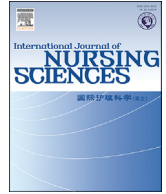




Contents lists available at ScienceDirect

International Journal of Nursing Sciences

journal homepage: <http://www.elsevier.com/journals/international-journal-of-nursing-sciences/2352-0132>

Research Paper

Cross-cultural adaptation and psychometric evaluation of the Thai version of the Enhancing Recovery in Coronary Heart Disease Social Support Inventory in individuals with chronic illnesses

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ARTICLE INFO

Article history:

Received 12 March 2024

Received in revised form

18 August 2024

Accepted 15 December 2024

Available online 16 December 2024

Keywords:

Chronic illness

Reliability

Self-care

Social support

Validity

ABSTRACT

Objectives: This study aimed to translate and psychometrically test the 7-item Enhancing Recovery in Coronary Heart Disease (ENRICH) Social Support Inventory (ESSI) scale within the Thai population.**Methods:** A scale translation and cross-sectional validation study was conducted. The English version was translated for Thai involved nine steps: preparation, forward translation, reconciliation, back-translation, back-translation review, harmonization, cognitive debriefing, review of cognitive debriefing and finalization, and proofreading. Psychometrics testing used data from a cross-sectional study from July to November 2022 at 16 primary care centers in southern Thailand, involving 405 participants. Structural validity was tested with exploratory and confirmatory factor analysis (EFA and CFA). Hypothesis testing validity was assessed through correlations with the Self-Care Self-Efficacy Scale version 3.0 (SCSES-v3.0) and the Self-Care of Chronic Illness Inventory version 4.c (SC-CII-v4.c). Reliability was evaluated using Cronbach's α coefficient and the intraclass correlation coefficient.**Results:** The Thai ESSI demonstrated excellent content validity. EFA revealed a one-factor structure, with high factor loadings for the first six items assessing informational, emotional, and instrumental support. The last item on structural support demonstrated inadequate factor loadings, suggesting its removal. CFA confirmed a well-fit one-factor structure for the 6-item ESSI. Hypothesis testing showed positive correlations with the SCSES-v3.0 and SC-CII-v4.c scales. Cronbach's α coefficient improved from 0.88 for the 7-item to 0.91 for the 6-item ESSI. Both the 7-item and the 6-item scales exhibited excellent test-retest reliability.**Conclusions:** Our study affirms the strong validity and reliability of the ESSI in the Thai population with chronic illnesses. The ESSI is deemed appropriate for evaluating social support in the context of chronic illness self-care.© 2024 The Authors. Published by Elsevier B.V. on behalf of the Chinese Nursing Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

What is known?

- Social support plays a significant role in chronic illness self-care.

- The 7-item Enhancing Recovery in Coronary Heart Disease (ENRICH) Social Support Inventory (ESSI) is a validated scale for predicting clinical and health outcomes in patients with chronic conditions.
- The 7-item ESSI includes six items assessing informational, emotional, and instrumental support and one item addressing structural support.

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Peer review under responsibility of Chinese Nursing Association.

What is new?

- The cross-culturally adapted Thai version of the 7-item ESSI shows excellent translational validity.
- Structural validity testing supports a well-fitting one-factor structure for the 6-item ESSI, excluding the structural support item.

1. Introduction

Self-care is essential for individuals with chronic conditions, involving routine behaviors and the motivation to make changes. Based on heart failure [1] and chronic illness self-care theories [2], existing self-care measures cover three key aspects. Self-care maintenance assesses behaviors for health promotion and illness management, self-care monitoring emphasizes recognizing changes in conditions, and self-care management involves handling worsened symptoms [2]. While various disease-specific self-care measures have been validated globally and across conditions like heart failure [3], hypertension [4], coronary heart disease [5], chronic obstructive pulmonary disease [6], diabetes [7], and spinal cord injuries [8], as well as generic measures like Self-Care of Chronic Illness Inventory and its updated version 4.c (SC-CII-v4.c) [9], research on self-care motivation remains limited. Motivational factors like self-efficacy and social support have been proposed [1,2], but psychometric testing has only been conducted for self-care self-efficacy scales [8,10]. Few psychometric studies have validated social support scales alongside self-care instruments.

In Thailand, social support has long been integral to self-care and chronic illness management, similar to global trends [11]. Social support involves perceived or actual assistance from a non-professional network [12]. It encompasses various concepts, such as social networks, social integration, and functional support, but is fundamentally categorized into types of support (e.g., emotional, informational, instrumental, companionate, esteem support) and structural support (social network or resources of support) [12,13]. This supportive element may originate from caregivers, families, relatives, neighbors, friends, colleagues, or community networks. Social support enhances coping productivity, well-being, and positive health outcomes while mitigating stress, anxiety, and depression [13].

Evidence shows that social support is linked to better self-care and health outcomes in various chronic conditions (i.e., hypertension, diabetes, heart disease, stroke, cancer, chronic respiratory disease) [14–19]. Adequate social support is associated with improved general health and well-being, coping with illness, and resilience [18,20,21]. It also leads to positive clinical outcomes, such as better disease control (i.e., glycemic control, blood pressure control, symptom control) and delayed progression [19,22]. Conversely, inadequate support is correlated with poor psychological outcomes [23,24], and increased hospitalization and mortality [25]. Additionally, social support and self-efficacy are interconnected motivational factors, enhancing each other, and contributing to better self-care and health outcomes [26,27].

