




# Acceptance Scale for Traditional Chinese Medicine Techniques in Cancer Patients: Development and Validation

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**Background:** Traditional Chinese Medicine techniques have unique advantages in complementary cancer treatment, and their clinical application largely relies on patient acceptance. Scientific assessment of patients' acceptance of Traditional Chinese Medicine techniques is a key step in promoting their clinical application. However, no scientifically validated tools exist to assess cancer patients' acceptance of Traditional Chinese Medicine techniques.

**Purpose:** To develop and validate the acceptance scale for Traditional Chinese Medicine techniques in cancer patients.

**Patients and Methods:** The study involved scale development and psychometric testing. Items were generated via conceptual definition, literature review, and qualitative research based on the Technology Acceptance Model. Two rounds of expert review and a pilot study refined the scale and assessed content validity. Psychometric evaluation was conducted on 370 cancer patients, including item analysis, exploratory and confirmatory factor analysis, validity assessments, and reliability testing.

**Results:** The finalized 25-item scale has four dimensions: perceived usefulness, perceived ease of use, behavioral intention, and apprehensions about usage. Content validity indices ranged from 0.933 to 1.000. Exploratory factor analysis revealed four common factors, accounting for 66.6% of the variance. Confirmatory factor analysis showed good fit ( $\chi^2/df=2.304$ , GFI=0.803, CFI=0.907, NFI=0.847, RMSEA=0.079). Convergent validity indicated Average Variance Extraction values of 0.493–0.679 and Composite Reliability of 0.858–0.913. Correlations between dimensions ranged from 0.624 to 0.730, with satisfactory discriminant validity. Reliability was high (Cronbach's alpha=0.951, split-half=0.871, test-retest=0.876).

**Conclusion:** This scale is a reliable and effective tool for assessing cancer patients' acceptance of Traditional Chinese Medicine techniques. It provides guidance for clinical practice and research involving these techniques.

**Keywords:** acceptance, neoplasms, scale development, traditional Chinese medicine, validity and reliability

## Introduction

With medical advances, the survival rate of cancer patients has been significantly improved.<sup>1</sup> However, patients often face adverse reactions such as nausea and vomiting, cancer pain, fatigue, insomnia, etc., during treatment and rehabilitation, which seriously affect treatment compliance and quality of life.<sup>2</sup> Traditional Chinese medicine (TCM) techniques have shown unique advantages and broad application prospects in managing cancer-related symptoms.<sup>3–5</sup>

TCM techniques constitute the core of TCM clinical practice, including moxibustion, gua sha, cupping, acupressure, ear acupressure, and other manual techniques.<sup>6</sup> These techniques exert their clinical efficacy by applying external manipulations to the human body under the guidance of TCM theory, and are also known as traditional external

treatment methods in TCM.<sup>7</sup> Clinical practice guidelines from several leading professional organizations, along with supporting studies, indicate that TCM techniques are effective in alleviating cancer-related symptoms such as nausea and vomiting, sleep disturbances, fatigue, and pain.<sup>8–11</sup> Further studies have also supported its multidimensional regulatory effects through mechanisms such as immune system modulation and improved microcirculation.<sup>12</sup> Multiple evidence also demonstrates that the adverse effects of TCM techniques are rare and mild, indicating that they have a favorable safety profile.<sup>13,14</sup> Given the advantages of TCM techniques in terms of efficacy and their relatively low risk of adverse effects, researchers around the globe have continued to focus on the utilization and promotion of these techniques for cancer patients in mainstream healthcare systems.<sup>4,15</sup>

It has been demonstrated that, in the practical application of TCM techniques, patients' perceptions of the acceptability of these techniques significantly influence the final treatment outcome.<sup>16,17</sup> The core concept of "acceptance" refers to the degree to which individuals psychologically recognize and embrace external entities or phenomena.<sup>18–20</sup> Currently, a variety of well-established acceptance tools have been used in clinical practice, such as the Sleep Problem Acceptance Questionnaire and the Ostomy Acceptance Questionnaire, which can meet the needs of patients in different areas.<sup>21,22</sup> These questionnaires provide an objective basis for clinical assessment, aid in the development of individualized intervention programs, and stimulate self-care motivation, thereby enhancing the overall effectiveness of treatment. However, most surveys on the acceptance of TCM techniques rely on self-designed questionnaires that lack a scientific development process and rigorous reliability and validity tests, resulting in one-sided findings.<sup>23,24</sup> In summary, it is necessary to develop a scale regarding cancer patients' acceptance of TCM techniques. This scale will help clinicians better understand patients' acceptance of TCM techniques, thereby guiding the development of targeted interventions for integrated treatment. This promotes patients' adherence to treatment, enhances the efficacy of specific TCM techniques within a comprehensive and integrated approach.

According to Davis' Technology Acceptance Model, users' adoption and usage of a technology are influenced by their judgments of its usefulness and ease of use based on external factors.<sup>19,20</sup> These judgments generate behavioral attitudes toward the technology, which in turn affect individuals' willingness to use it and their actual usage behavior. This model, grounded in the two primary determinants of perceived usefulness and perceived ease of use, effectively explains users' subjective attitudes and usage behaviors toward TCM techniques, facilitating accurate analysis of TCM techniques adoption. Moreover, the model has been widely applied in the medical field, particularly in studies examining the adoption of assistive technologies by chronic disease patients.<sup>25,26</sup> Therefore, this study defines "acceptance of TCM techniques" based on Davis' Technology Acceptance Model theory as the psychological attitude, perception, and adoption intention demonstrated by individuals when exposed to and learning about TCM techniques. And this theory guides the development of a scale to assess cancer patients' acceptance of TCM techniques, aiming to create a reliable and comprehensive tool for evaluating their acceptance level.

