

Psychometric Evaluation of a Persian Version of the Cardiac Depression Scale in Iranian Patients with Acute Myocardial Infarction

Abstract

Purpose: The aim of this study was to validate a Persian version of the Cardiac Depression Scale (CDS) in Iranian patients with Acute Myocardial Infarction (AMI). This was a methodological study.

Methods: A demographic survey and the CDS were used for data collection. The CDS was forward translated from English into Persian and back translated to English. Validity was assessed using face, content and construct validity.

Results: The construct validity of the scale showed two factors with eigenvalues greater than one. The Cronbach's alpha, Theta, McDonald, and construct reliability were greater than .70. Convergent and discriminant validity of the constructs were fulfilled.

Conclusions: Given the importance of mental health in risk prevention in AMI patients, the Persian CDS is a useful screening tool for detection of depression in this patient cohort.

Keywords

Cardiac Depression Scale; Psychometric; Depression; Acute Myocardial Infarction; Persian

INTRODUCTION

Depression is a common and debilitating condition in patients with acute myocardial infarction (AMI) (Schrader, Cheok, Hordacre, & Guiver, 2004; Serrano, Setani, Sakamoto, Andrei, & Fraguas, 2011). The role of depression in cardiovascular disease (CVD) has been strongly emphasized (Meneses et al., 2007). Its prevalence, 48 hours after AMI, is 60.7% (Hosseini, Tabiban, & Samarbakhsh, 2006). Depression occurs up to four times more often in patients with AMI than in the general population (Judith H. Lichtman et al., 2014; Judith. H. Lichtman et al., 2008; Williams, 2011) and is a risk marker for future AMI and mortality in CVD (J. Barth, Schneider, & von Kanel, 2010; Pozuelo et al., 2009). The prevalence of mild/moderate, and severe cardiac depression among Iranian patients with CVD has been reported as 17% and 53% respectively (Gholizadeh et al., 2010).

Negative effects of depression on patients with CVD have been widely mentioned in studies (Elderon & Whooley, 2013; Judith H. Lichtman et al., 2014; Judith. H. Lichtman et al., 2008). It is important to note that some researchers suggest that although early diagnosis and treatment of depression in patients with acute MI may not improve patients' quality of life and mood, it can have significant effects on the frequency of their disability and mortality (Judith H. Lichtman et al., 2014; Wang, Thompson, Chair, & Hare, 2008). Actually, AMI patients with co-morbid depression are less likely to adhere to their medication regimens, self-care and recommended lifestyle changes (e.g., smoking cessation and increased physical activity) needed in their recovery period (Ziegelstein et al., 2000). These patients are less likely to attend cardiac rehabilitation programs and are often socially isolated. However, while screening of depression in patients with AMI is not yet routine (Martin & Thompson, 2006), it has been recommended by the American Heart Association and appears warranted (Judith H. Lichtman et al., 2014; Judith. H. Lichtman et al., 2008).

Research has shown that targeted interventions can reduce depression in patients with CVD (Lespérance & Frasere-Smith, 2000), however, these benefits have not translated to reduced risk of cardiac events or mortality (Glassman et al., 2002; Lespérance & Frasere-Smith, 2000). It is possible that somatic symptoms indexed in many depression screening instruments such as the Beck Depression Inventory (BDI-I, BDI-II), Hospital Anxiety and Depression Scale (HADS) and the Center for Epidemiologic Studies Depression Scale (CES-D) may mimic physical symptoms in AMI thus producing false positives for depression (Thombs et al., 2008; Thornton, 2001).

The Cardiac Depression Scale (CDS) is the only scale designed for the screening of depression in cardiac patients with the sensitivity range of mild to severe (Chavez, Ski, & Thompson, 2014; Hare & Davis, 1996). Therefore, the aim of the present study was to translate this instrument into Farsi and validate it for an Iranian AMI patient population.

METHOD

Participants and Materials

This methodological study was conducted in 2015. A socio-demographic questionnaire and the CDS were used for data collection. The CDS was used for assessing depression. The CDS consists of 26 items that address a variety of affective, somatic and cognitive symptoms including mood, anhedonia, avolition, cognitive functioning, hopelessness, and sleep disturbance. The scoring of this tool is based on a 7-point Likert-type scale anchored by the presence or absence of descriptors. A total CDS score is calculated by the sum of the scores of each item, ranging from 26 to 182 (Hare & Davis, 1996). The CDS comprises two dimensions and seven subscales, with strong internal consistency (Cronbach's alpha = 0.9) (Hare & Davis, 1996). The CDS has 97% sensitivity and 85% specificity to detect major depression (Shi, Stewart, & Hare, 2010). A sample size of 5 to 10 times the number of items

tested is suggested as the minimum for conducting a factor analysis (Hamid Sharif Nia et al., 2016). Consequently, a convenience sample of 407 patients participated in the study.

