ORIGINAL RESEARCH

Psychometric evaluation of the Thai version of the Self-Care of Coronary Heart Disease Inventory Version 3

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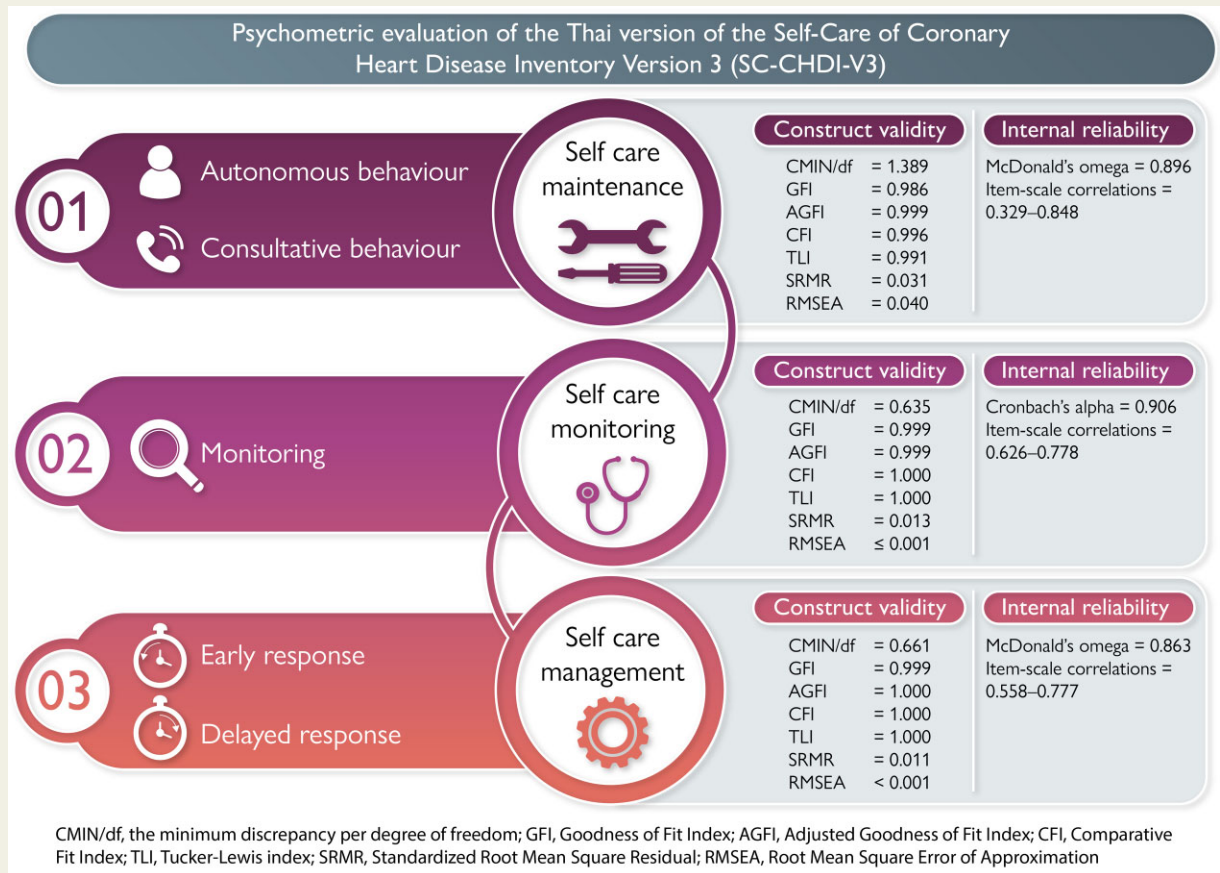|	
Aims	Engaging in self-care is an important aspect of the prevention and management of coronary heart disease (CHD), the leading cause of premature death in Thailand. As no validated tool exists to measure self-care in Thai people with CHD, we translated and examined the psychometric properties of the Self-Care of Coronary Heart Disease Inventory Version 3 (SC-CHDI-V3) in a Thai population.
Methods and results	The SC-CHDI-V3 was translated into Thai using the standard forward and backward translation procedure for self-care instruments. A cross-sectional design was used to examine the psychometric properties of the Thai version of the SC-CHDI-V3 in 250 patients with confirmed CHD in a tertiary hospital in southern Thailand. Cronbach's alpha and McDonald's omega coefficients were used to assess internal consistency, and confirmatory factor analysis was performed to assess construct validity. The Thai version of the SC-CHDI-V3 demonstrated acceptable internal consistency (Cronbach's alpha and McDonald's omega coefficients of each scale ranged from 0.821 to 0.910). Reliability estimates were adequate for each scale (range 0.863–0.906). Confirmatory factor analysis supported the original factor structure of the instrument, with good fit indices for all three scales (comparative fit index = 0.996–1.000; root mean square error of approximation = <0.001–0.040).
Conclusions	The Thai version of the SC-CHDI-V3 appears to be a valid and reliable instrument for measuring engagement in self-care maintenance, self-care monitoring, and self-care management among Thai people with CHD.

