Original Article

Validity and reliability of the Thai version of the Cardiac Depression Scale among Thai cardiac patients

Rapin Polsook* and Yupin Aungsuroch

Faculty of Nursing, Chulalongkorn University,
Boromarajonani Srisatapat Building, Patumwan, Bangkok, 10330 Thailand

Abstract

The purpose of this study was to translate the current Cardiac Depression Scale into a Thai language version and then examine its validity and reliability. Responses to the 26-item Thai version of the Cardiac Depression Scale (CDS) were collected from 243 Thai subjects with cardiac disease. The data met the significant assumptions for exploratory factor analysis. Hypothetical examples were generated and exploratory factor analysis was performed. Exploratory factor analysis revealed seven components to determine cardiac depression that may manifest as sleep disorder, uncertainty, moodiness, hopelessness, inactivity, anhedonia, and cognition. The instrument showed acceptable validity and reliability. In conclusion, the Cardiac Depression Scale can be used in the clinic to measure depression among Thai patients with cardiac disease.

Keywords: instrument, depression, cardiac patients, Thai

1. Introduction

Depression is a major cause of disease burden worldwide and is predicted to be the leading cause of disease by 2030. The prevalence of depression is high in patients with coronary artery disease (CAD) and is related to mortality, cardiovascular event, and hospital readmission (Chavez, Ski, & Thompson, 2014; Volz *et al.,* 2011). In Thailand, research has been conducted on depression in post-myocardial infarction patients. The study indicated that 45.5% of patients had mild to moderate depression and 13.4% had severe depression (Phromsont, Aungsuroch, & Polsook, 2017). Depression has been shown to influence hospital readmission which means CAD patients with greater depressive symptoms resulted in high rates of hospital readmission (Betihavas *et al.*, 2012; Pelle, Gidron, Szabo, & Denollet, 2008; Shimizu, Suzuki, Okumura, & Yamada, 2014). Moreover, heart failure patients with depression reported low quality of life and were also associated with high rates of hospital readmission. (Faller *et*

al., 2010; Heo, Lennie, Okoli, & Moser, 2009; O'Loughlin *et al.,* 2010).

Current clinical guidelines recommend that depression be assessed in all patients with CAD (Colquhoun *et al.,* 2013; Lichtman *et al.,* 2008). The National Heart Lung and Blood Institute (NHLBI) also suggests the use of a depression screening instrument in CAD patients; however, none of the depression instruments recommended by the NHLBI were constructed specifically for cardiac patients and their psychometric properties cannot be generalized across populations (Davidson *et al.,* 2006). The diagnostic accuracy of various depression screening tools was assessed in cardiac populations within consistent findings for sensitivity and specificity (Davidson *et al.,* 2006; Vieweg, Hasnain, Lesnefsky, & Pandurangi, 2011). However, existing measures of depression are not always suitable for cardiac patients because they were developed and validated in other populations and often in more severely depressed psychiatric patients (Chavez, Ski, & Thompson, 2014; Hare & Davis, 1996; Vieweg, Hasnain, Lesnefsky, & Pandurangi, 2011).

Therefore, a specific tool is needed for the assessment of depression in CAD patients. The assessment tool should be logical, easy to comprehend, and aid participants when answering the questionnaire. The Cardiac Depression

---

*Corresponding author
 Email address: rapin.p@chula.ac.th, nitinggel@yahoo.com

Scale (CDS) was developed by Hare and Davis (1996) to assess depression in cardiac patients and uses a Likert scale for item responses to measure depression (Chavez, Ski, & Thompson, 2014; Hare & Davis, 1996; Oldridge, 1997). To evaluate the cardiac depression scale in cardiac patients, a highly valid and reliable instrument with the appropriate number of questions and format is needed. To date, no such instrument exists for Thai cardiac patients. In particular, the CDS was previously developed and validated in Western populations. In the present study, we aimed to assess whether this tool would be valid in a new population. Therefore, the necessity and significance of a Thai version of the CDS were tested in Thai cardiac patients.