Procedure

Written permission for the use of the CDS was obtained from the developer of the scale, (Professor David L. Hare). The World Health Organization protocol of forward-backward translation technique was used for translating the scale from English into Persian (World Health Organization, 2016). Two English-Persian translators were invited to independently translate the CDS. An expert panel, consisting of some of this paper's authors as well as two professional translators, assessed and unified the two translations and constructed a single Persian translation of CDS. Thereafter, a Persian-English translator was asked to back-translate the Persian CDS into English. This English version of the CDS was sent to Professor Hare, the developer of the scale, for confirmation of the correctness of translations and confirming the similarity of the achieved English CDS with its original. Then, the final questionnaire was distributed to selected patients. In the case of illiterate patients, the researchers elaborately explained the questionnaire to the participants and marked their answers.

Psychometric Properties of the CDS-Persian Version

For assessing validity we used face, content and construct validity

Face validity assessment. The face validity of the Persian CDS was assessed both qualitatively and quantitatively.

Qualitative face validity assessment. For assessing the qualitative face validity of the Persian CDS, ten cardiac patients were invited to assess and comment on the appropriateness, difficulty, relevance and ambiguity of the items. Moreover, the time to complete the scale was determined. The scale was amended according to the patients' comments.

Quantitative face validity assessment. The item impact technique was adopted for assessing the quantitative face validity of the Persian CDS. Consequently, the same ten patients were asked to determine the importance of the items on a Likert-type scale from 1 (Not important) to 5 (Completely important). The impact score of each item was calculated by using the following formula, Importance · Frequency (%). In this formula, frequency is equal to the number of patients who had ascribed a score of 4 or 5 to the intended item and importance was equal to scores 4 or 5. If the impact score of the item was greater than 1.5, the item was considered suitable and it was maintained in the scale (Hajizadeh & Asghari, 2011; Maasoumi et al., 2013).

Content validity assessment

The content validity of the Persian CDS was also assessed both qualitatively and quantitatively.

Qualitative content validity assessment. The Persian CDS was provided to 15 experts (nine nursing doctorates, two psychiatrists, two clinical psychologists and two nurses) and they were asked to assess and comment on the wording, items allocation and scaling of the items (Colton & Covert, 2007). We revised the CDS according to their comments.

Quantitative content validity assessment. Quantitative content validity was assessed by calculating Content Validity Ratio (CVR) and Content Validity Index (CVI) for the items. CVR reflects whether the items are essential or not. Fifteen experts, as mentioned above, were asked to rate the essentiality of the CDS items on a three-point scale as follows: Not essential: 1; Useful but not essential: 2; and Essential: 3 (Cook & Beckman, 2006). The CVR of each item was calculated using the following formula: $CVR = (n_e - (N/2)) / (N/2)$. In this formula, N and n_e are respectively equal to the total number of experts and the number of experts who rate the intended item as 'Essential'. when the number of panelists is fifteen, the minimum acceptable CVR is equal to 0.49 (Lawshe, 1975).

CVI shows the degree in which the items of the **intended scale is relevant** and. CVI can be calculated for each item of a scale (Item-level or I-CVI) and also for all of the items (Scale-level or S-CVI). Thus, we asked the same fifteen panelists to rate the **relevance of the CDS** items on a four-point scale from 1 to 4. For instance, the four points for rating the relevance of the items were ‘Not relevant’, ‘Somewhat relevant’, ‘Quite relevant’, and ‘Highly relevant’ which were scored as 1, 2, 3, and 4, respectively. The I-CVI of each item was calculated by dividing the number of panelists who had rated that item as 3 or 4 by the total number of the panelists. Lynn et al. (2006) noted that when the number of panelists is equal to fifteen, the items which acquire an I-CVI value of 0.79 or greater are considered appropriate (Jay Lynn, Surya Das, Hallquist, & William, 2006).

Construct validity assessment

To examine the construct validity of the CDS, we performed (i) exploratory factor analysis (EFA), (ii) confirmatory factor analysis (CFA) and (iii) assessed reliability, convergent validity and discriminant validity (Baumgartner & Homburg, 1996). EFA and CFA were performed using SPSS version 22 and Analysis of Moment Structure (AMOS) software version 21 respectively. We applied Maximum Likelihood EFA with Promax rotation. The Kaiser–Meyer–Olkin (KMO) and Bartlett’s test of sphericity were used to check the appropriateness of the sample to conduct the factor analysis. Factor extraction was based on: (i) eigenvalues > 1; (ii) communalities > .3, and; (iii) scree plots (Cattell, 1966; Cattell & Jaspers, 1967; Field, 2013). The results obtained from EFA were confirmed by CFA and examination of the model fit indexes such as Chi-square (χ^2) test, Chi-square/degree of freedom ratio (normalized chi-square CMIN/DF), Goodness-of-fit index (GFI) > .95, Comparative Fit Index (CFI) > .90, Incremental Fit Index (IFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), Relative Fit Index (RFI), Root Mean Square Error of

Approximation (RMSEA) .05 - .10 moderate, and Standardized Root Mean Square Residual (SRMR) < .09 (Pahlevan Sharif & Mahdavian, 2015; Soleimani et al., 2016).