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Graphical Abstract

Psychometric evaluation of the Thai version of the Self-Care of Coronary Heart Disease Inventory Version 3 (SC-CHDI-V3)

01
Autonomous behaviour
Consultative behaviour

Self care maintenance

Construct validity	
CMIN/df	= 1.389
GFI	= 0.986
AGFI	= 0.999
CFI	= 0.996
TLI	= 0.991
SRMR	= 0.031
RMSEA	= 0.040

Internal reliability
McDonald's omega = 0.896
Item-scale correlations = 0.329–0.848

02
Monitoring

Self care monitoring

Construct validity	
CMIN/df	= 0.635
GFI	= 0.999
AGFI	= 0.999
CFI	= 1.000
TLI	= 1.000
SRMR	= 0.013
RMSEA	≤ 0.001

Internal reliability
Cronbach's alpha = 0.906
Item-scale correlations = 0.626–0.778

03
Early response
Delayed response

Self care management

Construct validity	
CMIN/df	= 0.661
GFI	= 0.999
AGFI	= 1.000
CFI	= 1.000
TLI	= 1.000
SRMR	= 0.011
RMSEA	< 0.001

Internal reliability
McDonald's omega = 0.863
Item-scale correlations = 0.558–0.777

CMIN/df, the minimum discrepancy per degree of freedom; GFI, Goodness of Fit Index; AGFI, Adjusted Goodness of Fit Index; CFI, Comparative Fit Index; TLI, Tucker-Lewis index; SRMR, Standardized Root Mean Square Residual; RMSEA, Root Mean Square Error of Approximation

Novelty

- This is the first translation and psychometric evaluation of a Thai version of the Self-Care of Coronary Heart Disease Inventory Version 3 (SC-CHDI-V3).
- The Thai version of the SC-CHDI-V3 appears to be a valid and reliable instrument for measuring engagement in self-care maintenance, self-care monitoring, and self-care management among Thai people with CHD.
- The new self-care monitoring scale, which replaced the self-care confidence scale of the previous version of the SC-CHDI, may identify patients who are likely or not to pay attention to their health condition and any changes arising from it or its treatment.

Introduction

Coronary heart disease (CHD) is the leading cause of death worldwide, responsible for 16% of the world's total deaths.[1] The total number of disability-adjusted life years (DALYs) due to CHD has risen steadily since 1990, reaching 182 million DALYs and 9.14 million deaths in 2019. The age-standardized death rate is estimated to be increasing in South East Asia, including Thailand.[2] In Thailand, CHD has been the leading cause of premature death for over a decade,

a trend expected to continue,[3] even though it is estimated that about half of these deaths could be prevented by risk factor control.[4]

Risk factor control can be accomplished by lifestyle modification and/or medical treatment, including stopping smoking, consuming a healthy diet, taking regular exercise, losing weight, and managing stress.[5] Clinical practice guidelines for the prevention and management of CHD recommend that patients engage in self-care, including unhealthy behaviour modification, medication adherence, and symptom monitoring.[6] It is well established that patients who adhere to these recommendations

through effective self-care have a reduced risk of recurrence of cardio-vascular disease.[6,7] Systematic reviews have demonstrated the benefits of effective self-care in reducing cardiovascular risk, including improved quality of life and reduced health service costs.[8–10]

Although self-care is an important aspect of CHD prevention and management, there is a dearth of studies examining self-care in Thai populations. Studies that measure self-care as an outcome have found poor-to-moderate engagement with regards to diet, exercise, smoking, stress, or medication adherence.[11] While studies of self-care interventions for Thai people with CHD appear to show some improvement in self-care abilities,[12–14] the variety and poor description of such interventions and the absence of validated self-care measures specifically for use in a Thai population have precluded firm conclusions from being drawn. As Thailand faces a growing burden of caring for people with CHD in the future, there is a pressing need for a psychometrically sound instrument to assess self-care in this population in order to guide appropriate interventions with the aim of improving patient health outcomes and patient and caregiver experiences.

