# Translation and Validation of the Attitude Scale for Artificial Intelligence Technology Application in Nursing

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**Date:** 2025-07-17T00:00:00+00:00

## Abstract

[Objective] To translate and culturally adapt the Attitude Scale Towards the Use of Artificial Intelligence Technologies in Nursing (ASUAITIN) into Chinese, and to examine its reliability and validity, thereby providing an assessment instrument for evaluating clinical nurses' attitudes toward the application of artificial intelligence technologies in their work. [Methods] Using the Brislin translation model, the scale was translated, back-translated, culturally adapted, and pre-tested to develop the Chinese version of ASUAITIN. Convenience sampling was employed to conduct a questionnaire survey among 396 nurses from a tertiary Grade A hospital in Beijing in March 2025 to test the scale' s reliability and validity. [Results] The Chinese version of ASUAITIN consisted of 2 dimensions and 15 items. The Cronbach' s $\alpha$ coefficient for the overall scale was 0.939, the split-half reliability was 0.738, and the Cronbach' s $\alpha$ coefficients for the two dimensions were 0.945 and 0.956, respectively. The test-retest reliability was 0.935. The scale-level content validity index was 0.981, and the item-level content validity index ranged from 0.875 to 1.000. Exploratory factor analysis extracted 2 common factors with a cumulative variance contribution rate of 77.402%. Confirmatory factor analysis results showed: chi-square/degrees of freedom ratio = 2.242, comparative fit index = 0.966, goodness-of-fit index = 0.882, normed fit index = 0.941, incremental fit index = 0.967, Tucker-Lewis index = 0.959, relative fit index = 0.929, and root mean square error of approximation = 0.079. [Conclusion] The Chinese version of ASUAITIN demonstrates good reliability and validity and can be used to assess Chinese clinical nursing staff' s attitudes toward the application of artificial intelligence technologies.

## Full Text

# Cross-Cultural Adaptation and Psychometric Validation of the Chinese Version of the Attitude Scale Towards the Use of Artificial Intelligence Technologies in Nursing (ASUAITIN)

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### Abstract

[**Objective**] To translate and adapt the Attitude Scale Towards the Use of Artificial Intelligence Technologies in Nursing (ASUAITIN) into Chinese and to evaluate its reliability and validity, thereby providing an assessment tool for evaluating clinical nurses' attitudes toward the application of artificial intelligence technologies in their work.

[**Methods**] Using the Brislin translation model, the scale was translated, back-translated, culturally adapted, and pilot-tested to develop the Chinese version of ASUAITIN. By convenience sampling, a questionnaire survey was conducted among 396 nurses from a tertiary Grade A hospital in Beijing in March 2025 to test the scale' s reliability and validity.

[**Results**] The Chinese version of ASUAITIN comprised 15 items across 2 dimensions. The Cronbach' s $\alpha$ coefficient for the entire scale was 0.939, the split-half reliability was 0.738, the Cronbach' s $\alpha$ coefficients for each dimension were 0.945 and 0.956 respectively, and the test-retest reliability was 0.935. The scale-level content validity index (S-CVI) was 0.981, and the item-level content validity index (I-CVI) ranged from 0.875 to 1.000. Exploratory factor analysis extracted 2 common factors with a cumulative variance contribution rate of 77.402%. Confirmatory factor analysis results showed a chi-square to degrees of freedom ratio of 2.242, Comparative Fit Index (CFI) of 0.966, Goodness-of-Fit Index (GFI) of 0.882, Normed Fit Index (NFI) of 0.941, Incremental Fit Index (IFI) of 0.967, Tucker-Lewis Index (TLI) of 0.959, Relative Fit Index (RFI) of 0.929, and Root Mean Square Error of Approximation (RMSEA) of 0.079.

[**Conclusion**] The Chinese version of ASUAITIN demonstrates good reliability and validity and can be used to assess Chinese clinical nursing staff' s attitudes toward the application of artificial intelligence technologies.

**Keywords:** Artificial Intelligence; Nurses; Scale; Cross-cultural Adaptation; Reliability; Validity; Nursing

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The rapid development of Artificial Intelligence (AI) has significantly advanced the medical field, with numerous AI technologies such as drug dispensing [1],

