RESEARCH

Reliability and validity of the Chinese version of the coronary artery disease empowerment scale (CADES) in patients with coronary artery disease after percutaneous coronary intervention

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Abstract

Background Empowerment is a comprehensive concept involving intrapersonal, interactional, and behavioral aspects. However, there is a lack of a specific empowerment scale for Coronary artery disease (CAD) related to knowledge and skills in China. The reliability and validity of the Coronary Artery Disease Empowerment Scale (CADES) need to be tested. This study aimed to assess the reliability and validity of the Chinese version of CADES among patients with CAD in China.

Methods The study adopted a cross-sectional design. After obtaining the copyright by contacting the author, the original English CADES was developed into Chinese by forward translation, back-translation, cross-cultural adaptation, and a pretest (30 patients). The Chinese version of CADES was administered to 391 CAD patients between September 2022 and June 2023, with the reliability and validity of the version evaluated. Exploratory factor analysis and confirmatory factor analysis were performed to examine the underlying factor structure of the translated questionnaire. The Cronbach's α coefficient, Guttman's split-half coefficient, and McDonald's omega coefficient were calculated to verify the scale's reliability.

Results For the Chinese version of CADES, the scale-content validity index was 0.972, with the item-content validity index ranging from 0.86 to 1.00. The questionnaire comprised 25 items, and exploratory factor analysis extracted four factors with loadings > 0.40, explaining 62.382% of the total variance. An acceptable model fit was achieved (χ^2/df = 1.764, RMSEA = 0.060, TLI = 0.901, CFI = 0.912, IFI = 0.913). The Cronbach's α coefficient of the total questionnaire was 0.928, with coefficients for the four factors ranging from 0.683 to 0.913. The split-half reliability coefficient was 0.777, and the McDonald's omega reliability coefficient was 0.926.

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Conclusions The Chinese version of CADES is reliable and valid among CAD patients in China. This instrument can serve as a valuable reference for guiding the implementation of targeted intervention strategies tailored to the empowerment status of CAD patients in clinical practice.

Keywords Coronary artery disease, Chinese version, Empowerment, Reliability, Validity

Introduction

Coronary artery disease (CAD) is characterized by the gradual narrowing or complete occlusion of the coronary artery lumen, leading to varying degrees of myocardial ischemia and hypoxia [1]. Due to its high incidence and associated disability, CAD has become a significant public health problem, especially in aging populations such as China [2]. Effective management of CAD requires a comprehensive approach aimed at controlling risk factors, reducing cardiac events, and improving overall prognosis. However, current healthcare management models predominantly involve authoritative education, where medical professionals play the leading role and patients remain passive recipients. This model fails to engage patients' enthusiasm and initiative, resulting in health behaviors that lack stability and permanence [3]. Enhancing patient empowerment has been suggested to foster more active engagement in their care, greater disease-related knowledge, and improved quality of life and well-being [4]. Consequently, there is an urgent need for a scale to measure empowerment among CAD patients in clinical practice.

Background

Empowerment is a multifaceted concept that encompasses intrapersonal, interactional, and behavioral dimensions, aiming to fully mobilize both internal health potential and external resources. This mobilization is crucial for enhancing patients' self-confidence in disease recovery and fostering active participation in their disease management [5, 6]. Various studies have conducted conceptual analyses and developed instruments to measure different aspects of patient empowerment [7–9]. These instruments enable comparative measurements before and after interventions, providing valuable insights and references for practical applications based on a well-defined concept of patient empowerment.

Several studies have introduced instruments to assess patient empowerment levels. One notable instrument is the 44-item scale developed by Zhou et al., which measures empowerment in patients with chronic diseases, including components such as informed confidence, client-provider relationship, social advocacy, awareness, control, and client-client support [10]. In 2010, Chen et al. developed the Chinese Diabetes Empowerment Process Scale to help healthcare professionals optimize their empowering actions, identifying four factors through exploratory factor analysis: mutual participation, raising awareness, providing necessary information, and open communication [11]. Jerofke et al. created a more concise and practical tool for measuring patient perceptions of empowering nurse behaviors during hospitalization [12]. Given the distinctive characteristics of various diseases, the focus of patient empowerment assessment may vary. Therefore, to enhance empowerment practices among healthcare professionals, a specific scale tailored to CAD-related knowledge and skills in China is needed.

