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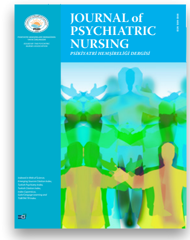

Original Article

Validity and reliability of the abbreviated technology anxiety scale in Turkish: A cultural adaptation study on nursing students

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Abstract

Objectives: The integration of technology into healthcare has accelerated, encompassing all healthcare services worldwide. If anxiety toward technology can be identified during the student period and appropriate measures can be taken, the use of health-related technologies in professional life may be facilitated and service quality improved. From this perspective, it is necessary to directly measure students' technology-related anxiety before their professional careers. This study aims to adapt the Abbreviated Technology Anxiety Scale to Turkish culture among nursing students.

Methods: This methodological study was conducted with 274 nursing students. Language, content, construct, and criterion-related validity analyses were performed. Reliability was assessed using internal consistency coefficients, item–total correlations, lower–upper 27% group analyses, and test–retest reliability (n=184).

Results: Exploratory factor analysis revealed a two-factor structure, differing from the original scale, explaining 55.67% of the total variance across 11 items. The Cronbach's alpha coefficient for the scale was 0.87. Differences between the lower and upper 27% groups were significant for all items. High and positive correlations were found between subscale totals and total scale scores obtained from the first and second administrations. Confirmatory factor analysis indicated a good model fit.

Conclusion: The 11-item, two-factor Abbreviated Technology Anxiety Scale obtained through this adaptation study is a valid and reliable measurement tool for use in Turkish culture.

Keywords: Nursing students; reliability; technology anxiety; validity

Technology plays an important role in health services, and with the acceleration of innovations in the healthcare field, the ability of students in health professions to adapt to technology is becoming increasingly important.[1] Nursing education continues to evolve with this technological transformation, aiming to equip students with practical skills through the use of modern technological tools in patient care.[2,3]

It is argued that the use of technology in nursing education can bridge the gap between the rapidly developing and changing world, theoretical knowledge, and clinical practice.[4–6] Innovative techniques such as artificial intelligence, simulation, and virtual reality—among the technologies used in nursing education—are applied by many educators, and their use in real-life settings is recommended, as evidence suggests that they can enhance students' learning outcomes.[7–11] Despite the positive contributions of these technological developments, nursing students' ability to keep pace with such changes and prepare for rapid technological transformation in healthcare services plays a crucial role in the quality of the profession.

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However, the inability to keep up with technological developments and anxiety related to technology use can pose significant obstacles for some students.[12,13] These concerns may lead students to develop negative attitudes toward technological tools, avoid using technology, or experience decreased performance during technology use.[14,15] In a qualitative study conducted by Karaveli Çakır with fifteen students, it was reported that students used many medical devices in hospital settings and experienced fear and stress due to foreign language use and the complexity of technological devices in clinical practice, resulting in difficulties in their use.[13] Additionally, some studies suggest that the use of ChatGPT—one of today's innovative technologies—in nursing education may create technology-related fear among students.[16,17] There is also evidence that the rapid integration of artificial intelligence into professions may generate anxiety and reservations regarding technology use.[18]

Anxiety leads individuals to avoid uncomfortable situations and learn avoidance behaviors. Avoidance makes it more difficult to confront similar situations in the future and results in a loss of confidence. It involves cognitive avoidance of distressing thoughts and avoidance of tasks, leading to decreased activity and performance.[19] This process contributes to self-limitation and may help explain why technology anxiety reduces technology use. Avoidance behaviors prevent success experiences, thereby diminishing confidence and making tasks that were previously manageable more difficult. Considering that nursing is a profession that evolves continuously, anxiety toward technology should be recognized as a potential barrier to keeping pace with technological innovations aimed at improving care quality.

Preventing the nursing profession from lagging behind technological advancements requires understanding students' concerns about technology during their education and developing appropriate strategies to reduce these concerns. Such efforts can enhance the effectiveness of educational programs and enable students to engage with technology more confidently.[20] In this context, the present study aimed to adapt and validate the Abbreviated Technology Anxiety Scale (ATAS) for Turkish culture, as no existing scale is available to measure nursing students' technology-related anxiety. The adapted scale may contribute to nursing education programs by informing educational strategies related to technology use and reducing students' sensitivity to technology. It is anticipated that the findings will guide future research and support initiatives aimed at advancing the nursing profession in an increasingly technology-integrated world.