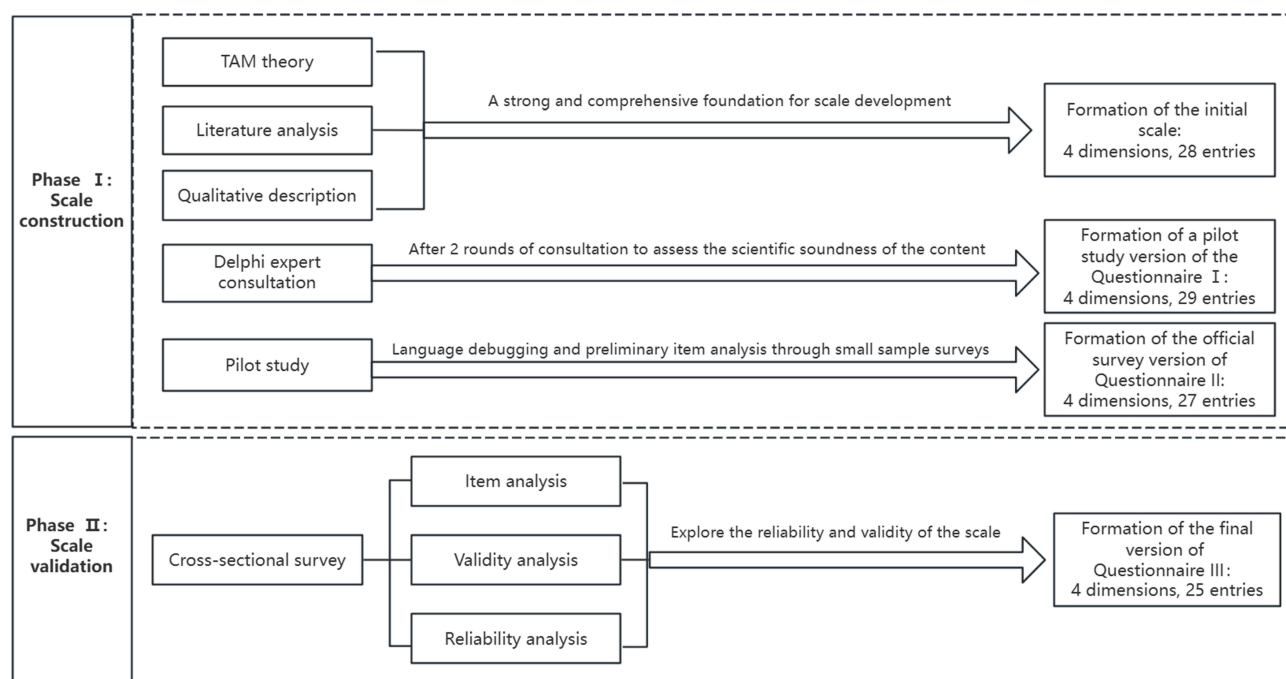
## Patients and Methods

This study have two phases: the first phase was the scale development phase, which was guided by Technology Acceptance Model and conducted in conjunction with literature analysis, qualitative research, Delphi expert consultation, and a pilot study; The second phase was the scale validation phase, which consisted of a cross-sectional survey to validate the scale's psychometric properties. (Figure 1)

### Scale Development Phase

#### Formation of a Research Team

The research team comprised eight members from diverse disciplines, including two TCM experts, two practitioners in the field of cancer, one scale development specialist, one healthcare administrator, and two TCM graduate students, ensuring comprehensive input in questionnaire development. Their main tasks included theoretical analysis, item bank construction, expert consultation design, feedback synthesis, and scale refinement.



**Figure 1** Summary of the three phases.

## Concept Definition and Initial Scale Dimensions

The development of a scale requires a clear description of the concepts being evaluated and the measurement structure. In this study, we took the Technology Acceptance Model as the core theoretical foundation, read the literature related to technology acceptance in cancer patients, defined the concept of “acceptance of TCM techniques”, and initially constructed the four-dimensional structure of the scale.<sup>18–20</sup>

## Items Generation

The initial item pool for the scale was generated based on a combination of literature review and qualitative interviews, ensuring a comprehensive and nuanced understanding of the factors influencing cancer patients’ acceptance of TCM techniques.

A comprehensive literature search was performed across PubMed, Web of Science, China National Knowledge Infrastructure(CNKI), China Science and Technology Journal Database (VIP), and Wangfang databases. The search covered all available articles from when the database was constructed to March 1, 2023. The following significant keywords were used: “cancer”, “traditional Chinese medicine”, “traditional Chinese medicine techniques”, “acceptance”, and “need.” The current status of acceptance of TCM techniques by cancer patients and related factors were summarized to provide a reference for the initial item bank development.

In order to gain a deeper understanding of the factors influencing patients’ acceptance of TCM techniques and to compensate for the possible shortcomings of the literature review alone, this study used a descriptive qualitative research design to conduct semi-structured interviews with purposively sampled patients with malignant tumors in three tertiary care hospitals in Fuzhou, China, in March 2023. Sample selection follows the principle of maximum variation to determine information saturation. Participants met the inclusion criteria: (1) Diagnosed with cancer; (2) Aware of their disease and familiar with or using TCM techniques; (3) Aged  $\geq 18$  years. Exclusion criteria: Individuals with hearing impairments, unable to communicate fluently in Chinese, or unable to express their thoughts clearly. Before the formal interviews, the research team pre-interviewed three patients and adjusted the interview outline based on the feedback. The interview outline was constructed according to the Technology Acceptance Model: (1) What are your feelings when using TCM techniques? (2) What is your attitude toward TCM techniques? (3) What made you decide to use TCM

techniques? (4) What reasons prevent you from using TCM techniques? (5) What do you suggest about the use of TCM techniques? (6) Are you willing to recommend TCM techniques to others?

This study used directed content analysis to process the collected interview data, which was effective in distilling key themes and concepts related to patient acceptance from the interview data, thus validating and complementing the entries derived from the literature research method.<sup>27</sup> Simultaneously, to ensure data accuracy, the research team completed transcription of recordings within 24 hours of each interview. Two researchers, both fully trained in qualitative research and skilled at extracting key information, conducted preliminary analysis. This rapid analysis process facilitated timely content verification, identifying gaps, ambiguities, or contradictions to enable subsequent supplementation and ensure data saturation.

### Delphi Expert Consultation

A purposive sampling method recruited 16 experts from various seven provinces of China for two consultation rounds to refine the items. Inclusion criteria were: (1) Significant influence in TCM or cancer,  $\geq 10$  years of relevant experience; (2) Undergraduate degree or higher with an associate senior or higher technical title; (3) Willingness and ability to complete consultations within two weeks; (4) Proficiency in scale development methodology.

In the initial phase of expert consultation via email, experts rated each survey item's necessity, importance, and comprehensibility using a five-point Likert scale (1=very unimportant to 5=very significant). An "expert advice column" and a "modification advice column" were included. After summarizing and analyzing the feedback, the research team conducted in-depth discussions and initiated a second round of expert review, inviting reassessment of the revised item. In the second round of the expert Delphi survey, a preferential order diagram was constructed based on expert judgments to compare the importance of different dimensions to the scale's objectives. The weighting order of each dimension was then presented through intuitive diagrams.

The consultation continued until a consensus was reached among the experts. Items were considered acceptable if the mean importance score exceeded 3.5, the coefficient of variation was below 0.25, and the expert authority coefficient (Cr) surpassed 0.7.<sup>28</sup>

### Pilot Study

To assess the feasibility and clarity of the initial scale, 60 cancer patients from a tertiary hospital in Fuzhou were selected for a pilot study in September 2023 using convenience sampling. Inclusion and exclusion criteria matched those of the qualitative study. Participants completed the scale independently, evaluating its format, content, readability, and response options. Based on their feedback and initial analysis, the research team will clarify the items again and improve their presentation, layout, and wording to improve clarity.

## Scale Validation Phase

### Recruitment

A convenience sampling approach was used to recruit cancer patients meeting the inclusion criteria for a survey conducted at three tertiary hospitals in Fuzhou, China, between October and December 2023. The inclusion and exclusion criteria were identical to those used in the pilot study. The sample size for the formal survey was 5 to 10 times the number of items in Questionnaire II, accounting for a 10% follow-up loss. Thus, the sample size was determined to be at least  $(27 \times 5) / 0.9$  to  $(27 \times 10) / 0.9 = 150$ –300 participants.<sup>29</sup> Exploratory factor analysis required a sample size with at least a 5:1 ratio of participants to items in Questionnaire II, while confirmatory factor analysis required a sample size of at least 200 participants.<sup>30</sup> Finally, we enrolled 380 participants.