data mining, speech recognition [2], and disease assessment [3] being actively applied in nursing practice. Research indicates [4] that AI technologies offer advantages in optimizing clinical decision-making, promoting nurse-patient communication, reducing workload, and improving nursing efficiency. Furthermore, AI applications are expected to substantially assist nursing personnel in providing evidence-based and personalized care in the future [5-7]. The National Health Commission' s "Action Plan for Further Improving Nursing Services (2023-2025)" explicitly states that medical institutions should fully utilize information technologies such as AI and the Internet of Things to optimize nursing service processes and innovate nursing service models [8]. However, due to dual concerns regarding potential ethical risks and possible job displacement, attitudes among nursing staff toward using AI technologies in their work have become divided [9-10]. One study showed [11] that 43% of nurses worry AI technologies may threaten nursing practice, and 57% believe AI could plunge the nursing profession into crisis. As key providers of healthcare services, clinical nurses' acceptance of AI technologies will directly affect their clinical implementation effectiveness. Therefore, understanding their attitudes holds significant practical importance. However, current research primarily focuses on AI technology development, and effective tools for assessing nurses' attitudes toward AI are still lacking. Dilek Yılmaz et al. [12] developed the Attitude Scale Towards the Use of Artificial Intelligence Technologies in Nursing (ASUAITIN) in 2025. This scale is easy to apply and demonstrates good reliability and validity. Consequently, this study undertook the translation and cultural adaptation of the English version of ASUAITIN to provide a reliable tool for assessing clinical nurses' attitudes toward AI technology applications.

### 1.1 Scale Introduction

ASUAITIN was developed by Turkish scholars Dilek Yılmaz et al. [12] in 2025 to measure clinical nursing staff' s attitudes toward the application of artificial intelligence technologies. The scale contains 15 items across two dimensions: positive attitudes (9 items) and negative attitudes (6 items). Each item uses a 5-point Likert scale, where 1 represents "strongly disagree" and 5 represents "strongly agree." The total scale score ranges from 15 to 75, with higher scores indicating more positive attitudes toward AI technology application. The Cronbach' s $\alpha$ values for the total scale and each dimension are 0.910, 0.933, and 0.917, respectively.

### 1.2 Scale Translation

After obtaining permission and authorization from the original scale authors, the research team translated and back-translated the scale using the Brislin translation model [13] through the following steps: (1) Forward translation: Two nursing faculty members proficient in both Chinese and English (who had passed the CET-6 exam) independently translated the scale into Chinese, producing Chinese initial versions A and B. The research team then compared, revised, and

integrated these two versions to form Chinese version ASUAITIN C. (2) Back-translation: A nursing PhD graduate proficient in Chinese and English and a nursing professional English course instructor independently back-translated ASUAITIN C into English versions ASUAITIN D and E. After discussing and modifying discrepancies, they were integrated into English version ASUAITIN F. (3) Review: The researchers sent English version ASUAITIN F back to the original authors for evaluation of consistency with the original scale and solicited modification suggestions for any inconsistencies. Based on the original authors' recommendations, the research team repeated the forward translation, back-translation, and review processes until reaching consensus with the original authors, ultimately forming Chinese version ASUAITIN G.

### 1.3 Cultural Adaptation

To ensure cultural appropriateness and content equivalence of the Chinese version of ASUAITIN [14], the research team invited eight experts via email or face-to-face meetings to form an expert committee to evaluate item relevance, language clarity, and cultural appropriateness for the Chinese context. The eight experts included two university faculty members engaged in computer science research, three faculty members engaged in nursing informatics research, and three clinical nursing experts from tertiary Grade A hospitals. All held associate professor or deputy chief nurse positions or higher, including three with doctoral degrees, four with master' s degrees, and one with a bachelor' s degree.

### 1.4 Pilot Survey

In February 2025, a convenience sample of 20 nursing staff members from a tertiary Grade A hospital in Beijing was selected for a pilot survey. Using Chinese version ASUAITIN G, detailed feedback was recorded regarding items and wording that participants found unclear or difficult to understand. After discussion with the eight experts, modifications were made to form the final version.

#### 1.5.1 Study Participants

From March to April 2025, clinical nurses from a tertiary Grade A hospital in Beijing were selected as study participants using convenience sampling. Inclusion criteria were: more than one year of clinical work experience and voluntary participation in the study. Exclusion criteria were: nurses from non-clinical departments and nurses who were on leave or otherwise absent during the survey period. Sample size was calculated using the item-to-sample ratio of 5-10 times [15], and considering a 20% attrition rate, a minimum of 188 cases was required. Additionally, Wu Minglong [16] proposed that the sample size for exploratory factor analysis should reach at least 300 cases. Therefore, this study aimed for a sample size of over 300 cases. The study was approved by the ethics committee of the participating institution.