What is presently known on this subject?

- Nursing education continues to evolve daily with ongoing technological transformation.
- Difficulty in keeping up with technological developments and anxiety about using technology can pose obstacles for students.
- To prevent nursing education from lagging behind technological advancements, it is important to understand students' concerns about technology.

What does this article add to the existing knowledge?

- Assessing students' concerns is important for improving the effectiveness of educational programs.
- The ATAS is a valid and reliable scale that can be used to determine nursing students' technology-related anxiety.

What are the implications for practice?

- Identifying nursing students' anxiety toward technology and their negative attitudes toward its use is essential for contemporary nursing education.
- The Turkish-adapted and validated ATAS is expected to contribute to the assessment, monitoring, and reduction of technology anxiety among students.
- Developing educational approaches that align with technological innovations and meet international standards is crucial for shaping the future of the nursing profession.

Materials and Method

Type and Purpose

The purpose of this methodological study was to adapt the ATAS for use among Turkish nursing students. Accordingly, the study sought to answer the following main question: Is the ATAS a measurement tool suitable for the culture of Turkish nursing students?

Study Group

The study group consisted of undergraduate students enrolled in the nursing department of a university located in the Aegean Region of Türkiye. In determining an adequate sample size, the commonly accepted approach of including at least five participants per item was considered. However, although a participant-to-item ratio of 10:1 has been suggested, it has been stated that using at least 20 participants per item provides more robust results for factor analysis.[21] The original ATAS consists of 11 items. Accordingly, the target sample size for this methodological study was set at a minimum of 220 students (20×11 items), and the study was completed with 274 students.

Data Collection

Sociodemographic Data Form: This form consisted of 11 questions designed to collect information on students' age, gender, grade level, marital status, income status, maternal and paternal education levels, place of residence, daily internet use, technology follow-up status, and technology use status.

Abbreviated Technology Anxiety Scale (ATAS): The original scale, developed by Wilson et al.,[22] was designed to measure individuals' levels of technology anxiety and consists of 11 items in a single dimension. It is a 5-point Likert-type scale ranging from "strongly disagree" to "strongly agree." The items aim to capture individuals' personal feelings and emotional responses toward information and communication technologies, including technological tools that support work and education sectors and their development. The minimum possible score on the ATAS is 11, indicating the lowest level of technology anxiety, while the maximum score is 55, indicating the highest level of anxiety. In the original scale, the Cronbach's alpha coefficient (α) was reported as 0.91. In the present study, factor analysis conducted with data obtained from nursing students revealed a two-factor structure: negative impact (NI) and negative bias (NB). Higher scores indicate higher levels of technology anxiety. In this study, α values were calculated as 0.84 for NI, 0.74 for NB, and 0.87 for the total ATAS.

Data Collection Process

After the initial translation procedures, a pilot application was conducted with 35 nursing students who were not included in the study sample, and they were asked whether the items were understandable. A preliminary application was carried out to finalize the measurement tool by eliminating identified deficiencies and errors and to revise the items accordingly. In scale adaptation studies, it is recommended to conduct a pilot application with 30–40 individuals to assess the comprehensibility of the items.[23] As no negative feedback or suggestions were received, it was decided to administer the scale to a sample of sufficient size for adaptation studies. During the reliability assessment phase, 274 volunteer nursing students were included. For the test–retest analysis, the scale was administered to 184 nursing students. In accordance with psychometric guidelines, a two- to three-week interval—commonly recommended to minimize memory effects while preventing true change in the underlying construct—was selected between the two administrations. After this interval, the scale was re-administered to 184 nursing students who were available and agreed to participate in the retest phase. Both administrations were conducted using the same instructions, measurement environment, and data collection procedures to ensure methodological consistency. The research data were collected face-to-face from students enrolled in the nursing department of Muğla Sıtkı Koçman University. This study was prepared in accordance with the GRRAS checklist.