Unlike patients with other chronic diseases, CAD patients often do not experience symptoms after an acute attack. This lack of symptoms can result in a limited understanding of the disease and reduced motivation for secondary prevention, leading to lower participation rates in healthcare [13]. Although percutaneous coronary intervention (PCI) can reopen blocked blood vessels and alleviate angina pectoris, it does not halt the progression of atherosclerosis, and there remains a risk of recurrence post-operation [14]. The incidence of coronary artery restenosis after PCI was as high as 10%, with restenosis rates after drug-eluting coronary stents still between 5 and 10% [15]. Thus, it is essential to enhance patient empowerment to help them manage their health and address symptoms that may recur after PCI. To this end, a CAD-specific empowerment assessment tool is necessary. Kim et al. designed a Coronary Artery Disease Empowerment Scale (CADES) in 2021, which comprehensively evaluated the empowerment of CAD patients across three dimensions: self-determination, emotional self-regulation, and personal competence of disease management perception [16]. The CADES, comprising 25 items, demonstrated good reliability and validity. However, further validation is needed to determine whether the CADES can be directly employed to assess empowerment levels among Chinese adults with CAD.

Purpose

Due to the complexity of the concept of empowerment, various measurement tools have been developed. However, until now, a validated Chinese version of CADES has not been available. Given the specific characteristics of CAD, the need for such a scale is pressing. Therefore, this study aims to test the reliability and validity of the Chinese version of CADES, providing a suitable evaluation tool for domestic medical staff to assess patient empowerment.

Research questions: (1) Is the Chinese version of CADES a valid scale for Chinese society? (2) Is the

Chinese version of CADES a reliable scale for Chinese society?

Methods

Study design

A cross-sectional validation design was adopted in this study. We contacted the original author of the scale, Professor Kim, to obtain authorization and consent [16]. The Brislin principle of translation (forward-translation, back-translation, acculturation) was adopted [17].

Development of the Chinese version of CADES

Scale translation

After obtaining permission from the author of the English CADES, the translation process was shown in Fig. 1.

Cross-cultural adaptation

According to the equivalence model first proposed by Flaherty et al. in 1988 [18], seven experts from the fields of clinical nursing, nursing management, psychology, and medicine were invited to further modify and polish the scale from five aspects: content, semantic, technical, criterion, and conceptual equivalence to ensure the cross-cultural validity. The research group sorted out the opinions of seven experts, and the pretest version CADES-2 was finally formed after discussion and modification. The criteria for expert selection were as follows:
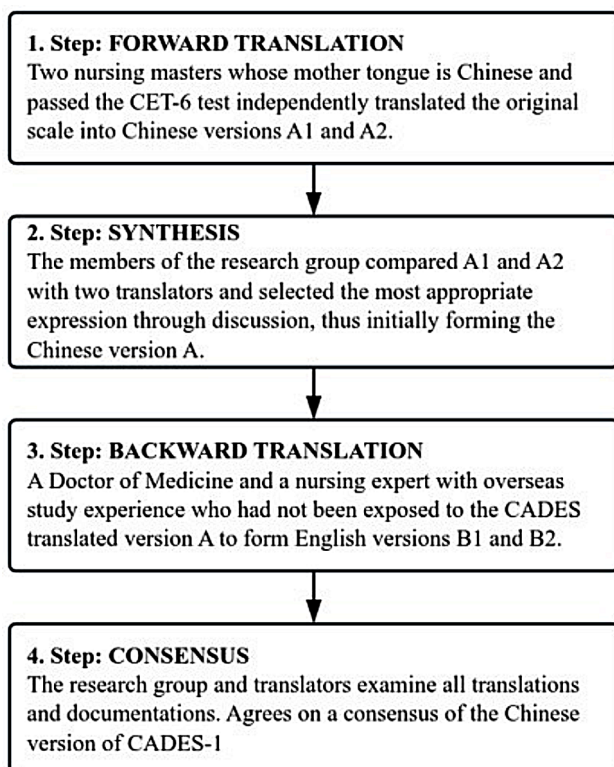
1. Step: FORWARD TRANSLATION
Two nursing masters whose mother tongue is Chinese and passed the CET-6 test independently translated the original scale into Chinese versions A1 and A2.