### Data Collection

This study distributed questionnaires on-site after obtaining informed consent, with patients completing them independently. Should patients encounter difficulties understanding the questionnaire content, researchers provided necessary explanations and guidance.

## Quality Control of Data Collection

Researchers undergo standardized training, including scenario simulations and field exercises. During the data collection phase, if a patient provides ambiguous responses, researchers immediately communicate with the patient to clarify, ensuring data accuracy and consistency.

## Data Analysis

SPSS Version 25.0 and SPSS Amos Version 27.0 were used for data analysis. Descriptive statistics, such as means, standard deviations, frequencies, and percentages, were applied to summarize demographic characteristics. The methods employed for item analysis, as well as validity and reliability testing, are detailed as follows:

Item analysis: Four methods were employed to screen the items in the scale. (1) Correlation coefficient method: Items with a correlation coefficient less than 0.40 with the total scale score were removed. (2) Coefficient of variation (CV) method: Items with a CV less than 0.15 were eliminated. (3) Critical ratio method: Items for which the total scores in the lowest and highest 27% groups did not reach statistical significance ( $P > 0.05$ ) or had  $t$ -values  $< 3.000$  were excluded. (4) Internal consistency method: Items that did not significantly improve the Cronbach's alpha coefficient of the scale were deleted.<sup>31</sup>

Content validity: Calculated using the overall content validity index (CVI) and scoring the importance of each item when the number of experts  $\geq 6$ . For each item, the item-level content validity index (I-CVI) should be  $\geq 0.78$ . The overall scale-level content validity index (S-CVI/UA) should be  $\geq 0.80$ , and the average scale-level content validity index (S-CVI/Ave) should be  $\geq 0.90$ , indicating strong content validity of the scale.<sup>32</sup>

Construct validity: (1) Exploratory factor analysis (EFA): Bartlett's test and the Kaiser-Meyer-Olkin (KMO) test were used to assess factor analysis suitability. Factors were extracted via maximum variance rotation.<sup>33</sup> (2) Confirmatory factor analysis (CFA): Model validation was done using the maximum likelihood method. The model fit was assessed with fit indices, and poorly fitting parts were revised.<sup>34</sup> (3) Convergent validity: Assessed via standardized loading coefficient, average variance extracted (AVE), and composite reliability (CR). A scale is considered valid if the standardized loading coefficient  $> 0.55$ , AVE  $> 0.50$ , and CR  $> 0.70$ .<sup>35</sup> (4) Correlation analysis and discriminant validity: Pearson correlation assessed relationships among dimensions and total score for internal consistency. Discriminant validity was met when the AVE for each dimension exceeded the squared correlation coefficient between the two dimensions.<sup>36</sup>

Reliability Analysis: (1) Internal Consistency: Assessed using Cronbach's alpha and split-half reliability coefficients for the overall scale and each dimension. Values  $> 0.70$  were considered acceptable.<sup>36</sup> (2) Test-Retest Reliability (Stability): Evaluated by administering the scale to a sample of 30 cancer patients on two occasions, two weeks apart.

## Ethical Considerations

This study was approved by the institutional ethics committee (IRB No. 2023KS-75-1) in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to the survey, with the option to withdraw at any time without consequence.

## Results

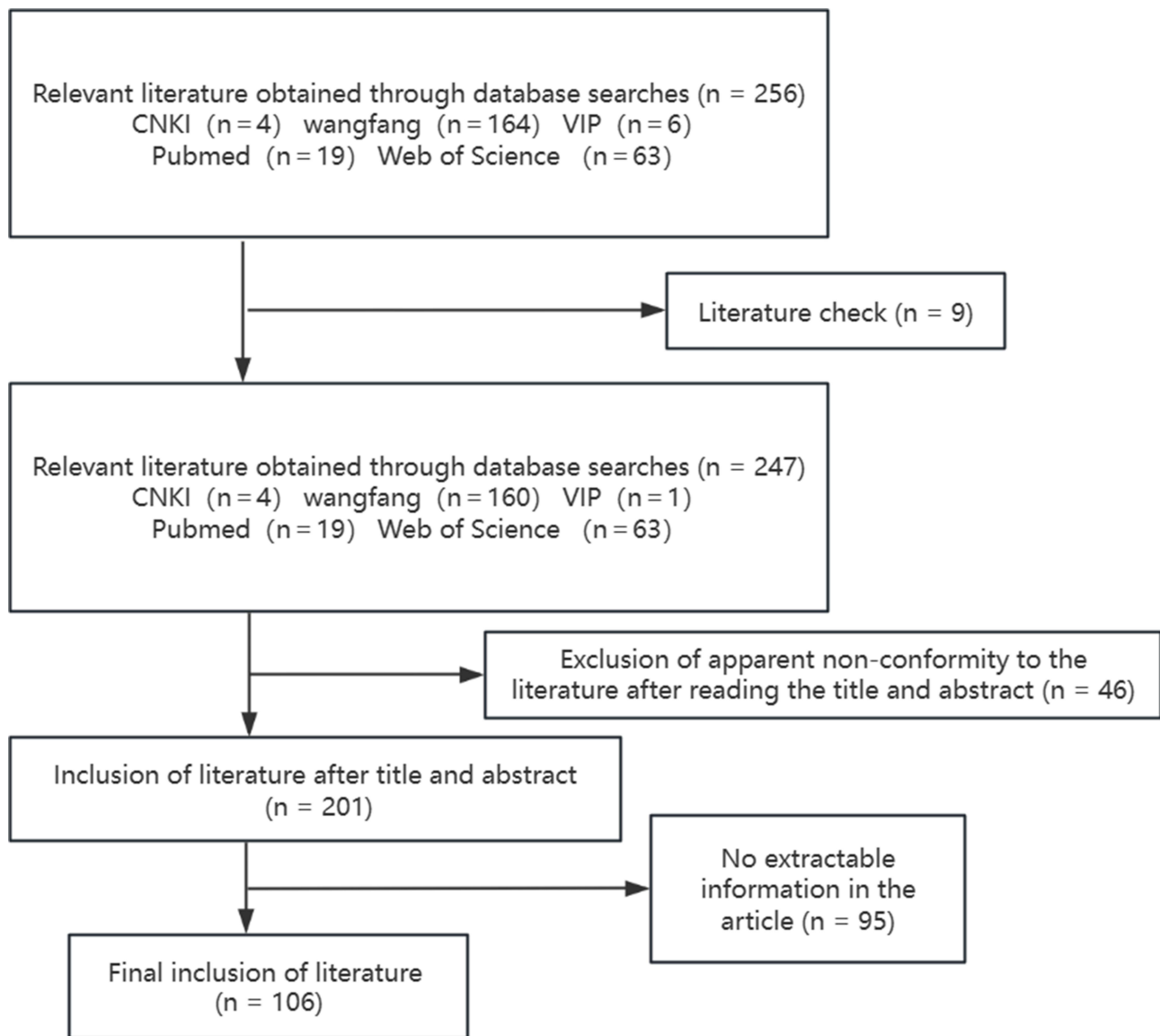
### Scale Development

#### Definition of Scale Construct

Guided by the Technology Acceptance Model theory and combined with literature and qualitative interviews, the key dimensions for the construction of the scale have been identified, including perceived usefulness, perceived ease of use, behavioral intention, and apprehensions about usage.

