



ORIGINAL ARTICLE

The Relationship Between Nurses' Digital Competencies and Their Attitudes Toward Telehealth Use: A Descriptive Cross-Sectional Study

Hemşirelerin Dijital Yeterlilikleri ile Telesaglık Kullanımına Yönelik Tutumları Arasındaki İlişki: Tanımlayıcı Kesitsel Bir Çalışma

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Abstract

Introduction: The rapid digitalization of healthcare has led to increased use of telehealth in nursing practice. This study aimed to examine the relationship between Turkish nurses' levels of digital competence and their attitudes toward the use of telehealth.

Methods: A descriptive cross-sectional research design was employed. Actively working nurses across Türkiye were selected for the study. Data were collected between December 5, 2024, and January 5, 2025, through an online survey utilizing a nurse demographic information form, the Digital Competence Scale, and the Nurses' Attitudes Toward the Use of Telehealth Scale (NATUTS). Descriptive statistics, independent-samples t-test, one-way analysis of variance, Pearson correlation analysis, and multiple linear regression analysis were used for data analysis.

Results: A total of 280 actively working nurses across Türkiye were included in the study. The majority of the participating nurses were aged 40 years or younger (81.4%), female (86.4%), and held a bachelor's degree. Older nurses and those with longer professional experience exhibited higher levels of digital anxiety and lower total NATUTS scores ($p<0.05$). Nurses' perceptions of digital competence ($B=0.312$, $p<0.05$), digital adaptability ($B=0.848$, $p<0.001$), and digital anxiety ($B=-1.264$, $p<0.001$) were identified as significant predictors of NATUTS scores.

Discussion and Conclusion: To enhance the integration of telehealth into nursing practice, structured training programs and continuous professional development opportunities should be prioritized.

Keywords: Attitudes; Digital competence; Health care; Nursing; Telehealth

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Telehealth is an important strategy that strengthens interactions between patient and professional by eliminating geographical and temporal barriers and improving access to health care in remote areas.^[1,2] The COVID-19 pandemic significantly accelerated the adoption of telehealth services, making remote healthcare delivery a more widespread and essential component of medical care during this period.^[3] Adaptation to telehealth has become a critical factor that directly influences service quality, highlighting the growing importance of healthcare professionals' digital competencies.^[4] Nurses play a key role in the adoption and effective utilization of digital technologies.^[5] Research indicates that nurse-led telehealth services improve patient satisfaction and contribute to the sustainability of the healthcare system.^[6]

The Twelfth Development Plan of Türkiye (2024–2028) “Qualified People, Strong Families, Healthy Society” targets and policies include increasing the quality and duration of life of individuals and ensuring the provision of financially sustainable health services based on reliable, high-quality, effective, evidence-based processes and digital health technologies for generations in complete physical and mental well-being.^[7] The digital transformation of healthcare is creating more evidence-based knowledge, skills and competencies for professionals to support healthcare. Promoting and facilitating digital health competencies within the education and training curricula of all health professionals and related workers is an important policy and action under the Global Strategies for Digital Health (2020–2025).^[8] Choosing the right technology and utilizing it efficiently in telehealth applications are essential elements in increasing the quality of healthcare services.^[9]

Digital competence enables nurses to strengthen patient management and communication with the care team while ensuring the provision of safe and high-quality care.^[10] Nurses' digital competence is a critical factor that determines their ability to use telehealth applications effectively and manage challenges encountered in the process.^[11] However, there is evidence suggesting that educational opportunities in this field are insufficient in Türkiye.^[5]

This descriptive cross-sectional study aimed to examine the relationship between nurses' levels of digital competence and their attitudes toward telehealth use.

Materials and Methods

Design and Sample

This descriptive cross-sectional study was conducted with nurses working in clinical settings across Türkiye. The research questions were as follows:

1. What are the digital competency levels of nurses?
2. What are nurses' attitudes toward telehealth utilization?
3. Is there a significant relationship between nurses' digital competency levels and their attitudes toward telehealth use?

Data were collected through an online survey between December 5, 2024, and January 5, 2025. The study population consisted of all actively employed nurses in Türkiye. According to the most recent data available during the research period, published by the Republic of Türkiye Ministry of Health, there were 243,565 nurses nationwide in 2022.^[12] The sample size was calculated using the known population sampling method, determining a required sample of 272 participants based on a 90% confidence interval and a 5% margin of error. Actively working and voluntarily agreed nurses, aged between 18–65, were selected for the study. Those who did not provide consent, were younger than 18 or older than 65, or were not actively working as nurses were excluded from the study.