2. Methods

2.1 Study sample

This study involved the test of reliability and validity of an instrument to assess depression among Thai cardiac patients. Modified multi-stage sampling using a multi-stage process was used to yield a probability sample in Thai cardiac patients. Participants were drawn from four hospitals from each region of Thailand: North, Northeast, Central, and South (National Statistics Organization, 2011) with approval from the Institutional Review Board of each hospital. Simple random sampling was used to approach the participants. A total of 243 cardiac patients were recruited for this study. For exploratory factor analysis, the sample size had to be 100 or greater to meet the statistical power (Hair, Black, Babin, & Anderson, 2010). Subjects were recruited from the cardiology inpatient departments according to the following inclusion criteria: (1) Thai post-myocardial infarction and heart failure patients who were recently admitted in the cardiology inpatient departments; (2) age ≥20 years; (3) no cognitive impairment and no disease complications based on the current medical records; and (4) willingness to participate in the study. The study purpose, benefits, risks, and length of time needed to complete the interview were explained to all patients. All participants signed informed consent forms prior to the interview and information from the subjects was coded to ensure anonymity.

2.2 Instrument

In this study, depression is defined as an individual having depressive mood and symptoms related to sleep disorder, uncertainty, moodiness, hopelessness, inactivity, anhedonia, and cognition. The Cardiac Depression Scale (CDS) was developed by Hare and Davis (1996). The items on the CDS were listed by a range of health professionals who had extensive experience in managing cardiac patients. These professionals came from disciplines such as cardiology, psychiatry, psychology, occupational therapy, physiotherapy, and cardiac nursing (Chavez, Ski, & Thompson, 2014; Hare & Davis, 1996; Oldridge, 1997). Twenty-six items were selected by consensus that constituted the face validity of the scale. Some positive as well as negative items were chosen and then structured on a Likert scale from 1 to 7 for a range of responses on a self-rating questionnaire. The CDS is a 26-item

self-rating scale used specifically for medical cardiac patients in Australia and this tool has been validated in adult cardiac inpatients and had satisfactory concurrent validity with the Beck Depression Inventory. Participants are asked to respond to each item from 1 (disagree strongly) to 7 (agree strongly) with a score ranging from 26 to 182. It has high internal reliability (Cronbach's alpha = 0.93) and an acceptable test-retest reliability (0.79) (Chavez, Ski, & Thompson, 2014; Hare & Davis, 1996; Oldridge, 1997).

2.3 Translation process

This tool was translated from English into Thai by two instructors who were experts in the English language at the Language Institute of Chulalongkorn University and an independent translator who was a nurse instructor with expertise in cardiovascular nursing and studied abroad for more than 5 years. The Thai version was evaluated by two Thai/English bilingual individuals. The questionnaire was then translated back into English by two Thai-English independent translators who each had taught English to graduate students for more than 10 years and a nursing instructor with expertise in cardiovascular nursing who had studied abroad for more than 5 years. The investigators compared both versions in the original language, conducted checks with the translators and advisors, discussed the differences, and produced a final consensus version. The final Thai version was tested for content validity by five experts. Two cardiologists and three nursing instructors ensured that it was acceptable and that the meaning of each item was correctly translated. A pilot study was conducted in Thai cardiovascular patients for the final Thai version of the instrument. A total of 30 cardiovascular patients at the cardiology inpatient departments at Phramongkutklao Hospital were recruited for the pilot study.

2.4 Reliability and validity of the instrument

2.4.1 Content validity

Content validity was determined by five experts: two cardiologists and three nursing instructors. The experts were asked to rate the level of relevancy between the items and the definitions of the concepts as represented. A four-point Likert-type scale ranging from 4 (strongly relevant) to 1 (strongly irrelevant) was used to rate each item. The content validity index (CVI) was calculated for the CDS.

2.4.2 Reliability

The reliability of the CDS was tested for internal consistency and a Cronbach's alpha coefficient >.70 was considered satisfactory. The homogeneity of the CDS was tested by item-total and inter-item correlation coefficients. An item-total correlation coefficient >.30 was considered acceptable. For inter-item correlations, coefficients between .30 and .70 were considered acceptable. A coefficient <.30 indicated that items were not present in the tool, whereas a coefficient >.70 indicated repetition (Hair, Black, Babin, & Anderson, 2010).