Validity and Reliability Evaluation Stages of the Scale

Validity Stages

a. **Language validity:** The translation and cross-cultural adaptation of the scale into Turkish were carried out in accordance with international standards.[24] To ensure linguistic equivalence, the original English version of the scale was translated into Turkish by five individuals, including one expert with a degree in English education, the researchers, and two field experts proficient in both English and Turkish. The Turkish version was then back-translated into English by two bilingual individuals who had not seen the original scale. The back-translated English versions were reviewed and compared by a native English speaker, and necessary revisions were made. All translation versions were reviewed item by item by the researchers, and the Turkish wording that best represented each item was finalized.
b. **Content validity:** The Davis technique was used for the Turkish version of the scale, and five experts holding doctoral degrees in Psychiatric Nursing were consulted. Based on expert evaluations, the content validity index (CVI) for each item was found to be >0.80, and no items required removal. The final version of the scale was established after minor revisions were made in line with expert suggestions to enhance item clarity.
c. **Construct validity:** To determine the construct validity of the ATAS, exploratory factor analysis (EFA) was performed using the Direct Oblimin rotation method, followed by confirmatory factor analysis (CFA).

Reliability Stages

a. **Internal consistency:** The α coefficients of the ATAS and its subdimensions were calculated.
b. **Item–total score reliability:** The relationship between each item and both the construct measured and the total scale score was examined.
c. **Item analysis–based reliability:** Reliability was evaluated using lower and upper 27% group analyses.
d. **Pearson correlation analysis:** The relationships between the total scale score and subdimension total scores were assessed using correlation analysis.
e. **Invariance over time:** Test–retest reliability analysis was conducted to evaluate the temporal stability of the scale. In the test–retest procedure, the ATAS was re-administered (n=184) three weeks later. Correlation analysis revealed a strong relationship between the subdimension scores obtained from the first and second administrations ($r=0.82; p<0.001$).

Statistical Analysis

In the Turkish adaptation study of the ATAS, SPSS v25.0 was used for exploratory factor analysis (EFA), and AMOS v24.0 was used for confirmatory factor analysis (CFA). In factor analysis, the Kaiser–Meyer–Olkin (KMO) coefficient was used to assess the suitability of the data for factor analysis, and the Bartlett sphericity test was used to examine whether the correlation matrix was an identity matrix. The number of factors was determined by considering eigenvalues and the scree plot. Principal component analysis was selected as the factor extraction method, and the Direct Oblimin method was chosen as the rotation technique to explain the factor structure. Subsequently, CFA was performed to test the adequacy of the factor structure in explaining the model, and fit indices were calculated by constructing a path diagram.

For reliability analysis, Cronbach's alpha (α) coefficient was calculated. Item–total score correlations, lower–upper 27% group analyses, t-test, and Pearson correlation analysis were performed for the test–retest procedure. Descriptive statistics were analyzed using arithmetic mean and standard deviation values. The level of statistical significance was accepted as $p<0.05$ and $p<0.001$.

Ethical Aspects of the Research

Permission for the cultural adaptation of the ATAS was obtained from Dr. Matthew L. Wilson, the corresponding author, via e-mail in June 2023. Subsequently, ethical approval was obtained from the Medical and Health Sciences Ethics Committee-2 (Sports, Health) of Muğla Sıtkı Koçman University, with the decision dated 31.10.2023 and numbered 131. Institutional permission was also obtained from the faculty where the study was conducted. Students who agreed to participate in the study were informed about the research, and their informed consent was obtained. All stages of the research were conducted in accordance with the Declaration of Helsinki.

Results

This study aimed to test the cultural adaptation of the ATAS. The sociodemographic characteristics of nursing students, findings related to the construct validity of the ATAS, findings related to the reliability of the ATAS, and findings regarding the relationships between the scores obtained from the scales were presented separately.

Sociodemographic Data of Nursing Students

It was found that 81.4% of the nursing students included in the study were aged 18–22 years, and the mean age was 21.16±1.86. Of the students, 59.9% were female, 35.8% were in the third year of study, nearly all (99.3%) were single, and 51.82% reported that their income was equal to their expenses. It was determined that 54% lived in dormitories. Regarding technology-related questions, 74.1% reported using the internet for more than 3 hours per day, 83.9% reported following technological developments, and 58.4% described their level of technology use as moderate (Table 1).