Data Collection

Participants were recruited using the snowball sampling method, and the survey was disseminated via social media platforms such as Instagram, Telegram, and WhatsApp. This method was chosen to address potential challenges in reaching participants due to nurses' heavy clinical workloads.^[13] Data were collected using a Nurse Demographic Information Form, the Nurses' Attitudes toward the Use of Telehealth Scale (NATUTS)^[4] and the Digital Competency Scale (DCS).^[11] The time taken to complete the data collection forms varied between 10 and 15 minutes.

Various measures were implemented in this study to enhance data quality and ensure the reliability of results. Participants' anonymity and confidentiality were strictly maintained, and access to the survey was controlled. Technical measures such as IP address tracking and unique participation codes were applied to prevent multiple responses from the same participant. To increase participant motivation and response rates, the survey was designed to be concise and transparent, with clearly structured, straightforward questions. This approach aimed to facilitate participant engagement, leading to higher response rates and more reliable data collection. Furthermore, safeguarding participant anonymity and confidentiality throughout the data collection process ensured that respondents felt more comfortable providing honest answers. These precautions contributed to

improving the reliability and quality of the data, thereby supporting the validity of the study findings.^[13] All questions in the online survey (Google Forms) were set as mandatory. As a result, no missing data were recorded. The dataset was also manually checked before analysis to confirm completeness.

Data Collection Tools

Nurse Demographic Information Form

Developed by the researchers based on relevant literature, this form was used to collect data on nurses' sociodemographic characteristics (e.g., age, gender, workplace, and years of experience) and their knowledge of telehealth.^[14,5] It consisted of 15 questions.

The Nurses' Attitudes toward the Use of Telehealth Scale (NATUTS)

Developed by Yılmaz et al.^[4] in Turkish, it is the first instrument designed to measure nurses' attitudes toward telehealth use. The scale consists of 19 items structured into three factors: satisfaction, rejection, and improvement, explaining 64.4% of the total variance. The Cronbach's alpha values for these factors are 0.93, 0.86, and 0.87, respectively. Responses are evaluated using a five-point Likert scale, where the satisfaction and improvement factors are positively scored (1 = strongly disagree, 5 = strongly agree), while the rejection factor is reverse-scored (1 = strongly agree, 5 = strongly disagree). The total score ranges from 19 to 95, with higher scores indicating a more positive attitude toward telehealth usage. The scale is applicable to all nurses.^[4] In this study, Cronbach's alpha value was found to be 0.929, demonstrating high internal consistency.

Digital Competency Scale (DCS)

Developed by Tutar et al.^[11] in Turkish, this scale assesses the digital competencies of individuals working in both the public and private sectors. It comprises three dimensions: perception of digital competence, perception of digital adaptability, and perception of digital anxiety. This instrument consists of 21 items, evaluated using a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), with a total score ranging from 21 to 105. Cronbach's alpha values for the dimensions were previously reported to be 0.97, 0.95, and 0.81, respectively, with an overall internal consistency of 0.98.

^[11] In the current study, Cronbach's alpha value was found to be 0.854, indicating good reliability.

Statistical Analysis

Data analysis was performed using Statistical Package for Social Sciences (SPSS) for Windows version 22.0 (IBM Corp, Armonk, NY, USA). Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize sociodemographic characteristics and study variables. The Kolmogorov-Smirnov test, skewness, and kurtosis values were examined to assess the data distribution. Depending on the type of variable, the independent-samples t-test and one-way analysis of variance were conducted, with post hoc tests applied when necessary. Pearson correlation analysis was used to examine the relationships between DCS and NATUTS scores and subscale scores. Additionally, multiple linear regression analysis was performed to investigate the predictive effects of the DCS dimensions on NATUTS scores. The "variance inflation factor" (VIF) has been used to evaluate potential collinearity using a benchmark VIF <3. A p-value of <0.05 was considered statistically significant.

Ethical Statement

The study was approved by the Health Science Ethics Committee of Çankırı Karatekin University (Date: 4.12.2024; Number: 17). Before completing the survey, individuals provided electronic informed consent via the first question. Participants could not proceed with the survey without providing consent. This study was conducted in conformity with the principles outlined in the Helsinki Declaration.