Average variance extracted (AVE), maximum shared squared variance (MSV) and average shared square variance (ASV) were estimated to assess the convergent and discriminant validity of the extracted CDS factors. In order to establish convergent validity (i) AVE should be greater than .5 and (ii) construct reliability should be greater than AVE. To meet the discriminant validity criteria, both MSV and ASV of each construct should be less than its AVE (Ahadzadeh, Sharif, Ong, & Khong, 2015; Fornell & Larcker, 1981; Joseph F Hair, Black, Babin, & Anderson, 2010).

Reliability assessment

Cronbach's alpha (α), theta (θ), and McDonald's Omega (Ω) Coefficient as measures of internal consistency were used to evaluate the reliability of the Persian version of CDS.. Construct reliability of the extracted factors was assessed following Hair et al.'s (2010) approach, whereby construct reliability (CR) > .7 indicates good reliability (J.F. Hair, Black, Babin, & Anderson, 2013). The intra-class correlation coefficients (ICC) was used to establish the test–retest reliability of the CDS over an interval of a 2-weeks using two-way mixed intra-class correlation coefficients (ICC) for absolute agreement at the level of individual items. The results are interpreted as follows: 0–0.2 as low, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1 as almost perfect (Landis & Koch, 1977). To assess the suitable sample size for the test–retest reliability, power analysis was performed. The power analysis identified that a sample of 15 patients was required to have a power of .80 to detect a test–retest correlation of .90 at a significance level of .05 (Cohen, 1992; Walter, Eliasziw, & Donner, 1998).

Multivariate normality and outliers

To evaluate normality it is helpful to assess both univariate and multivariate normality. Univariate distributions were examined for outliers and skewness and kurtosis. Multivariate distributions were evaluated for normality using Mardia's coefficient of multivariate kurtosis whereby a Mardia's coefficient > 8 indicates deviation of multivariate normality (Raoprasert & Islam, 2010). Multivariate outliers can be evaluated through evaluation of Mahalanobis distance ($p < .001$) (Harrington, 2008; Tabachnick & Fidell, 2013).

Ethical considerations

The study was approved by the Ethics Committee of the University of Medical Sciences (Code: IR.MAZUMS.REC.95.2065), Sari, Iran. Patients were informed about the study objectives and procedures. Moreover, they were ensured that participation was voluntary and it would not affect the course of their treatment. The confidentiality of patients' information was guaranteed. Informed verbal consent was obtained from all participants.

RESULTS

Patient demographics

The socio-demographic profile of the participants is reported in Table 1. As it is shown, the sample included 224 (55%) were male and 183 (45%) were female with the mean age of 63.72 (SD = 16.37). From all participants, 221 (54.3%) patients were illiterate or could only read and write minimally. The majority of participants reported elevated blood pressure (54.1%) and most of them had family heart disease (73%).

[Insert Table 1 approximately here]

Construct validity

Table 2 shows the results of EFA using Maximum Likelihood method with Promax rotation on the Persian Version of the CDS (n = 200). The analysis revealed two factors together accounting for 56.79% of the variance comprising 16 of 26 items (Factor 1: 10 items and Factor 2: 6 items). Ten items were removed due to weak factor loading (less than .5).

[Insert Table 2 approximately here]

CFA was conducted ($n = 207$) to confirm and validate the factor structure obtained from EFA. The results showed that the initial two factor measurement model did not fit the data well ($\chi^2(103) = 1298.075, p < .05, \chi^2/df = 12.603, GFI = .714, CFI = .754, NFI = .739, IFI = .755, RFI = .696, TLI = .713, Standardized RMR = .090, RMSEA (90\% C.I.) = .169 (.161 - .177)$). Examination of the items for sources of model misfit identified several items with high standardised residuals ($z\text{-score} > 4.0$) and poor discriminant validity; the following items were removed: Factor 1 items Q6, Q17 and Q25; Factor 2 items Q2, Q4 and Q12. As shown in Figure 1, the error terms of four pairs of items of Factor 1 and one pair of items of Factor 2 were allowed to freely co-vary to improve the measurement model fit.

[Insert Figure 1 approximately here]

The revised model was found to be a good fit, as evidenced by goodness of fit indices ($\chi^2(29) = 147.442, p < .05, \chi^2/df = 5.084, GFI = .935, CFI = .949, NFI = .938, IFI = .950, RFI = .904, TLI = .922, Standardized RMR = .043, RMSEA (90\% C.I.) = .10 (.085 - .117)$) and significant factor loadings greater than .6 ($z\text{-value range } 7.909 \text{ to } 23.980$). Moreover, as AVE of both factors exceeded .5 and their respective construct reliability was greater than their AVE, convergent validity was demonstrated. Furthermore, AVE of both factors was greater than their respective MSV and ASV that fulfilled the requirements of discriminant validity.