#### Development of the Initial Scale

Initial keyword-based searches yielded 256 articles. After excluding duplicates and irrelevant studies based on title, abstract, and full-text review, 106 articles were ultimately included (Figure 2). The research team systematically analyzed and synthesized factors related to the acceptance of TCM techniques by cancer patients from the included literature, leading to the preliminary generation of 24 scale items.



**Figure 2** Literature screening flowchart.

This study included 15 cancer patients who participated in semi-structured in-depth interviews. Among them, 8 were female and 7 were male; ages ranged from 35 to 80 years (mean age:  $56.07 \pm 12.93$  years). Educational attainment included 3 participants with primary or junior high school education, 6 with high school or technical secondary education, and 6 with college or higher education. Directed content analysis was used to organize, code, classify, categorize, and refine the textual information from the meaning level by reading it repeatedly sentence by sentence to obtain four themes and 11 sub-themes: perceived usefulness (relieving uncomfortable symptoms, regulating physical status, and receiving psychological support and satisfaction), perceived ease of use (simplicity of technical operation, ease of access), behavioral intention (willingness to learn related knowledge, openness to share information with others, need for professional guidance), apprehensions about usage (low recognition of therapeutic efficacy, slow to take effect and prolonged treatment duration inconsistent with patient expectations, concerns about costs). Through analysis of the interview data, in addition to the themes of perceived usefulness, perceived ease of use, and behavioral intention aligned with the Technology Acceptance Model, a theme of patients' "apprehensions about usage" regarding TCM techniques emerged. These concerns directly affect patients' acceptance and willingness to use TCM. Therefore, the "apprehensions

about usage” theme was incorporated into the survey scale as an additional dimension, resulting in a total of four dimensions.

Based on the real feedback from patients in the qualitative study, the items analyzed from the literature study were validated and some information was added. Therefore, the initial 24 items derived from the literature analysis were linguistically adjusted, summarized, and embellished. This revision not only added 5 items to respond more comprehensively to the factors affecting patient acceptance, but also combined 2 items into one, aiming to improve the conciseness and efficiency. Specifically, for the Perceived Usefulness (A) dimension, qualitative data highlighted patients’ perception of TCM techniques assisting tumor treatment and facilitating successful completion—aspects not fully captured by literature-derived items. Thus, A4 (“TCM techniques can facilitate the smooth completion of cancer treatment”) was incorporated. In the Perceived Ease of Use (B) dimension, patient feedback emphasized the significance of accessible TCM knowledge and minimal disruption to daily life. To reflect this extended understanding of “ease of use”, B3 (“The knowledge of TCM techniques is easy to understand”) and B8 (“Using TCM techniques will not affect my daily life”) were added. For Behavioral Intention (C), interviews revealed a strong willingness among patients to share experiences and learn with family, underscoring the influence of social and familial integration on acceptance. This led to the inclusion of C4 (“I am willing to actively share TCM techniques”) and C5 (“I am willing to learn TCM techniques with my family”). Finally, for Apprehensions About Usage (D), items D5 (“I find it difficult to assess whether TCM techniques are suitable for my current physical condition”) and D6 (“I find it difficult to choose the TCM techniques most suitable for my physical condition”) were initially considered as distinct items. However, analysis of patient interview data revealed a common underlying theme, with both items reflecting the challenge patients face in making decisions when selecting TCM techniques. To meet the requirement for item differentiation in scale development and avoid content redundancy that could confuse respondents. Consequently, consolidating D5 and D6 into a single item, “Difficulty in selecting appropriate TCM techniques for operation” (D5), more concisely encapsulates the core obstacles patients encounter during technique selection.

This meticulous process resulted in a preliminary item pool comprising 28 items, distributed across the four dimensions: Perceived Usefulness (A1-A8), Perceived Ease of Use (B1-B8), Behavioral Intention (C1-C6), and Apprehensions About Usage (D1-D6).

## Delphi Results

The 16 experts who met the selection criteria mainly focused on clinical cancer research, TCM treatment and scale development. The average age of the experts was (41.75±5.51) years old and the average working experience was (18.63 ±6.10) years. The valid recovery rates of the two rounds of consultation were 100% and 93.75%, respectively, which indicated that the experts were highly motivated, and the Cr value was 0.9, which indicated that the assessment results were highly reliable, and the Kendall’s coefficient of concordance was 0.132 and 0.182, which indicated that the experts’ opinions were highly concordant.

Informed by expert recommendations, the first round of revisions involved refining 12 verbal expressions (Table 1). Some experts pointed out that A3 (TCM techniques can enhance the therapeutic effects of anti-cancer drugs), A4 (TCM techniques can significantly facilitate the smooth completion of cancer treatment) and A6 (TCM techniques can improve physical health status) were all about the beneficial effects of TCM techniques on patients through the promotion of tumor treatment, and that there was duplication of items. Therefore, after discussion and analysis by the research team, the three items A3, A4 and A6 were combined to one “TCM techniques can promote the body’s optimal condition to better support cancer treatment”. Some experts pointed out that regarding A8 “There are no uncomfortable or unbearable feelings during the use of TCM techniques”, Gua Sha, cupping, auricular acupoint pressure and other techniques have pain or uncomfortable feeling, and it was pointed out that this item should be put in the apprehensions about usage dimension. Research group adopted the experts’ opinion and categorized A8 into the dimension of “apprehensions about usage”, which was shaped into D3 “Discomfort is experienced during the use of TCM techniques”. Some experts pointed out that in the dimension of “perceived usefulness”, adjustments could be made according to physiological, psychological and social responses. After discussing, analyzing and adjusting the existing items, the research team added a new item of about social responses, A5 “Use of TCM techniques can promote participation in social activities”. In the dimension of

**Table 1** First Round of Comments from Expert Peer Review

Items	Pre-Modification	Post-Modification
A1	TCM techniques can relieve or improve discomfort symptoms	TCM techniques can improve discomfort symptoms
A2	TCM techniques can make the mood pleasant, relaxing and comfortable	TCM techniques can make the mood pleasant and relaxing
B1	The tools used in TCM techniques are easily accessible in daily life	The tools required for TCM techniques are easily accessible in daily life
B4	TCM techniques are easy to master	TCM techniques are easy to handle
B7	I and/or my family can use TCM techniques	I and/or my family can independently use TCM techniques.
C3	Willing to try different kinds of TCM techniques	Willing to experience different kinds of TCM techniques
C4	Willing to proactively share TCM techniques	Willing to proactively share the effects of TCM techniques
C6	Professional guidance from health care professionals promotes the use of TCM techniques	I would be more willing to use TCM techniques if I had the guidance of health care professionals
D1	The efficacy of TCM techniques is uncertain	The efficacy of TCM techniques is unclear
D3	TCM techniques have adverse reactions	Adverse reactions of TCM techniques
D4	TCM techniques can cause economic pressure	TCM techniques can incur additional treatment costs
D6	The correct level of operation of TCM techniques is affected by the professionalism of the operators	The effectiveness of TCM techniques is affected by the professionalism of the operators

“perceived ease of use” was suggested to add items that could reflect the fact that TCM techniques are available in a variety of ways and do not require a specific place to perform the operation. After discussion, the research team adopted the experts’ opinions and added the items of B7 “The use of TCM techniques does not require a specific site” and B10 “In daily life, access to TCM techniques services is easily available (eg, community primary health centers, health care centers, recreation centers, etc)”. These changes culminated in the second iteration of the questionnaire, comprising 29 items.