Given the significant impact of social support on chronic illness self-care, there is a critical need for a valid and reliable scale to assess this factor. Unlike self-care self-efficacy measures, existing social support measures have not been specifically developed or psychometrically evaluated for chronic illness self-care. Among the validated scales, the Enhancing Recovery in Coronary Heart Disease (ENRICH) Social Support Inventory (ESSI), particularly the short version 7-item ESSI [28], is suitable for chronic illness populations and is available for use. Developed for cardiac patients, the ESSI is proposed as a unidimensional scale that assesses three support

types (i.e., informational, emotional, and instrumental) and structural support (key support person) [29]. Widely used across conditions [24,30], the ESSI predicts health outcomes and demonstrates good reliability, similar to other multidimensional social support scales like the Berlin Social-Support Scales [31], Duke-UNC Functional Social Support Questionnaire [32], and Perceived Social Support from Family (PSS-Fa) and Friends (PSS-Fr) [33].

The ESSI shows potential for Thai individuals with chronic illnesses, but concerns about its validity and reliability remain. While reliability studies report good internal consistency, further psychometric evaluation is needed [28,34]. Despite excellent test-retest reliability [34], item selection inconsistencies persist. The original study suggests removing item 4 (help with daily chores) and item 7 (marital/partner status) to improve reliability [28], while others [34] recommend excluding only item 7. These suggestions focus on reliability metrics, not structural validity (dimensionality). Structural validity has been explored only in the 12-item Thai ESSI, which revealed two dimensions: emotional and information support and instrumental and appraisal support [35]. However, limited evidence exists regarding the dimensionality of the 7-item ESSI. In hypothesis testing, the 7-item scale correlates positively with health-related quality of life at baseline and six-month follow-up [34] and clinical outcomes [28]. Yet, the reproducibility of the 7-item scale with chronic illness self-care measures, grounded in self-care theories [1,2], still needs to be explored.

To our knowledge, few studies have examined the psychometric properties of the 7-item ESSI in the population with chronic illnesses across Thai and broader Asian contexts. This highlights the need for further validation, particularly in the context of chronic illness self-care and beyond its original Western background. Therefore, in this study, we evaluated the psychometric properties of the 7-item scale among Thai individuals with chronic illnesses. Specifically, we examined its construct validity, particularly focusing on structural validity (dimensionality) and hypothesis testing [36], as well as assessing reliability, including internal consistency reliability, test-retest reliability, and measurement error. By situating the ESSI within a chronic illness self-care framework, this study advances its application in Thailand and contributes to global self-care measurement science.

2. Methods

2.1. Study design

This methodology and cross-sectional study utilized data from a parent study [37] conducted between July and November 2022. The original study aimed to translate and psychometrically test the SC-CII-v4.c and related scales, including the Self-Care Self-Efficacy Scale version 3.0 (SCSES-v3.0) and ESSI. The protocol followed the Consensus-based Standards for selecting Health Measurement Instruments (COSMIN) Reporting Guideline for measurement properties [38]. The study was grounded in the Middle-Range Theory of Self-Care of Chronic Illness [2], emphasizing the universality of self-care across chronic conditions.

2.2. Instrument translation and translational validity

2.2.1. Translation and cross-cultural adaptation processes

The Thai version of the 7-item ESSI was translated and cross-culturally adapted alongside the SC-CII-v4.c and SCSES-v3.0, following the ISPOR Task Force for Translation and Cultural Adaptation framework [39] and detailed elsewhere [37]. Permission was granted by the developer (PH Mitchell), and the process was led by

the corresponding author (J. Suwanno) with a co-author (C. Phonphet and L. Thiamwong). It included preparation, forward translation, reconciliation, back-translation, back-translation review, harmonization, cognitive debriefing, review of the cognitive debriefing results and finalization, and proofreading [39]. These steps involved seven committees. This included five doctoral nursing experts in chronic illness management (i.e., hypertension, heart disease, stroke, chronic obstructive pulmonary disease, and chronic conditions in older adults), four of whom studied in the US. Two other members are native English speakers familiar with Thai culture. Their expertise ensured linguistic accuracy and cultural relevance. The scale was mostly straightforward to translate, with only item 7 requiring adaptation due to the common presence of extended families in Thai culture. To accurately capture the essence of structural support from family members, item 7 was adapted to: “Are you currently living with a spouse, children, kin, or relatives?” to better reflect structural support in the Thai context.

In the cognitive debriefing, we involved 10 individuals with chronic conditions; this ISPOR step is akin to a pilot study. They assessed the items’ languages (i.e., words, phrases, sentences), clarity, and cultural relevance. Their feedback was incorporated into the reviewing of cognitive debriefing, confirming that all items were understandable and required no revisions. The finalized Thai and back-translated versions of the 7-item ESSI were produced through these rigorous steps.