[Insert Table 3 approximately here]

As reported in Table 3, Cronbach's alpha, Theta, McDonald Omega, and construct reliability of Factor 1 and Factor 2 demonstrated good reliability and internal consistency for both factors. The average measure ICC was .732 with a 95% confidence interval from .693 to .765 ($F(406) = 3.82, p < .001$).

DISCUSSION

The aim of the present study was to psychometrically evaluate the Persian version of the Cardiac Depression Scale in Iranian patients with AMI. The results identified a bi-dimensional CDS factor structure explaining 56% of the variance. These findings are similar to those of Gholizadeh et al. (2010) who also identified a two factor structure using the CDS in Iranian patients (Gholizadeh et al., 2010). In contrast, Wise et al. (2006) identified six CDS factors (including mood, anhedonia sleep, suicide, cognition and fear), explaining 61.36% of variance in Australian cardiac patients (Wise, Harris, & Carter, 2006). Similarly, Wang et al. (2008) identified a 6 factor CDS structure and one dimension(i.e. mood, sleep, anhedonia, uncertainty, cognition, hopelessness and inactivity), explaining 62% of the variance (Wang et al., 2008).

The participants of the present study were AMI patients. According to Hair (2009), in psychology and humanities studies, explaining 50-60% of the variance, items extraction is appropriate (Hair Jr, Black, Babin, & Anderson, 2009). Following EFA, for which all model fit parameters were met, the CDS was examined using CFA. The first factor extracted from the CDS was related to death anxiety and despair. Tomer and Eliason (1996) suggest that anxiety and despair are not uncommon when a person is faced with a life threatening condition (Tomer & Eliason, 1996). Given the well-known morbidity and mortality risk of depression in CVD (Jürgen Barth, Schumacher, & Herrmann-Lingen, 2004), it is important that mental health disturbances, such as anxiety and depression, be detected and managed. The nursing staff plays an important role in management of depression symptoms and referral to a qualified mental health professional for consideration of various treatment options (Judith. H. Lichtman et al., 2008; Sharif Nia et al., 2014). Taking care of those patients who are aware of the risk of losing their lives is complex. Thus, it is important to know much more about the factors that lead to anxiety reduction and to have nurses at the management of this complex situation (Sharif Nia, Lehto, Ebadi, & Peyrovi, 2016).

The second factor extracted from the CDS pertained to life satisfaction, which refers to the patient's attitude toward life and their beliefs about the future. It incorporates aspects of well-being, satisfaction about the relationship with others and focus goals, concept and personal ability to cope with daily life. Life satisfaction should be evaluated in relation to economic status, education, experiences and residence, as well as many other factors. Patients with AMI are more likely suffer from depression than patients with other diagnosis (Steca et al., 2013).

According to the final model of CDS, there is a correlation between measurement errors of items 18th and 13th (e1, e4), 13th and 5th (e1, e5), 5th and 8th (e5, e6), 5th and 26th (e5, e8), and 15th and 20th (e13, e16). Munro (2005) stated that correlated measurement error occurs in the situation when variables have not been identified clearly or not measured directly. So it can affect the answers to the items (Munro, 2005). A latent variable, including the only true scores of a construct's indicators measurement error, is a problem (Jiang, 2014). Self-reported measurement method may lead to measurement errors. On the other hand, measurement errors can be the result of similar meaning or close of words and phrases in both positive and negative statements (Harrington, 2008).

The results of the current study showed that structural items of the Persian CDS have good convergent and divergent validity. Hair (1995) stated that there is convergent validity when the structural items are close to each other and share more variances with each other. Divergent validity may be observed when the intended structural items and extracted hidden factors were completely separated from each other (J.F Hair, Anderson, Tatham, & Black, 1995). It is clear that we will have no appropriate convergent validity when the hidden factors have not been explained well by the extracted items and they have insufficient correlation with each other (Fornell & Larcker, 1981).