In the second round of inquiries, the CV of the 29 items ranged from 0.00 to 0.14, with an average of 0.09, and the range of the full score ratio was from 0.33 to 1.00, indicating good consistency and acceptability. Due to problems with the description in some statements, the experts suggested modifications to some items. After discussion, the research team adopted the following amendments: The expression “to better support cancer treatment” in A3 was deemed inappropriate. And amend it to “TCM techniques can promote the body’s better condition.” A5 was amended from “Promote participation in social activities” to “Promote participation in social interactions”; B5 to B8 were amended from “use” to “implement”; D5 was revised from “Adverse reactions or safety issues” to “Adverse reactions or safety issues that occurred”; D7 was changed from “The effectiveness of TCM techniques is affected by the professionalism of the operators” to “The therapeutic effect of TCM techniques is affected by the professionalism of the operators”. In addition to modifications to the wording of the items, the sequence of items in Dimension D was adjusted based on suggestions from several clinically experienced experts. The order was revised to rank the items according to the level of concern among cancer patients regarding the acceptance of TCM techniques, with “Difficulty in selecting appropriate TCM techniques for operation” moved from D6 to D3. These revisions ensure the accuracy and scientific nature of the indicator description. The weights of the indicators were further calculated by the preferential order diagram method, and it was found that “perceived usefulness” had the highest weight (0.3944), while perceived ease of use, behavioral intention, and apprehensions about usage were 0.1944, 0.2556, and 0.1556, respectively, which provided the basis for the evaluation. Finally, a pilot study version of the Questionnaire I was formed with 4 dimensions and 29 items.

### Pilot Study Results

During the pilot study phase from September to October 2023, 60 questionnaires were distributed, 57 were recovered, and 56 of these were valid. The recovery validity rate was 98.24%, and the average response time was about 6 minutes. Patients generally found the scale items to be clear and concise, and there were only two items that did not meet the statistical requirements. The research team concluded that item B10 “In daily life, access to TCM techniques services is easily available (eg, community primary health centers, health care centers, recreation centers, etc.)”, exhibited low content validity ( $CV < 0.15$ ), indicating insufficient representativeness; thus, it was removed. Similarly, item D5 “Adverse reactions of TCM techniques”, was considered by the team to lack adequate relevance, as its correlation

coefficient<sup>®</sup> with the total score was below 0.40. This suggests that the item does not accurately measure the construct targeted by the scale. Additionally, clinical practice indicates that TCM techniques are generally safe, and this item does not reflect patients' concerns regarding the acceptance of TCM techniques among cancer patients. Therefore, item D5 was also eliminated. The official survey version of Questionnaire II consisted of four dimensions and 27 items.

## Scale Validation

### General Characteristics of Participants

In this study, 380 questionnaires were distributed, of which 376 were recovered, and 370 were valid, resulting in an effective recovery rate of 98.40%. Among them, 165 were males, and 205 were females; the age range of the patients was 23–79 (53.45±11.62) years old, and the included cancer types contained breast cancer, colon cancer, lung cancer, etc. The general information is detailed in Table 2.

**Table 2** General Characteristics of Participants (n=370)

Variable	Classify	N	n (%)
Gender	Male	165	44.59
	Female	205	55.41
Age	≤30	12	3.24
	31~40	43	11.62
	41~50	80	21.62
	51~60	135	36.49
	61~70	81	21.89
	≥70	19	5.15
Education	Primary school and below	119	32.16
	Junior middle school	117	31.62
	High school	68	18.38
	University and above	66	17.84
Marriage	Unmarried	7	1.89
	Married	355	95.95
	Divorced or widowed	8	2.16
Monthly household (yuan)	<3000	39	10.54
	3000-5000	48	12.97
	>5000	283	76.49
Payment method of medical expenses	Medical insurance for urban workers	111	30.00
	Medical insurance for urban residents	132	35.68
	New rural cooperative	103	27.84
	Own expense	3	0.81
	Other	21	5.68
Work status	Employed	241	65.14
	Unemployed	81	21.89
	Retired	48	12.97
Have you considered using TCM techniques	Yes	183	49.46
	Uncertainty	187	50.54
Have you considered using TCM techniques to relieve your discomfort	Yes	164	44.32
	No	206	55.68
Whether TCM techniques were used before the onset of the disease	Yes	168	45.41
	No	202	54.59
Have you any knowledge of TCM techniques	Yes	247	66.76
	No	123	33.24
Do you think that TCM techniques have adverse reactions or safety issues	Yes	26	7.03
	No	344	92.97

(Continued)

**Table 2** (Continued).

Variable	Classify	N	n (%)
Are there any places that provide TCM techniques near where you live	Yes	243	65.68
	No	127	34.32
Type of cancer	Lymphoma	21	5.68
	Myeloma	11	2.97
	Nasopharyngeal carcinoma	54	14.59
	Lung cancer	55	14.86
	Liver cancer	10	2.70
	Carcinoma of colon	23	6.22
	Oophoroma	16	4.32
	Mammary cancer	93	25.14
	Gastric cancer	26	7.02
	Rectal cancer	12	3.24
	Other	49	13.24
Cancer Phase	0	1	0.27
	I	18	4.86
	II	59	15.95
	III	104	28.11
	IV	184	49.73
	Other	4	1.08
Course of disease (year)	<1	152	38.38
	1~5	151	40.81
	5~10	52	14.05
	>10	15	4.05
Therapy method	Chemotherapy	345	93.24
	Surgery	5	1.35
	Immunization therapy	4	1.08
	Endocrine therapy	8	2.16
	Other	8	2.16

### Item Analysis Results

Data from 370 cancer patients collected between October and December 2023 were analyzed for item analysis. Correlation coefficient analysis revealed that all item-total score correlations were  $\geq 0.4$  and statistically significant ( $P < 0.05$ ). The dispersion method showed that the CV for each item was  $\geq 0.15$ . Critical ratio analysis indicated all items had ratios  $\geq 3.00$ , also statistically significant ( $P < 0.05$ ). Cronbach’s alpha analysis indicates that after removing item A5, the Cronbach’s alpha coefficient for the remaining items in dimension A “Perceived Usefulness” increased from 0.896 to 0.903, demonstrating high internal consistency for this dimension.

### Validity Analysis

#### Content Validity

The I-CVI for each scale item was in the 0.933–1.000 interval, the S-CVI/UA was 0.839, and the S-CVI/Ave for the total scale was 0.989, which met the statistical criteria.

