

Development and validation of kinesiophobia scale for enterostomy patients

Hanbin Chen

Zhongnan Hospital of Wuhan University

Jingyi Wang

Zhongnan Hospital of Wuhan University

Huiqin Ji

Zhongnan Hospital of Wuhan University

Yiqing Yu

Zhongnan Hospital of Wuhan University

Chen Tang

Zhongnan Hospital of Wuhan University

Bilong Feng

Zhongnan Hospital of Wuhan University

Jun Zhong

zhong.jun@whu.edu.cn

Zhongnan Hospital of Wuhan University

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Abstract

Aims: The aim of this study is to develop and validate a kinesiophobia scale for enterostomy patients, thereby providing a reliable tool for assessing their levels of kinesiophobia.

Design: This was a mixed-method study.

Methods: The final initial version of the scale was developed based on the "Fear-Avoidance Model (FAM)." We used a literature review, semi-structured interviews, and a Delphi expert survey. From October to December 2025, we surveyed 152 enterostomy patients. Item analysis and exploratory factor analysis led to the final scale version. From January to April 2026, 347 enterostomy patients completed a survey. We then performed confirmatory factor analysis, reliability tests, and validity tests.

Results: The kinesiophobia scale for enterostomy patients has five dimensions: perceived risk, fear beliefs, self-efficacy, exercise avoidance, and functional disorder. It includes 26 items. The overall Cronbach's α for the scale was 0.921. Coefficients for each dimension ranged from 0.844 to 0.883. Exploratory factor analysis identified five factors, which accounted for 63.304% of the total variance. Confirmatory factor analysis showed a good model fit. The average variance extracted (AVE) values ranged from 0.724 to 0.763. Composite reliability values ranged from 0.847 to 0.884, confirming good convergent validity. The square roots of the AVE for each dimension were greater than the absolute values of the correlation coefficients between that dimension and the others. This indicated good discriminant validity.

Conclusion: The kinesiophobia scale developed for enterostomy patients in this study demonstrates good reliability and validity, and can serve as an effective tool for assessing the level of kinesiophobia in these patients.

Reporting Methods ☐ STROBE guidelines for cross-sectional studies.

Implications for the Profession(s) or Patient Care

This scale provides nurses with a practical tool to help identify enterostomy patients with kinesiophobia, thereby enabling them to offer personalized rehabilitation recommendations with the aim of improving patient outcomes.

Patient or Public Contribution: Enterostomy patients played a key role in this study, contributing to the development and validation of the scale. Specifically, during the item generation phase, 16 patients participated in semi-structured cognitive interviews to help identify core themes and establish an initial pool of items. We additionally recruited two groups of participants who completed the psychometric testing of the scale and provided critical data for its validation.

What Does This Article Contribute to the Wider Global Clinical Community?

- Given the lack of assessment tools for kinesiophobia among enterostomy patients both domestically and internationally, this study developed the first assessment scale specifically designed for enterostomy patients.
- It provides a standardized tool that enables healthcare professionals to accurately identify kinesiophobia in enterostomy patients and develop personalized rehabilitation plans.

Background

Enterostomy surgery is a vital treatment for various gastrointestinal diseases, such as colorectal cancer, inflammatory bowel disease, and intestinal obstruction [1], and has become an effective measure for saving patients' lives. With the rising incidence of diseases such as colorectal cancer, the population of enterostomy patients continues to grow [2, 3]. Currently, there are approximately 1 million enterostomy patients in China [4], 725,000 to 1 million in the United States [5], and over 1.7 million in Europe [2]. Although enterostomy has significantly improved patients' 5-year survival rates [6], changes in bowel habits following the procedure present patients with multiple challenges related to physiological function, body image, and social adaptation, severely impacting their quality of life [1, 7, 8].

Physical activity is defined as "any bodily movement resulting from skeletal muscle contraction that leads to energy expenditure, increasing the body's energy expenditure beyond the level of basal metabolism" [9]. The American College of Sports Medicine [10] recommends that cancer patients engage in regular physical activity; the resumption of physical activity is a crucial step for enterostomy patients returning to normal life. Regular physical activity not only helps improve cardiopulmonary function, increase muscle strength, and reduce the incidence of stoma-related complications, but also alleviates anxiety and depression and enhances self-efficacy [10–12]. However, clinical studies indicate that physical activity levels among enterostomy patients are generally low [13, 14]. A survey of 2,631 enterostomy patients conducted by Russell et al. found that fear of exercise, lack of knowledge about exercise, and concerns about the risk of peristomal hernias were the primary barriers to their participation in physical activity [15]. This excessive, irrational fear of physical activity, stemming from pain and concerns about physical complications, is referred to as "kinesiophobia" [16].

Several well-established assessment tools have been developed to evaluate "kinesiophobia." For example, in 1991, Miller et al. [17] developed the Tampa Scale for Kinesiophobia (TSK) for patients with chronic pain; In 1993, Waddell et al. [18] developed the Fear-Avoidance Beliefs Questionnaire (FABQ) to measure patients' fear-avoidance beliefs regarding physical activity and work; in 2011, Polish researcher Knapik [19] developed the Kinesiophobia Causes Scale (KCS) to identify and quantify the biological and psychological causes of kinesiophobia in individuals or populations. In addition, researchers have developed disease-specific scales for conditions such as coronary heart disease [20], temporomandibular joint disorder [21], and chronic respiratory diseases [22]. These scales have

demonstrated good reliability and validity across various populations and have become indispensable assessment tools in their respective fields of research.

However, these scales were not designed for enterostomy patients and cannot capture the specific sources of fear unique to this population, such as: physical activity potentially leading to stoma bag leakage, displacement, or detachment; bleeding, edema, or injury to the stoma mucosa during physical activity. Generalized scales struggle to effectively capture these specific scenarios directly related to stomas. Therefore, this study aims to develop and validate a kinesiophobia scale tailored to enterostomy patients to address the shortcomings of current assessment tools and provide a reference for accurately evaluating kinesiophobia in this population.