Results

A total of 280 actively working nurses across Türkiye were included in the study. The majority of the nurses participating in the study were 40 years old or younger (81.4%), female (86.4%), and held a bachelor's degree. Among the participants, 50.7% were married, 43.2% had one to five years of professional experience, and 83.9% worked as clinical nurses. Regarding telehealth use, 51.8% reported never using it, while 48.2% stated that they had used it multiple times. In terms of its impact on workload, 44.3% believed that telehealth use reduced workload, 37.1% found it ineffective, and 18.6% thought that it increased workload (Table 1).

The total NATUTS score was 66.15 ± 10.58 (min: 36, max: 95). The subscales of NATUTS had a mean score of 39.00 ± 6.79 for satisfaction, 17.21 ± 3.84 for rejection, and 9.94 ± 2.40 for improvement. The total DCS score was 77.09 ± 9.08 (min: 38, max: 105). The mean scores for its subscales were 30.78 ± 4.72 for the perception of digital competence, 38.42 ± 5.76 for the perception of digital adaptability, and 7.89 ± 2.24 for the perception of digital anxiety (Table 2).

The total NATUTS score was significantly higher among nurses aged 40 and under (66.79 ± 10.86) compared to those over 40 (63.37 ± 8.78) ($p < 0.05$; $d = 0.346$). According to Tukey HSD results, the rejection subscale score of associate degree nurses was significantly lower than that of nurses with a bachelor's or graduate degree ($p < 0.05$; $\eta^2 = 0.027$). Additionally, graduate degree nurses (10.31 ± 2.54) had significantly higher scores in the improvement subscale ($p < 0.05$; $\eta^2 = 0.024$) and total NATUTS scores ($p < 0.05$; $\eta^2 = 0.029$) compared to other groups. Professional experience had a significant impact on satisfaction and total NATUTS scores ($p < 0.05$; $\eta^2 = 0.058$; $\eta^2 = 0.052$). According to Tukey HSD analysis, nurses with one to five years of experience had the highest satisfaction ($p < 0.05$; $\eta^2 = 0.058$) and total NATUTS ($p < 0.05$; $\eta^2 = 0.052$) scores. However, rejection scores did not show a significant difference based on professional experience ($p > 0.05$). Telehealth usage experience significantly influenced rejection ($p < 0.05$; $d = 0.325$), satisfaction ($p < 0.05$; $d = 0.307$), and total NATUTS scores ($p < 0.05$; $d = 0.344$). Nurses who had used telehealth multiple times had higher rejection scores (17.85 ± 3.44), satisfaction scores (40.07 ± 6.38), and total NATUTS scores (68.01 ± 10.13). However, telehealth usage experience did not significantly affect improvement scores ($p > 0.05$; $d = 0.129$) (Table 3).

Nurses over the age of 40 ($p < 0.05$; $d = 0.468$) and those with 16 or more years of professional experience ($p < 0.05$; $\eta^2 = 0.032$) had significantly higher digital anxiety scores compared to nurses under 40 and those with less professional experience. According to Tukey HSD analysis, nurses with a graduate degree (39.91 ± 5.92) had the highest digital adaptability scores compared to nurses with lower educational levels ($p < 0.05$; $\eta^2 = 0.042$) (Table 4).

Positive correlations were identified between perception of digital competence and the total NATUTS score ($r = 0.457$, $p < 0.01$), as well as its satisfaction ($r = 0.483$, $p < 0.01$) and improvement ($r = 0.397$, $p < 0.01$) subscales. Similarly, perception of digital adaptability showed positive correlations with the total NATUTS score ($r = 0.630$, $p < 0.01$) and the satisfaction ($r = 0.610$, $p < 0.01$) and improvement ($r = 0.487$, $p < 0.01$) subscales. In contrast, perception of digital anxiety was negatively correlated with the total NATUTS score ($r = -0.432$, $p < 0.01$) and the satisfaction ($r = -0.246$, $p < 0.01$), improvement ($r = -0.231$, $p < 0.01$), and rejection ($r = -0.614$, $p < 0.01$) subscales (Table 5).

