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Development and validation of the sarcopenia disease risk perception scale for older adults

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Abstract

Background Sarcopenia represents a constant threat to the health of older adults, and accurate risk perception is essential for disease prevention and control. However, current methodologies lack rigorously validated instruments to assess the perceived risk of sarcopenia among this group. Thus, this study aimed to develop and validate a sarcopenia disease risk perception scale for older adults.

Design The study was conducted in two phases: development of the initial scale and its psychometric evaluation. A STROBE checklist was employed.

Methods Based on the two-factor model of risk perception theory and the health belief model, the initial draft of the scale was created through literature review, expert consultations, and a preliminary survey with a small sample. Then, we used a cross-sectional study methodology to conveniently select 438 Chinese older adults. Item analysis, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA) were used to refine and validate the scale items. Internal consistency and external consistency were assessed to confirm the scale's reliability.

Results These evaluations established the scale's framework: content validity, item analysis, and EFA. The two factors extracted from the initial analysis explained 62.250% of the observation variance. The CFA confirmed a good fit for the model, demonstrating the scale's robust reliability and validity. The finalized scale includes 15 items and two dimensions: perceived susceptibility (eight items) and perceived severity (seven items).

Conclusion The Sarcopenia Disease Risk Perception Scale for Older Adults is reliable and valid, making it appropriate for assessing the risk perception level in the target population.

Keywords Aged, Sarcopenia, Risk, Perception, Validation

Introduction

Sarcopenia is an age-related muscle dysfunction characterized by reduced skeletal muscle mass, strength, and physical capability [1]. Systematic analyses [2] and reports from the European Working Group on Sarcopenia in Older People (EWGSOP) [3] indicate that sarcopenia prevalence rates among the global older adult population ranges from 6 to 12%. In 2019, the Asian Working Group for Sarcopenia (AWGS) reported prevalence rates in the Asian older adult population of 5.5–25.7% [1]. In South Korea, sarcopenia prevalence rates is 13.1–14.9% among older men and 11.4% among older women [4]. Recent epidemiological studies in the Chinese population reveal sarcopenia prevalence rates of 8.9–38.8% among community-dwelling older adults [5]. Specifically, the incidence rates ranges from 5 to 13% among those aged 60 to 70 years, and up to 67.1% in those aged over 80 years [5].

The occurrence of sarcopenia significantly increases the risk of fractures, incapacity, and disability among

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older adults. It also adversely affects the prognosis of other diseases, seriously diminishing the quality of life and increasing the burden on individuals, families, and society. This hampers the pursuit active aging [6–8]. Consequently, the prevention and management of sarcopenia are vital for promoting healthy aging and enhancing late-life quality.

This has been clearly emphasized by both the AWGS [1] and the EWGSOP [3]: a structured assessment of sarcopenia risk is crucial to identify at-risk individuals, and effective assessment tools enable nurses to implement more targeted and efficient preventive measures. While doctors and nurses commonly evaluate sarcopenia risk using biochemical indicators, risk prediction models, and scoring tools in older adults, patient self-assessment is often overlooked by healthcare providers [9–11]. Patients, as primary caretakers of their own health, should proactively gain disease-related knowledge and enhance their risk management skills [12, 13]. An accurate risk perception can correct misconceptions about diseases, change detrimental behaviors, aid recovery, maintain long-term stability, and prevent disease onset [14–16]. Thus, quantitatively assessing sarcopenia risk perception in older adults is vital for both patients and healthcare professionals.

Existing universal disease risk assessment tools, such as the Risk Perception Questionnaire for Chronic Patients(RPQCP) [17], the Chronic Non-Communicable Disease Risk Perception Assessment Tool (CN-CDRPAT) [18], The Tripartite Model of Risk Perception(TRIRISK) [19],and designed to gauge patient perceptions of disease occurrence. These tools are easy to use but suffer from limited measurement dimensions and poor specificity, which can lead to measurement bias. The Perception of Risk of Chronic Kidney Disease Scale for Type 2 Diabetic Patients, by contrast, offers strong specificity and valuable application [20]. Regrettably, reports on the risk perception of sarcopenia among older adults are scarce, and specific measurement tools are lacking. Consequently, this study developed the Sarcopenia Disease Risk Perception Scale for Older Adults (SDRPS-OA), aiming to provide a robust tool for assessing disease risk perception among the older adults.

Methods

This study was conducted in two phases: (1) Development of the test version of the scale; (2) Improvement and psychometric evaluation of the scale. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was employed [21].