Instruments to assess specific aspects of self-care ability among patients with CHD include the Cardiac Self-Efficacy Scale[15] and the Heart Health Self-Efficacy and Self-Management scale,[16] though their limited uptake, use and coverage of self-care in Thailand has indicated that there is a need for an instrument that provides a more comprehensive and clinically meaningful assessment. An instrument that shows potential is the Self-Care of Coronary Heart Disease Inventory (SC-CHDI).[17] A Thai version of the SC-CHDI will help not only provide a more comprehensive assessment of self-care, but also, as the inventory has been translated into other languages, permit comparisons of patients' self-care across Asia and other parts of the world.

The SC-CHDI has been translated and published in several languages and used to assess self-care maintenance, self-care management, and self-care confidence in populations in Lithuania, China, Iceland, Catalonia, Brazil, Uruguay, Italy, and Turkey (www.self-care-measures.com). Recently, the SC-CHDI has been revised—version 3 (V3)[18] and, as with a self-care instrument for patients with hypertension,[19] it is based on a theory of self-care of chronic illness.[20] This latest version of the SC-CHDI-V3 comprises three scales: self-care maintenance; self-care management; and self-care monitoring. The self-monitoring scale replaced the 'self-care confidence scale' of the previous version of the SC-CHDI. Further, the response format was revised from a 4-point to a 5-point Likert scale.[18]

The purpose of this study was to translate the SC-CHDI-V3 into Thai and examine its psychometric properties in a sample of Thai-speaking patients with CHD in southern Thailand.

Methods

Study design

We conducted a cross-sectional study of patients recruited from the outpatient clinic of a public tertiary hospital (800 beds) cardiac centre in southern Thailand, from April to June 2021. The cardiac centre performs revascularization procedures such as percutaneous coronary intervention and coronary artery bypass grafting.

Sample

`A convenience sample of patients with CHD was enrolled. Inclusion criteria were: (i) age 18 years or over; (ii) documented clinical diagnosis of CHD

(angina, myocardial infarction, stent placement, or coronary artery bypass surgery); and (iii) able to give informed consent. Patients with cognitive dysfunction, mental illness, frailty, as determined on the basis of documented medical history, and difficulty communicating were excluded.

The suggested minimum sample size for exploratory factor analysis is $n = 150–200$ with a ratio of 5–10 participants per item.[21] To allow adequate inference in confirmatory factor analysis, we determined a participant-to-item ratio of 10:1 was necessary. The SC-CHDI-V3 comprises 3 scales and 23 items, thus a minimum of 230 participants was required. We enrolled 250 to allow for possible attrition. During data collection, there was no dropout.

Ethical approval

Ethical approval for this study was granted by the Institutional Review Board of Suratthani Hospital (REC 64-0020). The study conforms to the principles outlined in the Declaration of Helsinki. Prior to data collection, participants were given a full explanation of the purpose of the study, its procedures, expected benefits and potential harms, and were informed of their right to withdraw from the study at any time. They were also assured of confidentiality. For those who agreed to participate, written informed consent was obtained. All data were coded to ensure anonymity and kept securely in a locked cabinet or via encryption, with access given only to the research team.

Procedure

Patients with CHD who had been discharged from hospital and fulfilled the inclusion criteria received a written description of the study. Eligible patients were approached individually by the nurse researcher and informed about the purpose of the study and the time required for participation. After permission was granted, patients were invited to complete a set of paper-based self-administered questionnaires. For patients who could not read unaided, a nurse read out the questions and entered the responses on their behalf. Questionnaires were administered in the outpatient clinic and took approximately 30 min to complete.

Instrument

The SC-CHDI-V3 comprises 23 items divided across 3 scales: self-care maintenance (9 items); self-care monitoring (7 items); and self-care management (7 items).[18]

The self-care maintenance scale asks patients how routinely do they, for example, keep healthcare appointments, take medications, and do physical activity. The self-care monitoring scale asks patients how often they, for example, monitor their condition, how they feel, and their blood pressure. The self-care management scale asks patients, if they have any symptoms, how likely they to try, for example, to change their activity level, take medication, and tell their healthcare provider. Each item on the 3 scales is scored 1–5 on a 5-point Likert scale.