2.2.2. Translational validity

Before psychometrics testing, content validity was assessed to ensure the scale’s translational appropriateness [40]. A panel of nine expert nurses specializing in chronic care evaluated the scale. The panel included three primary care nurse practitioners (two with master’s degrees and one with post-baccalaureate training in chronic care), four acute care nurse specialists (three with master’s degrees specializing in stroke, heart disease, or chronic kidney disease, and one with post-baccalaureate cancer care expertise), and two doctoral nurses with expertise in chronic illness self-care and scale development. Experts rated on a 1–4 ordinal scale for relevant (1 “not relevant” to 4 “very relevant”), clarity (1 “not clear” to 4 “very clear”), simplicity (1 “not simple” to 4 “very simple”), and ambiguity (1 “doubtful” to 4 “meaning is clear”) [41]. A score of 3 or 4 was considered desirable. All items scored 4 for each criterion, requiring no changes. The scale-level content validity index (S-CVI) was 1.00, estimated using the kappa table [42]. Similarly, the Thai SC-CII-v4.c (S-CVI = 0.99) and Thai SCSES-v3.0 (S-CVI = 1.00) demonstrated excellent translational validity [37].

2.3. Psychometric testing

2.3.1. Participants, settings, and data collection

Details on participant recruitment, settings, and data collection are provided elsewhere [37]. Briefly, 422 (out of 430 approached) adult patients (aged ≥ 18 years old) with chronic conditions lasting at least three months were recruited using convenience sampling from 16 primary healthcare centers across six Southern Thai provinces. Participants had conditions such as hypertension, diabetes, heart disease, stroke, chronic respiratory disease, chronic kidney disease, and cancer. Excluded were hospitalized patients or those discharged within three months to minimize acute medical event influences on self-care. Dimensionality analysis through confirmatory factor analysis (CFA) aimed for a sample size of 200, which was sufficient [43]. Our sample size met the rule of one item per 20 samples for SC-CII-v4.c and one item per 60 samples for ESSI [43].

Data were collected using pencil-and-paper forms at the healthcare center or participants’ preferred locations. Sixteen

trained nurses assisted with data collection, following research protocols. Training covered self-care concepts, the research project, participant protection, informed consent, and data collection procedures. To assess test-retest reliability, 60 participants completed the ESSI twice, 10–14 days apart. All participants were included in the final psychometric analysis.

2.3.2. Instruments

All data regarding the measurements used in this analysis, including the ESSI, SC-CII-v4.c, SCSES-v3.0 and participants’ characteristics have been provided in the parent project.

2.3.2.1. ENRICHD Social Support Inventory. The psychometric properties of the cross-culturally adapted Thai 7-item ESSI were evaluated. The scale measures types of support (items 1–6) and structural support (item 7) [28]. Emotional support is assessed through five items (1, 2, 3, 5, and 6), covering aspects such as someone to listen and affection. Instrumental support is addressed in item 4, focusing on assistance with daily chores. Structural support is captured in item 7, which assesses living arrangements with family members or relatives. Notably, items 2 (“Someone available to give you good advice about a problem”) and 5 (“Anyone to provide talking over problems or helping you make a difficult decision”) potentially reflect informational support, though they are categorized under emotional support due to overlap [23]. Participants rated items 1–6 on a 5-point Likert scale (1 “none of the time” to 5 “all of the time”), while item 7 was rated dichotomously (no = 2, yes = 4). Total scores range from 8 to 34, with higher scores indicating greater perceived social support. The original study [28] reported acceptable internal consistency reliability (Cronbach’s α coefficient = 0.76), which improved to 0.84 when excluding items 4 and 7. Other studies reported good reliability (Cronbach’s α coefficient = 0.88) for the overall scale, with item 7 exhibiting the lowest correlation with the total score [33].

2.3.2.2. Self-Care Self-Efficacy Scale version 3.0. The cross-culturally adapted Thai 10-item SCSES-v3.0 assessed the validity of the Thai ESSI through hypothesis testing, a construct validity measure per COSMIN guidelines [36]. This scale measures self-efficacy in self-care maintenance, monitoring, and management. Participants rated confidence on a 5-point Likert scale (1 “not confident” to 5 “very confident”), with higher scores indicating greater self-efficacy. The SCSES-v3.0 has demonstrated robust psychometric properties and cross-cultural applicability across diverse populations, including American, Chinese, Italian, and Brazilian [10], with excellent internal reliability (Cronbach’s α coefficient = 0.89–0.93). The Thai SCSES-v3.0 demonstrated excellent internal reliability (Cronbach’s α coefficient = 0.94) in this study samples ($n = 405$), with item-to-total correlation ranging from 0.71 to 0.80. Removing items did not significantly affect the Cronbach’s α coefficient.

2.3.2.3. Self-Care of Chronic Illness Inventory version 4.c. The Thai 19-item SC-CII-v4.c [37] was used to validate the Thai ESSI through hypothesis testing [36]. This generic chronic illness self-care measure includes three interconnect scales. The 7-item Self-Care Maintenance scale evaluates health promotion (e.g., sleep, diet, exercise, stress management) and illness management behaviors (e.g., medication adherence, routine follow-up). The 5-item Self-Care Monitoring scale evaluates vigilance in recognizing illness signs and symptoms, medication side effects, and treatment complications. The 7-item Self-Care Management scale evaluates symptom management strategies (e.g., recognizing changes, dietary adjustments, medication use). Responses use a 5-point Likert scale (1 “never/not likely” to 5 “always/very likely”), except for two

Self-Care Management items (13 and 19), rated on a 0–5 scale.