Table 1. Sociodemographic variables of nursing students (n=274)

Variables	Group	n	%
Age (mean±SD: 21.16±1.86)	18–22	223	81.4
	23 and over	51	18.6
Gender	Female	164	59.9
	Male	110	40.1
Class	1	55	20.1
	2	53	19.3
	3	98	35.8
	4	68	24.8
Marital status	Single	272	99.3
	Married	2	0.7
Income status	Income<outcome	113	41.2
	Income=outcome	142	51.8
	Income>outcome	19	6.9
Place of residence	Family	73	26.6
	Friend	53	19.3
	Dormitory	148	54.0
Daily internet use	< 1 hour	9	3.3
	1–3 hours	62	22.6
	>3 hours	203	74.1
Following the technology	Yes	230	83.9
	No	44	16.1
Level of technology use	Low	8	2.9
	Medium	160	58.4
	High	106	38.7

SD: Standard deviation.

Findings Regarding the Construct Validity of the ATAS

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted to test the construct validity of the ATAS. The suitability of the data for factor analysis was examined using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity. The results indicated that the sample size and correlations among variables were adequate for factor analysis (KMO=0.89; χ^2=1202.61; $p<0.001$).

Principal component analysis was used as the extraction method in the EFA, and the Direct Oblimin rotation method was applied. The EFA revealed two factors with eigenvalues greater than 1, explaining 55.67% of the total variance. The first factor explained 46.03% of the variance, and the second factor explained 9.6%. Factor loadings ranged from 0.581 to 0.838 (Table 2). As shown in the scree plot (Fig. 1), the ATAS demonstrated a two-factor structure.

In the subsequent validity and reliability phase, CFA was performed. Based on the EFA results, the scale consisted of 11 items loading on two factors. The standardized values obtained from the CFA are presented in Table 3. Model fit was evaluated using goodness-of-fit indices. The fit indices were χ^2=60.22; sd=37; CMIN/df=1.62; AGFI=0.93; GFI=0.96; NFI=0.95; CFI=0.98; IFI=0.98; TLI=0.97; RMSEA=0.48 ($p<0.01$) (Table 3). The path diagram obtained after CFA is shown in Figure 2. The factor loadings of the ATAS items ranged from 0.40 to 0.80.

Findings Regarding the Reliability of the ATAS

To assess internal consistency, Cronbach's alpha coefficients and item–total correlation analyses were conducted, and item discrimination was evaluated using lower and upper 27%

Table 2. ATAS factor loadings and factor variance distributions

Items		Factor	
		1	2
3.	I am uncomfortable using technology	0.83	
4.	Technology does not improve my quality of life	0.67	
5.	I feel out of control using technology	0.67	
6.	I feel uneasy using technology	0.66	
7.	I feel technology complicates simple tasks	0.65	
10.	Using technology makes me nervous	0.63	
11.	I am often annoyed when using technology	0.58	
1.	I am not a technology person		0.83
2.	I am reluctant to learn new features of technology		0.70
8.	Keeping up with the newest technology is impossible		0.60
9.	I am inefficient with technology		0.58
	Eigenvalues	5.064	1.06
	Variance	46.03	9.63
	Cumulative variance	46.03	55.67

Table 3. The ATAS goodness of fit values

Fit index	Value	Goodness-of-fit value	Acceptable goodness-of-fit value	Assessment
Chi-square (χ^2)	60.22	$0 \leq \chi^2 \leq 2df$	$2df < \chi^2 \leq 3df$	Good fit
Degree of freedom (df)	37	–	–	–
CMIN/df (χ^2/df)	1.628	$0 \leq \chi^2/df \leq 2$	2 < AGFI ≤3	Good fit
AGFI	0.93	0.90 ≤ AGFI ≤1.00	0.85 ≤ GFI ≤0.90	Good fit
GFI	0.96	0.95 ≤ GFI ≤1.00	0.95 ≤ GFI ≤0.97	Good fit
NFI	0.95	0.95 ≤ NFI ≤1.00	0.90 ≤ NFI ≤0.95	Good fit
CFI	0.98	0.97≤ NFI ≤1.00	0.95 ≤ CFI ≤0.97	Good fit
IFI	0.98	0.95 ≤ IFI ≤1.00	0.94 ≤ IFI ≤0.90	Good fit
TLI	0.97	0.95 ≤ TLI ≤0.97	0.94 ≤ TLI ≤0.90	Good fit
RMSEA	0.04	0 ≤ RMSEA ≤0.05	0.05 < RMSEA ≤0.08	Good fit
p	0.009			