2. 4. 3 Construct validity

Principal component analysis extraction was applied with varimax rotation for the extracted factors. For extraction and conceptual consideration, factors with eigenvalues greater than 1 were extracted, a scree plot was prepared, and all of the cumulative percent of variance was extracted. Factor loadings ≥0.4 were defined as sufficient to determine a factor (Hair, Black, Babin, & Anderson, 2010).

2.5 Data collection

After receiving permission to access the subjects, the investigator conducted the study at the cardiology inpatient departments. The researcher presented the benefits and risks of the intervention and the protection of human rights in nontechnical terms to obtain approval from the patients for participation in the study. If the patients met the inclusion criteria and agreed to participate, then he or she was asked to sign a consent form. Participants were then asked to complete the CDS. During data collection, the participants were able to refuse or leave without any consequence. The interview process took approximately 30-45 minutes to complete. Data collection took place from January 2016 to October 2017.

2.6 Data analysis

Statistical analysis was performed with the SPSS software package version 17. The level of statistical significance was set at a P-value of 0.05. Descriptive statistics and exploratory factor analysis were employed to examine the construct validity of the CDS.

3. Results

3.1 Characteristics of the samples

The characteristics of the 243 Thai cardiac patients who met the inclusion criteria of the study are shown in Table 1. The participants were aged 22 to 92 years. The percentage of males was 59.7% and the percentage of those who were married was 72.8%. Fifty-one percent of participants had a primary school education, followed by Bachelor degree (11.5%) and secondary school (11.1%). Most of participants had a monthly salary less than 5,000 baht (~150 USD) (30.4%). The Cardiac Canadian Society Class was used to categorize the symptom severity of the participants. The participants had class I (16.5%), class II (35%), class IV (30%), and class III (18.5%) symptom severities.

3.2 Reliability and validity

3.2.1 Degree of relevance and content validity

The average degree of relevance for the questionnaire items used in this study was 90% which indicated that the Thai version of the CDS was an accurate reflection of the English version. The CVI was found to be 1.0, which indicated a good level of content validity for the Thai version.

3.2.2 Reliability

The Cronbach's alpha of the CDS Thai version was .82. Item-total and inter-item correlation coefficients were also tested (r=.002 to .645, r=.025 to .665, respectively). Prior to conducting exploratory factor analysis, the necessary assumptions of factor analysis were tested. The linearity of variables and the factorability characteristics of variables were analyzed. The correlation coefficients were .089 to .526. In this study, the Kaiser-Mayer-Olkin measure of sampling adequacy was equal to 0.866 which was accepted to be a good value. The Barlett's test of sphericity of the 26 items showed statistical significance (x^2= 2387.027, df= 325, P= 0.00). It indicated that the population correlation matrix was not an identity matrix.

The principal component analysis extraction method was used to extract the factors. The CDS was orthogonally rotated by varimax rotation (Table 2). Seven factors that explained 62.02% of the total variance were identified. Communalities in each factor ranged from .49 to .76. Factors 1 through 7 explained 15.51%, 12.62%, 10.11%, 8.13%, 5.61%, 5.12%, and 4.92% of the variance, respectively (Table 2). Overall, the appearance of the factor structure was reasonable and explainable. Factor 1 had seven items reflecting mood

Table 1. Demographic and clinical characteristics of patients with post-myocardial infarction.

Characteristics	N=243
Age, min-max, (mean ± SD)	22-92 (62±14.19)
Sex	
Male	145 (59.7)
Female	98 (40.3)
Marital status	
Single	19 (7.8)
Married	177 (72.9)
Widowed	38 (15.6)
Divorced	19 (3.7)
Education level	
No education	13 (5.4)
Primary school	124 (51.1)
Secondary school	27 (11.1)
High school	25 (10.3)
Diploma	18 (7.5)
Bachelor degree	28 (11.5)
Master degree	4 (1.7)
Doctoral degree	3 (1.4)
Financial status, monthly income	
No salary	48 (19.8)
≥5,000 baht	74 (30.4)
5,001-15,000 baht	71 (29.2)
15,001-25,000 baht	23 (9.5)
25,001-35,000 baht	11 (4.5)
35,001- 45,000 baht	5 (2.1)
More than 45,000 baht	11 (4.5)
Cardiac Canadian Society Class	
Class 1	40 (16.5)
Class 2	85 (35.0)
Class 3	73 (30.0)
Class 4	45 (18.5)

Data are presented as n (%) unless indicated otherwise.
SD = Standard deviation.

