Development and Validation of a Stage-Based Influencing Factors Scale for Traditional Chinese Medicine Health Behaviors (Postprint)

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Abstract

Background: Practicing Traditional Chinese Medicine (TCM) health behaviors is crucial for improving individual and community residents' overall health levels; however, the practice rate among residents is not ideal. Identifying the influencing factors at various stages of TCM health behaviors is a prerequisite for developing targeted strategies, yet there is currently no instrument available for exploring the influencing factors of residents' TCM health behaviors.

Objective: To develop a Stage-Based Influencing Factors Scale for Traditional Chinese Medicine Health Behaviors and test its reliability and validity, providing an assessment tool for identifying facilitating and hindering factors of residents' TCM health behaviors.

Methods: Guided by the Theoretical Domains Framework and Multi-Theory Model, an initial item pool was constructed through literature review and semi-structured interviews; a test version of the scale was developed after Delphi expert consultation and pilot survey. From October to December 2024, a survey was conducted in Hubei, Sichuan, and Guangdong provinces using convenience sampling. A total of 597 questionnaires were distributed, with 547 valid questionnaires recovered (effective response rate: 91.62%). Scale items were screened, and the scale' s reliability and validity were tested.

Results: Through literature review and semi-structured interviews, an initial scale with 3 dimensions and 28 items was constructed. The scale was revised and improved through expert consultation, with both rounds achieving a 100.0% response rate, expert authority coefficients of 0.889 and 0.903, and Kendall' s coordination coefficients of 0.151 and 0.114 (all $P<0.05$). Based on expert feedback and group discussion results, the initial scale was modified to form a test scale with 3 dimensions and 26 items. After reliability and validity testing, the

final Stage-Based Influencing Factors Scale for Traditional Chinese Medicine Health Behaviors comprised 3 dimensions and 10 items. Exploratory factor analysis revealed a cumulative variance contribution rate of 63.231% for the three factors, with factor loadings ranging from 0.605 to 0.834. Confirmatory factor analysis model fit indices showed: chi-square to degrees of freedom ratio (2/df)=2.012, root mean square error of approximation (RMSEA)=0.061, root mean square residual (RMR)=0.032, goodness-of-fit index (GFI)=0.956, normed fit index (NFI)=0.919, incremental fit index (IFI)=0.957, and Tucker-Lewis index (TLI)=0.939, indicating good model fit. Convergent and discriminant validity indices were within acceptable ranges. The content validity of the Stage-Based Influencing Factors Scale for Traditional Chinese Medicine Health Behaviors was 0.970, with item-level content validity indices ranging from 0.890 to 1.000. The overall Cronbach' s alpha coefficient of the scale was 0.818, with a split-half reliability of 0.778, demonstrating good reliability.

Conclusion: The Stage-Based Influencing Factors Scale for Traditional Chinese Medicine Health Behaviors demonstrates good reliability and validity and can serve as an assessment tool for health managers in conducting research on influencing factors of TCM health behaviors.

Full Text

General Practice Tools and Methods

Development of the Traditional Chinese Medicine (TCM) Health Behaviors Stage-Specific Influencing Factors Scale and Its Reliability and Validity Testing

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Abstract

Background: Practicing traditional Chinese medicine (TCM) health behaviors is crucial for improving individual and community health. However, the actual practice rate remains suboptimal. Identifying stage-specific influencing factors of TCM health behaviors is a prerequisite for developing targeted intervention

strategies, yet no validated tool currently exists to explore these factors among residents.

Objective: To develop the TCM Health Behaviors Stage-Specific Influencing Factors Scale and evaluate its reliability and validity, providing an assessment tool for identifying facilitators and barriers to TCM health behaviors.

Methods: Guided by the Theoretical Domains Framework (TDF) and Multi-Theory Model (MTM), an initial item pool was constructed through literature review and semi-structured interviews. A trial version was developed after Delphi expert consultation and pre-testing. From October to December 2024, convenience sampling was conducted in Hubei, Sichuan, and Guangdong provinces. A total of 597 questionnaires were distributed, with 547 valid questionnaires returned (91.62% response rate). Items were screened, and the scale' s reliability and validity were tested.