ATAS: Abbreviated technology anxiety scale; CMIN/df: Chi-square/degrees of freedom; AGFI: Adjusted goodness-of-fit index; GFI: Goodness-of-fit index; NFI: Normed fit index; CFI: Comparative fit index; IFI: Incremental fit index; TLI: Tucker-lewis index; RMSEA: Root mean square error of approximationc.

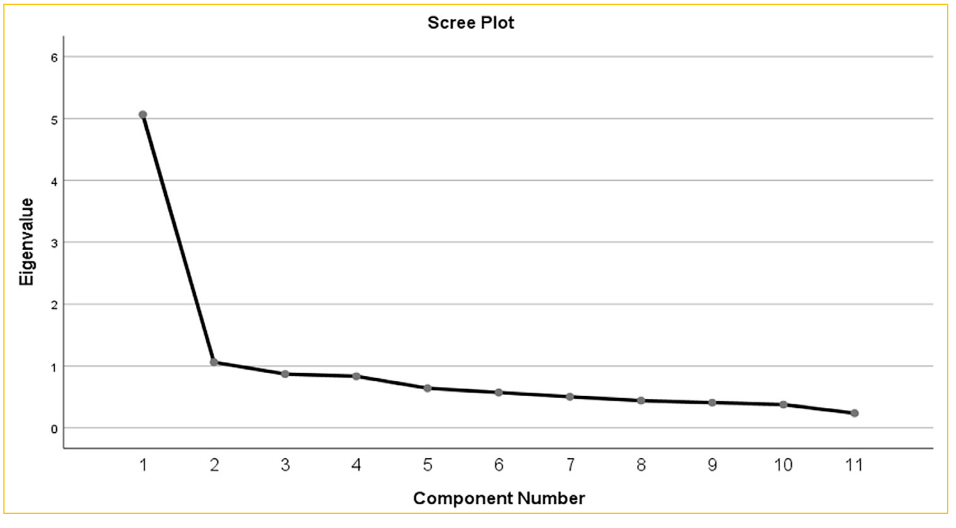

Figure 1. Scree plot.