Table 2.   Total variance explained and communalities (N=243).

Component	Initial eigenvalues			Rotation sums of squared loadings			Communalities
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
DE1	7.714	29.669	29.669	4.032	15.507	15.507	.600
DE2	2.159	8.304	37.972	3.281	12.618	28.125	.562
DE3	1.520	5.847	43.819	2.629	10.110	38.235	.498
DE4	1.357	5.217	49.037	2.115	8.133	46.368	.553
DE5	1.309	5.036	54.072	1.459	5.612	51.980	.602
DE6	1.063	4.089	58.161	1.331	5.120	57.099	.509
DE7	1.002	3.854	62.015	1.278	4.916	62.015	.657
DE8	.972	3.737	65.752				.638
DE9	.941	3.621	69.373				.726
DE10	.784	3.015	72.388				.761
DE11	.735	2.827	75.214				.589
DE12	.684	2.632	77.846				.553
DE13	.636	2.448	80.294				.724
DE14	.573	2.204	82.498				.683
DE15	.540	2.079	84.576				.696
DE16	.489	1.881	86.457				.687
DE17	.480	1.844	88.302				.693
DE18	.451	1.733	90.034				.601
DE19	.441	1.697	91.731				.651
DE20	.408	1.571	93.302				.603
DE21	.368	1.415	94.717				.549
DE22	.324	1.247	95.964				.626
DE23	.310	1.193	97.157				.514
DE24	.289	1.111	98.269				.688
DE25	.247	.949	99.218				.663
DE26	.203	.782	100.000				.498

DE = Depression

(Items 4, 18, 21, 22, 24, 25, and 26). Factor 2 had seven items that captured cognition (Items 2, 7, 12, 15, 19, 20, and 23). Factor 3 had six items that explained the dimension of uncertainty (Items 1, 5, 6, 8, 13, and 14). Factor 4 had 2 items that revealed inactivity (Items 16 and 17). Factors 5 had 2 items that reflected hopelessness (Items 3 and 11). Factor 6 had one item that captured anhedonia (Item 10). Factor 7 had one item that captured sleep (Item 9). Factors 6 and 7 had one item with high factor loadings ($>.80$). Never-theless, these two factors explained only 5.12% and 4.92%, respectively, but they were clear-cut indicators of variability and relatively good descripttions (Table 3).

4. Discussion

In the current study, the reliability and validity of the CDS were acceptable to assess depression among Thai cardiac patients. The internal consistency was satisfactory (Cronbach's alpha = .82), and the overall ranges of the item-total and inter-item correlation coefficients were appropriate (r= .002 to .645, r= .025 to .665, respectively). A reliability analysis was carried out on the perceived task value scale that was comprised of 26 items. Cronbach's alpha showed the questionnaire reached acceptable reliability (α=0.82). Most items appeared to be worthy of retention, resulting in a decrease in the alpha if deleted. If removal of some items had r<.30, Cronbach's alpha was not different from retention of all items. Additionally, all items measured the depressive

symptoms which were consistent with the original version. These results were consistent with Hair, Black, Babin, and Anderson (2010) which indicated that an item-total correlation coefficient of >.3 0 was considered acceptable. For inter-item correlations, coefficients between .30 and .70 were considered acceptable. A coefficient <.3 0 indicated that items were not present in the tool, whereas a coefficient >.70 indicated repetition. An exploratory factor analysis of the Thai version of the CDS revealed seven subscales of depression: moodiness, cognition, uncertainty, inactivity, hopelessness, anhedonia, and sleep. The Thai version was found to be consistent with the original version, but differences existed among the items in each subscales. Due to the great differences in culture and language between Thailand and western countries, it is important to reflect this in the items that discuss moodiness, cognition, uncertainty inactivity, hopelessness, anhedonia, and sleep. Additionally, one-third of the participants had class II (35%) which includes the presence of angina during strenuous, rapid, or prolonged ordinary activity, such as walking or climbing the stairs, or mild symptoms (mild shortness of breath or angina or both) and slight limitations during ordinary activities (Sangareddi *et al.,* 2004). All items in the subscales of the Thai version had differences from the original version which were moodiness, cognition, uncertainty, inactivity, hopelessness, anhedonia, and sleep. However, all items reflected depression among cardiac patients. Moreover, both the Thai and original versions were based on depressive symptoms. Thus, for Thai cardiac patients, the Thai version of

Table 3.   Factor analysis with varimax rotation of the Cardiac Depression Scale (N=243).