2. Step: SYNTHESIS
The members of the research group compared A1 and A2 with two translators and selected the most appropriate expression through discussion, thus initially forming the Chinese version A.

3. Step: BACKWARD TRANSLATION
A Doctor of Medicine and a nursing expert with overseas study experience who had not been exposed to the CADES translated version A to form English versions B1 and B2.

4. Step: CONSENSUS
The research group and translators examine all translations and documentations. Agrees on a consensus of the Chinese version of CADES-1

Fig. 1 Translation process

bachelor's degree or above, intermediate or above professional title, and five years of working experience in related fields.

Pretest

In September 2022, 30 patients with CAD who were hospitalized in the department of cardiology of a hospital were investigated in advance to evaluate whether the language expression of the scale was clear and easy to understand and to adjust the language expression of items according to patient feedback [19].

Subjects

In this study, the convenience sampling method was employed to conduct a questionnaire survey among patients in the first affiliated hospital of a university who met the inclusion and exclusion criteria from September 2022 to June 2023. The inclusion criteria were: (1) met the diagnostic of CAD with a duration of at least 3 months; (2) admission for PCI; (3) age between 18 and 75 years, with the ability to understand questions; (4) fluency in spoken or written Chinese; (5) stable disease statue (no recent exacerbations); and (6) informed consent and voluntary participation. The exclusion criteria were: (1) a history of other serious life-threatening conditions (such as advanced-stage cancer, end-stage organ failure, severe respiratory disorders, or advanced neurological disorders); and (2) mental disorders or cognitive impairment.

Data collection occurred in two phases. The first stage focused on item analysis and exploratory factor analysis. The sample size should be 5–10 times that of the questionnaire items, and our questionnaire contains 25 items [20]. The study's sample size was 5 times the items, and the required sample size was at least 147 cases. Our study achieved a sample size of 185 participants, with 180 valid questionnaires and an effective rate of 97.30%. For confirmatory factor analysis, a minimum sample size of 200 cases is generally required [21]. In the second stage, 215 people were surveyed, with 211 valid questionnaires and an effective rate of 98.14%.

Instruments

All participants completed the Chinese versions of the CADES and the Chinese version of General Self-Efficacy Scale (C-GSES). In addition, participants provided general profile information, including sociodemographic and clinical variables related to CAD, such as sex, age, marital status, education level, and disease duration.

Chinese version of the GSES

The GSES developed by Schwarzer et al. was widely used in many countries to measure an individual's confidence in their ability to cope with a wide range of stressful or

Jiang *et al. BMC Cardiovascular Disorders*   (2024) 24:438

Page 4 of 9

challenging demands [22]. The GSES has been translated into Chinese, and the C-GSES has demonstrated good reliability with Cronbach's alpha of 0.91 [23]. The C-GSES consists of 10 items with a unidimensional factor structure. Each statement is measured on a four-point likert scale, ranging from 1 (always false) to 4 (always true). The sum of the item scores was the general self-efficacy score, with total scores ranging from 10 to 40. Higher scores indicate greater self-efficacy.

Chinese version of the CADES

The CADES was used to assess empowerment in patients with CAD in Korea [16]. The scale consisted of 25 items, including self-determination, emotional self-regulation, and personal competence of disease management perception. The degree of agreement with each item was expressed on a five-point ordinal scale (from 1 = strongly disagree to 5 = strongly agree). The total score ranged from 25 to 125 points. The higher the score, the higher the degree of empowerment. The Cronbach's α coefficient of the English scale was 0.89–0.93, and it had good reliability and validity.