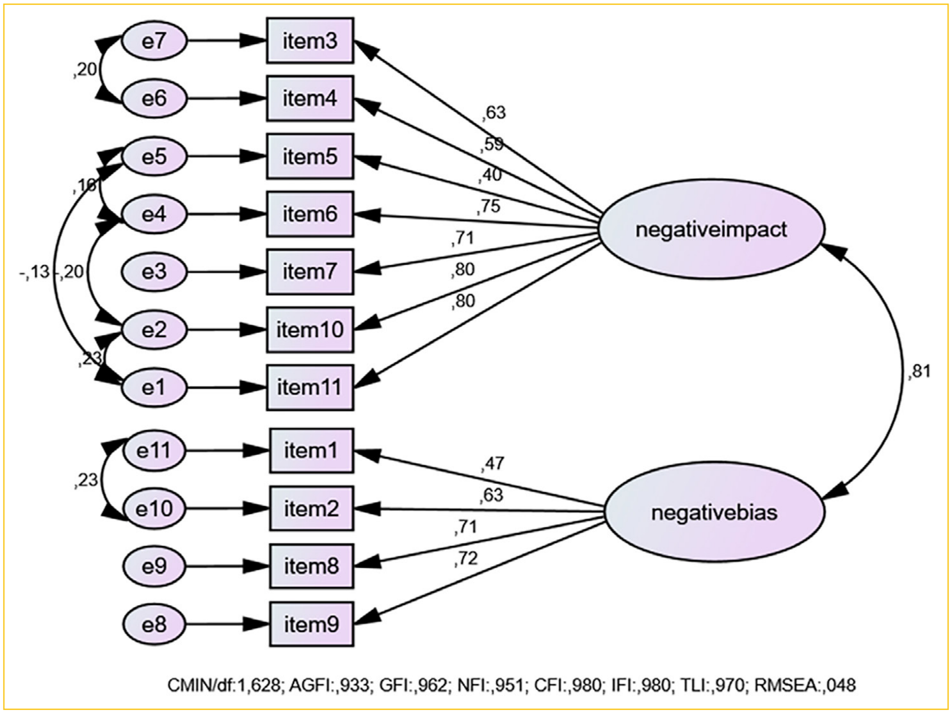

Figure 2. Path diagram.

group comparisons. The α values were 0.84 for the negative impact (NI) subdimension, 0.74 for the negative bias (NB) subdimension, and 0.87 for the total ATAS. Item–total correlation coefficients ranged from 0.38 to 0.71. Differences between the lower and upper 27% groups were significant for all items ($p<0.001$) (Table 4).

Pearson correlation analysis was performed to examine the relationships between the total scale score and subdimension scores. Strong positive correlations were found between the total ATAS score and the NI subdimension ($r=0.95$) and the NB subdimension ($r=0.84$), while a moderate positive correlation was observed between NI and NB ($r=0.63$) ($p<0.001$) (Table 5).

To evaluate the stability of the ATAS over time, the scale was re-administered to 184 participants three weeks after the initial administration. As shown in Table 5, high and positive correlations were found between the subdimension scores and total scores obtained from the first and second administrations ($p<0.001$).

In this adaptation study, a structural difference was observed compared with the original structure of the ATAS. The emerg-

Table 4. Item-total correlations and cronbach's alpha reliability coefficients of the items and lower-upper group analyses

Factors	Item	Corrected item-total correlation	Cronbach's Alpha if item deleted	Lower 27% group (n=74) mean±SD	Upper 27% group (n=74) mean±SD	t	p
Factor 1: Negative impact (α: 0.84)	Item 3	0.59	0.86	1.02±0.16	2.71±1.06	-13.46	0.000
	Item 4	0.57	0.86	1.29±0.78	3.17±0.95	-13.03	0.000
	Item 5	0.38	0.88	1.68±0.96	3.16±0.99	-9.15	0.000
	Item 6	0.66	0.85	1.18±0.39	3.17±0.91	-17.19	0.000
	Item 7	0.62	0.86	1.06±0.25	2.85±0.90	-16.38	0.000
	Item 10	0.71	0.85	1.04±0.19	2.97±0.95	-17.12	0.000
	Item 11	0.71	0.85	1.06±0.30	2.89±0.95	-15.60	0.000
Factor 2: Negative bias (α: 0.74)	Item 1	0.42	0.87	1.41±0.75	2.78±0.83	-10.42	0.000
	Item 2	0.57	0.86	1.13±0.34	2.81±1.04	-13.12	0.000
	Item 8	0.58	0.86	1.22±0.51	2.95±1.02	-12.97	0.000
	Item 9	0.59	0.86	1.32±0.68	3.13±0.95	-13.25	0.000
ATAS (α: 0.87)							

ATAS: Abbreviated technology anxiety scale; SD: Standard deviation; α: Cronbach's alpha.

Table 5. Initial measurement and test-retest measurement correlations of ATAS total and subscale scores

	Initial			Test-retest		
	Total	NI	NB	Total	NI	NB
Initial						
Total	1					
NI	0.95**	1				
NB	0.84**	0.63**	1			
Test-retest						
Total	0.82**	0.77**	0.69**	1		
NI	0.79**	0.82**	0.52**	0.94**	1	
NB	0.66**	0.48**	0.78**	0.84**	0.60**	1

**: p<.001. ATAS: Abbreviated technology anxiety scale; NI: Negative impact; NB: Negative bias.

ing factors were named by the researchers based on the content of the items. The NI subdimension consisted of seven items (items 3, 4, 5, 6, 7, 10, and 11) describing the negative impacts of technology on individuals, whereas the NB subdimension consisted of four items (items 1, 2, 8, and 9) reflecting negative bias toward technology. No reverse-scored items were included in the scale.