Items	Dimensions						
	1	2	3	4	5	6	7
1. I have dropped many of my interests and activities	.033	.085	.655	.239	.288	-.139	.052
2. My concentration is as good as it ever was	-.130	.698	.155	-.022	.022	-.105	-.147
3. I can't be bothered doing anything much	.134	.126	.201	.065	.611	.177	.123
4. I get pleasure from life at present	.466	.456	.243	.162	.074	-.133	.141
5. I am concerned about the uncertainty of my health	.334	.057	.667	.009	.058	.188	.054
6. I may not recover completely	-.053	.179	.582	.259	-.043	.249	-.072
7. My sleep is restless and disturbed	.443	.462	.386	-.163	.041	.000	.265
8. I am not the person I used to be	.444	.083	.519	-.007	.215	-.214	.268
9. I wake up in the early hours of the morning and cannot get back to sleep	-.084	-.127	.083	.127	.157	-.046	.808
10. I feel like I'm living on borrowed time	.099	.033	.089	.104	.192	.831	-.069
11. Dying is the best solution for me	.292	.112	-.010	.101	.690	.012	.062
12. I feel in good spirits	.397	.539	.234	.169	-.010	-.008	.148
13. The possibility of sudden death worries me	.309	.293	.464	.068	-.279	.462	.175
14. There is only misery in the future for me	.366	.126	.564	.455	-.033	.044	-.067
15. My mind is as fast and alert as always	.007	.736	.065	.175	.258	.196	-.118
16. I get hardly anything done	.160	.229	.146	.729	.226	.040	.053
17. My problems are not yet over	.194	.194	.223	.723	-.011	.142	.160
18. Things which I regret about my life are bothering me	.624	.019	.243	.349	.047	.160	-.047
19. I gain just as much pleasure from my leisure activities as I used to	.286	.551	.186	.468	.001	-.112	-.002
20. My memory is as good as it always was	-.061	.638	-.111	.343	.072	.232	.062
21. I become tearful more easily than before	.675	-.040	.125	-.051	.243	.106	.059
22. I seem to get more easily irritated by others than before	.751	.025	.080	.177	.097	.043	-.114
23. I feel independent and in control of my life	.358	.445	.232	.185	-.070	.166	-.259
24. I lose my temper more easily nowadays	.795	.054	.111	.145	.125	.014	-.065
25. I feel frustrated	.546	.496	-.010	.140	.001	.044	.312
26. I am concerned about my capacity for sexual activity	.407	.306	.003	.065	-.336	.074	.341

Factor loadings >.40 are in boldface.

CDS was found to be a reliable and valid measure of depression.

This study has some limitations. All participants were diagnosed with heart failure and myocardial infarction during admission in the hospital which is a specific group. As a result, the finding cannot be generalized to others such as non-communicable disease and cardiac surgery. Further studies are required to assess the use of the CDS among other groups of patients with cardiovascular and non-communicable disease in Thailand. The sample size of 300 is needed for good power factor analysis (Williams, Brown, & Onsman, 2010).

5. Conclusions

The reliability and validity of the Thai version of the CDS was appropriate for measuring depression among Thai cardiac patients. Nevertheless, information on the reliability and validity of the instrument should be confirmed in larger populations for very good results. Although the components of the factor analysis were different between the Thai and original version, the items of the Thai version of the cardiac depression scale were the same as those in the original version and based on depressive symptoms. This tool and the knowledge contained in this paper may be used by nurses and others to assess depression among Thai cardiac patients.

Acknowledgements

References

Betihavas, V., Davidson, P. M., Newton, P. J., Frost, S. A., Macdonald, P. S., & Stewart, S. (2012). What are the factors in risk prediction models for rehospitalization for adults with chronic heart failure? *Australian Critical Care*, *25*, 31-40.