Data collection

The data collection period for this study spanned from September 2022 to June 2023. The study received approval from the Ethics Committee of the First Affiliated Hospital, College of Medicine, Zhejiang University (IIT20220341B-R1). Following this, the research coordinator presented the study to the head nurses of the hospital wards. Upon receiving their approval, patients who met the inclusion criteria and were willing to participate were asked to sign informed consent forms and complete a short questionnaire.

All the investigators were members of this research group, familiar with the research topic, and trained in the questionnaire administration method. The questionnaires were distributed to patients on the day of discharge. Investigators were available to assist patients with any questions or doubts during the process of completing the survey. All questionnaires were distributed and collected on the spot, and the data were sorted out in time to eliminate invalid questionnaires. A total of 400 scales were distributed, with 391 responses received, and the effective completion rate was 97.75%. The average time to finish the survey was about 5–6 min.

Reliability and validity test method
Item analysis

In this study, the critical ratio method and item-total score correlation method were used for item analysis: (1) Critical ratio (CR) method: the top 27% and bottom 27% of the total scale scores represented the high and low groups, respectively. An independent sample t-test was used to compare the differences between these groups for each item. Items with no statistical significance ($P \geq 0.05$) or CR values < 3 were deleted [24]. (2) Item-total score correlation method: the correlation coefficient between each item and the total scale score was assessed through correlation analysis. Items with correlation coefficients < 0.3 or not reaching the significance level ($P \geq 0.05$) were deleted [25].

Validity analysis

(1) The Content Validity Index was calculated based on expert opinions, including the item-level content validity index (I-CVI) and the scale-level content validity index (S-CVI). Seven experts rated the correlation between each item and its dimension of the Chinese CADES on a scale of 1 to 4 (1 = not related, 2 = weak correlation, 3 = more relevant, and 4 = very relevant). I-CVI ≥ 0.78 and S-CVI ≥ 0.90 were considered acceptable [26]. (2) Exploratory factor analysis and confirmatory factor analysis were conducted to assess construct validity. The Kaiser-Meyer-Olkin (KMO) test (KMO > 0.60) and Bartlett's χ^2 test ($P < 0.05$) were used to determine the suitability for factor analysis. Factors with eigenvalues > 1 were extracted, and the cumulative variance contribution rate was calculated. Items with factor loadings < 0.4 or double loadings were deleted [27]. Confirmatory factor analysis was used to examine the factor model, evaluating the model fit with the χ^2 degree of freedom ratio (χ^2/df), Tucker-Lewis index (TLI), comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA) [28]. (3) For criterion-related validity, the correlation between the Chinese CADES and the C-GSES was calculated using Pearson's correlation analysis.

Reliability analysis

(1) Internal consistency referred to the homogeneity and internal correlation among all items in the scale, which were assessed using Cronbach's alpha coefficient. A score greater than or equal to 0.6 was considered acceptable [29]. (2) Split-half reliability was determined by calculating Guttman's split-half coefficient, with its coefficient over 0.70 being considered satisfactory [30]. (3) The reliability of test scores was analyzed by computing McDonald's omega coefficient, considering values of 0.7 or higher as satisfactory [31].

Statistical analysis

IBM SPSS software version 25.0 and AMOS software version 28.0 were used for the statistical analysis. Data are

presented as the mean ± standard deviation for continuous variables or as N (%) for categorical variables. Item analysis was performed using the critical ratio method and correlation coefficient method. Content validity was determined based on expert ratings of the items. Exploratory factor analysis and confirmatory factor analysis were utilized to validate the structural integrity of the scale. Pearson's correlation between the Chinese CADES and C-GSES scores was calculated to determine criterion-related validity. The reliability of the scale was evaluated using Cronbach's alpha coefficient, split-half coefficient, and McDonald's omega coefficient.