Methods

Design

From April 2025 to April 2026, we conducted a mixed-methods study focused on the development and validation of a kinesiophobia scale for enterostomy patients. The study consisted of three phases: (1) item generation and revision; (2) item evaluation and exploration; and (3) psychometric evaluation of the scale. (Fig. 1)

Phase 1: the generation and revision of the items

Establish theoretical framework

In 1983, Lethem et al. [23] proposed the Fear-Avoidance Model (FAM) to explain the fear-avoidant behaviors exhibited by individuals in response to painful stimuli. As research has progressed, the FAM has evolved from its early conceptual foundations to integrate physiological, psychological, and sociological factors. It explores the psychological mechanisms underlying fear-related avoidance behaviors triggered by various physical discomforts, such as pain and palpitations, and the vicious cycle that ultimately leads to adverse outcomes, including functional impairment, disability, and depression [24]. Based on the FAM, this study interprets the process and outcomes of kinesiophobia, encompassing four dimensions: “perception of danger,” “fear beliefs,” “exercise avoidance,” and “social support.” These correspond respectively to “the subject’s perception of danger from the object,” “the subject’s fear that exercise will lead to adverse outcomes,” “the subject’s avoidance of physical activity due to concerns about potential adverse outcomes,” and “encouragement, information, or practical assistance received from external sources that can alleviate fear-related beliefs.”

Literature review

Searches were conducted using keywords, such as “stoma/ileostomy/colostomy/enterostomy” and “exercise/fear of exercise/exercise anxiety/fear avoidance/avoidance behavior/kinesiophobia.” We searched English databases (PubMed, Web of Science, Embase, and Scopus) and Chinese databases (CNKI, Wanfang, and VIP) to collect literature related to kinesiophobia in enterostomy patients. The search period spanned from the inception of each database to April 30, 2025. After literature screening, 16 studies were ultimately included; the screening process is shown in Fig. 2. Based on the theoretical framework and the results of the literature analysis, this study preliminarily constructed an item pool for the kinesiophobia scale for enterostomy patients, comprising 4 dimensions and 25 items.

Semi-structured interviews

This study employed purposive sampling to select enterostomy patients who visited the gastrointestinal surgery department of a Grade A tertiary hospital in Wuhan between May and June 2025 as the study subjects. Telephone follow-ups were conducted to investigate their experiences of kinesiophobia. Inclusion criteria: 1) Age ≥ 18 years; 2) Time since enterostomy surgery ≥ 1 month; 3) Alert and able to communicate effectively. Exclusion criteria: 1) Participation in other research studies; 2) Coexisting severe organ dysfunction or chronic diseases.

Based on the research objectives and the results of the literature review, preliminary interviews were conducted with 3 enterostomy patients. After repeated revisions, a formal interview outline was developed, with the specific content as follows: 1) What effects do you think physical activity has on you? 2) Do you feel afraid or anxious when you want to engage in physical activity? What are your main concerns? 3) What abilities or conditions do you feel you need to have in order to engage in physical activity with confidence? 4) Under what circumstances would you try to avoid physical activity? 5) Has reducing your physical activity had any impact on your life?

Prior to the interview, participants were informed of the purpose of the study and asked to sign an informed consent form. With their consent, the entire interview was audio-recorded. Each interview lasted 25 to 40 minutes. Within 24 hours of the interview's conclusion, two researchers independently transcribed the audio recordings into text, and the data were analyzed using content analysis. The sample size was determined based on the principle of data saturation, employing a maximum diversity sampling strategy to include patients of varying ages, genders, stoma types, and postoperative durations as broadly as possible, thereby ensuring the richness and diversity of the data. Ultimately, interviews were completed with 16 enterostomy patients. After the research team organized and analyzed the interview data, seven items were added, resulting in an item pool for the kinesiophobia scale for enterostomy patients, comprising four dimensions and 32 items.

Delphi expert consultation

From July to August 2025, 20 experts were invited via WeChat or Email to participate in the Delphi consultation. The criteria for expert selection are as follows: 1) Experts in fields such as stoma therapy,

stoma care, rehabilitation medicine, and pain medicine; 2) At least 5 years of relevant professional experience; 3) A bachelor's degree or higher; 4) A professional title at the intermediate level or above.

The expert questionnaire includes: questionnaire instructions, an expert profile form, a scale content evaluation form, and an expert authority evaluation form. Scores for each dimension and item of the scale are based on a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" and scored from 1 to 5, respectively. The response rate of the expert consultation is used to measure expert engagement, while the authority coefficient is used to assess the credibility of expert opinions. The Kendall's coefficient of concordance and the coefficient of variation are used to measure the degree of agreement among expert opinions. Items with an importance score ≤ 3.50 and a coefficient of variation >0.25 were removed, and modifications were made based on expert feedback. After two rounds of expert consultation, the experts' opinions converged, and the consultation process was concluded.

Pilot test

Using convenience sampling, 20 enterostomy patients who visited the gastrointestinal surgery department of a Grade A tertiary hospital in Wuhan in September 2025 were selected for a pilot test. Face-to-face cognitive interviews were conducted to assess patients' feedback on the semantics, clarity of expression, and comprehensibility of the scale items. The scale was revised based on the participants' comments and suggestions regarding the items.

Phase 2: the evaluation and exploration of the items

A series of analytical methods was employed to evaluate the items. The critical ratio (CR) method was used to distinguish between different responses to the same item among enterostomy patients, thereby reflecting the sensitivity of the scale items, as indicated by the CR value. The top 27% of total questionnaire scores were designated as the high-score group, and the bottom 27% as the low-score group. An independent samples t-test was used to compare the scores between the two groups, and items with $P>0.05$ were removed [25]. The correlation between the scores of individual items and the total scale score was expressed as a correlation coefficient. When the correlation coefficient was <0.4 , indicating a poor correlation, it was recommended that the item be deleted [26].