The Thai SC-CII-v4.c is valid and reliable for various chronic conditions [37]. The allocation of items in health-promoting behavior (items 1, 2, 3, 4, and 7) and illness-related behavior (items 5 and 6) dimensions differs from the original US model. However, the Self-Care Monitoring scale (items 8–12), as well as the Autonomous Behavior (items 13, 14, 15, and 19) and Consulting Behavior (items 16, 17, and 18) dimensions of the Self-Care Management scale, are consistent with the original model. The internal consistency reliability was acceptable, with composite reliability ranges from 0.80 to 0.85 for scales and 0.93 overall. McDonald's ω ranges from 0.67 to 0.78 for multidimensional scales and 0.88 overall. Test-retest reliability is strong, with intraclass coefficients ranges from 0.83 to 0.94 for scales and 0.92 overall [37].

2.3.2.4. Participants' characteristics. Demographic information covered a range of variables, including age, gender, educational background, marital status, living arrangements, employment status, and household income. Clinical data comprised specific chronic diseases (e.g., hypertension, diabetes, heart disease), additional chronic conditions (e.g., dyslipidemia, hearing impairments, visual impairments), medications, treatments, and the duration of illnesses. The study also included data on the total number of chronic diseases and additional chronic conditions and the number of medications and treatment modalities.

2.3.3. Ethical consideration

The parent study was approved by the Institutional Review Board of Walailak University (Approval no. WUEC-22-168-01). The same institute approved the analysis based on the exemption protocol (Approval no. WUEC-24-079-01). The study adhered to the standards outlined in the Declaration of Helsinki. All participants in the original study provided oral and written informed consent and were aware of their rights and responsibilities. Their right to withdraw and the confidentiality of their personal data was also ensured. The analyzed data were anonymized and treated as strictly confidential.

2.3.4. Data analysis

Data analysis was performed using SPSS version 28.0 and AMOS version 24.0. Descriptive statistics summarized participant characteristics and item scale description. The Mahalanobis distance test ($n = 422$) identified 17 multivariate outliers, leaving a final sample of 405 analysis. Most items, except item 7, had acceptable skewness and kurtosis.

Following the COSMIN criteria [36], structural validity and hypothesis testing were key to establishing the scale's construct validity. Structural validity was evaluated through a cross-validation procedure that incorporated both EFA and CFA. This methodology is grounded in classical test theory [44]. Procedures applied in this study are derived from psychometric studies of the relevant self-care measure [45]. Given the measurement concerns and the fact that the original ESSI represented various types of support, suggesting a potentially multidimensional structure. However, despite being widely regarded as a mature scale and broadly used, no evidence has been identified to confirm its factorial structure in the Thai context. To address this, we conducted EFA prior CFA to determine the number of plausible factors to extract and to decide which items would be included in the final CFA [45]. The entire sample was randomly split into two subsamples: A ($n = 192$) for EFA and B ($n = 213$) for CFA. EFA with subsample A determined the number of latent dimensions using the maximum likelihood estimator and varimax rotation [46], with Kaiser-Meyer-Olkin (KMO) ≥ 0.60 and Bartlett's test of sphericity ($P < 0.05$) indicating suitable for factor analysis [47]. Parallel analysis was

conducted on subsample B and the overall sample to confirm the number of factors.

CFA in subsample B validated the EFA solution using various fit indices, with acceptable values as follows [48–50]. Specifically, the Comparative Fit Index (CFI) and Tucker and Lewis Index (TLI) value ≥ 0.90 . Absolute fit indices included the Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR) values of ≤ 0.08 . For RMSEA, the null hypothesis was rejected if the associated P -value < 0.05 , and a close fit was indicated if $P > 0.05$, taking into account the 90% confidence interval (90%CI) [50]. Factor loadings of $\geq |0.40|$ were adequate, while loadings $\geq |0.70|$ were considered very good [51]. The chi-square test was reported but not used for interpretation due to its sensitivity in large samples [3]. CFA with the full sample summarized the model.

Hypothesis testing [36] examined the correlation between ESSI scores and those on SCSES-v3.0 and SC-CII-v4.c. These two scales were utilized with a specific focus, where social support is theoretically proposed as a motivation factor for self-care behavior [2]. The positive relationship between social support and self-care behaviors [14–16,18,19] and self-efficacy in self-care [26,27] was evidence. Pearson's correlation coefficients (r) with $P < 0.05$ (two-tailed) were used, and correlations were categorized as weak ($r = 0.10$ – 0.29), moderate ($r = 0.30$ – 0.49), or strong ($r \geq 0.50$) [52].

Internal consistency reliability was assessed with Cronbach's α coefficient for the unidimensional scale [53], with corrected item-to-total correlation used to evaluate item relevance and a threshold of ≥ 0.30 for item discrimination [54]. Test-retest reliability was assessed with intraclass correlation coefficients [55]. All reliability estimates of ≥ 0.70 were considered adequate [56].