Results

Characteristics of the subjects
The patients' age of the sampling was 30–75 years old. The characteristics of the participants are summarized in Table 1.

Cross-cultural adaptation
Based on the results of translation and cultural adaptation, this study revised the scale with the following specific changes. Clinical nursing experts noted that the term "disease management" in items was vague and recommended changing it to "management of coronary artery disease" with a detailed list of specific disease management activities. Item 3 did not conform to the cultural background of our country and was revised to "I practice my methods to control my mind (e.g., 求神拜佛, worshiping Buddha, meditating, taking a deep breath, walking)." Item 19 "The goal I want to achieve." was changed to "I have the goal I want to achieve in my life (e.g., traveling, seeing my offspring get married)." Dimension 3, which described cognition, needed clarification to avoid confusion with the coping behavior described in Dimension 1; therefore, the term "knowing" was emphasized and made bold. In addition, feedback from 30 patients with CAD indicated no difficulties in understanding the revised items, leading to the development of the final Chinese version of the scale.

Item analysis
(1) The CR values of all items were 6.327–18.020, and the differences were statistically significant ($P<0.001$). (2) The correlation coefficient between the score of each item and the total score of the questionnaire was 0.381–0.715 ($P<0.001$). As a consequence of these findings, all items were retained.

Validity
Content validity All the participants reported that they understood the items and were easy to answer. The I-CVI of the Chinese CADES ranged from 0.86 to 1.00, and the S-CVI was 0.972, well above the criterion for content validity, indicating acceptable content validity.

Construct validity

(1) The results of exploratory factor analysis showed that the KMO index of the Chinese version of CADES was 0.922, and Bartlett's sphere test value was 2,852.273 ($P<0.001$), confirming the sampling appropriateness, with sufficient association between variables to perform factor analysis. Four common factors with eigenvalue > 1 were extracted by principal component analysis, which could explain 62.382% of the total variance. The loading of each item on its dimension in the component matrix was > 0.40 by maximum variance orthogonal rotation. Table 2 shows that a four-factor structure containing 25 items was the best structure. Differ from the 3-factor structural model of the original scale, item 9, 10, 11, and 12 became a new common factor. Combined with professional knowledge and the actual clinical significance of the item, item 9 still belonged to the dimension of the original scale.

(2) The 25 items were used as observation variables to establish a structural equation model, with the maximum likelihood method employed for model estimation. The fitting indexes of the initial model were not ideal, indicating a deviation between the default model and the actual observation data (Fig. 2). Following two revisions, the fitting indexes improved to greater than 0.9, reaching an acceptable

Table 1 Characteristics of the participants (*N*=391)

Variables	Groups	Sample A (*n*, %)	Sample B (*n*, %)
Sex	Male	122 (67.78)	135 (63.98)
	Female	58 (32.22)	76 (36.02)
Age	30–40	8 (4.44)	3 (1.42)
	41–50	11 (6.11)	16 (7.58)
	51–60	42 (23.33)	45 (21.33)
	61–75	119 (66.11)	147 (69.67)
Marital status	Married	135 (75.00)	171 (81.04)
	Single (never married, separated, widowed, or divorced)	45 (25.00)	40 (18.96)
Education level	Junior middle school and below	114 (63.33)	137 (64.93)
	High school or technical secondary school	52 (28.89)	61 (28.91)
	College and above	14 (7.78)	13 (6.16)
Disease duration (years)	< 1	60 (33.33)	81 (38.39)
	1–5	84 (46.67)	90 (42.65)
	> 5	36 (20.00)	40 (18.96)

Table 2 CADES item-factor analysis (*n* = 211)