Results: The initial scale comprised 28 items across 3 dimensions. After expert consultation, modifications yielded a test version with 26 items across 3 dimensions. Following reliability and validity testing, the final scale included 10 items across 3 dimensions. Exploratory factor analysis revealed a cumulative variance contribution rate of 63.231% for the three factors, with factor loadings ranging from 0.605 to 0.834. Confirmatory factor analysis demonstrated good model fit: $2/df = 2.012$, RMSEA = 0.061, RMR = 0.032, GFI = 0.956, NFI = 0.919, IFI = 0.957, TLI = 0.939. Convergent and discriminant validity indices were within acceptable ranges. The scale-level content validity index was 0.970, with item-level indices ranging from 0.890 to 1.000. The overall Cronbach' s α coefficient was 0.818, and split-half reliability was 0.778, indicating good reliability.

Conclusion: The TCM Health Behaviors Stage-Specific Influencing Factors Scale demonstrates satisfactory reliability and validity, serving as a practical assessment tool for health managers investigating factors influencing TCM health behaviors.

Keywords: Traditional Chinese medicine health behaviors; Influencing factors; Scale; Reliability; Validity

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Introduction

Against the backdrop of the medical model shifting toward "health management-centered care," the health promotion value of TCM' s "preventive treatment" philosophy has become increasingly prominent [1]. TCM health behaviors refer to multi-stage, multi-dimensional actions that individuals undertake to prevent illness, maintain health, or promote physical, mental, social, and moral well-being for themselves and others, guided by TCM health preservation theories and techniques [2]. Encouraging residents to practice and adhere to TCM health behaviors is crucial for enhancing their health management agency and promoting physical and mental well-being. However, research indicates a paradox:

while residents exhibit high cultural identification with TCM, their actual practice rates remain low [3], suggesting that TCM health behavior formation is influenced by numerous factors. Currently, research in the TCM health domain is limited, particularly regarding influencing factor exploration and assessment tool development. Although existing scales and theories are available for health behavior research, most were developed within Western cultural contexts and may not align well with Chinese cultural backgrounds [4-5], potentially limiting their explanatory power. Moreover, existing assessment tools typically focus on superficial behavioral categories (e.g., physical exercise, nutrition) while neglecting deeper stage-specific characteristics [4,6-7]. In light of these limitations, this study, grounded in the conceptual connotation of TCM health behaviors and integrated with established health behavior theories, explores facilitators and barriers across multiple stages and levels. We developed the TCM Health Behaviors Stage-Specific Influencing Factors Scale to provide an assessment tool for identifying residents' TCM health behavior stages and influencing factors, thereby offering a scientific basis for developing targeted management strategies.

Methods

Formation of the Scale Development Team

The research team comprised 10 members, including 2 professors, 2 associate professors, and 6 nursing graduate students. The team was responsible for literature review, initial item pool development, organizing semi-structured interviews, conducting expert consultations, discussing scale optimization, and performing statistical analyses.

Theoretical Framework and Conceptual Guidance

The conceptual framework of TCM health behaviors includes four antecedent factors (individual, social, natural, and TCM-specific characteristics) and three outcome factors (self-health, helping others' health, and cultural promotion) [2]. This study developed interview outlines based on this framework' s antecedents and consequences.

The Theoretical Domains Framework (TDF), developed by Michie et al. [8] based on psychological theories of behavior change, facilitates multi-level identification of potential facilitators and barriers to TCM health behaviors. The Multi-Theory Model (MTM) of health behavior change, proposed by Sharma [9], is a two-stage precision model for health education and promotion that reveals influencing factors during behavior initiation and maintenance. While both TDF and MTM are comprehensive frameworks integrating behavior and behavior change factors, they have distinct emphases and complement each other. Therefore, this study integrated TDF and MTM to comprehensively and precisely identify key influencing factors at each stage of TCM health behaviors during the qualitative research phase, guiding scale dimension and item development.

Initial Item Pool Development

Literature Review We searched Chinese databases (CNKI, Wanfang) and English databases (Web of Science, PubMed) using Chinese search terms including "TCM health preservation," "TCM health care," "TCM health activities," "health behavior," and "influencing factors," along with English terms such as "Health Maintenance of Traditional Chinese Medicine," "Preventive Treatment of Disease," and "Health Behaviors." This review clarified that theoretical knowledge, accessible health resources, and cultural identification are closely associated with residents' TCM health behavior practice and sustainability, providing a reference for item pool development.