### 1.5.2 Data Collection Methods

Electronic questionnaires were distributed online through the Wenjuanxing platform. The questionnaire instructions explained the study's purpose, significance, and completion methods, emphasizing that the survey was anonymous and data would be used for research purposes only. Submission was only possible after completing all items. Participants who agreed could click "confirm"to fill out the questionnaire, while those who disagreed could exit. Completion time ranged from 2 to 5 minutes. The questionnaire included self-designed general demographic information (gender, age, education level, department, years of work experience, professional technical title) and the Chinese version of ASUAITIN. The research team screened each submitted questionnaire individually; questionnaires with identical responses for most items or completion times shorter than 2 minutes were considered invalid.

### 1.6 Statistical Methods

Data analysis was performed using SPSS 26.0 and AMOS 26.0 software. Count data were described using frequency, composition ratio, or percentage. Item analysis employed the critical ratio method and correlation analysis. Content validity was evaluated using the scale-level content validity index (S-CVI/Ave) and item-level content validity index (I-CVI). Construct validity was estimated using exploratory factor analysis and confirmatory factor analysis. Reliability was assessed using Cronbach' s $\alpha$ coefficient, Pearson correlation coefficient, and Spearman-Brown coefficient to evaluate internal consistency, test-retest reliability, and split-half reliability, respectively. Statistical significance was set at $P < 0.05$.

### 2.1 Results of Cultural Adaptation and Pilot Survey

Based on expert opinions and nurses' questions about questionnaire content during the pilot survey, the research group made the following modifications to the Chinese version of ASUAITIN: Item 2, "When I think about how AI technology will be applied in nursing in the future, I feel uneasy," was revised to "When I think about how AI technology will be applied in the nursing field in the future, I feel uneasy." Item 3, "I believe that if AI technology is used more in the future, the nursing profession will be harmed," was changed to "I believe that if AI technology is used more extensively in the future, the nursing profession will be harmed." Item 5, "I believe that using AI technology in nursing work is incorrect," was modified to "I believe that using AI technology in nursing work is inappropriate."

### 2.2 General Information of Respondents

A total of 400 questionnaires were distributed, and 396 valid questionnaires were returned, yielding a valid response rate of 99%. General information about the respondents is presented in Table 1 .

**Table 1 General Information of Respondents (n=396)** Age (years) | Obstetrics/Gynecology, Pediatrics | Emergency/ICU/Operating Room | Number (n) | Percentage (%)

### 2.3 Item Analysis

1) **Critical Ratio Method**: After ranking the 396 scale scores in descending order, the top 27% and bottom 27% were identified as high and low groups, respectively. Independent samples t-tests were used to compare item scores between the two groups, with items having critical values $<$ 3.000 or non-significant differences being deleted [17]. Results showed that critical values for all items ranged from 14.513 to 28.641, with statistically significant differences between low and high groups ($P < 0.01$). Therefore, all items were retained. 2) **Correlation Coefficient Method**: Pearson correlation coefficients between each item and the total scale score were calculated, with items having correlation coefficients $< 0.4$ (indicating low homogeneity with the overall scale) being eliminated [18]. Results showed that correlations between individual item scores and the total score ranged from 0.631 to 0.822 ($P < 0.01$). Consequently, all items were retained.

#### 2.4.1 Content Validity

Eight experts were invited to independently rate item content relevance using a 4-point Likert scale (1 = completely irrelevant, 4 = highly relevant). When I-CVI $\geq 0.78$ and S-CVI/Ave $\geq 0.90$, content validity is considered good [17]. Based on expert consultation results, the I-CVI for the Chinese version of ASUAITIN ranged from 0.875 to 1.000, and the S-CVI/Ave was 0.981.

#### 2.4.2 Construct Validity

**2.4.2.1 Exploratory Factor Analysis** Using Excel, the 396 questionnaires were randomly divided into two groups of 198 each for exploratory factor analysis and confirmatory factor analysis to explore the scale' s internal structure. The KMO value for the Chinese version of ASUAITIN was 0.918, and Bartlett' s sphericity test showed $^2 = 3301.116$, $P < 0.01$, indicating the scale was suitable for principal component analysis. Common factors with eigenvalues $> 1$ were extracted, and scree plot analysis yielded 2 common factors with a cumulative variance contribution rate of 77.402%. The factor loading matrix is presented in Table 2 .

**Table 2 Factor Loading of the Chinese Version of ASUAITIN** 1. I believe AI technology will become an obstacle to nursing practice application. 7. AI technology can provide new opportunities for nurses. *(Note: Complete items require authorization from the original author; therefore, only partial items are shown in this article)*

**2.4.2.2 Confirmatory Factor Analysis** Confirmatory factor analysis was performed using AMOS 26.0 software. Results showed that for the revised model, the chi-square to degrees of freedom ratio ( $^2$/ ) was 2.242, Comparative Fit Index (CFI) was 0.966, Goodness-of-Fit Index (GFI) was 0.882, Normed Fit Index (NFI) was 0.941, Incremental Fit Index (IFI) was 0.967, Tucker-Lewis Index (TLI) was 0.959, Relative Fit Index (RFI) was 0.929, and Root Mean Square Error of Approximation (RMSEA) was 0.079. All indices were within acceptable ranges [16].