Chavez, C. A., Ski, C. F., & Thompson, D. R. (2014). Psychometric properties of the cardiac depression scale: A systematic review. *Heart, Lung and Circulation*, *23*, 610-618.

Colquhoun, D. M., Bunker, S. J., Clarke, D. M., Glozier, N., Hare, D. L., Hickie, I. B., . . . Branagan, M. G. (2013). Screening, referral and treatment for depression in patients with coronary heart disease. *The Medical Journal of Australia*, *198*(9), 1-7.

Davidson, K. W., Kupper, D. J., Bigger, T., Califf, R. M., Carney, R. M., Coyne, J. C., . . . Blood Institute Working Group. (2006). Assessment and treatment of depression in patients with cardiovascular disease: National Heart, Lung, and Blood Institute Working Group Report. *Psychosomatic Medicine*, *68*, 645-650.

Faller, H., Steinbuchel, T., Stork, S., Schowalter, M., Ertl, G., & Angermann, C. E. (2010). Impact of depression on quality of life assessment in heart failure. *International Journal of Cardiology*, *142*, 133-137.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis (7th ed)*. Upper Saddle River, NJ: Pearson Education.

Hare, D. L., & Davis, C. R. (1996). Cardiac depression scale: Validation of a new depression scale for cardiac patients. *Journal of Psychosomatic Research*, *40*(4), 379-386.

Heo, S., Lennie, T. A., Okoli, C., & Moser, D. K. (2009). Quality of life in patients with heart failure: Ask the patients. *Heart and Lung*, *38*, 100-108.

Linchtman, J. H., Bigger, J. T., Blumenthal, J. A., Frasure-Smith, N., Kaufmann, P. G., Lesperance, F., . . . Froelicher, E. S. (2008). Depression and coronary heart disease. *Circulation*, *118*, 1768-1775.

National Statistics Organization. (2013, March 1). Thailand Statistics. Retrieved from http://service.nso.go.th/nso/thailand/thailand.jsp

Oldridge, N. B. (1997). Outcomes assessment in cardiac rehabilitation: Health-related quality of life and economic evaluation. *Journal of Cardiopulmonary Rehabilitation*, *17*(3), 179-194.

O'Loughlin, C., Murphy, N. F., Colon, C., O'Donovan, A., Ledwidge, M., & McDonals, K. (2010). Quality of life predicts outcome in a heart failure disease management program. *International Journal of Cardiology*, *139*, 60-67.

Pelle, A. J. M., Gidron, Y. Y., Szabo, B. M., & Denollet, J. (2008). Psychological predictors of prognosis in chronic heart failure. *Journal of Cardiac Failure*, *14*(4), 341-350.

Phromsont, W., Aungsuroch, Y., & Polsook, R. (2017). Factor predicting depression among post-acute myocardial infarction patients (Unpublished master's thesis, Nursing Science, Graduate Studies, Chulalongkorn University, Bangkok, Thailand).

Sangareddi, V., Chockalingam, A., Gnanavelu, G., Subramanian, T., Jagannathan, V., & Elangovan, S. (2004). Canadian Cardiovascular Society classification of effort angina: an angiographic correlation. *Coronary Artery Disease*, *15*, 111-114.

Shimizu, Y., Suzuki, M., Okumura, H., & Yamada, S. (2014). Risk factors for onset of depression after heart failure hospitalization. *Journal of Cardiology*, *64*, 37-42.

Vieweg, W. R., Hasnain, M., Lesnefsky, E. J., & Pandurangi, A. K. (2011). Review of major measuring instruments in comorbid depression and coronary heart disease. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *35*, 905-912.

Volz, A., Schmid, J., Zwahlem, M., Kohls, S., Saner, H., & Barth, J. (2011). Predictors of readmission and health related quality of life in patients with chronic heart failure: A comparison of different psychosocial aspects. *Journal of Behavioral Medicine*, *34*, 13-22.

Williams, B., Brown, T., & Onsman, A. (2010). Exploratory factor analysis: A five-step guide for novices. *Australian Journal of Paramedicine*, *8*(3), 1-13.