Framework

The framework was based on the health belief model [22] and the two-factor model of risk perception theory [23, 24]. The health belief model underscores the role of perception in health behavior decision-making, identifying the assessment of disease threat as essential for deciding whether to engage in health behaviors. Perceived susceptibility refers to an individual's belief in their vulnerability to a disease, representing the subjective risk; Perceived severity refers to the anticipated severe consequences a disease might have on one's life. The two-factor model of risk perception theory highlights the influence of risk perception on health protective behaviors, where the uncertainty of event occurrence and the severity of outcomes align with the health belief model's constructs. Accordingly, the initial draft of the scale included two dimensions: perceived susceptibility and perceived severity.

Phase 1: development of the pretest version of the scale

Following the established framework, two dimensions of risk perception were identified: perceived susceptibility and perceived severity. Literature searches were conducted on PubMed, Web of Science, Embase, CINAHL, Scopus, and Cochrane. Relevant policies from the World Health Organization and health committees in Europe, Asia, the USA, Japan, Korea, and China concerning sarcopenia risk perception in older adults were also reviewed. The rationality of the items was discussed by the research team, and the first draft of the scale was created, consisting of two dimensions and 18 items.

A Delphi survey was conducted with 12 experts from five Chinese provinces, all holding senior titles and having more than 20 years of expertise in geriatric nursing/medicine, chronic disease management/treatment, nutrition, medical humanities, or psychometrics. After the first round of discussions, two items were deleted, three items were consolidated into one, one new item was added, and two items were revised. Following the second round, the experts were generally satisfied with the scale items, resulting in no deletions or additions but two modifications. A preliminary survey was then carried out with 24 older adults to assess item comprehension and the difficulty of completion. Ultimately, the pretest version of the scale was finalized, comprising two dimensions and 17 items.

Phase 2: refinement and psychometric evaluation of the scale

Sampling and data collection

During Jun to December 2023, convenience sampling was utilized to select participants from two hospitals and two community centers in Hangzhou City. Inclusion criteria included: (1) being aged 60 or above; (2) having the ability to communicate; (3) providing informed consent and showing willingness and ability to complete the survey. Exclusion criteria were: (1) older adults previously

diagnosed with sarcopenia, as determined through direct inquiry or health records; (2) individuals with other critical, unstable medical conditions.

With approval from community leaders, all households were visited, and eligible older adults were surveyed. To broaden the scale' s applicability, assessments were also conducted among eligible individuals in the outpatient, geriatric, endocrinology, and cardiology departments of the hospitals. Prior to data collection, research team members were trained to provide uniform instructions about the study' s purpose and significance. Participants independently completed the questionnaires, which were distributed and collected on the same day. This study received approval from a local university's Institutional Review Board (IRB number: 2024055), and all subjects signed informed consent forms.

Data collection was conducted in three rounds: (1) Round 1 involved item analysis and exploratory factor analysis (EFA). The sample size for factor analysis was set at 5 to 10 times the number of scale items, with the preliminary version of the scale containing 17 items [25]. Accounting for 10% potential invalid questionnaires, the target sample size ranged from 94 to 187 participants; 155 questionnaires were collected, with 150 being valid. (2) Round 2 focused on confirmatory factor analysis (CFA) and reliability analysis, requiring a sample size exceeding 200 [26, 27]. Considering a 10% rate of invalid questionnaires, at least 220 participants were needed; 310 questionnaires were collected, with 288 deemed valid. (3) Round 3 was primarily for test-retest reliability analysis, with a sample size of at least 1/10 of the Round 2 sample, thus a minimum of 30 participants [26, 27].

Instruments

The questionnaire comprised two parts: (1) demographic and sociological data; (2) the SDRPS-OA(pretest version), utilizing a 5-point Likert scale with responses ranging from 'very disagree' to 'strongly agree', scored as 1 through 5, respectively. Higher scores indicate a higher level of sarcopenia disease risk perception among older adults.

Data analysis

Content validity of the scale was assessed using Microsoft Excel. The Content Validity Index (CVI) was calculated by dividing the item-level CVI (I-CVI) by the scale-level CVI (S-CVI/Ave). An I-CVI greater than 0.79 was considered acceptable; an S-CVI/Ave of 0.90 was deemed acceptable [28, 29]. Incomplete questionnaires were excluded, and the data were analyzed using SPSS 26.0 (Armonk, NY: IBM Corp) and AMOS 26.0. Descriptive statistics were presented as numbers and percentages.

Item analysis and EFA were conducted using SPSS 26.0(Armonk, NY: IBM Corp). We carefully screened and modified the items by item analysis methods, including critical ratio (CR) method, correlation analysis and homogeneity test. The top 27% with the highest total scores were classified as the high group, and the bottom 27% with the lowest total scores as the low group. Significance of the mean differences between these groups was assessed for each item to exclude non-discriminatory items. Items with a CR value less than 3.0 were considered weakly differentiated and were excluded [30]. Pearson correlation analysis was performed to determine if the correlation coefficient between each item and the total score was significant, with a minimum selection criterion of $r \geq 0.3$ [31]. For the homogeneity test, the specific criterion was the Cronbach's α. If the coefficient increased after an item was deleted, that item was excluded [32].