Phase 3: the psychometric evaluation of the scale

Validity analysis

Validity refers to the degree to which a measurement is effective and is generally divided into content validity and construct validity. By calculating the item-total correlation coefficients, the correlation between each item and the total score of the scale is analyzed; if the correlation coefficient is greater than 0.4, this indicates good content validity [27]. When analyzing construct validity, the Kaiser-Meyer-

KMO test and Bartlett's sphericity test are first conducted. When the KMO value is greater than 0.800 and the P-value for Bartlett's sphericity test is less than 0.001, this indicates that factor analysis is appropriate. Subsequently, principal component analysis is performed, and the items retained after the analysis are subjected to maximum variance orthogonal rotation to extract common factors [28]. Criteria for factor identification: eigenvalue>1; cumulative variance explained>50%;≥3 items per factor; item loadings on the corresponding factor>0.4, and loadings on other factors<0.4 [29].

Reliability analysis

- Reliability is a key indicator for evaluating the consistency, stability, and reliability of a scale; it essentially reflects the degree of consistency in results obtained from repeated measurements of the same item using the same method. Drawing on previous research, Cronbach's α and the corrected item-total correlation (CITC) were used to assess the reliability of the measurement items. The cutoff value for Cronbach's α was set at 0.8; a coefficient greater than 0.8 indicates good scale reliability. The threshold for CITC was set at 0.4; if an item's CITC value was below 0.4 and removing that item significantly improved the overall Cronbach's α of the scale, the item was excluded.

Data collection

- Using convenience sampling, enterostomy patients who were receiving treatment at the gastrointestinal surgery department of a Grade A tertiary hospital in Wuhan were selected as the study participants. The inclusion and exclusion criteria were consistent with those used in the semi-structured interviews. The survey utilized the initial version of the scale, which included five dimensions—perceived risk, fear beliefs, self-efficacy, avoidance of physical activity, and functional impairment—with a total of 28 items. Each item was rated using a 5-point Likert scale, ranging from “Strongly Disagree” to “Strongly Agree” and scored from 1 to 5. The “Self-Efficacy” dimension was reverse-scored. The total scale score ranged from 28 to 140, with higher scores indicating a greater degree of kinesiphobia among patients.
- The scale survey was conducted in two phases: Phase 1 (October to December 2025), in which the sample size was used for item screening; and Phase 2 (January to April 2026), in which the sample size was used for testing the scale's reliability and validity. This study calculated the sample size based on 5 to 10 times the number of scale items, while accounting for 10% to 20% of invalid questionnaires; therefore, the sample size ranged from 154 to 336 cases. In Phase 1, 154 questionnaires were distributed, and 152 valid questionnaires were returned, resulting in a valid response rate of 98.7%. In Phase 2, 360 questionnaires were distributed, and 347 valid questionnaires were returned, resulting in a valid response rate of 96.4%. This study has been reviewed and approved by the hospital's Institutional Review Board, and all participants provided informed consent.

Data analysis

- Data analysis for this study was conducted using SPSS 26.0 and AMOS 24.0.

Results

Sociodemographic characteristics of the participants

- The exploratory survey included a total of 152 enterostomy patients, while the validation survey included 347 enterostomy patients. Demographic data are presented in Table 1.

Table 1
Sociodemographic characteristics of the participants

Factors	Group	Exploratory survey		Validation survey	
		N1 = 152		N1 = 347	
		n	%	n	%
Age	18 ~ 45	13	8.55	25	7.20
	45 ~ 60	55	36.18	132	38.04
	≥ 60	84	55.26	190	54.76
Gender	Male	86	56.58	206	59.37
	Female	66	43.42	141	40.63
Marital status	Unmarried	4	2.63	19	5.48
	Married	142	93.42	291	83.86
	Divorced	2	1.32	11	3.17
	Widowed	4	2.63	26	7.49
Education level	Primary education	87	57.24	200	57.64
	Secondary education	41	26.97	96	27.67
	Advanced education	24	15.79	51	14.70
Monthly income(RMB)	<3000	96	63.16	186	53.60
	3000 ~ 6000	34	22.37	108	31.12
	>6000	22	14.47	53	15.27
Is commercial health insurance available?	Yes	17	11.18	46	13.26
	No	135	88.82	301	86.74

Results of expert consultation

In the first round of expert consultation, 20 questionnaires were distributed, and 20 valid responses were received, resulting in a 100% response rate; in the second round, 15 questionnaires were distributed, and 14 valid responses were received, resulting in a 93.3% response rate. The average age of the 14 experts was (36.71 ± 5.73) years, and their average years of professional experience was (13.47 ± 6.26) years. Among them, 3 held doctoral degrees, 9 held master's degrees, and 2 held bachelor's degrees; 6 held senior professional titles, and 8 held intermediate professional titles. In the two rounds of expert consultation, the experts' authority coefficients were 0.845 and 0.880, respectively; Kendall's coefficient of concordance were 0.213 and 0.162, respectively (both $P<0.05$); the mean importance scores for each dimension and item ranged from 4.52 to 4.90 and 4.20 to 4.86, respectively; and the coefficients of variation ranged from 0.09 to 0.26 and 0.00 to 0.09, respectively.

During the expert consultation process, experts determined that the “social support” dimension was more of an external influencing factor rather than a core manifestation of kinesiphobia itself, and therefore removed it. At the same time, based on patient interview results and relevant theories from the FAM, the “self-efficacy” and “functional disruption” dimensions were added to more comprehensively reflect the psychological and behavioral characteristics of kinesiphobia in enterostomy patients. Furthermore, two semantically similar items were merged into a single item: “I am unsure which physical activities are suitable for enterostomy patients and am afraid of making the wrong choice.” The wording of eight items was revised; for example, “I believe physical activity is very likely to cause stoma bag leakage or detachment” was changed to “I am concerned that physical activity will cause stoma bag leakage, displacement, or detachment.” After two rounds of expert consultation, an initial scale was developed, comprising five dimensions and 28 items.

Feasibility

The results of the pilot test showed that all patients were able to accurately understand the content of the scale, and it took 5 to 10 minutes to complete the questionnaire, indicating that the scale has a high level of acceptability; therefore, no modifications were made to the scale items.