In the present study the reliability of the CDS tool was assessed using Cronbach's alpha. Moreover, to the best of our knowledge, it is the first study that assessed reliability of CDS using Theta and McDonald. The results showed that the reliability of this tool is appropriate. The higher the Cronbach's alpha implies the appropriateness of internal consistency of the questionnaire and its correlation between questions. In fact, it indicates that the questions of the CDS are measuring similar concepts and there is no conceptual dispersion in it. The reliability of this tool was assessed in different studies and was reported to be 0.76-0.93 (Birks, Roebuck, & Thompson, 2004; Gholizadeh et al., 2010; Hare & Davis, 1996; Vinzi, Chin, Henseler, & Wang, 2010; Wang et al., 2008). Also it was indicated that this tool had a significant relationship with the Beck depression scale and Clinical rating (Hare & Davis, 1996). The assessment of the reliability of the CDS among 239 Chinese students showed that the correlation of this tool with CDS long form ($p < 0.001$, $r = 0.80$) and Beck depression scale ($p < 0.001$, $r = 0.64$) is reliable (Vinzi et al., 2010). Ski et al (2011) also assessed the reliability of this tool by Mokken scaling among 603 cardiac patients and reported a suitable $Rho > 0.8$ value (Ski, Thompson, Hare, Stewart, & Watson, 2012). In another study on cardiac patients in England, the reliability of the tool was measured at 0.79 by using the test re-test method. It was also mentioned that there is a strong relationship between this tool and BDI, SF-36 and HADS (Hospital Anxiety and Depression Scale) (Birks et al., 2004).

The results also showed that the Persian version of CDS had a good construct reliability. In fact, structural reliability or factor consistency could be a kind of substitution for Cronbach's alpha in structural equation modeling (Vinzi et al., 2010). One of the important features in estimating CR in comparison to Cronbach's alpha is that, it does not impressed by the amount of scale items and measured structure; while it depends on the actual factor loading of each items on the latent variable (Vinzi et al., 2010). Previous studies did not assess reliability using construct reliability measure.

In summary, the results of this study showed that the Persian version of the CDS has a two-factor structure (i.e. death anxiety and life satisfaction) and acceptable reliability and validity. Therefore, the validated instrument can be used in future studies for assessing depression among patients with AMI in Iranians.

Limitations

The researchers of this study have ensured that the forward-backward translation method was to a high standard and the original author of the scale confirmed the accuracy of the translation. Notwithstanding this, there is always a potential difficulty in using a scale which was originally designed for a different population. Cultural differences and language nuances may not be translatable and test users would be advised to be cognizant of this potential issue. Also, filling the questionnaire for illiterate patients by researchers may bias their responses.

Recommendations

We recommended that more detailed studies to be conducted to earn trustworthy results by other investigators. **Screening of depression be** done in all cardiac patients. Future validation studies with samples from different populations and also longitudinal designs are suggested to verify the findings of this study. Also, since Iranian populations reside all over the world, testing of the tool in Iranians in Europe, Asia and the USA would be beneficial to determine its generalizability to all Iranian populations.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

This research received no specific grant from any agency in the public, commercial, or not-for-profit sectors.

Conflict of interest

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

References

- Ahadzadeh, Ashraf Sadat, Sharif, Saeed Pahlevan, Ong, Fon Sim, & Khong, Kok Wei. (2015). Integrating Health Belief Model and Technology Acceptance Model: An Investigation of Health-Related Internet Use. *Journal of medical Internet research*, 17(2).
- Barth, J., Schneider, S., & von Kanel, R. (2010). Lack of social support in the etiology and the prognosis of coronary heart disease: a systematic review and meta-analysis. *Psychosom Med*, 72(3), 229-238. doi: 10.1097/PSY.0b013e3181d01611
- Barth, Jürgen, Schumacher, Martina, & Herrmann-Lingen, Christoph. (2004). Depression as a risk factor for mortality in patients with coronary heart disease: a meta-analysis. *Psychosomatic Medicine*, 66(6), 802-813.
- Baumgartner, Hans, & Homburg, Christian. (1996). Applications of structural equation modeling in marketing and consumer research: A review. *International journal of Research in Marketing*, 13(2), 139-161.
- Birks, Yvonne, Roebuck, Alun, & Thompson, David R. (2004). A validation study of the Cardiac Depression Scale (CDS) in a UK population. *British journal of health psychology*, 9(1), 15-24.
- Cattell, Raymond B. (1966). The scree test for the number of factors. *Multivariate behavioral research*, 1(2), 245-276.
- Cattell, Raymond B, & Jaspers, Joseph. (1967). A general plasmode (No. 30-10-5-2) for factor analytic exercises and research. *Multivariate Behavioral Research Monographs*.
- Chavez, Carolina A, Ski, Chantal F, & Thompson, David R. (2014). Psychometric properties of the Cardiac Depression Scale: A systematic review. *Heart, Lung and Circulation*, 23(7), 610-618.