Scoring instructions for the SC-CHDI-V3 use a standardized score computed separately for each individual score. It is recommended that if the respondent answers ≥50% of the items in a multi-item scale (e.g. self-care maintenance), the score should be calculated. If the respondent answered ≤50% of the items, the score for that scale should be set to missing. To compute a standardized score, a raw scale score is first computed, then transformed to a standardized score that ranges from 0 to 100.

Instrument translation

The English version of the SC-CHDI-V3 was forward and backward translated using the five steps for self-care instrument translation recommended.[22] In the first step, permission was granted by the original instrument developer (Barbara Riegel) of the SC-CHDI to translate it into Thai. In the second step, forward translation of the SC-CHDI from English to

Thai language was independently performed by two bilingual translators with a good command of English: one a doctoral-prepared nurse and the other a non-medical professional. Both drafts from the translators were identified as TH1 and TH2, respectively. In the third step, TH1 and TH2 were synthesized in order to reduce bias from the translation. This was followed by another review and verification by a bilingual (English and Thai) researcher and two translators who assessed the concepts and the appropriate use of language. Versions TH1 and TH2 were combined to form the SC-CHDI-V3 Thai version. This process was used such that the Thai version of the SC-CHDI-V3 was translated having the same meaning as the original. In the fourth step, two new independent bilingual translators translated the Thai version of the SC-CHDI-V3 back to English. They were blinded from the original version of the inventory. The two back-translated English versions, TH-E1 and TH-E2, respectively, were synthesized into one English version.[22] Translated versions were compared with the original to identify and amend any incorrect use of language and potential misinterpretations by an expert group including all translators. After the translation and adaptation process, the final Thai version was tested for content validity by five experts: two cardiologists, two advanced practice nurses with more than 5 years of experience in cardiovascular nursing, and a doctoral-prepared nurse instructor with more than 5 years of experience in cardiovascular nursing. This version was then sent for review to the developer of the instrument (Barbara Riegel) for a final check.

Data analysis
Content validity
To assist with determining presence of cultural differences as a product of backward and forward translation, item ratings were analysed using a Content Validity Index (CVI), the most widely used method of quantifying content validity for multi-item scales.[23] The Thai version of the SC-CHDI-V3 was reviewed by five experts (as above). The CVI was calculated as a proportion of total 'item relevance' ratings (0–1) by each member of the expert panel, with higher scores indicating higher degrees of agreement on the relevance of an item for the scale. An item with a CVI score of 0.8 or over was deemed relevant.[23]

Construct validity and reliability
Exploratory factor analysis (EFA) with varimax rotation was performed using SPSS (version 28; SPSS Inc., Chicago, IL, USA). Factor extraction was performed to test the dimensionality of the SC-CHDI-V3 Thai version using the principal component analysis method. The criterion used was an eigenvalue >1.[24] Factor extraction was performed to test the dimensionality of the Thai version of the SC-CHDI-V3. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were computed in the first step of the EFA: a KMO of at least 0.7 and a Bartlett's test of sphericity of $P < 0.05$ indicates item sets are suitable for confirmatory factor analysis (CFA).

We performed CFA using Stata/BE17 (StataCorp LLC) to test the structure of the Thai version of the SC-CHDI-V3 with maximum likelihood estimation.[25] We evaluated the following fit indices and criteria using common thresholds for acceptable fit.[26,27] Goodness of fit index (GFI; >0.90), adjusted goodness of fit index (AGFI; >0.90), comparative fit index (CFI; >0.95), Tucker–Lewis index (TLI; >0.95), root mean square errors of approximation (RMSEA; <0.08), and standardized root mean square residuals (SRMR; <0.08).[26,27] CMIN/df was used to evaluate the fit between the theoretical model and sample data, where values of 2 or lower indicate a good fit.

Internal consistency was calculated with Cronbach's alpha and McDonald's omega coefficients,[28,29] the latter being a more general estimator of reliability because it does not assume essential tau equivalence.[20] Values of >0.7 are considered to indicate an acceptable level of internal consistency.[28,29] The item-to-scale correlation, which assesses the extent to which the item is related to the remainder of its scale with the item omitted, should exceed 0.3.[28]

Results
Sample characteristics
The sample ($n = 250$) had a mean age of 60 years, and a mean duration of CHD of 2 years; over two-thirds were males, just over half were educated to primary school level and nearly one-third to secondary school level (*Table 1*).

Content validity
The CVI of the Thai version of the SC-CHDI-V3 was 0.86. The item-level CVI for the self-care maintenance, self-care monitoring, and self-care management scales were 0.87, 0.86, 0.87, respectively.