Results of exploratory survey

The results of the critical ratio test showed that the p-values for all items in the scale were less than 0.05; therefore, no items were deleted. The results of the correlation coefficient test showed that the correlation coefficients between the scores of each item and the total score are detailed in Table 2. As shown in the table, the correlation coefficient between item Q22 and the total score was less than 0.4; therefore, it was deleted.

Table 2
Correlation coefficient test(n = 152)

Measurement Items	Correlation coefficient	Measurement Items	Correlation coefficient
Q1	0.574	Q15	0.525
Q2	0.554	Q16	0.470
Q3	0.545	Q17	0.651
Q4	0.600	Q18	0.511
Q5	0.613	Q19	0.511
Q6	0.574	Q20	0.558
Q7	0.474	Q21	0.636
Q8	0.590	Q22	0.241
Q9	0.544	Q23	0.571
Q10	0.568	Q24	0.492
Q11	0.572	Q25	0.526
Q12	0.548	Q26	0.537
Q13	0.578	Q27	0.564
Q14	0.540	Q28	0.487

Results of reliability test

In this study, the Cronbach's α coefficient for the overall scale was 0.907, which is greater than 0.8; the CITC values for all items were greater than 0.4, and all items passed the reliability test; therefore, no items were deleted.

Results of validity test

The KMO value was 0.851, the approximate chi-square value for Bartlett's sphericity test was 2085.536, the degrees of freedom (df) were 351, and the significance level (sig) was 0.000, which is less than 0.05. This indicates that the measurement variables in this study passed the KMO and Bartlett's sphericity tests and are suitable for exploratory factor analysis. Further factor extraction yielded a total of 5 factors. After rotation, the cumulative percentage of variance explained was 63.304%, which is greater than 60.000%, indicating a satisfactory result.

Based on this, the sample data were subjected to a maximum variance orthogonal rotation, as shown in Table 3. According to existing research, when the factor loading of an item is less than 0.4, it is recommended that the item be deleted [30]. In this study, the factor loading for Q6 was less than 0.400, so it was deleted.

Accordingly, after deleting Q6 and Q22, the remaining 26 entries will retain their original numbers and will not be renumbered, in order to ensure the traceability of the entries. Based on the specific meanings of the items in the questionnaire used in this study, Q1, Q2, Q3, Q4, and Q5 are defined as perceived risk; Q7, Q8, Q9, Q10, and Q11 as fear beliefs; Q12, Q13, Q14, Q15, and Q16 as self-efficacy; Q17, Q18, Q19, Q20, Q21, and Q23 as exercise avoidance; and Q24, Q25, Q26, Q27, and Q28 as functional disorder.

Table 3
Rotated factors matrix

	Factors				
	1	2	3	4	5
Q1	0.097	0.774	0.153	0.132	0.075
Q2	0.099	0.782	0.007	0.137	0.161
Q3	0.017	0.770	0.091	0.229	0.064
Q4	0.128	0.779	0.104	0.176	0.101
Q5	0.223	0.753	0.182	0.070	0.095
Q6	0.266	0.321	0.267	0.264	0.140
Q7	0.122	0.090	0.052	0.771	0.013
Q8	0.119	0.200	0.181	0.698	0.150
Q9	0.129	0.164	0.075	0.760	0.114
Q10	0.207	0.130	0.173	0.737	0.027
Q11	0.032	0.200	0.138	0.747	0.215
Q12	0.185	0.083	0.794	0.175	0.045
Q13	0.153	0.177	0.740	0.237	0.037
Q14	0.114	0.136	0.767	0.049	0.187
Q15	0.102	0.110	0.786	0.163	0.060
Q16	0.042	0.057	0.792	0.001	0.229
Q17	0.721	0.213	0.175	0.097	0.214
Q18	0.754	0.081	0.080	0.041	0.104
Q19	0.813	0.074	0.074	0.049	0.063
Q20	0.680	0.085	-0.013	0.255	0.203
Q21	0.694	0.261	0.120	0.205	0.104
Q23	0.705	-0.015	0.258	0.106	0.176
Q24	0.133	0.052	0.053	0.141	0.760
Q25	0.233	0.027	0.033	0.148	0.773
Q26	0.143	0.217	0.171	0.001	0.725
Q27	0.055	0.183	0.205	0.140	0.757

	Factors				
	1	2	3	4	5
Q28	0.176	0.063	0.112	0.059	0.737

Results of validation survey

A total of 347 questionnaires were distributed for formal analysis. Reliability was measured using Cronbach's α , and the results are shown in Table 4. The overall Cronbach's α for the scale was 0.921, and the Cronbach's α values for the five dimensions—perceived risk, fear beliefs, self-efficacy, exercise avoidance, and functional disorder—were all greater than 0.8, indicating good reliability. Confirmatory factor analysis was conducted, and the model fit was high ($\chi^2/df=1.556$, GFI=0.912, RMSEA=0.040, CFI=0.963, NFI=0.904, IFI=0.963). The AVE values for all variables were greater than 0.5, indicating good construct validity. The CR for each variable was greater than 0.7, indicating good convergent validity.

Table 4
Reliability and validity tests (n = 347)

Variable	Measurement Items	Standard load factor	Cronbach's α	CR	AVE
Perceived risk	Q1	0.713	0.858	0.858	0.548
	Q2	0.747			
	Q3	0.754			
	Q4	0.719			
	Q5	0.766			
Fear beliefs	Q7	0.792	0.874	0.874	0.582
	Q8	0.728			
	Q9	0.766			
	Q10	0.765			
	Q11	0.762			
Self-efficacy	Q12	0.794	0.864	0.865	0.561
	Q13	0.765			
	Q14	0.702			
	Q15	0.751			
	Q16	0.730			
Exercise avoidance	Q17	0.742	0.883	0.884	0.560
	Q18	0.694			
	Q19	0.769			
	Q20	0.774			
	Q21	0.787			
	Q23	0.720			
Functional disorder	Q24	0.731	0.844	0.847	0.525
	Q25	0.741			
	Q26	0.733			
	Q27	0.711			

Note: Q6 and Q22 were removed during the exploratory phase, so the numbering in this table is not consecutive.