- Cohen, J. (1992). A power primer. *Psychol Bull*, 112(1), 155-159. doi: <http://dx.doi.org/10.1037/0033-2909.112.1.155>
- Colton, David, & Covert, Robert W. (2007). *Designing and constructing instruments for social research and evaluation*: John Wiley & Sons.
- Cook, David A, & Beckman, Thomas J. (2006). Current concepts in validity and reliability for psychometric instruments: theory and application. *The American Journal of Medicine*, 119(2), 166. e167-166. e116.
- Elderon, Larkin, & Whooley, Mary A. (2013). Depression and cardiovascular disease. *Progress in Cardiovascular Diseases*, 55(6), 511-523.
- Field, Andy. (2013). *Discovering statistics using IBM SPSS statistics*: Sage.
- Fornell, C, & Larcker, D.F (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Gholizadeh, Leila, Salamonson, Yenna, Davidson, Patricia M, Parvan, Kobra, Frost, Steven A, Chang, Sungwon, & Hare, David L. (2010). Cross- cultural validation of the Cardiac Depression Scale in Iran. *British Journal of Clinical Psychology*, 49(4), 517-528.
- Glassman, Alexander H, O'Connor, Christopher M, Califf, Robert M, Swedberg, Karl, Schwartz, Peter, Bigger Jr, J Thomas, . . . Finkel, Mitchell S. (2002). Sertraline treatment of major depression in patients with acute MI or unstable angina. *Jama*, 288(6), 701-709.
- Hair, J.F, Anderson, R.E, Tatham, R.L, & Black, W.C. (1995). *Multivariate data analysis* (4th ed ed.): Englewood Cliffs, NJ: Prentice Hall.
- Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2013). *Multivariate Data Analysis*: Pearson Education Limited.

- Hair, Joseph F, Black, WC, Babin, BJ, & Anderson, RE. (2010). *Multivariate data analysis*. 7th ed. Upper Saddle River, NJ: Prentice Hall; .
- Hair Jr, J.F, Black, W.C , Babin, B.J, & Anderson, R.E. (2009). *Multivariate Data Analysis* (7th Edition ed.). United States of America: Prentice Hall.
- Hajizadeh, E, & Asghari, M. (2011). *Statistical methods and analyses in health and biosciences a research methodological approach*. Tehran: *Jahade Daneshgahi Publications*.
- Hare, D. L., & Davis, C. L. (1996). Cardiac depression scale: validation of a new depression scale for cardiac patients. *J Psychosom Res*, 40. doi: 10.1016/0022-3999(95)00612-5
- Harrington, D. (2008). *Confirmatory Factor Analysis*: Oxford University Press, USA.
- Hosseini, H, Tabiban, S, & Samarbakhsh, A. (2006). Depression following the first attack of myocardial infarction. *Bimonthly research Journal Pejouhandeh*, 5(10), 317-320.
- Jay Lynn, Steven, Surya Das, Lama, Hallquist, Michael N , & William, John C (2006). Mindfulness, acceptance, and hypnosis: Cognitive and clinical perspectives. *International Journal of Clinical and Experimental Hypnosis*, 54(2), 143-166.
- Jiang, W. (2014). *Business Partnerships and Organizational Performance: The Role of Resources and Capabilities*: Springer Berlin Heidelberg.
- Landis, J Richard, & Koch, Gary G. (1977). The measurement of observer agreement for categorical data. *biometrics*, 33(1), 159-174. doi: <http://dx.doi.org/10.2307/2529310>
- Lawshe, CH. (1975). A qualitative approach to content validity. *Personnel Psychology*, 25, 563-575.
- Lespérance, François, & Frasere-Smith, Nancy. (2000). Depression in patients with cardiac disease: a practical review. *Journal of psychosomatic research*, 48(4), 379-391.
- Lichtman, Judith H., Froelicher, Erika S., Blumenthal, James A., Carney, Robert M., Doering, Lynn V., Frasere-Smith, Nancy, . . . Wulsin, Lawson. (2014). Depression as

a Risk Factor for Poor Prognosis Among Patients With Acute Coronary Syndrome: Systematic Review and Recommendations. *A Scientific Statement From the American Heart Association*. doi: 10.1161/cir.0000000000000019

Lichtman, Judith. H., Bigger, J. T., Jr., Blumenthal, J. A., Frasure-Smith, N., Kaufmann, P. G., Lesperance, F., . . . Froelicher, E. S. (2008). Depression and coronary heart disease: recommendations for screening, referral, and treatment: a science advisory from the American Heart Association Prevention Committee of the Council on Cardiovascular Nursing, Council on Clinical Cardiology, Council on Epidemiology and Prevention, and Interdisciplinary Council on Quality of Care and Outcomes Research: endorsed by the American Psychiatric Association. *Circulation*, *118*(17), 1768-1775. doi: 10.1161/circulationaha.108.190769

Maasoumi, Raziye, Lamyian, Minoor, Montazeri, Ali, Azin, Seyed Ali, Aguilar-Vafaie, Maria E, & Hajizadeh, Ebrahim. (2013). The sexual quality of life-female (SQOL-F) questionnaire: translation and psychometric properties of the Iranian version. *Reprod Health*, *10*(1), 25-31.

Martin, Colin R, & Thompson, David R. (2006). Depression in coronary heart disease patients: Etiological and screening issues. *Current Psychiatry Reviews*, *2*(2), 245-254.