A multiple linear regression analysis was conducted to assess whether nurses' digital competencies significantly predicted total NATUTS scores. The results indicated that the model was statistically significant ($F = 81.772$, $p < 0.001$)

Table 1. Socio-demographic characteristics of nurses

Characteristics	n	%
Age		
≤40 years	228	81.4
>40 years	52	18.6
Gender		
Female	248	86.4
Male	38	13.6
Marital status		
Married	142	50.7
Single	138	49.3
Educational status		
Associate degree	11	3.9
Bachelor's degree	211	75.4
Graduate degree	58	20.7
Duration of work experience		
1–5 years	121	43.2
6–15 years	98	35.0
≥16 years	61	21.8
Clinic type		
Medical and surgical	49	17.5
ICU and emergency	89	31.8
Other	142	50.7
Position		
Clinical nurse	235	83.9
Other	45	16.1
Experience using telehealth		
Never	145	51.8
More than once	135	48.2
Impact of telehealth on workload		
Reduces workload	124	44.3
No impact	104	37.1
Increases workload	52	18.6

ICU: Intensive care unit.

and explained approximately 46% of the variance in NATUTS scores ($R^2 = 0.46$). Table 6 demonstrates that the VIF is less than three for individual constructs; hence, multicollinearity is not an issue. The analysis revealed that perception of digital competence was a significant positive predictor of NATUTS scores ($B = 0.312$, $SE = 0.124$, $\beta = 0.139$, $t = 2.516$, $p = 0.012$), with a 95% confidence interval (CI) ranging from 0.068 to 0.557. Similarly, perception of digital adaptability had a strong positive effect ($B = 0.848$, $SE = 0.106$, $\beta = 0.462$, $t = 7.999$, $p < 0.001$), with a 95% CI between 0.639 and 1.057. In contrast,

Table 2. Descriptive statistics of study variables

Variables	Mean	SD	Minimum	Maximum
NATUTS-satisfaction	39.00	6.79	21.00	55.00
NATUTS-rejection	17.21	3.84	5.00	25.00
NATUTS-improvement	9.94	2.40	3.00	15.00
NATUTS total	66.15	10.58	36.00	95.00
DCS-perception of digital competence	30.78	4.72	11.00	40.00
DCS-perception of digital adaptability	38.42	5.76	20.00	50.00
DCS-perception of digital anxiety	7.89	2.24	3.00	15.00
DCS total	77.09	9.08	38.00	105.00

SD: Standard deviation; NATUTS: Nurses' Attitudes Toward the Use of Telehealth Scale; DCS; Digital Competency Scale.

Table 3. Comparison of telehealth attitude scores among nurses by socio-demographic and professional

Variables	Satisfaction Mean±SD	Rejection Mean±SD	Improvement Mean±SD	NATUTS total Mean±SD
Age				
≤40 years	39.37±6.93	17.41±3.93	10.01±2.45	66.79±10.86
>40 years	37.40±5.88	16.35±3.26	9.62±2.09	63.37±8.78
Test and p-value	t=1.893 p=0.059 d=0.306	t=1.816 p=0.070 d=0.293	t=1.180 p=0.241 d=0.171	t=2.119 p=0.035* d=0.346
Educational status				
Associate degree	34.91±6.99	14.27±3.13	8.27±2.49	57.45±11.36
Bachelor's degree	38.99±6.71	17.44±3.58	9.92±2.32	66.35±10.49
Graduate degree	39.83±6.83	16.95±4.57	10.31±2.54	67.09±10.21
Test and p-value	F=2.456 p=0.088 η ² =0.017	F=3.817 p=0.023* η ² =0.027	F=3.419 p=0.034* η ² = 0.024	F=4.066 p=0.018* η ² =0. 029
Professional experience				
1–5 years	40.77±6.52	17.56±3.96	10.31±2.26	68.64±10.19
6–15 years	38.22±6.94	17.34±3.96	9.78±2.59	65.34±10.97
≥16 years	36.75±6.19	16.33±3.24	9.44±2.21	62.52±9.55
Test and p-value	F=8.527 p=0.000* η ² =0.058	F=2.194 p=0.113 η ² =0.016	F=3.062 p=0.05 η ² =0.022	F=7.571 p=0.001* η ² = 0.052
Experience using telehealth				
Never	38.01±7.02	16.62±4.08	9.79±2.43	64.42±10.73
More than once	40.07±6.38	17.85±3.44	10.10±2.35	68.01±10.13
Test and p-value	t=-2.554 p=0.01* d=0.307	t=-2.714 p=0.007* d=0.325	t=-1.082 p=0.28 d=0.129	t=-2.876 p=0.004* d=0.344

SD: Standard deviation; NATUTS: Nurses' Attitudes Toward the Use of Telehealth Scale; p<0.05: Statistically significant; d: Cohen's d; η²: Eta squared.

perception of digital anxiety was found to be a significant negative predictor of NATUTS scores ($B=-1.264$, $SE=0.218$, $\beta=-0.268$, $t=-5.795$, $p<0.001$), with a 95% CI ranging from -1.694 to -0.835 (Table 6).