Table 1   Sociodemographic characteristics ($n = 250$)

Characteristic	n	%
Gender		
Male	178	71.2
Female	72	28.8
Age (59.8 ± 11.2)		
≤ 60	137	54.8
>60	113	45.2
Education level		
Illiterate	4	1.6
Primary school	138	55.2
Secondary school/college	76	30.4
Undergraduate and master	32	12.8
Profession		
Unemployed/student	46	18.4
Employee	32	12.8
Business owner/trader	41	16.4
Public employee	24	9.6
Farmer	107	42.8
Marital status		
Married	207	82.8
Single	21	8.4
Divorced/widowed	22	8.8
Co-morbidity		
Diabetes	64	25.6
Hypertension	140	56.0
Dyslipidaemia	154	61.6
Years since CHD diagnosis	Mean (SD) 2.7 (2.2)	
<1	102	40.8
1–5	113	45.2
6–10	30	12.0
>10	5	2.0

SD, standard deviation.

Table 2 Exploratory factor analysis and reliability of the self-care maintenance scale ($n = 250$)

Item	Component and factor loadings		Item-to-scale correlation	McDonald's omega if item deleted	McDonald's omega
	Factor 1 Consultative	Factor 2 Autonomous			
1. Keep appointments with your healthcare provider?	0.858		0.329	0.910	0.896
2. Take aspirin or other blood thinner?	0.837		0.501	0.893	
3. Do something to relieve stress (e.g. medication, yoga, music)?		0.940	0.848	0.863	
4. Do physical activity (e.g. take a brisk walk, use the stairs)?		0.857	0.833	0.864	
5. Take prescribed medicines without missing a dose?	0.711		0.643	0.882	
6. Ask for low fat items when eating out or visiting others?		0.525	0.460	0.894	
7. Try to avoid getting sick (e.g. flu shot, wash your hands)?		0.854	0.745	0.875	
8. Eat fruits and vegetables?		0.858	0.769	0.871	
9. Avoid cigarettes and/or smokers?		0.850	0.708	0.877	
Eigen value	4.322	2.142			
Variance	48.028	23.799			
Cumulative variance	48.028	71.827			

Kaiser–Meyer–Olkin $= 0.865$, Bartlett's $\chi^2 = 1570.778$ ($P < 0.001$).

Construct validity and reliability

Self-care maintenance scale

Preliminary tests for EFA showed acceptable values (KMO 0.865 and Bartlett's test $\chi^2 = 1570.778$, $P < 0.001$), indicating that the correlations were sufficient for analysis, which revealed two factors—Factor 1 'consultative behaviour', comprising three items, and Factor 2 'autonomous behaviour', comprising six items—explaining 71.83% of the total variance: Factor 1, 48.03%; Factor 2, 23.80% (Table 2). In CFA, after adjusting for error of covariance, the model demonstrated a good fit: CMIN/df = 1.389, GFI = 0.986, AGFI = 0.999, CFI = 0.996, TLI = 0.991, SRMR = 0.031, RMSEA = 0.040 (Table 3). Standardized estimated factor loadings ranged from 0.47 to 0.99 (Figure 1). McDonald's omega was 0.896 and item-scale correlations ranged from 0.33 to 0.85 (Table 2).

Self-care monitoring scale

Preliminary tests for EFA showed acceptable values (KMO 0.889 and Bartlett's test $\chi^2 = 1097.757$, $P < 0.001$), indicating that the correlations were sufficient for analysis, which revealed one factor—'Monitoring' comprising seven items—explaining 64.13% of the total variance (Table 4). In CFA, the model demonstrated a good fit: CMIN/df = 0.635, GFI = 0.999, AGFI = 0.999, CFI = 1.000, TLI = 1.000, SRMR = 0.013, RMSEA = <0.001 (Table 3). Standardized estimated factor loadings ranged from 0.64 to 0.82 (Figure 2). Cronbach's alpha was 0.906 and item-scale correlations ranged from 0.63 to 0.78 (Table 4).
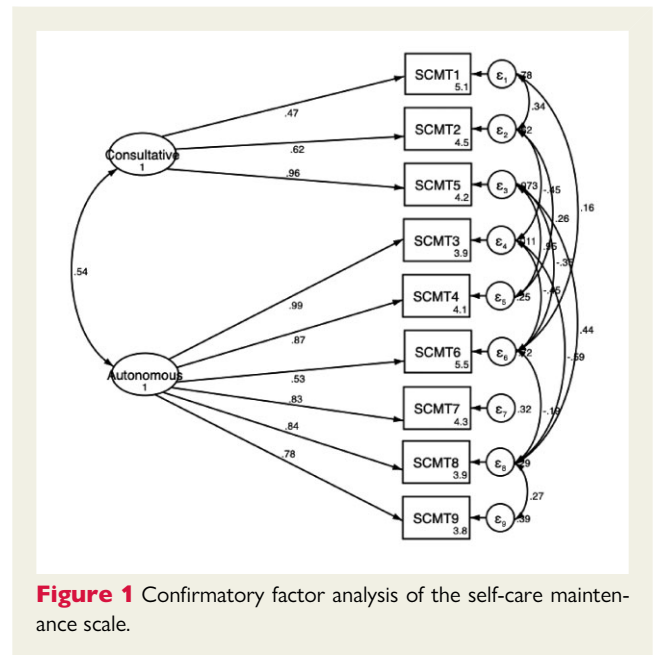