Meneses, R, Almeida, MC, Abecasis, J, Arroja, I, Carvalho, A, & Aleixo, A. (2007). Depression in patients with myocardial infarction. *Revista portuguesa de cardiologia: orgao oficial da Sociedade Portuguesa de Cardiologia= Portuguese journal of cardiology: an official journal of the Portuguese Society of Cardiology*, *26*(11), 1143-1165.

Munro, B.H. (2005). *Statistical Methods for Health Care Research*: Lippincott Williams & Wilkins.

- Pahlevan Sharif, Saeed, & Mahdavian, Vahid. (2015). *Structural Equation Modeling by the Use of AMOS*. Tehran: Fazel.
- Pozuelo, L., Tesar, G., Zhang, J., Penn, M., Franco, K., & Jiang, W. (2009). Depression and heart disease: what do we know, and where are we headed? *Cleve Clin J Med*, 76(1), 59-70. doi: 10.3949/ccjm.75a.08011
- Raoprasert, T., & Islam, S.M.N. (2010). *Designing an Efficient Management System: Modeling of Convergence Factors Exemplified by the Case of Japanese Businesses in Thailand*: Physica-Verlag HD.
- Schrader, G., Cheok, F., Hordacre, A. L., & Guiver, N. (2004). Predictors of depression three months after cardiac hospitalization. *Psychosom Med*, 66(4), 514-520. doi: 10.1097/01.psy.0000128901.58513.db
- Serrano, C. V., Jr., Setani, K. T., Sakamoto, E., Andrei, A. M., & Fraguas, R. (2011). Association between depression and development of coronary artery disease: pathophysiologic and diagnostic implications. *Vasc Health Risk Manag*, 7, 159-164. doi: 10.2147/vhrm.s10783
- Sharif Nia, H., Ebadi, A., Lehto, R. H., Mousavi, B., Peyrovi, H., & Chan, Y. H. (2014). Reliability and validity of the persian version of templer death anxiety scale-extended in veterans of iran-iraq warfare. *Iran J Psychiatry Behav Sci*, 8(4), 29-37.
- Sharif Nia, H., Lehto, R. H., Ebadi, A., & Peyrovi, H. (2016). Death Anxiety among Nurses and Health Care Professionals: A Review Article. *Int J Community Based Nurs Midwifery*, 4(1), 2-10.
- Sharif Nia, Hamid, Pahlevan Sharif, Saeed, Goudarzian, Amir Hossein, Haghdoost, Ali Akbar, Ebadi, Abbas, & Soleimani, Mohammad Ali. (2016). An evaluation of psychometric properties of the Templer's Death Anxiety Scale-Extended among a sample of Iranian chemical warfare veterans. *Hayat*, 22(3), 229-244.

- Shi, William Y, Stewart, Andrew G, & Hare, David L. (2010). Major depression in cardiac patients is accurately assessed using the Cardiac Depression Scale. *Psychotherapy and psychosomatics*, 79(6), 391-392.
- Ski, Chantal F., Thompson, David R., Hare, David L., Stewart, Andrew G., & Watson, Roger. (2012). Cardiac Depression Scale: Mokken scaling in heart failure patients. *Health and Quality of Life Outcomes*, 10(1), 1-5. doi: 10.1186/1477-7525-10-141
- Soleimani, Mohammad Ali, Pahlevan Sharif, Saeed, Allen, Kelly A., Yaghoobzadeh, Ameneh, Sharif Nia, Hamid, & Gorgulu, Ozkan. (2016). Psychometric Properties of the Persian Version of Spiritual Well-Being Scale in Patients with Acute Myocardial Infarction. *Journal of Religion and Health*, 1-17. doi: 10.1007/s10943-016-0305-9
- Steca, P., Greco, A., Monzani, D., Politi, A., Gestra, R., Ferrari, G., . . . Parati, G. (2013). How does illness severity influence depression, health satisfaction and life satisfaction in patients with cardiovascular disease? The mediating role of illness perception and self-efficacy beliefs. *Psychol Health*, 28(7), 765-783. doi: 10.1080/08870446.2012.759223
- Tabachnick, B.G., & Fidell, L.S. (2013). *Using Multivariate Statistics*: Pearson Education.
- Thombs, Brett D, de Jonge, Peter, Coyne, James C, Whooley, Mary A, Frasure-Smith, Nancy, Mitchell, Alex J, . . . Smith, Cheri G. (2008). Depression screening and patient outcomes in cardiovascular care: a systematic review. *Jama*, 300(18), 2161-2171.
- Thornton, Lori A. (2001). Depression in Post- Acute Myocardial Infarction Patients. *Journal of the American Academy of Nurse Practitioners*, 13(8), 364-367.
- Tomer, A , & Eliason, G. (1996). Toward a comprehensive model of death anxiety. *Death Stud* 20, 343-365.
- Vinzi, V.E., Chin, W.W., Henseler, J., & Wang, H. (2010). *Handbook of Partial Least Squares: Concepts, Methods and Applications*: Springer.