After item analysis, the Kaiser Meyer Olkin (KMO) and Bartlett's test of sphericity were performed to assess sampling adequacy. The KMO value exceeded 0.60 [33], and the Bartlett test was significant, confirming the data's suitability for factor analysis. Principal component analysis (PCA) was then conducted with the maximum variance orthogonal rotation method to identify common factors. Items with eigenvalues greater than 1 were retained, excluding those with factor loadings below 0.5 or with maximum loadings on two or more factors exceeding 0.5 [34]. At least two items were retained under each factor.

CFA utilized the maximum likelihood estimation method. Evaluation metrics included the chi-square to degrees of freedom ratio ($\chi 2/df$), root mean square error of approximation (RMSEA), normalized fit index (NFI), tucker-lewis index (TLI), incremental fit index (IFI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI). Acceptable model fit was indicated by $\chi 2/df < 5$, RMSEA < 0.08, and NFI, TLI, IFI, CFI > 0.90, GFI and AGFI > 0.80 [32, 33, 35]. Cronbach's α was used to assess internal consistency, with a range from greater than 0.6 to less than 0.9 considered optimal to avoid redundancy [36]. Test-retest reliability assessed the scale's stability by calculating the correlation between the same subjects' scores across two time points. A retest interval of 2 weeks was used, and a retest reliability of ≥0.70 indicated good external consistency [33].

Results

Participants

A total of 438 older adults participated in the study. EFA was performed on 150 cases, and CFA on 288 cases. The demographic breakdown was 171 males (39%) and 267 females (61%). Age distribution was as follows: 60–69 years (193, 44.1%), 70–79 years (177, 40.4%), 80–89 years (58, 13.2%), and 90 years and above (10, 2.3%).

Table 1 Results of EFA($n=150$)

Items	Perceived susceptibility	Perceived severity
Older	**0.809**	0.270
With other chronic diseases	**0.794**	0.169
Insufficient nutritional intake	**0.775**	0.283
Bad Lifestyle	**0.768**	0.253
Involuntary weight loss	**0.754**	0.230
Increased medication use	**0.738**	0.183
Thin limbs and frequent episodes of weakness	**0.620**	0.358
Difficult walking and a slow gait	**0.603**	0219
Increase the risk of falls	0.185	**0.799**
Increase the risk of fractures	0.237	**0.830**
Increase the likelihood of hospitalization	0.171	**0.598**
Increase economic burden	0.300	**0.694**
Increase burden of family care	0.282	**0.773**
Increased risk of cerebrovascular accidents	0.119	**0.745**
Adversely affect the prognosis of other diseases	0.325	**0.699**
Eigenvalue	8.832	1.751
Cumulative contribution rate (%)	51.952	62.250

Educational levels were: primary school or below (147, 33.6%); junior high school (71, 16.2%); senior high school (76, 17.4%); and college or above (144, 32.9%). Marital status was: unmarried (11, 2.5%); married (355, 81.1%); divorced (37, 8.4%); widowed (35,8%).

Content validity

After two rounds of expert consultation, the S-CVI/Ave was 0.900, and the I-CVI ranged from 0.833 to 1.000, indicating good content validity of the scale.

Item analysis

The CR for all items exceeded 3 (ranging from 5.649 to 13.434, $P<0.05$);The correlation coefficients for the items were above 0.3 ($r=0.599$ to 0.773, $P<0.05$);No significant increase in the Cronbach's α coefficient was observed after the deletion of any items.

Exploratory factor analysis

The initial EFA identified two items below 0.5,which were removed after team discussion. A second EFA was conducted on the remaining 15 items, with loadings ranging from 0.598 to 0.830, all exceeding 0.5, KMO=0.917 ($\chi2=1746.893$, $p<0.001$). The cumulative variance explained by the two factors was 62.250% (Table 1).

Confirmatory factor analysis

The model demonstrated a good fit: $\chi2/df=2.670$, RMSEA=0.075, GFI=0.903, AGFI=0.869, CFI=0.949, IFI=0.950, TLI=0.940, NFI=0.922.

Table 2 Results of the reliability analysis($n=288$)

Variables	Cronbach's α coefficient（n=288)	Retest reliability(n=30)
Perceived susceptibility	0.826	0.810
Perceived severity	0.802	0.872
Total table	0.855	0.820

The mean (SD) of the total scale scores was 30.73 (1.37). The means (SDs) of the subscale scores for perceived susceptibility and perceived severity were 13.97 (0.23) and 13.76 (1.31), respectively.