Figure 1 Confirmatory factor analysis of the self-care maintenance scale.

Self-care management scale

Preliminary tests for EFA showed acceptable values (KMO 0.745 and Bartlett's test $\chi^2 = 932.868$, $P < 0.001$), indicating that the

correlations were sufficient for analysis, which revealed two factors—Factor 1 'early response', and Factor 2 'delayed response', each comprising three items—explaining 78.23% of the total variance: Factor 1, 41.05%; Factor 2, 37.17% (*Table 5*). In CFA, after adjusting for error of covariance, the model demonstrated a good fit: CMIN/df = 0.661, GFI = 0.999, AGFI = 1.000, CFI = 1.000, TLI = 1.000, SRMR = 0.011, RMSEA = <0.001 (*Table 3*). Standardized estimated factor loadings ranged from 0.57 to 0.88 (*Figure 3*). McDonald's omega was 0.863, and item-scale correlations ranged from 0.56 to 0.78 (*Table 5*). One item (17) 'The last time you had a symptom… how quickly did you recognize it as a heart symptom?' did not load on either factor.

Discussion

In this study, we translated and tested the psychometric properties of the Thai version of the SC-CHDI-V3 which comprises three scales: self-care maintenance, self-care monitoring, and self-care management. To the best of our knowledge, this is the first study

to do so. Overall, we found the three scales of the Thai version of the SC-CHDI-V3 to be psychometrically sound, indicating the inventory is a valid and reliable measure of self-care ability among Thai patients with CHD.

Construct validity was shown to be acceptable across the three scales, indicating the potential to assist healthcare professionals in the assessment of self-care ability among Thai patients with CHD. For example, the self-care maintenance scale may allow for the identification of patients who are likely or not to keep healthcare appointments or take medications. The self-care monitoring scale may allow for the identification of patients who are likely or not to pay attention to their health condition and any changes arising from it or its treatment. Lastly, the self-care management scale may allow for the identification of patients who are likely or not to respond and act quickly and appropriately to abnormal signs and symptoms if and when they occur.

The nine-item self-care maintenance scale demonstrated good fit statistics for a two-factor structure, classified as 'autonomous behaviour' that requires self-motivation, and 'consultative behaviour' that is influenced by others, similar to the structure of the self-care maintenance scale of the SC-CHDI.[17] The new item (7) in the self-care
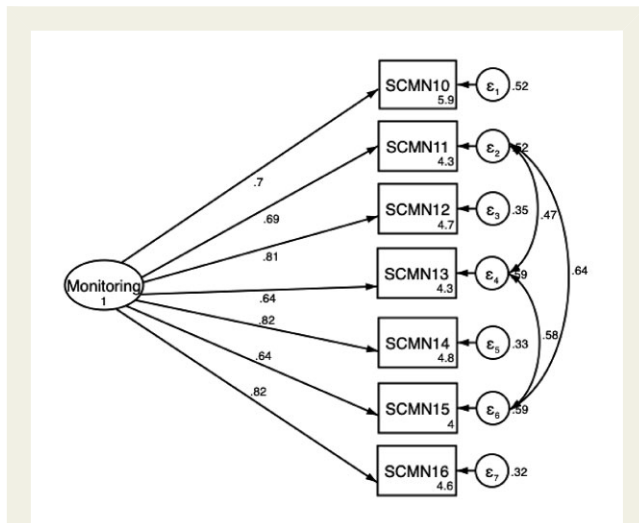