Discussion

In this study, the cultural adaptation of the ATAS was examined. The findings of this adaptation study, which evaluated the ATAS consisting of 11 items and two subdimensions for measuring technology anxiety in nursing students, demonstrated that the scale meets the required criteria in terms of language, content, construct validity, and reliability and can be confidently used with nursing students. As a result of the analyses, the original form of the scale was preserved, and no modifications to the scale items were required.

When the literature on content validity is reviewed, it is reported that the content validity index (CVI) should be at least 0.80.[25,26] In the present study, content validity analysis conducted using the Davis technique indicated that expert agreement met the minimum required level for the content validity of the ATAS (CVI>0.80).

Previous studies providing recommendations for scale adaptation have emphasized that the results of the Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett's test of sphericity should be considered to evaluate construct validity.[27] It is recommended that the KMO value be above 0.60 and preferably close to 1. Furthermore, a KMO value between 0.70–0.80 indicates moderate sampling adequacy, a value between 0.80–0.90 indicates good sampling adequacy, and a value above 0.90 indicates excellent sampling adequacy.[28,29] Consistent with these criteria, the present study found that the KMO value was 0.89, which is considered close to an excellent level, and Bartlett's test was statistically significant. These findings indicate that the sample size was adequate for factor analysis and that factor analysis could be appropriately applied to the ATAS.

The literature suggests that the total variance explained should be at least 0.50 for items to sufficiently contribute to the measured construct.[30] As shown in Table 2, the total variance explained by the scale (55.67%) meets this criterion, indicating that the two-factor structure explains more than half of the total variance and has strong representativeness.[26] Additionally, the Direct Oblimin rotation method was employed under the assumption that the factors were correlated.[30] The moderate positive correlation observed between the factors supports the appropriateness of this rotation method. Moreover, the distribution of factor loadings across scale items can be considered satisfactory.[26,31]

When item–total correlations, Cronbach's alpha coefficients, and differences between the lower and upper 27% groups were examined to assess item discrimination, item–total correlation coefficients ranged from 0.38 to 0.71, and the differences between the lower and upper 27% groups were statistically significant. Item–total correlation coefficients are influenced by sample size, and when the sample size is less than 400, these values are expected to be at least 0.30.[32] According to Büyüköztürk,[27] a statistically significant difference between the mean scores of the lower and upper 27% groups is an indicator of internal consistency. The values obtained in this study indicate that the items have a high discrimination index and support the internal consistency of the ATAS.[26]

Cronbach Alpha reliability coefficients indicated that the α value for the total scale was 0.87, the α value for the negative impact factor was 0.84, and the α value for the negative bias factor was 0.74. In the literature, it is reported that α values range between 0.0 and 1.0, and that values between 0.60–0.79 indicate high reliability, whereas values of 0.80 and above indicate very high reliability.[33,34] From this perspective, the α values calculated in the present study demonstrate that the scale is highly reliable in accordance with the literature and that adequate internal consistency has been achieved.

To evaluate the temporal invariance of the scale, a test–retest analysis was performed three weeks after the first administration.[26] As a result of paired correlation analyses, the correlation coefficients were r=0.82 for the total scale, r=0.82 for the NI subdimension, and r=0.78 for the NB subdimension (p<0.001). To establish temporal stability, it is recommended that test–retest applications be conducted at least twice, with correlation coefficients of at least 0.50 for subjective tests, and at least r=0.70, preferably r=0.80, for attitude scales.[26] Evaluation of the correlation coefficients showed that the measurements obtained from the two administrations were highly similar, indicating strong stability of the scale over time.

The most commonly used statistics in confirmatory factor analysis include chi-square statistics (χ^2 and χ^2/df), AGFI, GFI, NFI, CFI, IFI, TLI, and RMSEA.[35] When the goodness-of-fit indices were evaluated according to reference values, all indices indicated good model fit (Table 3). These findings suggest that the distribution of the items constituting the scale is highly appropriate for the two-factor structure obtained through CFA. In the CFA, the factor loadings of the scale items ranged between 0.40 and 0.80. According to Alpar,[32] factor loadings between 0.30 and 0.40 represent the minimum acceptable level, loadings of 0.50 and above indicate practical significance, and loadings of 0.70 and above indicate strong explanatory power. Within the scale, two items were at the acceptable level, three items demonstrated practical significance, and six items showed strong explanatory capacity for the construct.

