, reducing the workload of the employees in the health sector, and enabling patients to access health facilities more easily.

Ethics Committee Approval: The Eskisehir Osmangazi University Clinical Research Ethics Committee granted approval for this study (date: 01.06.2021, number: 50).

Authorship Contributions: Concept – AM, MFO, AK, LOMT, SM; Design – AM, MFO, AK, LOMT, SM; Supervision – AM, MFO, AK, LOMT, SM; Materials – AM, MFO, AK, LOMT, SM; Data collection and/or processing – AM, MFO, AK, LOMT, SM; Analysis and/or interpretation – AM, MFO, AK, LOMT, SM; Literature review – AM, MFO, AK, LOMT, SM; Writing – AM, MFO, AK, LOMT, SM; Critical review – AM, MFO, AK, LOMT, SM.

Conflict of Interest: No conflict of interest was declared by the authors.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declared that this study has received no financial support.

Peer-review: Externally peer-reviewed.

REFERENCES

1. World Health Organization (WHO). Telemedicine: Opportunities and Developments in Member States. Report on the second global survey on eHealth. Available at: https://iris.who.int/bitstream/handle/10665/44497/9789241564144_eng.pdf?sequence=1. Accessed Jan 12, 2024.
2. Önal S, Kaya GG. Remote patient follow-up and tele-medicine in the pandemic process and its place in primary care. [Article in Turkish]. Klinik Tıp Aile Hekimliği Derg 2020;12:98–106.

3. Toader E, Damir D, Toader IA, editors. Ethical and legal issues related to the clinical application of telemedicine. Proceedings of the 3rd International Conference on E-Health and Bioengineering - EHB 2011; 2011 Nov 24-26; Iaşi; Romania.
4. Sungur C. Patient satisfaction in telemedicine applications: a systematic review study. [Article in Turkish]. Hacettepe J Health Admin 2020;23:505–22.
5. Zayapragassarazan Z, Kumar S. Awareness, knowledge, attitude and skills of telemedicine among health professional faculty working in teaching hospitals. J Clin Diagn Res 2016;10:JC01–4. [CrossRef]
6. Alpar R. Spor Sağlık ve Eğitim Bilimlerinden Örneklerle Uygulamalı İstatistik ve Geçerlik-Güvenirlik. 5th ed. Ankara: Detay Yayıncılık; 2018. p. 493–569.
7. Gökler ME, Aydın R, Ünal E, Metintaş S. Determining validity and reliability of Turkish version of Fear of Missing out Scale. [Article in Turkish]. Anatolian J Psychiatry 2016;17 Suppl 1:53–9. [CrossRef]
8. Chen J, Yang Q, Zhao Q, Zheng S, Xiao M. Psychometric validation of the Chinese version of the Second Victim Experience and Support Tool (C-SVEST). J Nurs Manag 2019;27:1416–22. [CrossRef]
9. Bjørnsen HN, Eilertsen MEB, Ringdal R, Espnes GA, Moksnes UK. Positive mental health literacy: development and validation of a measure among Norwegian adolescents. BMC Public Health 2017;17:717.
10. Elhadi M, Elhadi A, Bouhuwaish A, Bin Alshiteewi F, Elmabrouk A, Alsuyihili A, et al. Telemedicine awareness, knowledge, attitude, and skills of health care workers in a low-resource country during the COVID-19 pandemic: cross-sectional study. J Med Internet Res 2021;23:e20812. [CrossRef]
11. Büyüköztürk Ş. Sosyal Bilimler için Veri Analizi El Kitabı. İstatistik, Araştırma Deseni SPSS Uygulamaları ve Yorum. 8th ed. Ankara: Pegem Akademi Yayıncılık; 2007. p. 71.

Appendix 1. Factor loads of the items of the "AKAS of Telemedicine" Questionnaire, total item correlations, and cronbach alpha coefficients when excluding an item