Finally, measurement error was estimated using the standard error of measurement (SEM) to assess the scale's precision [57]. The smallest detectable change (SDC) was also calculated to determine the clinically significant score difference. SEM was calculated using the formula [57]: $SD \times \sqrt{1 - \text{reliability coefficient}}$, where SD is the ESSI scale's standard deviation and the reliability coefficient is Cronbach's α coefficient. A scale was considered precise if SEM was less than $SD/2$. SDC was calculated using the formula [58]: $1.96 \times \sqrt{2 \times \text{SEM}}$.

3. Results

3.1. Participants' characteristics

Most of the final 405 participants (Appendix A) were women and older adults (Mean = 67.70, SD = 13.29 years). Most had completed primary school, were literate, married or in spousal relationships, lived in large families, and reported sufficient or comfortable household income. On average, they reported two chronic diseases with an eight-year duration of illness and one other chronic condition, resulting in three overall chronic comorbidities. The most prevalent were hypertension, diabetes, and stroke. Notably, no differences in characteristics existed between patients in the subsamples A and B, except for two chronic diseases (chronic kidney disease and other chronic diseases).

3.2. Item descriptive

Table 1 presents the descriptive statistics of the scale of the item. All the items exhibited a normal distribution and scored above 4.00, except for item 7. Among the first six items, item 3, "Is there someone available to you who shows you love and affection?" scored highest, while item 2, "Is there someone available to give you good advice about a problem?" scored lowest. Similar results were observed in subsamples A and B (Appendix B). The mean

Table 1Descriptive analysis of scale items for the cross-culturally adapted Thai ESSI in the overall sample ($n = 405$).

Thai ESSI	Mean \pm SD	Skewness	Kurtosis
Item-level			
1. Is there someone available to you whom you can count on to listen to you when you need to talk?	4.34 \pm 0.69	−0.71	−0.16
2. Is there someone available to give you good advice about a problem?	4.25 \pm 0.71	−0.57	−0.27
3. Is there someone available to you who shows you love and affection?	4.53 \pm 0.62	−1.00	−0.05
4. Is there someone available to help you with daily chores?	4.35 \pm 0.75	−0.99	0.70
5. Can you count on anyone to provide you with emotional support (talking over problems or helping you make a difficult decision)?	4.35 \pm 0.71	−0.74	−0.21
6. Do you have as much contact as you would like with someone you feel close to, someone in whom you can trust and confide?	4.34 \pm 0.71	−0.89	0.81
7. Are you currently living with a spouse, children, kin, or relatives?	3.90 \pm 0.44	−4.05	14.53
Scale-level			
6-item ESSI	26.17 \pm 3.52		
7-item ESSI	30.07 \pm 3.62		

Note: ESSI = Enhancing Recovery in Coronary Heart Disease (ENRICHD) Social Support Inventory.

scores for the overall scale did not differ between the two groups (P for t -test >0.05).

3.3. Structural validity (dimensionality)

3.3.1. Exploratory factor analysis

Table 2 presents results from the EFA and CFA. EFA was conducted on the adapted Thai version using subsample A ($n = 192$). A one-factor structure was extracted, accounting for 57.34% of the total variance. The KMO value of 0.89 and significant Bartlett's test ($\chi^2 = 794.86$, $P < 0.001$) confirmed the suitability for factor analysis [47]. Six items (items 1–6) exhibited high factor loadings (ranging from 0.76 to 0.85), while item 7 showed a significantly weak loading at 0.23 and was uncorrelated. EFA was then repeated on a subset of a 6-item scale (excluding item 7). This analysis yielded a one-factor model with a higher total variance explained (65.94%) and high loadings for all items (ranging from 0.76 to 0.85).

As detailed in Appendix C, consistent results were observed when performing EFA on subsample B ($n = 213$) and the overall sample ($n = 405$). The results suggest that the 6-item ESSI effectively represents a unique social support construct. Consequently, the 6-item ESSI was used for CFA, hypothesis testing, and reliability assessment. Item 7 was excluded due to poor factor loading and its lack of correlation with other items, which may indicate that structural support (item 7) is perceived as less relevant or atypical in this population.

3.3.2. Confirmatory factor analysis

To assess the structural validity of the 6-item ESSI scale, we

conducted a CFA using subsample B. The one-factor model demonstrated an excellent fit: χ^2 (9, $n = 213$) = 13.28, $P = 0.150$, CFI = 0.99, TLI = 0.99, RMSEA = 0.04 (90%CI = 0.00–0.09), $P = 0.47$, SRMR = 0.02). For further validation, we conducted CFA on the overall sample, yielding a model with a nearly perfect fit: χ^2 (9, $n = 405$) = 29.93, $P < 0.001$, CFI = 0.98, TLI = 0.97, RMSEA = 0.07 (90%CI = 0.04–0.10), $P = 0.069$, SRMR = 0.02). Factor loadings for all items were consistently high (Table 2 and Appendix D), whether in subsample B (ranging from 0.72 to 0.90) or the overall sample (ranging from 0.76 to 0.86).