Considering that anxiety related to technological devices—exposure to which is increasing due to rapid technological development—may negatively affect nursing students' education, hinder adaptation to innovative developments, and ultimately impair the quality of healthcare services, identifying technology-related anxiety and planning appropriate interventions are essential.[16–18] As nursing education in the country where this study was conducted becomes increasingly technologically advanced, technology-related anxiety may become more apparent, and its impact on technology use may increase. However, this situation is likely to differ across countries with varying levels of technological integration in educational curricula. Therefore, comparative studies examining the current situation in different countries are needed.

Strengths and Limitations of The Study

The scale adapted in this study is unique in that it directly measures technology-related anxiety, which constitutes a major strength of the study. Despite these strengths, several limitations should be noted. The participants consisted solely of undergraduate nursing students from a university located in a metropolitan city in Türkiye; therefore, the findings may not represent all nursing students across the country. Nevertheless, although this is a national-level scale adaptation study, the successful validation of a tool that directly measures future nurses' anxiety toward technology—rather than general anxiety in today's technological environment—may provide an opportunity for other countries to initiate similar research. The measurement power of the scale may be enhanced by applying it to different sample groups. Another limitation is that the scale could not be tested using simultaneous criterion-related validity measures. Despite these limitations, the findings indicate that the ATAS is a valid and reliable instrument for assessing technology-related anxiety among undergraduate nursing students. Expanding the sample size and ensuring balanced sociodemographic characteristics are recommended to obtain a more representative sample.

Importance for Practice

As nursing is a constantly evolving field, it is essential for students to adapt to and effectively use technology. The integration of technological tools such as digital patient monitoring systems, medical devices, and simulation-based training in nursing education enables students to enhance clinical experience, simulate real-world scenarios, and provide more effective and efficient patient care.[36] However, anxiety related to technology adaptation may hinder these benefits.[22] Technology anxiety may lead students to experience fear, uncertainty, or distress when using new technological tools, negatively affecting their educational performance and, consequently, the delivery of effective healthcare services.[37,38] To prevent the nursing profession from lagging behind technological advancements, it is important to identify students' technology-related concerns during their education and to develop appropriate strategies to reduce these concerns, thereby enhancing educational effectiveness and promoting confident interaction with technology. For these reasons, identifying students' technology-related anxiety, as well as negative impacts and biases toward technology, is critical. The ATAS assesses specific negative effects—such as emotional distress, tension, feelings of inadequacy, and perceived loss of control—experienced during technology use, along with negative preconceptions about technology, rather than general technology anxiety. Thus, the scale specifically targets the emotional and cognitive dimensions of technology-related anxiety. The Turkish-adapted ATAS is expected to contribute to the literature and practice by facilitating the identification, adaptation, and reduction of technology anxiety in nursing education. Keeping pace with technological innovations within a high-quality and internationally valid educational framework has become a key factor shaping the future of the nursing profession. From this perspective, defining and measuring technology anxiety in nursing students and planning appropriate interventions when necessary are essential for future healthcare professionals.

Conclusion and Recommendations

The results of the adaptation of the Abbreviated Technology Anxiety Scale to Turkish culture among nursing students indicate that the final version of the scale demonstrates good fit with the original model. The ATAS consists of 11 items scored on a 1–5 Likert scale, with total scores ranging from 11 to 55, where higher scores indicate higher levels of technology anxiety. The scale includes no reverse-scored items. Factor analysis revealed two subdimensions: Negative Impact (Items 3, 4, 5, 6, 7, 10, and 11), which reflects emotional and cognitive discomfort and other adverse effects experienced during technology use, and Negative Bias (Items 1, 2, 8, and 9), which represents individuals' negative attitudes and biases toward technology.

The Turkish version of the ATAS can be considered a valid and reliable measurement tool for assessing nursing students' technology-related anxiety. It is recommended that the scale be applied and tested in larger and more diverse sample groups. The findings may contribute to improving and enhancing current and future educational and professional practices in nursing.

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