Reliability analysis

The Cronbach's α coefficient for the 15-item scale was 0.855, indicating reliable internal consistency, with dimension coefficients ranging from 0.802 to 0.826. The test-retest reliability of the scale was 0.820, showing reliable external consistency, with dimension retest reliabilities ranging from 0.810 to 0.872 (Table 2).

Discussion

The SDRPS-OA comprises two dimensions and 15 items, with eight dedicated to perceived susceptibility and seven to perceived severity. The items were developed through a comprehensive review of literature, expert consultations, and pilot testing. The results indicate satisfactory reliability and validity, affirming the scale's effectiveness.

This study incorporated key elements from the two-factor model of risk perception theory and the health belief model, as confirmed by the EFA results. Additionally, the CFA results demonstrated that the structural equation model was well-fitted. Factor 1 (perceived susceptibility) concerns the patient's understanding of the causes of sarcopenia. Perceived susceptibility is the initial step in disease risk perception. Individuals make preliminary judgments about their likelihood of contracting the disease based on its causes, which is crucial for targeted interventions [37–39]. Concurrently, research indicates that individuals who perceive the negative impact of disease on their physical health are likely to take preventive actions [15]. Hence, factor 2 (perceived severity) assesses the perception of the disease's consequences, highlighting issues such as the impact of falls on the lives of older adults [40]. These two factors are crucial dimensions for understanding disease perception and influencing preventive behaviors in older adults. Healthcare professionals experienced in psychological assessment, scale development, and chronic disease management were consulted in this study through correspondence or questionnaire. The experts were highly authoritative and representative, providing essential guidance from both professional and practical perspectives, which significantly contributed to the improvement of the scale items and ensured their systematic and comprehensive nature.

The results indicated that the internal consistency of the SDRPS-OA was acceptable (Cronbach's α=0.875). Low Cronbach's α values suggest poor justification for the items, whereas very high values indicate redundancy among them [40]. Compared to the CN-CDRPAT (0.68) [18] and TRIRISK (0.94) [19], the Cronbach's α obtained in this study was favorable, demonstrating good homogeneity among the scale items. The test-retest reliability was also robust, confirming the scale's stability over time.

Excessive risk perception can lead to a prolonged state of high stress, exacerbating negative emotions such as fear and anxiety. Conversely, a low level of risk perception can cause individuals to overlook disease risks, reducing their engagement in health management behaviors and delaying treatment [29, 41]. Given this, the present study represents a significant initial step towards understanding sarcopenia perception among older adults. In the preliminary phase, the mean score for perceived sarcopenia risk among Chinese older adults was found to be 30.73 (SD 1.37), with subscale scores of 13.97 (0.23) and 13.76 (1.31). These findings suggest that the level of risk perception for sarcopenia among older adults needs further enhancement, likely due to their limited knowledge about the condition [39]. Thus, healthcare professionals should focus on improving the dissemination of sarcopenia knowledge. Patience in health coaching is crucial for the older adult population, and relevant organizations should enhance the risk communication skills of healthcare providers to facilitate personalized and effective risk messaging. Furthermore, the scale may be utilized to quantitatively assess the effectiveness of related educational or intervention programs.

As far as we know, no studies currently assess the level of sarcopenia disease risk perception in older adults, and this study may help bridge this gap in the literature. The content of the scale is simple, objective, and easy to understand, making it well-suited to the fast-paced clinical environment and highly valuable for clinical application. However, this study has some limitations. First, older adults with verbal communication disorders and severe diseases were excluded, hence the scale was not validated in these populations. Second, all participants were recruited from Hangzhou, China, which limits the generalizability of the findings. Third, the calibration validity of the SDRPS-OA was not assessed due to the absence of a suitable gold standard tool.

Conclusion

The Chinese version of the Sarcopenia Disease Risk Perception Scale for Older Adults developed in this study features clear, concise items and requires a short completion time, demonstrating good reliability and validity. Healthcare professionals can use this scale to gauge sarcopenia awareness among older adults, enhance disease prevention and healthcare awareness, and ultimately reduce the incidence of sarcopenia.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12877-024-05487-z.

Supplementary Material 1

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Author contributions
Wenjuan Zhang: Writing – review & editing, Writing – original draft. Ziyu Sun: Investigation, Data curation. Jiaqi Wang: Investigation. Yuhong Wu: Supervision.

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

Declarations

Ethics approval and consent to participate
The study received ethical approval from the Hangzhou Normal University (2024055). The Declaration of Helsinki was followed in conducting the study. Participants received information about the objectives of the study and provided informed consent before participating in the research. The study was anonymous and collected data could not trace back to individual respondents.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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