#### Exploratory Factor Analysis

The formal survey Questionnaire II in this study comprised 27 items, and 160 completed questionnaires were selected for EFA. The initial factor analysis revealed that  $KMO=0.925$  and Bartlett’s test of sphericity was significant ( $\chi^2=2945.932$ ,  $df=325$ ,  $P < 0.001$ ), making it suitable for EFA. After orthogonal rotation by principal component analysis and maximum variance method, the commonality of scale items ranged from 0.470 to 0.842 for the first time. In the factor analysis, item B9:

“In daily life, I and/or my family members can independently use TCM techniques”, exhibited cross-loadings above 0.4 on two different factors, with a difference of less than 0.05 between the loadings. Therefore, this item was removed to ensure the robustness and clarity of the factor structure. A second EFA was conducted. The KMO value was 0.920, and the result of Bartlett’s test of sphericity was significant ( $\chi^2 = 2803.965$ ,  $df = 300$ ,  $P < 0.001$ ). Four common factors were extracted again, accounting for 66.604% of the variance. Item commonality ranged from 0.469 to 0.838, with absolute factor loadings between 0.530 and 0.832, all exceeding 0.40. The item distribution matched the predefined dimensions (Table 3 and Figure 3).

### Confirmatory Factor Analysis

The remaining 210 samples were used for CFA. The original model fit was poor, and after correction concerning the modification index (MI) and the expected parameter changes (EPC), the model fit indicators were ideal ( $\chi^2/df=2.304$ ,  $GFI=0.803$ ,  $CFI=0.907$ ,  $NFI=0.847$ ,  $IFI=0.907$ , and  $RMSEA=0.079$ ) (Figure 4).

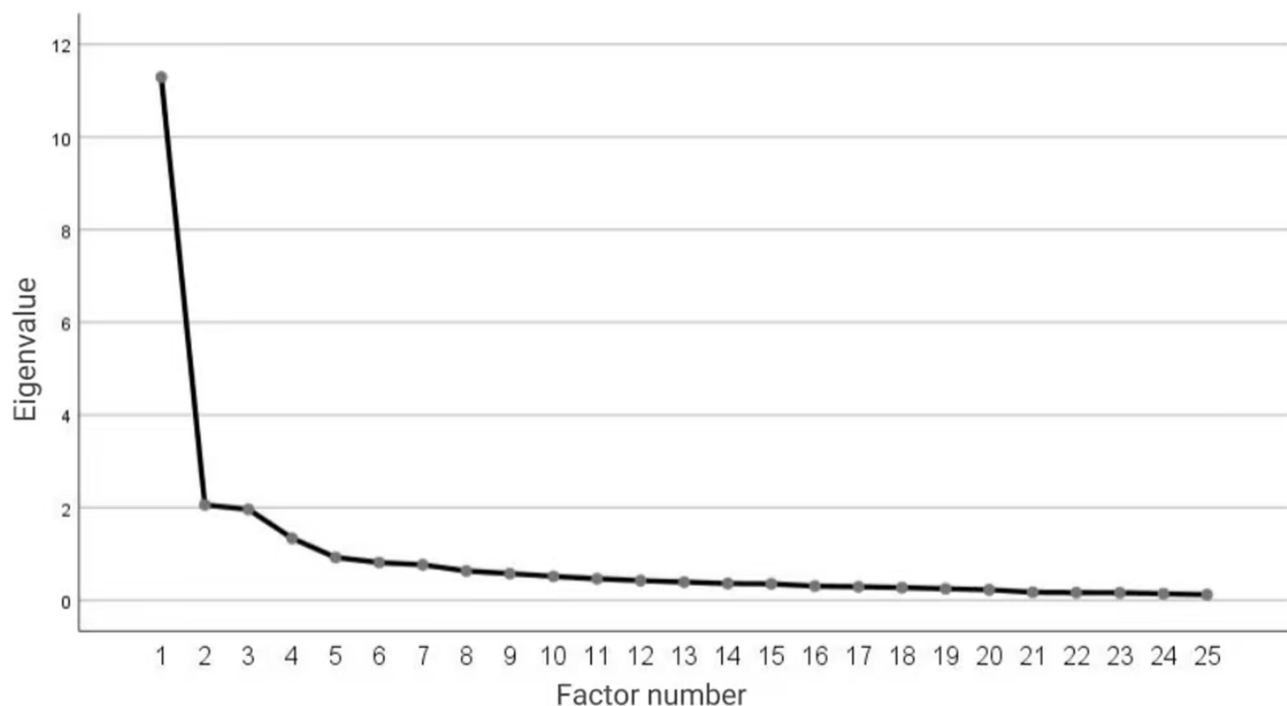
### Convergent Validity

The standardized loading coefficients for each item based on the CFA were all  $> 0.55$ . The AVE values between items and dimensions ranged from 0.493 to 0.679. The CR values ranged from 0.858 to 0.913, and all were  $> 0.70$ , which meets the statistical criteria.

**Table 3** The Second Factor Load Matrix and Common Degree (n=160)

Item	Factor Load				Common Degree
	1	2	3	4	
A1 TCM techniques can improve discomfort symptoms (such as fatigue, insomnia, pain, etc.)			0.785		0.729
A2 TCM techniques can regulate the body and promote recovery			0.832		0.838
A3 TCM techniques can promote the body's optimal condition			0.802		0.753
A4 TCM techniques can make the mood pleasant and relaxing			0.561		0.626
A5 Using TCM techniques can improve the quality of life			0.655		0.666
B1 The knowledge of TCM techniques is easy to understand	0.688				0.583
B2 TCM techniques are easy to handle	0.719				0.641
B3 Knowledge and information about TCM techniques are easily accessible	0.801				0.736
B4 The tools required for TCM techniques are easily accessible in daily life	0.721				0.650
B5 Implementing TCM techniques does not take up a lot of time	0.715				0.621
B6 Implementing TCM techniques does not consume much energy	0.738				0.630
B7 The implement of TCM techniques does not require a specific site	0.795				0.765
B8 Implementing TCM techniques does not affect daily life	0.774				0.749
C1 Willing to accept the introduction of TCM techniques by others		0.530			0.517
C2 Willing to take the initiative in learning relevant knowledge of TCM techniques		0.685			0.720
C3 Willing to experience different kinds of TCM techniques		0.722			0.710
C4 Willing to proactively share the effects of TCM techniques		0.737			0.619
C5 Willing to learn TCM techniques with family and friends		0.716			0.724
C6 I would be more willing to use TCM techniques if I had the guidance of health care professionals		0.687			0.647
D1 The efficacy of TCM techniques is unclear				0.773	0.738
D2 TCM techniques are long and difficult to adhere to				0.697	0.630
D3 Difficulty in selecting appropriate TCM techniques for operation				0.731	0.757
D4 Discomfort in the use of TCM techniques				0.693	0.536
D5 TCM techniques can incur additional treatment costs				0.534	0.469
D6 The therapeutic effect of TCM techniques is affected by the professionalism of the operators				0.732	0.596