3.3.3. Sensitive analysis for dimensionality

A sensitivity analysis for the dimensionality of the original 7-item ESSI was conducted to compare results (table not shown). This analysis retained item 7 in its original form and examined the scale's structure using EFA on subsample A ($n = 192$) and the overall sample ($n = 405$). Within each group, approximately 72.4% ($n = 139$) and 72.0% ($n = 292$), respectively, were currently married or partnered. Employing similar methodologies as with the adapted Thai version, a one-dimensional structure emerged in subsample A (KMO = 0.89, Bartlett's $\chi^2 = 691.79$, $P < 0.001$), with Eigenvalues of 3.67, explaining 52.47% of the variance. While items 1–6 demonstrated excellence loadings (ranging from 0.73 to 0.80) and significant commonalities (ranging from 0.53 to 0.64), item 7 showed inadequate performance, with a low factor loading at 0.15 and uncorrelated at 0.02.

Results for the overall sample ($n = 405$) aligned with those from subsample A (KMO = 0.91, Bartlett's $\chi^2 = 1535.91$, $P < 0.001$), revealing a one-dimensional structure with Eigenvalues of 3.87,

Table 2

Factor loadings from EFA and CFA results, item-total corrected correlation, and internal reliability of the cross-culturally adapted Thai ESSI.

Thai ESSI	EFA results (Subsample A)				CFA results		ITC
	7-item ESSI	n^2	6-item ESSI	n^2	6-item ESSI (Subsample B)	6-item ESSI (Overall sample)	6-item ESSI (Overall sample)
Item 1	0.79	0.62	0.78	0.62	0.81	0.80	0.75
Item 2	0.80	0.64	0.80	0.64	0.79	0.79	0.75
Item 3	0.83	0.70	0.84	0.70	0.72	0.77	0.73
Item 4	0.85	0.72	0.85	0.72	0.79	0.82	0.77
Item 5	0.82	0.67	0.82	0.67	0.90	0.86	0.81
Item 6	0.76	0.58	0.76	0.58	0.77	0.76	0.72
Item 7	0.23	0.05	—	—	—	—	—
Kaiser-Meyer-Olkin	0.89		0.90				
Bartlett's χ^2	794.86 ($P < 0.001$)		771.52 ($P < 0.001$)				
Total Eigenvalues	4.01		3.95				
Total variance (%)	57.34		65.94				

Note: CFA = confirmatory factor analysis. EFA = exploratory factor analysis. ESSI = Enhancing Recovery in Coronary Heart Disease (ENRICHD) Social Support Inventory. ITC = item-total corrected correlation. n^2 = communalities. Subsample A: $n = 192$; Subsample B: $n = 213$; Overall sample: $n = 405$.

explaining 55.32% of the variance. Again, item 7 exhibited poor factor loading at 0.15 and remained uncorrelated at 0.02, while items 1–6 demonstrated high factor loadings (ranging from 0.76 to 0.85) and correlated communities (ranging from 0.53 to 0.66). Item 7 did not contribute to the internal construct of the ESSi, regardless of whether the original or adapted Thai version was employed.

3.4. Hypothesis testing

Pearson's correlation coefficients supported the construct validity of the ESSi in Thai individuals with chronic illnesses (Appendix E). Positive correlations were observed between scores on the 6-item ESSi scale and SCSES-v3.0 ($r = 0.33$, $P < 0.001$) and with Self-Care Maintenance ($r = 0.33$), Self-Care Monitoring ($r = 0.33$), Self-Care Management ($r = 0.31$), and overall SC-CII-v4.c ($r = 0.38$) scales (all $P < 0.001$). Moderate correlations were similarly noted for the adapted Thai 7-item ESSi ($r = 0.32$ – 0.38) and the original 7-item ESSi ($r = 0.33$ – 0.39).

3.5. Reliability

3.5.1. Internal consistency reliability and item analysis

The Cronbach's α coefficient for the 6-item ESSi in the overall sample ($n = 405$) was 0.91, indicating excellent reliability. All items demonstrated good discrimination, with item-to-total corrected correlation ranging from 0.72 to 0.81. Deleting any item did not significantly increase the coefficient. For the adapted Thai 7-item scale (with item 7 adapted), Cronbach's α coefficient was 0.88, with item 7 showing poor discrimination of 0.16. Sensitivity analysis of the original 7-item ESSi scale (with item 7 unaltered) yielded Cronbach's α coefficient of 0.85. Removing item 7 improved Cronbach's α coefficient to 0.91 for both versions. Detailed reliability estimates are provided in Appendix F. High inter-item correlations were observed for all items except item 7 (Appendix G).

3.5.2. Test-retest reliability

The ESSi exhibited excellent test-retest reliability (Appendix F). Intraclass correlation coefficients for each item indicated good-to-excellent reliability (ranging from 0.89 to 1.00). The intraclass correlation coefficients for the overall 6-item scale and the adapted Thai 7-item scale were 0.93 (95%CI = 0.90–0.95) and 0.92 (95%CI = 0.89–0.95), respectively, showing comparable reliability.

3.5.3. Measurement error

The SDC for the 6-item scale and the adapted Thai 7-item scale were 2.82 and 3.14, respectively. For the 6-item scale, the SEM was 1.03, and SD/2 was 1.76. For the adapted Thai 7-item scale, the SEM was 1.28, and the SD/2 was 1.81. These coefficients highlight the meaningful magnitude of change for both versions.