Items	Factor loadings			
	I	II	III	IV
Q1	0.546	-	-	-
Q2	0.740	-	-	-
Q3	0.611	-	-	-
Q4	0.785	-	-	-
Q5	0.754	-	-	-
Q6	0.707	-	-	-
Q7	0.694	-	-	-
Q8	0.513	-	-	-
Q9	-	0.703	-	-
Q10	-	0.646	-	-
Q11	-	0.702	-	-
Q12	-	0.526	-	-
Q13	-	-	0.715	-
Q14	-	-	0.621	-
Q15	-	-	0.766	-
Q16	-	-	0.579	-
Q17	-	-	0.610	-
Q18	-	-	0.706	-
Q19	-	-	0.425	-
Q20	-	-	-	0.796
Q21	-	-	-	0.794
Q22	-	-	-	0.791
Q23	-	-	-	0.660
Q24	-	-	-	0.802
Q25	-	-	-	0.801

range (Fig. 3). Table 3 presents the fitting indexes before and after the modification.

Criterion-related validity

The C-GSES is used as the gold standard to measure the criterion validity. Pearson's correlation test was performed on the scores of the Chinese CADES and C-GSES, and the correlation coefficient was 0.634 (*P* < 0.001).

Reliability

The Cronbach's α coefficient of the Chinese version of CADES was 0.928, and the Cronbach's α coefficients of the four factors were 0.856, 0.683, 0.845, and 0.913, respectively. The scale was divided into two parts according to the odd and even numbers, and Guttman's split-half coefficient was 0.777. The McDonald's omega reliability coefficient of the total scale was calculated as 0.926. The reliability for the four sub-dimension of the scale were 0.858, 0.706, 0.848, and 0.913.

Discussion

Assessing the level of empowerment in patients with CAD can help medical staff identify gaps in self-management support and tailor interventions accordingly. The
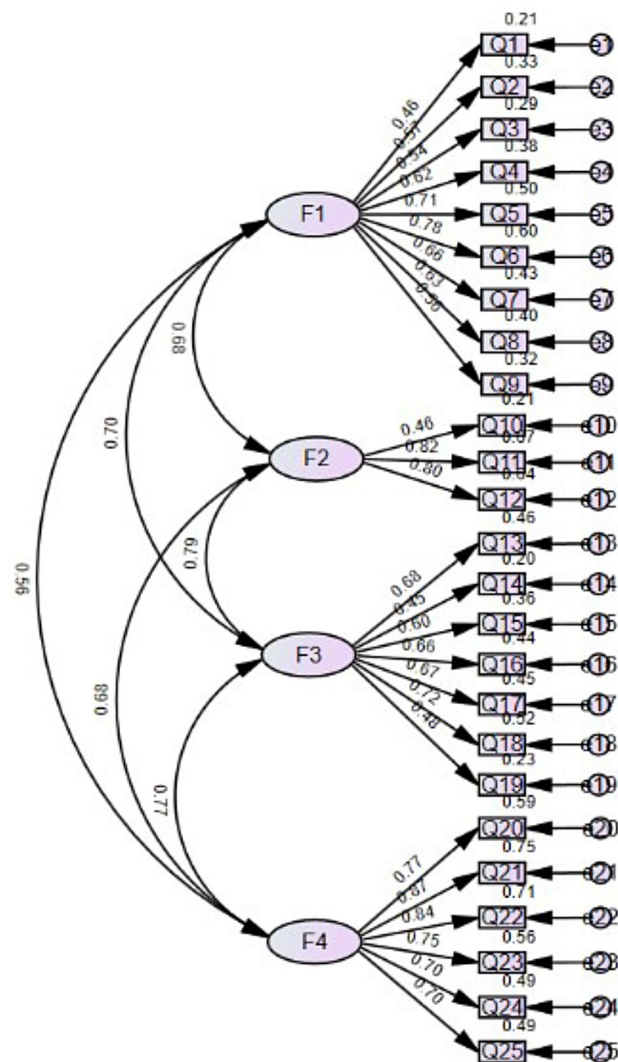

Fig. 2 Fitting figure of default model of the Chinese version of the Coronary Artery Disease Empowerment Scale

purpose of this study was to psychometrically evaluate an instrument to assess empowerment in CAD patients, namely, CADES. Through a rigorous cultural adaptation process, we successfully translated the scale into Chinese and validated it, ensuring its reliability and validity. The Chinese version of CADES covered four dimensions, offering a comprehensive assessment of intrapersonal, interactional, and behavioral aspects crucial for the health empowerment of CAD patients. Given the heightened risk of CAD complications such as arrhythmia and heart failure, patients face substantial challenges in managing their condition. Our scale's targeted item content addresses this issue, sidestepping the low sensitivity often associated with universal scales [32].