**Abbreviation:** TCM, Traditional Chinese Medicine.



**Figure 3** The second gravel diagram.

### Correlation Analysis and Discriminant Validity

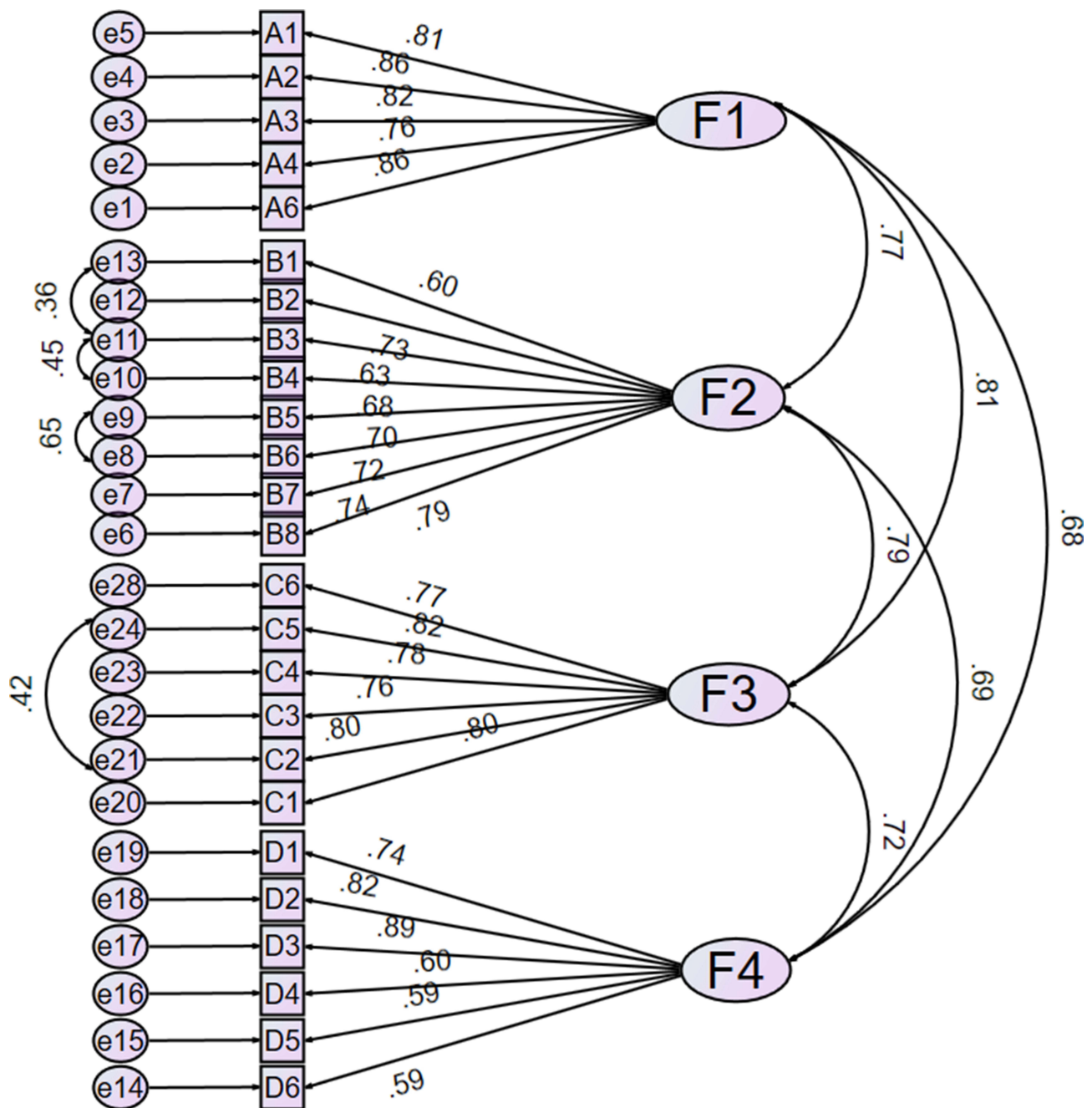
The correlation coefficients between each dimension and the total score ranged from 0.624 to 0.730. The correlation coefficients of the dimensions with the total scores of the scales were 0.864, 0.884, 0.881, and 0.835, respectively. The squared correlation coefficients ranged from 0.389 to 0.533. Additionally, the values of AVE for each dimension were greater than the squared correlation coefficients between the dimensions.

### Reliability Analysis

The Cronbach's alpha for the overall scale was 0.951, with values of 0.903, 0.908, 0.902, and 0.853 for the dimensions of perceived usefulness, perceived ease of use, behavioral intention, and apprehensions about usage, respectively. The split-half reliability for the overall scale was 0.871, with corresponding values of 0.877, 0.839, 0.906, and 0.829 for each dimension. The test-retest reliability of the overall scale was 0.876, while the dimensions showed re-test reliabilities of 0.758, 0.780, 0.767, and 0.802, respectively.

### The Formal Scale

After reliability and validity verification, the scale demonstrated excellent performance. The overall Cronbach's  $\alpha$  reached 0.951, with all dimension  $\alpha$  values exceeding 0.85, indicating good internal consistency. Exploratory factor analysis confirmed four latent factors explaining 66.6% of the total variance. Confirmatory factor analysis also showed excellent model fit indices, supporting the scale's structural validity and stability. Furthermore, the items demonstrated strong discriminative power, effectively differentiating participants across varying acceptance levels. The overall design remained concise and content-clear, ultimately resulting in a final scale with four dimensions and 25 items, using a 5-point Likert scale for scoring. The scoring settings are as follows: in the dimensions of perceived usefulness and perceived ease of use (5=strongly agree to 1=strongly disagree). In the dimension of behavioral intention (5=very willing to 1=very unwilling). Regarding apprehensions about usage (5= not at all worried to 1=very worried). The higher the scale score, the better the cancer patients' acceptance of TCM techniques. ([Supplementary Table 1](#)).



**Figure 4** Results of confirmatory factor analysis.  
**Notes:** F1 (Factor 1: perceived usefulness), F2 (Factor 2: perceived ease of use), F3 (Factor 3: behavioral intention), and F4 (Factor 4: apprehensions about usage).

## Discussion

This study developed and validated a scale to assess cancer patients’ acceptance of TCM techniques. Guided by theory of the Technology Acceptance Model, and clarified the concept of cancer patients’ acceptance of TCM techniques to establish the overall dimensional framework of the scale. The research team integrated findings from multiple databases and qualitative interviews to summarize and analyze the data, forming the initial item pool for the scale. This approach follows the guidelines for developing measurement tools and enhances the scale’s initial content validity.<sup>36</sup>

The scale development process involved rigorous evaluation, including expert consultation and a pilot study. Experts specializing in various cancer TCM health management fields and involved in the scale development were invited to

provide feedback on language refinement and item optimization from multiple perspectives. Additionally, experts' supplementary comments were incorporated to add items, thereby enhancing the scale's content validity and comprehensiveness. Through two rounds of expert consultation, all criteria related to specialist authority, coefficient of variation, and Kendall's coordination coefficient were met, ensuring the authority and reliability of the results.<sup>28</sup> Through a clinical pilot study, the language of the scale items was revised and refined through multiple rounds to ensure that the wording was concise, clear, and easy to understand. Based on the results of the statistical analyses from the test data, items were deleted to improve the scale's validity. During the evaluation process, the patient's response time was reasonable, which satisfies the use of this scale in a medical environment. The results indicate that the scale has good clinical acceptability and feasibility.