Table 4. Comparison of digital competence scores among nurses by socio-demographic and professional characteristics

Variables	Digital competence Mean±SD	Digital adaptability Mean±SD	Digital anxiety Mean±SD
Age			
≤ 40 years	30.73±4.78	38.68±5.82	7.69±2.17
> 40 years	31.02±4.44	37.29±5.38	8.75±2.35
Test and p-value	t=-0.401 p=0.68 d=0.062	t=1.571 p=0.11 d=0.248	t=-3.127 p=0.002* d=0.468
Educational status			
Associate degree	28.54±4.45	33.63±6.66	9.09±2.11
Bachelor's degree	30.59±4.69	38.25±5.53	7.80±2.16
Graduate degree	31.87±4.66	39.91±5.92	7.98±2.51
Test and p-value	F=3.013 p=0.05 η ² =0.021	F=6.040 p=0.003* η ² =0.042	F=1.820 p=0.164 η ² =0.013
Professional experience			
1–5 years	30.85±4.40	38.85±5.34	7.69±2.25
6–15 years	30.55±5.29	38.65±6.33	7.65±2.11
≥16years	31.02±4.38	37.18±5.48	8.64±2.29
Test and p-value	F=0.205 p=0.81 η ² =0.001	F=1.843 p=0.16 η ² =0.013	F=4.520 p=0.012* η ² =0.032
Experience using telehealth			
Never	30.48±4.58	38.21±5.78	8.02±2.44
More than once	31.11±4.84	38.64±5.74	7.74±2.00
Test and p-value	t=-1.126 p=0.26 d=0.133	t=-0.613 p=0.53 d=0.074	t=1.043 p=0.29 d=0.125

SD: Standard deviation; p<0.05: Statistically significant; d: Cohen's d; η²: Eta Squared.

Discussion

To our knowledge, this is the first study to examine the relationship between Turkish nurses' digital competency levels and their attitudes toward telehealth use. Our findings indicate that digital competencies can be associated with positive attitudes toward telehealth. The total NATUTS score was significantly higher among nurses aged 40 and under compared to those over 40. Notably, nurses aged 40 and under also tended to exhibit lower levels of digital anxiety. The literature indicates that nurse leaders aged 20–39 have been shown to possess higher digital competence, whereas those aged 50 and older demonstrate lower levels of proficiency.^[14] In addition, Brown et al.^[15] reported that younger nurses tend to be more able and accepting/adaptable

to new technology. Younger generations, often referred to as the “digital native generation,” tend to exhibit more favorable attitudes toward digitalization. This highlights the need for future research to explore specific digital health competencies among this group.^[16] Nevertheless, academic education programs and training courses can contribute to increased experience and knowledge, regardless of age.^[17]

Our findings suggest that nurses with higher education levels tend to have more positive attitudes toward telehealth, whereas those with lower educational attainment are more likely to reject its use. This is supported by previous research indicating that advanced education enhances awareness and comprehension of telehealth concepts. For example, participants with a master's degree demonstrated

Table 5. Correlation coefficients between DCS and NATUTS scores

Variables	1	2	3	4	5	6	7
1. DCS-perception of digital competence	1						
2. DCS-perception of digital adaptability	0.608**	1					
3. DCS-perception of digital anxiety	-0.139*	-0.314**	1				
4. NATUTS total	0.457**	0.630**	-0.432**	1			
5. NATUTS-satisfaction	0.483**	0.610**	-0.246**	0.925**	1		
6. NATUTS-rejection	0.159**	0.356**	-0.614**	0.690**	0.421**	1	
7. NATUTS-improvement	0.397**	0.487**	-0.231**	0.691**	0.580**	0.254**	1

SD: Standard deviation; NATUTS: Nurses' Attitudes Toward the Use of Telehealth Scale; DCS: Digital Competency Scale; *: P<0.05: Statistically significant; **: P<0.01: Statistically highly significant.