Reliability refers to the internal consistency of the measured results. When there is a strong internal correlation or homogeneity among items, it suggests that all items
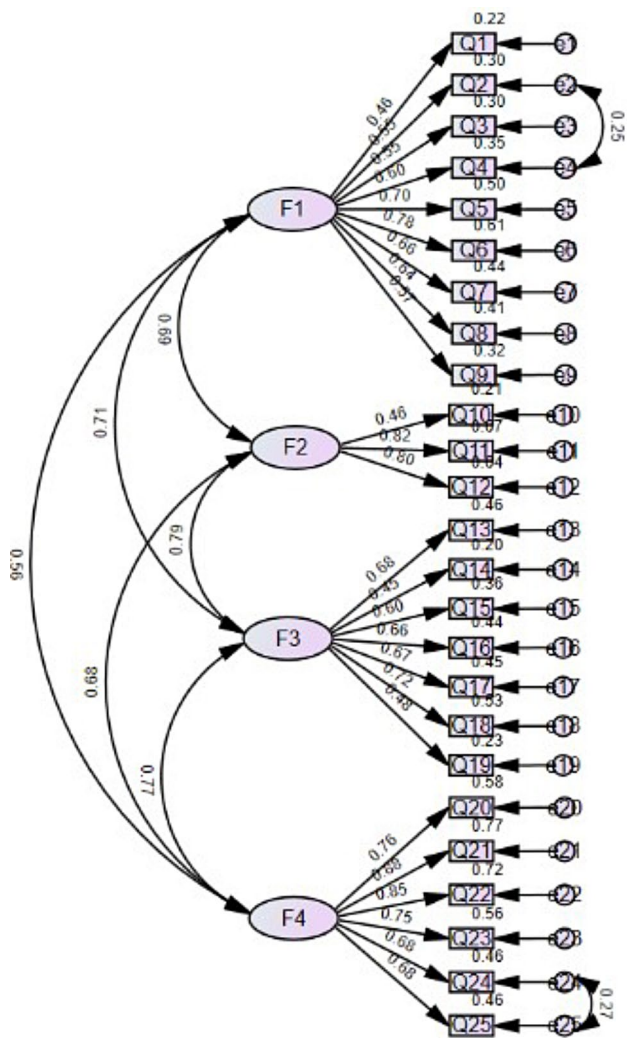
Fig. 3 Fitting figure of modification model of the Chinese version of the Coronary Artery Disease Empowerment Scale

Table 3 Fitting indexes before and after the model modification

Indexes	χ^2/df	CFI	TLI	IFI	RMSEA
Before modification	1.847	0.901	0.890	0.903	0.063
After modification	1.764	0.912	0.901	0.913	0.060
Reference standards	1–3	>0.90	>0.90	>0.90	<0.05 very good <0.08 good <0.10 fair

are consistently measuring the same problem or indicator, thus enhancing the reliability of the scale [33]. It is generally believed that Cronbach's alpha coefficient of 0.81 to 1.00 indicates almost perfect agreement, 0.61 to 0.80 indicates agreement, and 0.41 to 0.60 indicates moderate agreement. In this study, the Cronbach's α coefficient of CADES was 0.928, indicating good internal consistency for the Chinese version of CADES.

In addition, the split-half reliability of the scale was 0.777, which was higher than 0.7, indicating acceptable reliability.