4. Discussion

The study evaluated the psychometric properties of the cross-culturally adapted Thai version of the ESSi. The Thai ESSi demonstrated robust construct validity (i.e., structural validity and hypothesis testing) and reliability (i.e., internal consistent reliability, test-retest reliability, and measurement error) among Thai individuals with chronic illnesses.

Our analysis of the scale's dimensionality strongly supports its unidimensional nature, with a robust fit observed in the 6-item ESSi. This demonstrated that the selected items effectively assess social support in the Thai population with chronic illnesses. The scale's unidimensionality enhances its reliability and indicates that the 6-item scale captures the core dimensions of social support in the Thai context. Our findings align with previous studies

suggesting removing item 7, which assesses structural support [28,34]. Culturally, we adapted the item to emphasize family members as the primary support resource in Thailand, unlike the original version that focused on spouses. Item 7 consistently showed inadequate factor loading and no correlation with the other items. In contrast, the 6-item scale exhibited high factor loadings and inter-factor correlations, confirming that Thai individuals perceive the scale as a comprehensive measure of social support. The 6-item scale reflects emotional, informational, and instrumental support as a unified construct.

The inter-factor correlations emphasize the interconnectedness of the items, reflecting the comprehensive nature of social support for Thai individuals with chronic illnesses. This population's perception of social support aligns with those across diverse health conditions and cultural contexts [28,34], highlighting the universal relevance of the concept and the ESSi scale's applicability internationally. Our findings pave the way for future research, targeted interventions, and strategies tailored to this population's unique social support needs.

Hypothesis testing further supports the ESSi scale's construct validity in Thai individuals with chronic illnesses. Those reporting higher social support showed increased self-care self-efficacy and better performance in self-care domains, including maintenance, monitoring and management, and overall chronic illness self-care. These results support the self-care theory of chronic illness [2] and represent the first psychometric evidence linking social support, self-efficacy, and chronic illness self-care using the ESSi, SCSES-v3.0, and SC-CII-v4.c scales. Consistent with studies on various social support scales, our results reveal positive correlations between social support and self-efficacy across conditions like cancer [27], hypertension [59], heart diseases [60,61], diabetes [62], and various chronic conditions [63].

As an external force, social support enhances health and well-being by strengthening self-efficacy—an individual's internal resilience—through intricate interconnections [63]. It offers coping mechanisms and strategies individuals may not devise independently [27], providing emotional reassurance and encouragement to boost confidence in managing chronic conditions [64]. Social networks also provide valuable information on chronic illness management [59], enabling individuals to make informed health decisions and increasing their self-efficacy. Instrumental support, such as having “someone available to help with daily chores” (item 4), reduces practical burdens, reinforcing confidence in adhering to self-care routines.

This study validates the theoretical framework highlighting the critical role of social support in enabling comprehensive self-care, including health maintenance, monitoring change in health conditions, and management of symptoms. Our findings extend existing evidence by focusing on associations with ESSi and SC-CII-v4.c measures, primarily centered on comprehensive self-care. Few studies have explored the influence of social support on self-care monitoring and management domains. Our findings robustly affirm the existence of positive correlations between social support and self-care, aligning with observations across various chronic conditions. This correlation has been observed in certain self-care behaviors, such as adherence to treatment and rehabilitation in several chronic conditions [18,60,65]. Several studies have consistently shown the role of social support in encouraging individuals to adopt health-promoting and illness-management behaviors [66]. Social support also indirectly enhances self-efficacy, creating a dynamic interplay that improves self-care performance and health outcomes. This interconnected relationship between social support, self-efficacy, and self-care practices underscores their collective influence on chronic care outcomes [27]. Their synergy mitigates psychosocial distress, optimizes health-related quality of

life, and enhances well-being [65]. Recognized social support as a cornerstone of chronic illness self-care fosters a holistic, patient-centered approach to improving health outcomes.

The original ESSI demonstrated suitable internal consistency reliability with its 5-item version [28]. However, excluding items 4 (“Is there someone available to help you with daily chores?”) and 7 (“Are you currently married or living with a partner?”) improved the α coefficient. In our study, structural testing supported excluding only item 7, resulting in a 6-item scale with excellent internal reliability. This refinement reflected both shared and distinct cultural nuances. Unlike the original context, the Thai context highlighted the importance of item 4, which measures instrumental support. This item demonstrated particularly relevant for individuals with chronic conditions in Thailand, as their consistently high scores aligned with responses to other items on the scale.

The exclusion of item 7, reflecting cultural nuances, indicated that structural support was less significant than other types of support in both the original and Thai contexts. This finding aligns with studies in patients with heart diseases, which also reported favorable internal reliability for the 6-item ESSI [34]. The high internal reliability observed for the 6-item scale in our study mirrors results from 12-item ESSI used with Thai individuals with coronary heart disease [35]. This consistency suggests the scale’s generalizability in Thai, regardless of the version used. The robust internal reliability across different versions and health conditions highlights the stability of the internal reliability of the scale. This also suggested that the shorter version, like the 6-item scale, provides a more efficient and concise measure while maintaining reliable assessment outcomes.