Variable	Measurement Items	Standard load factor	Cronbach's α	CR	AVE
	Q28	0.705			
Note: Q6 and Q22 were removed during the exploratory phase, so the numbering in this table is not consecutive.					

As shown in the discriminant validity test results in Table 5, the values along the diagonal represent the square roots of the AVE for each dimension, which are 0.740, 0.763, 0.749, 0.748, and 0.724, respectively. The square roots of the AVEs for each dimension are all greater than the absolute values of the correlation coefficients between that dimension and the others, indicating that the five dimensions—perceived risk, fear beliefs, self-efficacy, exercise avoidance, and functional disorder—possess good discriminant validity. With that, the final version of the kinesiophobia scale for enterostomy patients was finalized.

Table 5
Discriminant validity test

Variable	Perceived risk	Fear beliefs	Self-efficacy	Exercise avoidance	Functional disorder
Perceived risk	0.740				
Fear beliefs	0.455	0.763			
Self-efficacy	0.414	0.432	0.749		
Exercise avoidance	0.514	0.467	0.541	0.748	
Functional disorder	0.409	0.437	0.464	0.536	0.724

Discussion

Enterostomy patients often actively avoid physical activity due to kinesiophobia and concerns about the risk of peristomal hernias [15]; kinesiophobia has become a significant barrier to their functional recovery and improvement in quality of life [31]. However, there is currently a lack of specific assessment tools for kinesiophobia in enterostomy patients. The items on existing general-purpose scales do not address stoma-related factors, making it difficult to accurately identify the true sources of fear in this population.

To address this gap, this study strictly adhered to scientific procedures and, based on the FAM, developed and validated a measurement tool for assessing kinesiophobia in enterostomy patients. First, a pool of scale items was constructed through a literature review, and semi-structured interviews were conducted to explore in depth the genuine feelings of enterostomy patients regarding kinesiophobia, thereby supplementing the item pool. Next, 20 experts from different cities and fields were invited to

participate in two rounds of expert consultation to evaluate and screen the scale items. The results of the consultation indicated that the experts' agreement coefficients, authority coefficients, and consensus levels were all satisfactory, confirming the reliability of the consultation findings.

The kinesiophobia scale for enterostomy patients has five dimensions: perceived risk, fear beliefs, self-efficacy, exercise avoidance, and functional disorder. While "self-efficacy" is not a core component of the classic FAM model, enterostomy patients repeatedly mentioned in qualitative interviews that they "did not know if they could exercise or how to exercise." This represents the core source of exercise fear and is also a key manifestation of self-efficacy. Furthermore, existing research has directly integrated self-efficacy into the core structure of the extended FAM model and received empirical support. In a 2020 longitudinal study, Slepian et al. [32] constructed an extended FAM model incorporating self-efficacy. Structural equation modeling indicated that this extended model fit well, and higher self-efficacy was significantly associated with better clinical outcomes. Therefore, treating self-efficacy as an independent dimension represents a contextual extension of the FAM rather than a theoretical deviation.

In the item analysis, this study identified one non-compliant item (Q22), indicating that the scale demonstrates good responsiveness, discriminant validity, and homogeneity. Regarding construct validity, exploratory factor analysis in the pilot study revealed a KMO value of 0.851 and a significant Bartlett's sphericity test ($P < 0.001$). Five latent factors were extracted, accounting for 63.304% of the cumulative variance, with all item factor loadings exceeding 0.4 (Q6 was excluded). This indicates that the theoretical structure of the scale aligns well with the measured data. Confirmatory factor analysis further confirmed the stability of the five-factor model

$\chi^2/df = 1.556$, GFI = 0.912, RMSEA = 0.040, CFI = 0.963, NFI = 0.904, and IFI = 0.963, indicating that the overall model fit is acceptable. The AVE for each dimension ranged from 0.525 to 0.582 (> 0.5), and the CR ranged from 0.847 to 0.884 (> 0.7). Furthermore, the square roots of the AVE for each dimension were all greater than their correlation coefficients with other dimensions, indicating that the scale possesses good convergent and discriminant validity. In terms of reliability, the overall Cronbach's α coefficient was 0.921, with coefficients for each dimension ranging from 0.844 to 0.883, all above 0.8, indicating high internal consistency of the scale. In summary, the kinesiophobia scale for enterostomy patients developed in this study demonstrates reliable reliability and validity and can serve as an effective tool for clinically identifying high-risk individuals and evaluating the effectiveness of interventions.

Preliminary results from the application of the scale indicate that the scores of kinesiophobia among enterostomy patients were (82.69 ± 15.90), which is at a relatively high level. This differs from the findings of QXZ et al. [33], which may be because a general-purpose scale cannot fully reflect the specific characteristics of kinesiophobia in enterostomy patients. Among the dimensions of this scale, the "fear beliefs" and "exercise avoidance" dimensions scored higher, indicating that enterostomy patients generally hold strong fear beliefs, which in turn lead to exercise avoidance behaviors. It is worth noting that their kinesiophobia stems more from concerns about stoma-related complications than from

mere physical discomfort. Therefore, when providing health education to enterostomy patients, healthcare professionals should assess the patients' level of fear regarding exercise, proactively explain the benefits of physical activity, provide evidence-based knowledge on preventing complications and coping strategies, help patients build confidence, and work together to develop an exercise plan.