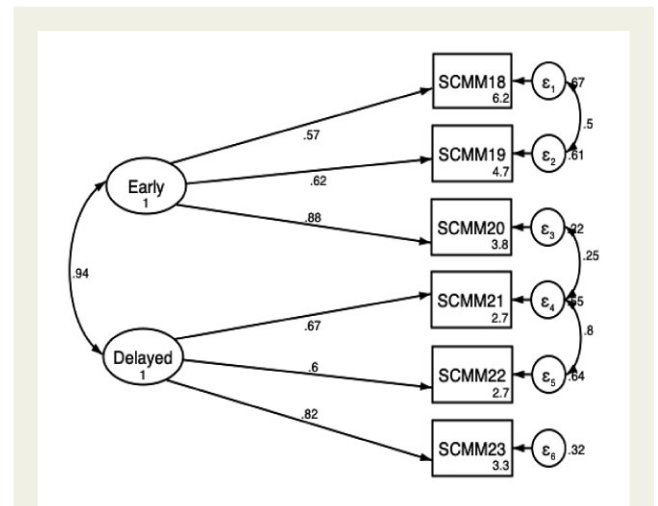**Figure 2** Confirmatory factor analysis of the self-care monitoring scale.

Figure 3 Confirmatory factor analysis of the self-care management scale.

Table 3   Fit index values for the Thai Self-Care of Coronary Heart Disease Inventory Version 3

Thai SC-CHDI-V3	Model	χ^2 test goodness of fit				GFI	AGFI	CFI	TLI	SRMR	RMSEA
		χ^2	df	*P*-value	CMIN/df						
Maintenance	Before adjust model	131.76	26	<0.001	5.067	0.917	0.992	0.932	0.906	0.064	0.128
	After adjust model	20.84	15	0.142	1.389	0.986	0.999	0.996	0.991	0.031	0.040
Monitoring	Before adjust model	163.32	14	<0.001	11.666	0.853	0.978	0.864	0.796	0.075	0.207
	After adjust model	6.99	11	0.800	0.635	0.999	0.999	1.000	1.000	0.013	<0.001
Management	Before adjust model	157.11	8	<0.001	19.639	0.834	0.971	0.840	0.700	0.125	0.274
	After adjust model	3.30	5	0.653	0.661	0.999	1.000	1.000	1.000	0.011	<0.001

CMIN/df, the minimum discrepancy per degree of freedom; GFI, goodness of fit index; AGFI, adjusted goodness of fit index; CFI, comparative fit index; TLI, Tucker–Lewis index; SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation.

Table 4 Exploratory factor analysis and reliability of the self-care monitoring scale (n = 250)

Item	Component and factor loadings Factor 1 Monitoring	Item-to-scale correlation	Cronbach's alpha if item deleted	Cronbach's alpha
10. Monitor your condition?	0.720	0.626	0.902	0.906
11. Pay attention to changes in how you feel?	0.843	0.778	0.886	
12. Check your blood pressure?	0.804	0.723	0.892	
13. Monitor whether you tire more than usual doing normal activities?	0.801	0.725	0.892	
14. Monitor for medication side effects?	0.805	0.724	0.892	
15. Monitor for symptoms?	0.822	0.749	0.889	
16. Monitor your weight?	0.805	0.721	0.892	
Eigen value	4.489			
Variance	64.133			
Cumulative variance	64.133			

Kaiser–Meyer–Olkin = 0.889, Bartlett's χ^2 = 1097.757 (P < 0.001).

Table 5 Exploratory factor analysis and reliability of the self-care management scale (n = 250)

Item	Component and factor loadings Factor 1 Early	Factor 2 Delayed	Item-to-scale correlation	McDonald's omega if item deleted	McDonald's omega
18. Change your activity level (slow down, rest)?	0.863		0.558	0.860	0.863
19. Take an aspirin?	0.880		0.566	0.864	
20. Take a medicine to make the symptom decrease or go away?	0.605		0.744	0.822	
21. Call your healthcare provider for guidance?		0.928	0.678	0.844	
22. Tell your healthcare provider about the symptom at the next office visit?		0.587	0.677	0.831	
23. Did the treatment you used make you feel better?		0.925	0.777	0.821	
Eigen value	2.463	2.230			
Variance	41.052	37.172			
Cumulative variance	41.052	78.224			

Kaiser–Meyer–Olkin = 0.745, Bartlett's χ^2 = 932.868 (P < 0.001).

maintenance scale of the SC-CHDI-V3, 'Try to avoid getting sick (e.g. flu shot, wash your hands)', loaded on the 'autonomous behaviour' factor. This may be due to perceptions of vaccine efficacy and safety and associated risks[30,31] especially as this study was conducted during the COVID-19 pandemic, when public health communications urged having a flu shot, washing hands, wearing a mask, and maintaining social distancing.[32] Also, regarding the CFA, of all nine items, Item 1 'Keep appointments with your healthcare provider' had a weaker factor loading (0.47), which may have been related to the pandemic,

with hospital appointments and visits curtailed and widespread fear of contagion.