Semi-Structured Interviews Using purposive sampling, we conducted semi-structured interviews from May to July 2024 with 12 residents practicing TCM health behaviors, 5 family members with shared living experiences, and 14 community workers who had organized TCM health activities. The interviews explored actual influencing factors at different stages of residents' TCM health behaviors. Interview outlines covered topics such as: (1) types of TCM health behaviors practiced and initial motivations; (2) factors promoting or hindering sustained practice; (3) coping strategies when encountering barriers; (4) desired support and resources; and (5) changes in perceptions of TCM over time. Under theoretical guidance and based on literature review and interview findings, multiple brainstorming sessions yielded 28 initial items across three aspects: behavior triggering, behavior consolidation, and behavior internalization.

Expert Consultation From August to September 2024, we invited 19 experts using purposive and snowball sampling. Inclusion criteria were: (1) intermediate professional title or above; (2) bachelor' s degree or above; (3) $ $10 years of work experience in relevant fields. After obtaining informed consent, electronic consultation questionnaires were emailed to experts, who rated the importance of 3 dimensions and 28 items using a 5-point Likert scale and provided comments. Items were screened using three criteria: mean importance rating (Mj) ≥ 4, coefficient of variation (CV) < 0.25, and full-mark rate $> 60\%$ [10]. Items meeting all three criteria were retained; those meeting none were considered for deletion; those meeting one or two criteria were revised or deleted based on expert feedback and group discussion.

Pre-Survey In September 2024, 30 community residents in Wuhan were conveniently sampled for offline pre-testing. Inclusion criteria were: (1) age 18-80 years; (2) clear consciousness and normal communication ability; (3) experience with TCM health behaviors or basic TCM cultural identification. Exclusion criteria included diagnosed dementia, Parkinson' s disease, epilepsy, stroke, psychiatric disorders, or insufficient comprehension. The pre-survey showed completion time of 2-5 minutes, with participants reporting clear and understandable items.

Formal Survey

Participants and Sample Size Based on scale development requirements, exploratory factor analysis requires 5-10 participants per item, while confirmatory factor analysis requires at least 200 participants. Using two independent samples and accounting for a 20% attrition rate, the test version with 26 items required a minimum sample size of $26 \times 8 \times 2 \times 1.2$ 499 participants.

From October to December 2024, we conducted surveys among community residents in Hubei, Sichuan, and Guangdong provinces using the same inclusion and exclusion criteria as the pre-survey. Data were collected through online and offline methods, distributing 597 questionnaires total.

Survey Instruments The questionnaire comprised two parts: (1) a general information form including demographic characteristics such as gender, age, and residence; and (2) the TCM Health Behaviors Stage-Specific Influencing Factors Scale (test version) with 3 dimensions and 26 items, using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Higher scores indicated more facilitators and fewer barriers to TCM health behaviors.

Survey Procedure and Quality Control Data were collected through combined online and offline methods. Online questionnaires were created via Wenjuanxing platform with mandatory completion of all items before submission, distributed through WeChat and QQ. Offline data collection involved face-to-face administration of paper questionnaires by researchers in communities and hospitals. Before completion, researchers explained the study purpose, privacy protection principles, and instructions. Participants were encouraged to complete questionnaires independently; assistance was provided for those with vision or mobility difficulties. Completed questionnaires were checked for omissions, patterned responses, and logical errors, with invalid questionnaires excluded from analysis.

This study was approved by the Hubei University of Chinese Medicine Ethics Committee (Approval No.: 2024001).

Statistical Analysis

Data were analyzed using SPSS 26.0, Excel 2016, and Amos 24.0 software, with statistical significance set at $P < 0.05$. Normally distributed continuous data were expressed as ($\bar{x} \pm s$), non-normally distributed data as M(QR), and categorical data as frequencies and percentages. Item analysis employed discrete trend method, critical ratio method, Cronbach' s α coefficient, correlation coefficient method, and factor analysis [11]. For validity evaluation, data were randomly split into two groups: one for exploratory factor analysis in SPSS to develop the optimal model, and another for confirmatory factor analysis in AMOS to evaluate model fit. Content validity was calculated based on expert consultation ratings to determine item-level content validity index (I-CVI) and scale-level

content validity index (S-CVI). Reliability was assessed using Cronbach' s α coefficient and split-half reliability.

Results

Participant Characteristics

A total of 597 questionnaires were distributed, with 547 valid questionnaires returned (91.62% response rate). Among the 547 participants, 125 (22.85%) were male and 422 (77.15%) were female, with a mean age of 38.5 $\pm$ 20.9 years. Urban residents accounted for 399 (72.94%) and rural residents for 148 (27.06%). Among them, 6 experts held senior professional titles, 11 held associate senior titles, and 2 held intermediate titles.