Table 6. Regression analysis of DCS Scores for predicting NATUTS scores

Predictor variables	B	SE	Beta	t	95% CI		VIF	p
					LL	UL		
(Constant)	33.927	4.342		7.814	25.379	42.474		0.000
Perception of digital competence	0.312	0.124	0.139	2.516	0.068	0.557	1.595	0.012*
Perception of digital adaptability	0.848	0.106	0.462	7.999	0.639	1.057	1.735	0.000*
Perception of digital anxiety	-1.264	0.218	-0.268	-5.795	-1.694	-0.835	1.115	0.000*

B: Unstandardized coefficient; SE: Standard error; CI: Confidence interval; LL: Lower limit; UL: Upper limit; VIF: Variance inflation factor; DCS: Digital Competency Scale; NATUTS: Nurses' Attitudes Toward the Use of Telehealth Scale. P<0.05: Statistically significant.

significantly greater knowledge of telehealth definitions compared to those with only a bachelor's degree.^[18] Recent literature has emphasized that digital competence is a core requirement for providing quality care in increasingly digital healthcare environments. However, despite the growing demand for such competencies, nursing and allied health curricula often fall short in adequately preparing students in this area. As such, integrating structured digital health education across healthcare disciplines and ensuring that educators themselves possess sufficient digital literacy are critical steps for preparing future professionals. Furthermore, continuous professional development for the existing workforce is essential to support the ongoing digital transformation in clinical practice.^[19] These insights underscore the need to embed telehealth competencies into nurse practitioner education programs and broader healthcare training curricula.^[20] Nonetheless, it is important to interpret our findings with caution. In our sample, only 20.7% of nurses held a graduate degree, which may limit the generalizability of these results. Future studies with more balanced representation across educational levels are warranted to confirm and expand upon these observations. In this study, digital anxiety was found to increase with years of professional experience, likely due to challenges in adapting to rapidly evolving technologies. While

professional experience contributes to clinical expertise, it may not correspond to digital confidence. In comparison, Brown et al.^[15] emphasized that older nurses tend to report lower levels of digital competence and confidence, which may affect their engagement with telehealth technologies. Usability issues, lack of integration into clinical workflows, and insufficient training opportunities were also reported as significant barriers. To overcome these obstacles, it is essential to support nurses in developing digital competencies and to ensure access to ongoing professional development opportunities.^[15,21]

The integration of digital competencies into nursing education is crucial for preparing nurses for digital transformation. Healthcare institutions must also provide adequate resources, infrastructure, and technical support to facilitate the effective use of digital systems.^[21–23] As healthcare delivery increasingly incorporates information and communication technologies, exposure to digital experiences has been shown to enhance nurses' adaptability and motivation. Conversely, limited digital competence may hinder the effective use of telehealth platforms and contribute to inequalities in healthcare access.^[24] For the successful clinical integration of telehealth, it is necessary to provide adequate training, supportive institutional policies, and a strong digital infrastructure.^[2,25]

In our study, perception of digital competence and digital adaptability were positively correlated with the total NATUTS score, as well as the satisfaction and improvement subscales, while digital anxiety exhibited a negative correlation. Notably, a strong negative correlation was identified between digital anxiety and rejection. The Technology Acceptance Model (TAM) helps explain how digital anxiety may negatively affect nurses' attitudes toward telehealth. TAM posits that perceived ease of use and perceived usefulness influence technology adoption. Nurses with high digital anxiety may find telehealth systems difficult or intimidating, reducing their perceived ease of use and overall acceptance.^[26] Supporting this framework, a study by An et al.^[27] found that perceived ease of use, perceived usefulness, and concerns about privacy and discomfort significantly influenced telehealth acceptance among adults in South Korea. These findings suggest that emotional responses such as anxiety can hinder technology uptake by influencing perceptions of usability. Therefore, addressing affective barriers such as digital anxiety is critical to promoting telehealth adoption among nurses and ensuring the effective integration of digital tools into clinical practice. A systematic review by Koivunen and Saranto emphasized the interaction between nurses' skills, attitudes, and technology use, highlighting that competence and positive attitudes facilitate telehealth adoption.^[28] Although the findings support the assumptions of the TAM, it is important to keep in mind that they are derived from self-reported perceptions rather than objective measures. While validated self-report scales were used in this study to assess nurses' digital competence and attitudes toward telehealth, such tools reflect participants' subjective evaluations rather than their actual skill levels. As with all self-assessment instruments, there is a potential risk of social desirability bias^[29] whereby participants may overestimate their digital abilities or underreport anxiety to present themselves more favorably.

In brief, digital competence, digital adaptability, and digital anxiety were identified as significant predictors of nurses' attitudes toward telehealth use. Similarly, Alshammari et al.^[17] emphasized that nursing students' attitudes toward technology use were strongly shaped by their educational experiences, particularly prior training and exposure to digital health tools. As both a science and an art, nursing requires the integration of technology into care processes. In this regard, the development of educational content on telehealth can positively influence knowledge and attitudes.