Limitations

This study has several limitations. First, test-retest reliability was not assessed, making it impossible to evaluate the scale's stability over time; it is recommended that future studies conduct repeated measurements on the same group at two-week intervals. Second, convenience sampling was used, and 152 patients were included in the exploratory analysis phase. Although this met the basic requirements, it fell short of the ideal standard; furthermore, all patients were from the same tertiary hospital, resulting in significant homogeneity bias, which limits the scale's external validity and generalizability across populations. Future studies should expand the sample size, conduct multicenter research, and include a more diverse range of demographic characteristics. Third, this study did not assess criterion-related validity. Although general-purpose exercise fear scales such as the TSK and FABQ exist, there is currently no specific gold standard for the enterostomy patients; direct adoption of these scales may introduce conceptual bias, which is one of the limitations of this study. Fourth, although the questionnaire was developed in Chinese, it did not undergo a rigorous translation-back-translation and cultural adaptation process, and its cross-cultural applicability requires further validation.

Conclusions

This study developed and validated a scale to measure kinesiophobia in enterostomy patients. The scale comprises five dimensions and 26 items, covering perceived danger, fear beliefs, self-efficacy, exercise avoidance, and functional disorder. The results indicate that the scale demonstrates good reliability and validity and can serve as an effective tool for assessing kinesiophobia in enterostomy patients.

Abbreviations

TSK
Tampa Scale for Kinesiophobia
FABQ
Fear—Avoidance Beliefs Questionnaire
KCS
Kinesiophobia Causes Scale
FAM
Fear—Avoidance Model
CR
Critical Ratio
KMO

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study. This study was approved by the Medical Ethics Committee of Zhongnan Hospital of Wuhan University (approval number: 2023103K).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no conflict of interest.

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Authors' contributions

HBC, JYW and HQJ contributed equally to this work and share the first authorship. They were involved in the conceptualization, methodology, investigation, data curation, formal analysis, and writing—original draft of the manuscript. JZ and BLF contributed equally to this work and share the corresponding authorship. They were responsible for the conceptualization, supervision, project administration, funding acquisition, and writing—review & editing. YQY and CT contributed to the quality control, and proof reading and format of the manuscript.

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References

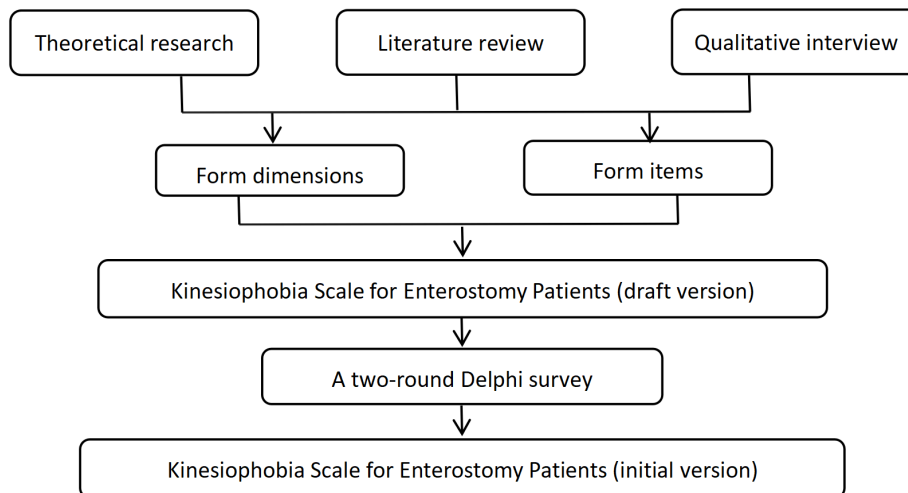
1. Antequera-Antequera Á, Valenza-Peña G, Raya-Benítez J, et al. Home-Based, Telematic Gradual Exercise for Permanent Colostomy Patients: Protocol for a Randomized Controlled Trial. *Healthc* (Basel. 2025;13(21). <http://dx.doi.org/10.3390/healthcare13212742>.
2. Ayik C, Özden DandCenan D. Ostomy Complications, Risk Factors, and Applied Nursing Care: A Retrospective, Descriptive Study. *Wound Manag Prev*. 2020;66(9):20–30.
3. Wang SM, Jiang JL, Li R, et al. Qualitative exploration of home life experiences and care needs among elderly patients with temporary intestinal stomas. *World J Gastroenterol*. 2024;30(22):2893–901. <http://dx.doi.org/10.3748/wjg.v30.i22.2893>.
4. Du X, Jiang H, Fu L, et al. Development and validation of a self-management behavior questionnaire for Chinese enterostomy patients. *Int J Nurs Sci*. 2022;9(2):252–8. <http://dx.doi.org/10.1016/j.ijnss.2022.03.007>.
5. Burgess-Stocks J, Gleba J, Lawrence K, et al. Ostomy and Continent Diversion Patient Bill of Rights: Research Validation of Standards of Care. *J Wound Ostomy Cont Nurs*. 2022;49(3):251–60. <http://dx.doi.org/10.1097/won.0000000000000876>.
6. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin*. 2021;71(3):209–49. <http://dx.doi.org/10.3322/caac.21660>.
7. Klinkhammer-Schalke M, Steinger B, Koller M, et al. Diagnosing deficits in quality of life and providing tailored therapeutic options: Results of a randomised trial in 220 patients with colorectal cancer. *Eur J Cancer*. 2020;130:102–13. <http://dx.doi.org/10.1016/j.ejca.2020.01.025>.
8. Kowalski C, Sibert NT, Breidenbach C, et al. Outcome Quality After Colorectal Cancer Resection in Certified Colorectal Cancer Centers—Patient-Reported and Short-Term Clinical Outcomes. *Dtsch Arztebl Int*. 2022;119(Forthcoming):821–8. <http://dx.doi.org/10.3238/arztebl.m2022.0325>.
9. Caspersen CJ, Powell KEandChristenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep*. 1985;100(2):126–31.
10. Schmitz KH, Campbell AM, Stuiver MM, et al. Exercise is medicine in oncology: Engaging clinicians to help patients move through cancer. *CA Cancer J Clin*. 2019;69(6):468–84. <http://dx.doi.org/10.3322/caac.21579>.
11. Park J, Rivard SJ, Maguire L, et al. Parastomal Hernia Rates and Exercise After Ostomy Surgery. *Dis Colon Rectum*. 2023;66(6):823–30. <http://dx.doi.org/10.1097/dcr.0000000000002395>.
12. Czosnek L, Richards J, Zopf E, et al. Exercise interventions for people diagnosed with cancer: a systematic review of implementation outcomes. *BMC Cancer*. 2021;21(1):643. <http://dx.doi.org/10.1186/s12885-021-08196-7>.