The excellent test-retest reliability observed with the 7-item scale in this study aligns with a previous study [34]. This suggests its reliability is replicable across different health conditions and cultural contexts. This stability is essential for a scale designed to capture stable constructs, such as types of support and structural support, reinforcing confidence in its reliability for assessing individual perceptions.

Moreover, the clear dimensionality construct with good fit indices and excellent reliability observed in the 6-item scale in this study can be attributed to the high scores reported by participants across all social support items. Although there were some variations between the CFA and EFA subsamples, our analysis involving the overall sample ensured robust results. In alignment with studies conducted in Thailand, a notable portion of participants in this study reside in extended families, where support stems from family members, such as spouses, children, grandchildren, and relatives [67]. These familial structures play a crucial role in providing support and forming close social networks for family members coping with chronic illnesses. Importantly, each patient has at least one family caregiver who is a significant support figure. Caregivers not only provided general support but also actively engaged in the self-care of patients [2]. These findings underscore the pivotal role of family members as key support figures, reflecting the cultural significance of structural support in the Thai context.

4.1. Strengths and limitations

This study has several strengths, including the robust psychometric validation of the ESSI, meticulous translation ensuring translational validity, and the first exploration of its structural validity (dimensionality) and hypothesis validation for assessing types of social support in chronic illness self-care. Rigorous methods, such as subsample and sensitivity analyses, and a large, diverse sample further enhance its statistical robustness and applicability. However, limitations include potential selection bias

from convenience sampling, and limited generalizability beyond southern Thailand. Caution is needed when extrapolating results to broader Thai populations due to potential differences in social support experiences, demographic, and subcultures. Additionally, the absence of standardized interrater reliability my affect data quality and replicability.

4.2. Implication for practice

The ESSI demonstrated its valid and reliable for assessing social support in chronic illness populations, aiding clinicians in motivating self-care and improving health outcomes. The 6-item ESSI (excluding item 7) is recommended for its efficiency, ease of use, and feasibility in busy clinical setting, while item 7 can assess structural support separately. Quick to administer and ideal for older adults, it reduces fatigue and enhances compliances. Incorporating the ESSI into routine care enables clinicians to monitor support changes, identify needs, and implement targeted interventions, such as educational support, peer support, and counseling, ultimately enhancing self-care and health outcome [27,28].

Future research should test the ESSI in other disease-specific conditions (e.g., heart diseases, stroke, chronic obstructive pulmonary disease, chronic kidney disease, cancer) to tailor the scale to specific social support needs. Studies could also explore how different patient groups respond to social support, enhancing understanding across populations. Validating the scale in specific chronic conditions will strengthen its reliability and applicability. To reduce selection bias, systematic and random sampling methods should replace convenience sampling for improved reliability and generalizability. Further validation across regions of Thailand will ensure cultural sensitivity and nationwide applicability. Assessing interrater reliability among clinicians ensures data validity and consistency in clinical settings and facilitates seamless collaboration among healthcare providers.

5. Conclusions

This study highlights the critical role of social support in chronic illness self-care and validates the psychometric properties of the ESSI in Thai context. The scale demonstrated a unidimensional structure capturing emotional, informational, and instrumental support, with robust structural validity and reliability confirmed through EFA, CFA, and sensitivity analyses. The 6-item version (excluding item 7) is recommended for assessing support types, while item 7, focusing on structural support, can be used separately. This streamlined scale showed superior internal validity, lower measurement error, and strong applicability in assessing social support as a motivational factor for self-care in chronic illness populations.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRedit authorship contribution statement

Santi Phetrui: Conceptualization, Methodology, Validation, Writing - original draft, Writing - review & editing. **Jom Suwanno:** Conceptualization, Methodology, Validation, Investigation, Formal analysis, Writing - original draft, Writing - review & editing, Funding acquisition, Supervision, Project administration. **Chantira Chiaranai:** Conceptualization, Methodology, Validation, Writing - original draft, Writing - review & editing. **Chonchanok Bunsuk:**

Conceptualization, Methodology, Validation, Investigation, Writing - review & editing, Funding acquisition. **Naruebeth Koson:** Conceptualization, Methodology, Validation, Writing - review & editing. **Wanna Kumanjan:** Conceptualization, Methodology, Validation, Investigation, Writing - review & editing, Funding acquisition. **Chennet Phonphet:** Conceptualization, Methodology, Validation, Investigation, Writing - review & editing. **Ladda Thiamwong:** Conceptualization, Methodology, Validation, Funding acquisition, Writing - review & editing, English editor, Supervision.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT to improve language and readability with caution. After using this tool, the authors reviewed and edited the content as required and took full responsibility for the content of the publication.

Funding

The original study was financially supported by Walailak University (grant number: WU65240, Year 2022).

Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Acknowledgements

We would like to extend our heartfelt appreciation to the nurses who served as research assistants. Their active participation in the data-collection process is invaluable. We gratefully thank Marzukee Mayeng, MSc, Department of Epidemiology, Faculty of Medicine, Prince of Songkhla University, Thailand, for statistical review and approval. Finally, for manuscript editing, we gratefully thank Michael McManus, PhD, from College of Community Innovation and Education, University of Central Florida, USA.

Appendices. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijnss.2024.12.013>.

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