Limitations

This study has several limitations. First, the use of snowball sampling via social media platforms may have primarily attracted individuals who were already familiar with digital technologies or more interested in telehealth applications. This could have introduced selection bias into the sample and limited the generalizability of the findings to the broader nursing population in Türkiye. Future studies are recommended to employ more representative sampling strategies, such as stratified random sampling. Second, the use of self-report instruments to assess digital competence and attitudes toward telehealth may have led to social desirability bias. Participants might have overestimated their digital skills or underestimated their levels of anxiety in an effort to present themselves more favorably. This may have reduced the objectivity of the data. To address this limitation, future research is recommended to employ mixed-methods designs (quantitative and qualitative) that incorporate objective measures and provide a more comprehensive understanding of nurses' digital competencies and experiences. Third, the cross-sectional design of the study prevents causal inferences. Although significant associations were identified, the direction of these relationships remains unclear. For example, it is not possible to determine whether higher digital competence leads to more positive attitudes or whether positive attitudes enhance digital competence. Longitudinal research is needed to better understand the temporal dynamics of these relationships. Fourth, although the scales used in this study were found to be valid and reliable, their cultural validity within the context of Türkiye's healthcare system was assumed rather than explicitly tested. Regional disparities, such as the digital divide between rural and urban areas, may affect both access to and perceptions of telehealth services, thereby limiting the external validity of the findings. Fifth, some participants may not have been fully familiar with key concepts such as "telehealth" or "digital competence." This may have led to misinterpretation of certain survey items and may have impacted the accuracy and completeness of responses. Finally, concurrent national policy developments such as Türkiye's ongoing digital health initiatives under the Twelfth Development Plan (2024–2028) may have influenced participants' awareness or attitudes at the time of data collection. Future studies should explore how such external factors shape the adoption of telehealth.

Conclusion

This study provides new insights into the factors influencing Turkish nurses' digital competencies and their attitudes toward telehealth use. The findings suggest that higher digital competencies are associated with more positive attitudes toward telehealth use. Enhancing nurses' digital skills, expanding the use of technology in patient care, and ensuring their adaptation to telehealth are of critical importance. The integration of telehealth education into nursing curricula will facilitate the adaptation of future healthcare professionals to technological advancements. Healthcare administrators and educators should organize training programs and workshops to strengthen nurses' digital competencies while ensuring institutional support and access to technological resources. Future research should focus on strategies to improve digital competencies and the long-term impact of telehealth on nursing practice.