Expert Consultation Results

Two rounds of expert consultation were conducted with a 100.0% response rate each round. Expert authority coefficients were 0.889 and 0.903, respectively, and Kendall' s coordination coefficients were 0.151 and 0.114 (both $P < 0.05$). In the first round, no items or dimensions met screening criteria. Based on expert feedback and group discussion, 2 items were deleted, 2 added, 2 merged, and 19 modified. In the second round, no items met screening criteria; 1 item was deleted and 16 optimized. After two rounds, the test version comprised 3 dimensions and 26 items (see Appendix Table 1).

Item Analysis

Five methods were used for item analysis: (1) Discrete trend method showed item 1.9 had standard deviation < 0.75, suggesting deletion [12]; (2) Critical ratio method revealed significant differences between high and low groups for all items ($t > 3$), supporting retention; (3) Correlation coefficient method showed items 1.5 and 2.10 had correlation coefficients < 0.4 with total score, suggesting deletion [13]; (4) Cronbach's α coefficient method: overall $\alpha = 0.919$, with items 1.3, 1.5, and 2.10 increasing α if deleted; (5) Factor analysis: KMO = 0.946, Bartlett' s $2 = 5{,}918.896$, extracting 5 factors with eigenvalues > 1 (cumulative variance = 56.530%). Items with cross-loadings > 0.4 and difference < 0.2 (1.5, 2.1, 2.4, 2.5, 2.7, 2.10, 3.2) were flagged for deletion. Comprehensive analysis resulted in deleting 9 items: 1.3, 1.5, 1.9, 2.1, 2.4, 2.5, 2.7, 2.10, and 3.2.

Validity and Reliability Testing

Validity Testing Structural Validity: The sample was randomly split into Dataset A (n = 274) and Dataset B (n = 273). Exploratory factor analysis was conducted on Dataset A. KMO = 0.921 and Bartlett's $2 = 1{,}727.144$ ($P < 0.05$) supported factorability. Principal component analysis extracted 3 factors with eigenvalues > 1 using varimax rotation. After four iterations, a 3-factor, 12-item model showed KMO = 0.872, Bartlett' s $2 = 978.049$, cumulative variance =

57.170%, with no cross-loadings. However, confirmatory factor analysis showed suboptimal fit for this model. Re-examining factor loadings and theoretical considerations, items 1.8 (“More friends around me are paying attention to TCM culture”) and 2.8 (“Even if TCM health activities work slowly, I am still willing to persist”) showed relatively weak associations and were deleted. The final exploratory factor analysis on 10 items yielded KMO = 0.841, Bartlett’ s 2 = 795.893, cumulative variance = 63.231%, and factor loadings of 0.605-0.834 without cross-loadings (Table 1). Based on item content and study purpose, the factors were named: Factor 1 “Behavior Consolidation,” Factor 2 “Behavior Triggering,” and Factor 3 “Behavior Intention.” Confirmatory factor analysis of the 3-factor, 10-item model showed good fit: 2/df = 2.012, RMSEA = 0.061, RMR = 0.032, GFI = 0.956, NFI = 0.919, IFI = 0.957, TLI = 0.939 (Table 2 , Figure 1 [Figure 1: see original paper]).

Convergent Validity: Convergent validity was assessed using factor loadings, composite reliability (CR), and average variance extracted (AVE). All factor loadings exceeded 0.5; AVE values were within acceptable ranges; and CR values for all dimensions exceeded 0.6 (Table 3), indicating good convergent validity [14].

Discriminant Validity: Discriminant validity results showed that the square root of AVE for the behavior intention dimension was greater than its correlations with other dimensions (Table 4).

Content Validity: The scale-level content validity index was 0.970, with item-level indices ranging from 0.890 to 1.000, indicating excellent content validity.

Reliability Testing The overall Cronbach’ s α coefficient was 0.818, with subscale coefficients of 0.653 (behavior intention), 0.688 (behavior triggering), and 0.796 (behavior consolidation). Split-half reliability was 0.778, indicating good reliability. The final TCM Health Behaviors Stage-Specific Influencing Factors Scale is presented in Table 5 .