The seven-item self-care monitoring scale demonstrated good fit statistics for a one factor structure, which is the same as that of the Self-Care of Hypertension Inventory.[19] These scale items related to patients monitoring their general condition, feelings, vital signs, and medications. The psychometric properties of this scale indicate that it is a useful tool for self-care monitoring in this population.

The six-item self-care management scale demonstrated good fit statistics for a two-factor structure, classified as 'early response' and 'delayed response', similar to the structure of the self-care management scale of the SC-CHDI.[17] In the Thai version of the SC-CHDI-V3, 'early response' related to rapidly changing activity levels and take medications, whereas 'delayed response' reflected a more protracted approach to self-care management, such as seeking guidance from the healthcare provider. The two-factor structure was slightly different from that identified in the SC-CHDI.[17] In our study, Items 19 and 20, pertaining to medication, belonged to the factor 'early recognition and response', whereas in the earlier study, they loaded on the factor 'delayed response'.[17] A possible explanation may be recent raised awareness that early oral aspirin and nitroglycerin administration, including self-administration, is associated with better health outcomes, such as a reduction in chest pain[33] and prevention or limitation of adverse cardiovascular events in this population.[34] Although not found in the SC-CHDI, in our Thai version of the inventory after inspection of the modification indices (Item 20) 'Take a medicine to make the symptom decrease or go away' and (Item 21) 'Call your healthcare provider for guidance', we allowed for a degree of covariance due to a logical relationship between calling a healthcare provider for guidance, before taking medicine to make the symptom decrease or go away. Allowing measurement errors to correlate in CFA is permitted when it is plausible from a theoretical and methodological standpoint, noting that allowance for covariance between measurement errors has no effect on the estimation of the other parameters.[35,36] As Item 17 'The last time you had a symptom…how quickly did you recognize it as a heart symptom?' did not load on either factor, it was removed from the self-care management scale. A possible explanation may be that very few patients in this study population, including those who had received PCI or CABG, reported symptoms.

A strength of our study is the robust translation and validation of an instrument to aid Thai patients with CHD engaging in self-care, including additional checks for cultural translational differences—all items had a CVI >0.80, thus were deemed relevant to the scale.[23] Also, construct validity as demonstrated by CMIN/df, GFI, AGFI, CFI, TLI, RMSEA, and SRMR values was found to be consistent with the SC-CHDI in the US populations[17] and in Turkish and Chinese translated versions.[37,38] Robust internal consistency using Cronbach's alpha and McDonald's omega coefficients was identified for the inventory and its three scales.

There are some limitations to our study that should be noted. Data were collected on one occasion only, so we were unable to estimate scale item stability. Due to the use of a convenience sample, and thus potential selection bias, generalizability of our findings may be limited and caution should be exercised as self-care constructs may vary among countries due to cultural differences. As there has been no psychometric reporting of the SC-CHDI-V3, factor structures were compared with the old version (2.2) and the Self-Care of Hypertension Inventory,[19] a similar instrument based on the same theory and with a self-care monitoring scale, thus comparable with the SC-CHDI-V3. Also, because an expert panel was used, there is a lack of the patient/user perspective. Lastly, in the absence of a well-established comparable measure, we were unable to determine concurrent validity and predictive validity.

Conclusion

Our findings show the Thai version of the SC-CHDI-V3 to be a reliable and valid instrument to measure engagement in self-care, including self-care monitoring, among Thai patients with CHD. This instrument may aid the assessment of self-care ability by elucidating how patients maintain their health, monitor, recognize, and label their signs and symptoms, and how they respond to those changes. Further studies of this version of the instrument are warranted, including ones to estimate scale item stability, concurrent and predictive validity, and applicability among other populations and settings.

Funding

Data availability

The data that support the findings of this study are available from the first author [Naruebeth.Ko@gmail.com], upon reasonable request.

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