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References

- Pazar B, Taştan S, İyigün E. Roles of nurses in tele-health services. *Med J Bakırköy* 2015;11(1):1-4. [In Turkish] [CrossRef]
- Roach CS, Pham A, Shawwa JJ, Ho A, Nee C, Dong G, et al. Constructing a digital bridge: a systematic review assessing electronic medical record and telehealth implementation for neurosurgery in Uganda. *World Neurosurg* 2025;198:124048. [CrossRef]
- Shaver J. the state of telehealth before and after the COVID-19 Pandemic Julia. *Prim Care* 2020;49(4):517-30. [CrossRef]
- Yılmaz S, Hepokur Yıldırım ŞN, Kitiş Y, Kan A. Nurses' attitudes towards telehealth: The development and validation of the nurses' attitudes towards the use of telehealth Scale. *J Clin Nurs* 2025;34(6):2138-48. [CrossRef]
- Keskin HG, Özhelvacı İ. Tele-Health System and Nursing. *JOPEHS* 2022;3(1):36-45. [In Turkish] [CrossRef]
- Charalambous J, Hollingdrake O, Currie J. Nurse practitioner led telehealth services: A scoping review. *J Clin Nurs* 2024;33(3):839-58. [CrossRef]
- Republic of Türkiye Presidency Strategy and Budget Directorate. Twelfth Development Plan (2024-2028). Available at: <https://www.sbb.gov.tr/>. Accessed October 31, 2020. [In Turkish]
- World Health Organization. Global strategy on digital health 2020-2025. Geneva: World Health Organization; 2021. p.4-34.
- Rutledge CM, O'Rourke J, Mason AM, Chike-Harris K, Behnke L, Melhado L, et al. Telehealth competencies for nursing education and practice: the four P's of telehealth. *Nurse Educ* 2021;46(5):300-5. [CrossRef]
- Laakkonen N, Jarva E, Hammarén M, Kanste O, Kääriäinen M, Oikarinen A, et al. Digital competence among healthcare leaders: A mixed-methods systematic review. *J Nurs Manag* 2024;1:8435248. [CrossRef]
- Tutar H, Erdem AE, Şahin N. Digital Competence Scale (DCS): A scale development study. *Selçuk Univ J Soc Sci Voc School* 2024; 27(1):31-47. [In Turkish]
- Republic of Türkiye Ministry of Health, General Directorate of Health Information Systems. Health statistics yearbook 2022. Ankara: Ministry of Health; 2024. p. 260-76. [In Turkish]
- Öntaş E, Sezer B, Okyay P. Fundamentals of online data collection: a practical guide for methods and approaches. *STED* 2023;32(5):401-14. [In Turkish]
- Adatara P, Baku EA, Atakro CA, Adedia DM, Jonathan JWA. Factors influencing information and communication technology knowledge and use among nurse managers in selected hospitals in the Volta region of Ghana. *CIN Comput Inform Nu* 2019;37(3):171-7. [CrossRef]
- Brown J, Pope N, Bosco AM, Mason J, Morgan A. Issues affecting nurses' capability to use digital technology at work: An integrative review. *J Clin Nurs* 2020;29(15-16):2801-19. [CrossRef]
- Longhini J, Rossetti G, Palese A. Digital health competencies among health care professionals: Systematic review. *J Med Internet Res* 2022;24(8):36414. [CrossRef]
- Alshammari A, Alanazi MF, Bahari G. Nursing students' awareness, knowledge, and attitudes regarding telehealth and telenursing use for high-quality healthcare: A cross-sectional study. *Nurse Educ Today* 2024;142:106359. [CrossRef]
- Ranjbar H, Bakhshi M, Mahdizadeh F, Glinkowski W. Iranian clinical nurses' and midwives' attitudes and awareness towards telenursing and telehealth a cross-sectional study. *Sultan Qaboos Univ Med J* 2021;21(1):50-7. [CrossRef]
- De Martinis M, Ginaldi L. Digital skills to improve levels of care and renew health care professions. *JMIR Med Educ* 2024;10(1):58743. [CrossRef]
- Kleib M, Arnaert A, Nagle LM, Sugars R, da Costa D. Newly qualified Canadian nurses' experiences with digital health in the workplace: comparative qualitative analysis. *JMIR Med Educ* 2024;10(1):53258. [CrossRef]

21. Konttila J, Siira H, Kyngäs H, Lahtinen M, Elo S, Kääriäinen M, et al. Healthcare professionals' competence in digitalisation: A systematic review. *J Clin Nurs* 2019;28(5-6):745-61. [\[CrossRef\]](#)
22. Tischendorf T, Hasseler M, Schaal T, Ruppert SN, Marchwacka M, Heitmann-Möller A, et al. Developing digital competencies of nursing professionals in continuing education and training - a scoping review. *Front Med* 2024;11:1358398. [\[CrossRef\]](#)
23. Jobst S, Lindwedel U, Marx H, Pazouki R, Ziegler S, König P, et al. Competencies and needs of nurse educators and clinical mentors for teaching in the digital age - a multi-institutional, cross-sectional study. *BMC Nurs* 2022;21(1):1-13. [\[CrossRef\]](#)
24. Le T V., Galperin H, Traube D. The impact of digital competence on telehealth utilization. *Heal Policy Technol* 2023;12(1):100724. [\[CrossRef\]](#)
25. Chang MY, Kuo FL, Lin TR, Li CC, Lee TY. The intention and influence factors of nurses' participation in telenursing. *Informatics* 2021;8(2):1-14. [\[CrossRef\]](#)
26. Holtz B, Mitchell K, Hirko K, Ford S. Using the technology acceptance model to characterize barriers and opportunities of telemedicine in rural populations: survey and interview study. *JMIR Form Res* 2022;6(4):35130. [\[CrossRef\]](#)
27. An MH, You SC, Park RW, Lee S. Using an extended technology acceptance model to understand the factors influencing telehealth utilization after flattening the COVID-19 curve in South Korea: Cross-sectional survey study. *JMIR Med Inform* 2021;9(1):25435. [\[CrossRef\]](#)
28. Koivunen M, Saranto K. Nursing professionals' experiences of the facilitators and barriers to the use of telehealth applications: a systematic review of qualitative studies. *Scand J Caring Sci* 2018;32(1):24-44. [\[CrossRef\]](#)
29. Mortel TF van de. Faking it: social desirability response bias in self-report research. *Aust J Adv Nurs* 2008;25(4):40-8.