Discussion

Scientifically Rigorous Scale Development Process

This study strictly followed scale development protocols. Based on the study purpose and guided by the TCM health behavior conceptual framework and established theoretical frameworks, we identified core influencing factors at each stage through semi-structured interviews to construct the initial item pool. Literature review supplemented potential influencing factors across age groups to enhance scale universality. During expert consultation, 19 experts from different provinces and disciplines evaluated item relevance, content representativeness, and expression accuracy from multiple perspectives. High authority coefficients across two rounds (0.889 and 0.903) ensured scientific and professional scale design. After expert consultation, pre-testing assessed participant comprehension,

completion time, and ambiguity, further refining item wording to reduce measurement error and enhance readability and operability. Subsequently, classical test theory guided item analysis and reliability/validity testing, with quantitative screening based on established criteria leading to the final 3-dimension, 10-item scale. Throughout item selection, we integrated statistical results with theoretical and practical considerations rather than relying solely on statistical indicators, ensuring scale rationality and scientific integrity [15].

Good Scale Reliability and Validity

The final scale demonstrated excellent content validity (S-CVI = 0.970) [16]. Structural validity was established through combined exploratory and confirmatory factor analysis for cross-validation. After KMO and Bartlett' s tests, exploratory factor analysis was conducted with 3 factors extracted as predetermined, using varimax rotation and item adjustment based on screening criteria. After four iterations, a 3-factor, 12-item model met all requirements, but confirmatory factor analysis showed suboptimal fit. Re-examining factor loadings and the theoretical model, items 1.8 and 2.8 showed relatively weak associations with their factors and questionable conceptual fit. Considering practical needs and statistical appropriateness [17], these items were deleted. The final 3-factor, 10-item model showed improved cumulative variance (63.231%) and factor loadings (0.605-0.834), with confirmatory factor analysis demonstrating good model fit, indicating strong structural validity. AVE values ranged from 0.430-0.487 and CR values from 0.655-0.797. The behavior intention dimension' s $\sqrt{}$AVE exceeded its correlations with other dimensions, demonstrating adequate discriminant validity and strong item-construct relationships, confirming good convergent and discriminant validity [14]. The final scale' s Cronbach' s α (0.818) and split-half reliability (0.778) indicate high reliability [18-19].

Scale Connotation and Practicality

TCM health behaviors are complex, multi-stage, and multi-dimensional. This study categorized influencing factors into three stages—behavior triggering, consolidation, and internalization—based on the TCM health behavior concept and TDF/MTM frameworks. Behavior triggering represents the critical period from intention to action; behavior consolidation denotes the stabilization of new behavior patterns through sustained practice; and behavior internalization involves complete integration of TCM health behaviors into daily life for self-health and cultural promotion. However, empirical support for the internalization dimension was insufficient, possibly because while the research team hypothesized that cultural identification drives internalization, most residents may currently remain at cognitive identification or superficial behavioral compliance stages rather than true internalization [20-21]. The final "behavior intention" dimension, though containing only 2 items, effectively captures economic cost and operational convenience as core elements affecting residents' TCM health behavior willingness [22-24]. The final 10-item scale uses clear, concise language

to reduce respondent burden while maintaining measurement precision, facilitating large-scale surveys. Higher scores indicate more facilitators and fewer barriers, suggesting stronger, more stable behavior patterns with greater resistance to interference. This culturally adapted, indigenous scale can serve as an assessment tool for policymakers and healthcare managers to conduct empirical research on health behaviors, providing a basis for targeted TCM health management strategies to promote residents' TCM health behaviors and improve overall health.

Author Contributions: WANG Sixue, YUAN Yue, and WANG Yuncui conceptualized and designed the study. WANG Sixue and YUAN Yue implemented the research. WANG Sixue, YUAN Yue, XIONG Lisha, YUAN Xiangqing, and FANG Xuelian collected data. WANG Sixue performed statistical analysis and drafted the manuscript. YUAN Yue, XIONG Lisha, and YUAN Xiangqing revised the manuscript. WANG Yuncui provided guidance on writing, quality control, and final approval, taking overall responsibility for the manuscript.

Conflict of Interest: The authors declare no conflict of interest.

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Appendix Table 1. TCM Health Behaviors Stage-Specific Influencing Factors Scale (Test Version)

Table 1. Component Matrix After Factor Analysis Rotation

Table 2. CFA Test Model Fitting Results

Table 3. Convergent Validity Results

Table 4. Model Discriminant Validity

Table 5. Traditional Chinese Medicine (TCM) Health Behaviors Stage-Specific Influencing Factors Scale

Figure 1. CFA Analysis Pathway Diagram [Figure 1: see original paper]

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