13. Asnong A, D'Hoore A, Wolthuis A, et al. Physical activity levels after low anterior resection for rectal cancer: one-year follow-up. *BMC Public Health*. 2021;21(1):2270. <http://dx.doi.org/10.1186/s12889-021-12311-5>.
14. Mo J, Thomson CA, Sun V, et al. Healthy behaviors are associated with positive outcomes for cancer survivors with ostomies: a cross-sectional study. *J Cancer Surviv*. 2021;15(3):461–9. <http://dx.doi.org/10.1007/s11764-020-00940-5>.
15. Russell S. Physical activity and exercise after stoma surgery: overcoming the barriers. *Br J Nurs*. 2017;26(5):S20–6. <http://dx.doi.org/10.12968/bjon.2017.26.5.S20>.
16. Todd DD, Kori SH, Miller RP et al. The Incidence of Kinisophobia in an Inpatient Chronic Pain Program. *Clin J Pain*;1991, 7.
17. Miller RP, Kori. SHandTodd DD. The Tampa Scale:a measure of kinisophobia. *Clin J Pain*. 1991;7(1):51–2.
18. Waddell G, Newton M, Henderson I et al., : *A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability*. *Pain*;1993, 52(2):157–168. [http://dx.doi.org/10.1016/0304-3959\(93\)90127-b](http://dx.doi.org/10.1016/0304-3959(93)90127-b)
19. Knapik A, Saulicz EandGnat R. Kinesiophobia - introducing a new diagnostic tool. *J Hum Kinet*. 2011;28:25–31. <http://dx.doi.org/10.2478/v10078-011-0019-8>.
20. Ozyemisci-Taskiran O, Demirsoy N, Atan T, et al. Development and Validation of a Scale to Measure Fear of Activity in Patients With Coronary Artery Disease (Fact-CAD). *Arch Phys Med Rehabil*. 2020;101(3):479–86. <http://dx.doi.org/10.1016/j.apmr.2019.09.001>.
21. Visscher CM, Ohrbach R, van Wijk AJ et al., : *The Tampa Scale for Kinesiophobia for Temporomandibular Disorders (TSK-TMD)*. *Pain*;2010, 150(3):492–500. <http://dx.doi.org/10.1016/j.pain.2010.06.002>
22. De Peuter S, Janssens T, Van Diest I, et al. Dyspnea-related anxiety: The Dutch version of the Breathlessness Beliefs Questionnaire. *Chron Respir Dis*. 2011;8(1):11–9. <http://dx.doi.org/10.1177/1479972310383592>.
23. Lethem J, Slade PD, Troup JD, et al. Outline of a Fear-Avoidance Model of exaggerated pain perception–I. *Behav Res Ther*. 1983;21(4):401–8. [http://dx.doi.org/10.1016/0005-7967\(83\)90009-8](http://dx.doi.org/10.1016/0005-7967(83)90009-8).
24. Crombez G, Eccleston C, Van Damme S, et al. Fear-avoidance model of chronic pain: the next generation. *Clin J Pain*. 2012;28(6):475–83. <http://dx.doi.org/10.1097/AJP.0b013e3182385392>.
25. Ferketich S. Focus on psychometrics. Aspects of item analysis. *Res Nurs Health*. 1991;14(2):165–8. <http://dx.doi.org/10.1002/nur.4770140211>.
26. Kraemer HC. Correlation coefficients in medical research: from product moment correlation to the odds ratio. *Stat Methods Med Res*. 2006;15(6):525–45. <http://dx.doi.org/10.1177/0962280206070650>.
27. Pingguo YZ, Lan YJ, Ma JX, et al. Evaluation and optimization of the Job Content Questionnaire (JCQ-22) based on classical test theory and item response theory. *Mod Prev Med*. 2025;52(17):3220–6. <http://dx.doi.org/10.20043/j.cnki.MPM.202503385>.

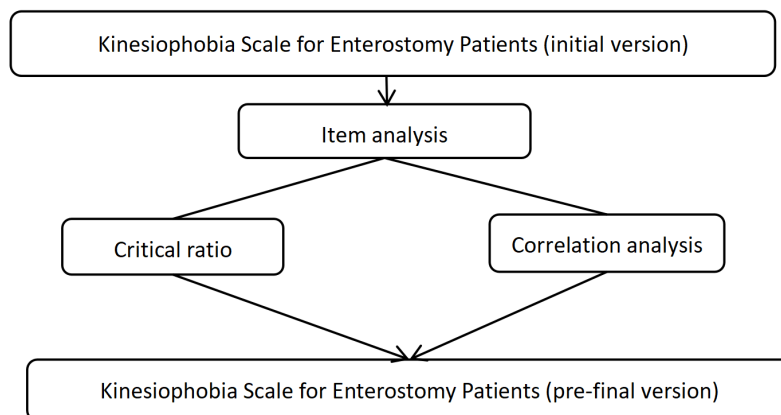
28. Tobias SandCarlson JE, BRIEF REPORT: BARTLETT'S TEST OF SPHERICITY AND CHANCE FINDINGS IN FACTOR ANALYSIS. *Multivar Behav Res.* 1969;4(3):375–7.
http://dx.doi.org/10.1207/s15327906mbr0403_8.
29. Li ZW, Feng LJ, Chen XS, et al. Development and application of a Fear of Movement Assessment Scale for patients with peripherally inserted central catheters. *Chin J Nurs.* 2025;60(09):1099–106.
30. Yang L, Zhou W, Gao Y, et al. Development and validation of the missed intensive nursing care scale. *BMC Nurs.* 2024;23(1):165. <http://dx.doi.org/10.1186/s12912-024-01805-3>.
31. Hirschey R, Nance J, Hoover R, et al. Physical Activity: A Systematic Review to Inform Nurse Recommendations During Treatment for Colorectal Cancer. *Clin J Oncol Nurs.* 2021;25(6):697–705.
<http://dx.doi.org/10.1188/21.Cjon.697-705>.
32. Slepian PM, Ankawi Band, France CR. Longitudinal Analysis Supports a Fear-Avoidance Model That Incorporates Pain Resilience Alongside Pain Catastrophizing. *Ann Behav Med.* 2020;54(5):335–45.
<http://dx.doi.org/10.1093/abm/kaz051>.
33. ZHOU QX, Zhu HY, Xin L, et al. Current status and influencing factors of kinesiophobia in colorectal cancer patients with enterostomy. *Chin J Nurs Educ.* 2026;23(3):357–63.
<http://dx.doi.org/10.3761/j.issn.1672-9234.2026.03.016>.