### 2.5 Reliability Analysis

The Cronbach' s $\alpha$ coefficient for the Chinese version of ASUAITIN was 0.939, with dimension-specific coefficients of 0.945 and 0.956, respectively. The split-half reliability was 0.738, and the test-retest reliability was 0.935.

### 3.1 The Chinese Version of ASUAITIN Has Good Application Value

In recent years, AI technology has achieved breakthrough progress, potentially bringing paradigm shifts in healthcare delivery, patient outcomes improvement, and nurse role transformation [19]. Although AI demonstrates significant advantages in patient monitoring and health management, nursing remains a highly personalized, human-centered profession [20] with irreplaceable attributes of emotional interaction, decision-making complexity, and humanistic care. Therefore, systematically assessing nursing staff' s acceptance of AI technology is crucial. This study conducted cross-cultural adaptation of the ASUAITIN scale to develop a standardized measurement tool aligned with China' s nursing practice context. This scale can evaluate clinical nurses' cognitive attitudes, usage motivations, and potential concerns regarding AI technology, providing empirical evidence for intelligent equipment allocation, stratified staff training, and human-machine collaboration process optimization. In practical application, its assessment results can directly inform decision-making on introducing AI nursing tools in medical institutions, guide development of occupational stress intervention strategies for nurses, and facilitate innovation in "patient-centered" smart nursing service models.

### 3.2 The Chinese Version of ASUAITIN Has Good Discriminant Validity

Results showed that critical ratios for all items in the Chinese version of ASUAITIN ranged from 14.513 to 28.641. Correlation analysis between items and total scores revealed that all item-total correlation coefficients exceeded 0.40 ($P < 0.01$), indicating high content consistency between items and the overall scale and meeting homogeneity requirements for scale development. These findings demonstrate that the Chinese version of ASUAITIN possesses good discriminant validity and can effectively identify differences in attitudes toward AI technology application among nursing staff at various levels.

### 3.3 The Chinese Version of ASUAITIN Has Good Reliability

Reliability tests the consistency, stability, and dependability of measurement tools [21]. The translated ASUAITIN demonstrated a Cronbach' s $\alpha$ coefficient of 0.939, split-half reliability of 0.738, and dimension-specific Cronbach' s $\alpha$ coefficients of 0.945 and 0.956, indicating excellent internal consistency and reliability. Test-retest reliability analysis showed a correlation coefficient of 0.935 over a 2-week interval, demonstrating good stability. These results confirm that the Chinese version of ASUAITIN achieves ideal reliability levels and can stably reflect clinical nurses' true attitudinal tendencies toward AI technology application.

### 3.4 The Chinese Version of ASUAITIN Has Good Validity

Validity refers to the degree to which a research tool can accurately predict the psychological or behavioral characteristics it intends to measure, serving to examine a scale' s accuracy and effectiveness [15]. Content validity testing showed that I-CVI ranged from 0.875 to 1.000 and S-CVI/Ave reached 0.981 for the Chinese version of ASUAITIN, meeting content validity evaluation criteria and indicating high consistency with the original scale. Construct validity analysis revealed that exploratory factor analysis extracted 2 common factors with eigenvalues $\geq 1$, accounting for 77.402% of cumulative variance, with all item loadings $> 0.5$ (exceeding the minimum standard of 0.4). Confirmatory factor analysis results showed acceptable model fit indices. These findings demonstrate that the Chinese version of ASUAITIN possesses ideal validity and meets psychometric requirements.

The Chinese version of ASUAITIN developed in this study comprises 2 dimensions and 15 items, demonstrating good reliability and validity. The scale is concise, easy to understand, and clearly worded, making it a reliable tool for evaluating Chinese nursing staff' s attitudes toward AI technology application. However, this survey was conducted only in a tertiary Grade A hospital in Beijing, which presents certain limitations. Future research will expand the sample size and conduct multi-center surveys to provide evidence-based support for clinical nursing managers in developing AI technology integration strategies.

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**Author Contributions**

Shang Li and Li Ye: Conceptualized the study, designed the research protocol, and wrote and revised the manuscript.

Xu Lanlan and Nie Xiaofei: Translated the scale and conducted cross-cultural adaptation.

Luo Yixue and Wang Dian: Analyzed and organized the data.

*Note: Figure translations are in progress. See original paper for figures.*