Validity encompasses content validity, construct validity, and criterion-related validity, assessing the accuracy of a measurement tool in reflecting real-world phenomena. In this study, seven experts with extensive clinical experience and solid professional knowledge were invited to evaluate the content validity. The content validity of the Chinese version of CADES in this study was 0.972. The construct validity reflects the alignment between measurement results and theoretical models, with higher validity indicating a more accurate measurement of the subject matter [34]. Exploratory factor analysis revealed four factors, with item loadings ranging from 0.425 to 0.802, accounting for 62.382% of the total variance. Items 9, 10, 11, and 12 formed a new common factor. Based on expert opinions and theoretical concepts, the research team decided to retain item 9 in its original dimension, while items 10, 11, and 12 were reclassified under the same dimension. Empowerment encompasses intrapersonal, interactional, and behavioral aspects. The interactional domain includes economic support exploration (item 10), active communication with healthcare professionals (item 11), and support systems (item 12). An instrument for Chinese patients with diabetes similarly divided empowerment into interactional and behavioral factors, consistent with our findings [35]. The final determination was that the scale comprises a four-dimensional structure: self-determination (items 1–9), seeking support (items 10–12), emotional self-regulation (items 13–19), and personal competence of disease management perception (items 20–25). Confirmatory factor analysis was employed to further validate the structure. Although the initial model did not demonstrate a good fit with the data, model fit indices improved after adding the error terms for two pairs of items in the modification model, given the evident causal relationships between paired items, such as items 2 and 4. Criterion-related validity assesses the correlation between the test scale and a reference scale. The Chinese CADES demonstrated a correlation coefficient of 0.634, exceeding the criterion-related validity of the original scale. This discrepancy may be attributed to socioeconomic differences in sample populations and reference scales.

By applying the the Chinese version of the CADES to CAD patients, we were able to examine the important relationship between empowerment and patient outcomes. This approach improves patients' awareness of CAD and its management, encouraging them to actively participate in their health care. Healthcare professionals can use the Chinese version of the CADES to evaluate patient empowerment, providing a reference for designing empowerment interventions and enhancing

Jiang *et al. BMC Cardiovascular Disorders*   (2024) 24:438

Page 8 of 9

interactions between healthcare professionals and CAD patients. In the future, the use of the CADES is likely to facilitate greater patient empowerment beyond just patient participation and patient-centered care, thus improving communication and understanding in healthcare policies [36].

Limitations

The study also has several limitations worth noting. Firstly, the population under investigation was limited to patients in Hangzhou, potentially restricting the generalizability of the findings due to sample selection bias. It is necessary to gradually expand the test to different provinces in China to ensure that a larger sample size fully represents the Chinese population. Secondly, this study examined the construct validity, content validity, and criteria-related validity of the CADES to confirm its clinical usefulness. However, responsiveness, interpretability, and predictive validity were not tested and should be addressed in future research. Lastly, as patients were surveyed on the day of discharge, the effects of their relationship with the investigators, as well as their physical condition and mood at the time of the study, could not be fully controlled. Future studies should address these factors by increasing the sample size and considering additional variables that might affect individual empowerment.

Conclusion

This study provides preliminary evidence for the validity and reliability of the Chinese version of CADES in patients with CAD. The findings suggest that the Chinese version of CADES is a potentially appropriate tool for evaluating patient empowerment. Furthermore, it is recommended to assess the measurement variance of the Chinese CADES across diverse Chinese populations residing in various regions and among individuals with different characteristics.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12872-024-04114-4.

Supplementary Material 1

Author contributions
Z.J., Z.W., and L.H. conceived and designed the study. Z.J., W.W., Z.D., Y.L., and Y.Y. helped with data collection. Z.J., Z.W., and L.H. provided statistical advice on study design and performed data analysis. Z.J., Z.W., and L.H. contributed to manuscript preparation and revision. All authors read and approved the final manuscript.

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

Declarations

Ethics approval and consent to participate
All procedures were carried out in accordance with the 1964 Helsinki declaration, and the research proposal was approved by the Ethics Committee of the First Affiliated Hospital, College of Medicine, Zhejiang University (IIT20220341B-R1). All study participants received informed consent.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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