Figures

Phase 1: The generation and revision of the items



Phase 2: The evaluation and exploration of the items



Phase 3: The psychometric evaluation of the scale

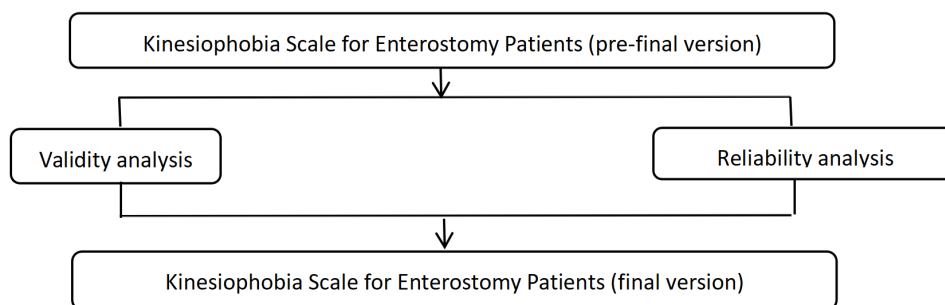


Figure 1

The development procedure of the Kinesiophobia Scale for Enterostomy Patients

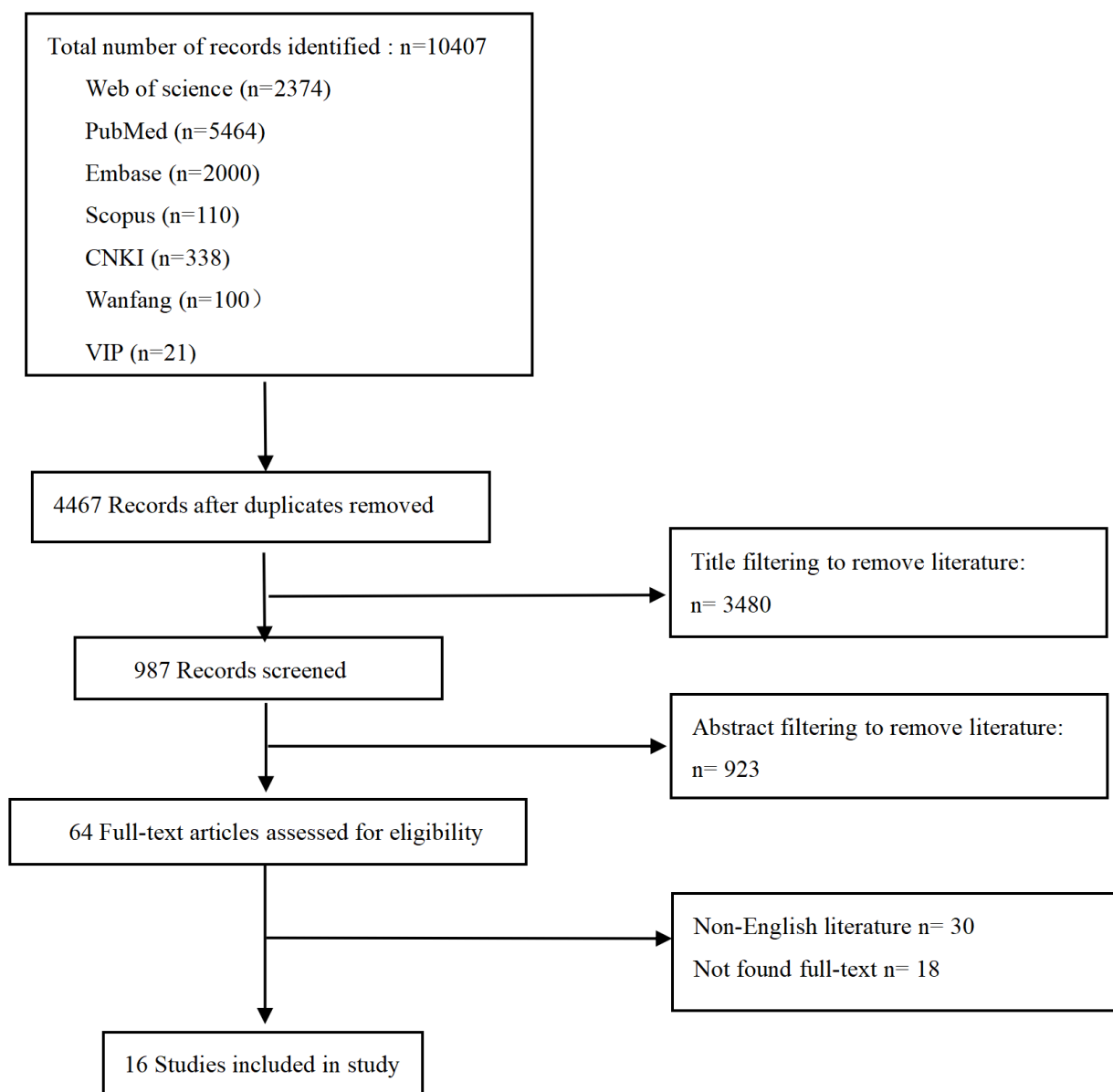


Figure 2

Literature Review Flowchart

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