- Walter, S. D., Eliasziw, M., & Donner, A. (1998). Sample size and optimal designs for reliability studies. *Stat Med*, *17*(1), 101-110. doi: [http://dx.doi.org/10.1002/\(SICI\)1097-0258\(19980115\)17:1<101::AID-SIM727>3.0.CO;2-E](http://dx.doi.org/10.1002/(SICI)1097-0258(19980115)17:1<101::AID-SIM727>3.0.CO;2-E)
- Wang, Wenru, Thompson, David R, Chair, Sek Ying, & Hare, David L. (2008). A psychometric evaluation of a Chinese version of the Cardiac Depression Scale. *Journal of psychosomatic research*, *65*(2), 123-129.
- Williams, Redford B. (2011). Depression After Heart Attack: Why Should I Be Concerned About Depression After a Heart Attack? *Circulation*, *123*(25), e639-e640. doi: 10.1161/circulationaha.110.017285
- Wise, Frances M., Harris, Darren W., & Carter, Lynn M. (2006). Validation of the Cardiac Depression Scale in a cardiac rehabilitation population. *Journal of Psychosomatic Research*, *60*(2), 177-183. doi: 10.1016/j.jpsychores.2005.07.019
- World Health Organization. (2016). Process of translation and adaptation of instruments. from http://www.who.int/substance_abuse/research_tools/translation/en/
- Ziegelstein, Roy C, Fauerbach, James A, Stevens, Sandra S, Romanelli, Jeanine, Richter, Daniel P, & Bush, David E. (2000). Patients with depression are less likely to follow recommendations to reduce cardiac risk during recovery from a myocardial infarction. *Archives of Internal Medicine*, *160*(12), 1818-1823.

APPENDIX

Example of a Persian Version of the Cardiac Depression Scale

در برابر هر سوال 7 امتیاز قرار گرفته که با توجه به میزان موافقت یا مخالفت خود با هر آیتم لطفا یک نمره به آن اختصاص دهید. لطفا توجه کنید که جواب بلی یا خیر موجود نمی باشد.

ردیف	ایتم	امتیاز						
1	بسیاری از علایقم را ترک کرده‌ام	1	2	3	4	5	6	7 (همه چیز را ترک نکردم)
2	تمرکز من مانند همیشه خوب است	1						7 (تمرکز بسیار عالی)
3	انجام کار طولانی مرا آزار نمی‌دهد	1						7 (آزار نمی‌دهد)
4	در حال حاضر از زندگی لذت می‌برم	1						7 (بسیار لذت می‌برم)
5	من از نامعلوم بودن وضعیت سلامتیتم نگرانم	1						7 (خیلی نگرانم)
6	ممکن است بطور کامل بهبود نیابم	1						7 (بهبود نمی‌یابم)
7	خواب بی‌قرار و آشفتگی دارم	1						7 (خیلی بی‌قرارم)
8	من شخصی که در گذشته بودم نیستم	1						7 (کاملاً متفاوت هستم)
9	صبح زود بیدار می‌شوم و دیگر نمی‌توانم بخوابم	1						7 (بیدار نمی‌شوم)
10	احساس می‌کنم که آخرین لحظات زندگی را می‌گذرانم	1						7 (آخرین لحظات)
11	مرگ بهترین راه حل برای من است	1						7 (بهترین راه است)
12	حس می‌کنم روحیه خوبی دارم	1						7 (روحیه خوبی دارم)
13	احتمال مرگ ناگهانی مرا نگران می‌کند	1						7 (همیشه)
14	فقط بیچارگی و بدبختی در آینده برای من خواهد بود	1						7 (فقط بدبختی خواهد بود)
15	ذهن من مانند همیشه آگاه و سریع است	1						7 (ذهنم سریع است)
16	کارها را به دشواری انجام می‌دهم	1						7 (هیچ کاری)
17	مشکلاتم هنوز تمام نشده است	1						7 (هنوز تمام نشدند)
18	پشیمانی‌هایی که در زندگی دارم، مرا آزار می‌دهد	1						7 (پشیمانی دارم)
19	مانند گذشته از اوقات فراغتم لذت می‌برم	1						7 (لذت می‌برم)
20	حافظه‌ام مانند همیشه خوب است	1						7 (حافظه‌ام خوب است)
21	زودتر از گذشته گریان می‌شوم	1						7 (گریان نمی‌شوم)
22	به نظر می‌رسد زودتر از گذشته از دست دیگران عصبانی می‌شوم	1						7 (منی شوم)
23	احساس می‌کنم زندگی مستقل و تحت کنترلی دارم	1						7 (مستقل نیستم)
24	جدیدا زودتر عصبانی می‌شوم	1						7 (عصبانی نمی‌شوم)
25	حس ناامیدی می‌کنم	1						7 (حس می‌کنم)
26	در مورد ظرفیتم در فعالیت‌های جنسی نگرانم	1						7 (نگران نیستم)