Assigning appropriate weights to each dimension is crucial for developing a comprehensive measurement system. In this study, weights were determined using the preferential order diagram method.<sup>37</sup> The results indicated that the first-level indicators had the following weights: perceived usefulness (0.3944), perceived ease of use (0.1944), behavioral intention (0.2556), and apprehensions about usage (0.1556). Perceived usefulness plays a key role in patient acceptance of TCM techniques, shaping subjective evaluations of treatment efficacy.<sup>19,20</sup> This aligns with cancer patients' emphasis on treatment utility and prior research findings.<sup>38,39</sup> Their behavioral intention to seek treatment better indicates their acceptance of TCM techniques.<sup>40,41</sup> Consequently, its weight exceeds that of perceived ease of use and apprehensions about usage, aligning with clinical realities. Apprehensions primarily stem from pre-existing perceptions, which are difficult to alter and exert limited influence on final acceptance, justifying its lowest weight. This refined dimensional structure enables a comprehensive and precise assessment of factors influencing patient acceptance. It points out the direction of health education for clinical healthcare professionals to instruct cancer patients to accept TCM techniques.

Validity is an essential criterion for assessing whether a scale effectively measures its intended content. This study evaluated the scale's validity by examining both content and structural validity. In terms of content validity, the second round of Delphi consultation revealed that the I-CVI values ranged from 0.933 to 1.000, with an S-CVI/Ave of 0.989 and an S-CVI/UA of 0.839. All these values surpassed the established threshold of 0.8, suggesting that the scale items adequately capture cancer patients' acceptance of TCM techniques with robust content validity.<sup>32</sup> In terms of structural validity, for the second round of EFA, the four factors extracted were consistent with the theoretical framework. The cumulative variance explained by these factors was 66.604%, and the factor loading of all items exceeded 0.40, demonstrating strong overall explanatory power. The scale exhibited good structural validity.<sup>32</sup> In the CFA, model fit indices such as  $\chi^2/df$ , GFI, CFI, NFI, IFI, and RMSEA were all within acceptable ranges, indicating that the data align with the four-factor structural model and demonstrate good model fit, though it has not yet fully reached an ideal state.<sup>34</sup> According to Qiu Haozheng's criteria for evaluating AVE, the AVE value is calculated from factor loadings. When loadings exceed 0.71 (ie, AVE > 0.5), the fit is considered highly ideal; loadings above 0.55 (ie, AVE > 0.3) indicate a good fit. The AVE value in this study is 0.493, which adequately explains the relevant variance of the observed variables. This indicates that the composite validity has reached a reasonable level but has not yet achieved the optimal target.<sup>42</sup> Correlation and differential validity analyses were conducted. These analyses showed that the scale's dimensions were sufficiently correlated while maintaining their independence. This allows the scale to assess different aspects of patient acceptance accurately. Reliability analysis showed that Cronbach's  $\alpha$  for the total scale and dimensions was above 0.8, indicating high internal consistency. Split-half reliability was 0.871, and test-retest reliability was 0.876, confirming the scale's stability and reliability over time.<sup>43</sup>

In summary, the rigorous development process of this scale ensures its scientific validity and comprehensiveness, highlighting its advantages in assessing cancer patients' acceptance of TCM techniques. Nonetheless, ongoing refinement and validation are essential to maintain its relevance and reliability.

## Implications for TCM Clinical Practice and Research

The development of this new scale provides TCM clinicians with a standardized tool for assessing patient acceptance of TCM techniques (eg, acupuncture, auricular acupuncture, or tuina). The scale allows for a better understanding of patient acceptance of TCM techniques and an analysis of the factors influencing patient acceptance of TCM techniques (eg, perceived efficacy, perceived ease of use), which can help guide clinicians in targeting health education and developing

interventions to improve patient acceptance of TCM techniques, leverage the therapeutic efficacy of TCM techniques, and facilitate symptom management to improve quality of life. In addition, this scale also expands the research field of cancer patients on TCM techniques, such as the prediction of the efficacy of TCM techniques by cancer patients and the analysis of the categorical characteristics of the application of TCM techniques by cancer patients, which provides a tool for the evaluation of indicators for these researches.

## Limitations and Perspectives

Although this study provides many insights for clinical practice, certain limitations remain. First, during scale development, deleted items were primarily based on statistical indicators (eg, reliability and validity metrics). However, in clinical applications, selection should integrate practical clinical significance and expert judgment alongside statistical rationale. Relying solely on statistical results may overlook clinically valuable content, increasing the risk of bias. Future scale development research will conduct more comprehensive evaluations of items, involving careful screening, deletion, or revision. Second, regarding scale structure, model fit indices remain below optimal standards, and the AVE value for Dimension B in convergent validity has not reached an ideal level. This indicates room for improvement in the scale items' representation of the underlying construct, potentially influenced by factors such as insufficient sample representativeness and data quality. Future research should ensure sample representativeness and data integrity while optimizing item design. Methods such as cognitive interviews could be employed to understand patient comprehension of items, thereby refining the scale structure and enhancing measurement stability. Third, the cross-sectional design also limits conclusions regarding predictive validity. This design cannot assess sensitivity to changes in patient acceptance over time or its predictive validity for long-term behavior. Longitudinal studies are needed to evaluate its stability in dynamic environments. Fourth, this study utilized convenience sampling, with the sample primarily confined to three hospitals in Fuzhou City. Chinese cancer patients, influenced by traditional Chinese culture and national circumstances, may hold an open attitude toward TCM techniques. This prevents a robust interpretation of the scale's reliability and validity, limiting the cultural diversity and generalizability of the findings. Future research should expand the sample size and actively involve researchers from other countries where TCM techniques are applied for cross-cultural validation. This will broaden the scale's applicability, thereby enhancing its global significance and impact.

## Conclusions

Based on the Technology Acceptance Model, this study developed a scale through a rigorous scale development process, comprising four dimensions and 25 items. The scale demonstrated good reliability and validity, providing an objective and reliable tool for assessing Chinese cancer patients' acceptance of TCM techniques. However, its applicability may still be limited by cultural, linguistic, and individual differences. Future research will expand the sample size and conduct cross-cultural validation to enhance the scale's universality and practical value.

## Data Sharing Statement

The data that support the findings of this study are available from the corresponding author, Liu Yang, upon reasonable request.

## Ethical Approval

The study was approved by the Medical Ethics Committee of Third People's Hospital of Fujian University of Traditional Chinese Medicine (IRB No.2023KS-75-1), in accordance with the principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants prior to the survey.

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

## Consent for Publication

We confirm that all listed authors meet the criteria for authorship and that all authors have agreed to the content of the submitted manuscript and are responsible for all aspects of the work.

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The author(s) report no conflicts of interest in this work.

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