	Factor load	Item total correlation coefficient	Cronbach's alpha value when the item was removed	
Awareness level on telemedicine				Explained variance: %64.936 Cronbach alpha: 0.950
1 Information and Communication Technologies (ICT) can be used effectively in health services.	0.699	0.650	0.949	
2 Information Technology (IT) and ICT-supported services are the latest developments in medicine.	0.686	0.638	0.950	
3 Telemedicine is part of medical education technology.	0.773	0.730	0.947	
4 Telemedicine and e-health are near-synonymous concepts.	0.718	0.670	0.949	
5 Face-to-face interaction of patients and doctors is possible with telemedicine.	0.728	0.680	0.949	
6 Telemedicine provides access to health services in places where transportation is difficult.	0.873	0.838	0.943	
7 With telemedicine, medical images can be transmitted for consultation to a remote specialist.	0.888	0.857	0.943	
8 Electronic home visits to elderly patients are possible through telemedicine.	0.859	0.821	0.944	
9 Rural physicians can send EKGs and X-rays to physicians elsewhere in the world and get their opinions.	0.822	0.780	0.945	
10 Continuing medical education programs can be done effectively and cost-effectively through telemedicine.	0.836	0.798	0.945	
11 Telemedicine can be used on battlefields, prisons, during natural and man-made disasters, and for disabled patients.	0.881	0.850	0.943	
12 Telemedicine helps provide medical education to a wider group of teachers and students.	0.865	0.829	0.944	
Knowledge level about telemedicine				Explained variance: %44.426 Cronbach alpha: 0.851
1 Telemedicine is the use of telecommunications to provide medical information and services.	0.234	0.161	0.858	
2 Conducting the treatment of the patient with drugs can be done through telemedicine.	0.670	0.587	0.834	
3 Direct and complete consultation of patients with another physician is possible through telemedicine.	0.657	0.561	0.836	
4 It is common for patients to consult another specialist via telemedicine over the Internet.	0.454	0.404	0.852	
5 Patients' examination data can be transmitted via telemedicine.	0.811	0.696	0.827	
6 Medical reviews of patients can be transmitted via telemedicine.	0.825	0.707	0.826	
7 Regular follow-up of patients can be done with telemedicine.	0.758	0.669	0.827	
8 Through telemedicine, patients can be managed, including the follow-up of surgical patients.	0.452	0.375	0.854	
9 Electronic medical records of patients can be kept through telemedicine.	0.830	0.713	0.828	
10 Electronic medical records of patients can be consulted by physicians.	0.834	0.729	0.826	
11 Health care via the Internet is a well-known practice.	0.495	0.436	0.848	

Appendix 1 (cont). Factor loads of the items of the "AKAS of Telemedicine" Questionnaire, total item correlations, and cronbach alpha coefficients when excluding an item

	Factor load	Item total correlation coefficient	Cronbach's alpha value when the item was removed	
Attitude towards telemedicine				Explained variance: %77.112 Cronbach alpha: 0.970
1 Having the ability to use computers and knowledge of ICT applications in the medical field is a must for healthcare professionals.	0.829	0.794	0.969	
2 Telemedicine provides quality healthcare by promoting teamwork among healthcare professionals.	0.893	0.869	0.967	
3 The application of information and communication technologies in health services reduces the financial burden on the state.	0.893	0.867	0.967	
4 Health for all can be easily achieved through ICT-supported health services.	0.868	0.838	0.967	
5 As healthcare professionals become more aware of the possibilities offered by telemedicine, their individual benefits increase.	0.931	0.913	0.965	
6 If my hospital had telemedicine training courses, I would attend.	0.834	0.800	0.969	
7 Patients should be encouraged to access medical information via emails and websites so that they can be better informed about their medical condition.	0.887	0.860	0.967	
8 By providing the public with easier access to health information and advice through Telemedicine, a healthier population will be created in the future.	0.907	0.886	0.966	
9 The use of telemedicine will bridge the gap between primary, secondary and tertiary care by improving connections between patients, nurses, general practitioners and specialist physicians.	0.840	0.806	0.968	
10 The use of telemedicine will encourage more teamwork in healthcare.	0.861	0.831	0.968	
11 The use of telemedicine provides a more equitable distribution of health services by placing more emphasis on preventive health services.	0.909	0.888	0.966	
Skills on telemedicine				Explained variance: %63.988 Cronbach alpha: 0.952
1 Ability to use e-mails with attachments	0.808	0.761	0.948	
2 Ability to scan documents and images	0.854	0.821	0.946	
3 Ability to video conference	0.827	0.788	0.947	
4 Ability to take digital photography	0.756	0.716	0.949	
5 "Medline" etc. the ability to access and search a medical site	0.803	0.766	0.947	
6 Ability to participate in online discussion forums	0.827	0.793	0.947	
7 Ability to download and upload web pages and images	0.773	0.720	0.949	
8 Ability to install and uninstall software	0.751	0.717	0.950	
9 Ability to use related software to read medical images	0.741	0.709	0.949	
10 Ability to install a webcam	0.832	0.802	0.946	
11 Ability to chat online	0.773	0.718	0.949	
12 Ability to write to disc or copy files to external storage devices	0.828	0.787	0.947	
13 Ability to establish network connections	0.816	0.779	0.947	