

Exploratory factor analytical study of depressive symptomatology: An Arab experience with a sample comprising college students, using the revised Beck Depression Inventory

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BACKGROUND AND OBJECTIVES: An understanding of the domains of depressive symptomatology could facilitate valid and interpretable comparisons across cultures. The objective of the present study was to assess the factor structure of the Beck Depression Inventory-II (BDI-II) in an Arab sample comprising college students, in comparison to the international data.

DESIGN AND SETTING: Cross-sectional questionnaire survey of Arab college students in their classrooms over a 1-year period.

PATIENTS AND METHODS: Participants (n=624) who completed the questionnaire, which had been translated into Arabic, during the 2007-2008 academic session. Exploratory factor analysis was done by principal axis factoring with oblique rotation.

RESULTS: Factor 1 consisted of psychological symptoms. Factor 2 mainly comprised somatic symptoms, but with some affective symptoms (loss of interest, irritability). Factor 3 also belonged to a purely psychological domain, whereas factor 4 was another mixture of somatic and psychological symptoms (41.8% of variance explained). Thus the four domains were as follows: cognitive I, somatic-affective I, cognitive II, and somatic-affective II. These domains were similar in construct to the original subscales on which the BDI-II was validated for students in North America. Our four-factor solution fulfilled the recommended criteria, namely, a strong first factor, simple structure (parsimony), and stable factors with construct meanings that are in line with theory.

CONCLUSION: Our factor structure defined depression in a manner consistent with theory, in that sadness, self-dislike, and guilt feelings defined the cognitive domain, whereas irritability and changes in sleep pattern and appetite mostly defined the somatic-affective domain. The BDI-II has construct validity across cultures.

The Beck Depression Inventory (BDI) is the most frequently used self-rating scale for evaluating depression.^{1,2} It has been revised (BDI-II) to correspond with the Diagnostic and Statistical Manual, 4th Edition (DSM-IV) criteria³ for depression.⁴ Despite over a decade of research, the factorial validity of the BDI-II is still controversial,^{5,6} as there is no formal assignment of items to scales;² hence, the issue of its factor structure has remained topical across cultures and health conditions.⁷⁻¹⁸ However, these studies are impor-

tant because an understanding of depressive symptoms from the perspective of factor analysis could facilitate valid and interpretable comparisons across cultures.¹⁹ In addition, specific domains of depression determined from exploratory factor analysis (EFA) have been linked with genetic vulnerability and outcome of psychiatric treatment,²⁰ dexamethasone non-suppression,²¹ localization of brain lesions,²² clinical outcome in physical illnesses,²³ and characterization of patients with suicidal tendencies and behavioral disorders.^{24,25}

In a meta-analysis of factor structures of the original version of the BDI, Shafer² found that the average number of factors extracted was 4 (range, 2-7) and that the average range of variance was 46%. About 70% of studies used principal components analysis (PCA) with varimax rotation. Studies typically recruited purposive (i.e., volunteer or non-random) samples, about 30% of whom were students (usually college students). The three most consistent domains of depression were negative attitudes toward self, performance impairment, and somatic complaints. The BDI-II was originally validated using an outpatient sample (n=500) and an undergraduate student sample (n=120).⁴ Each sample yielded two factors in EFA, using items that loaded ≥ 0.35 on the corresponding factors. The factors for the outpatient sample were labeled "somatic-affective" (SA) and "cognitive" (C) (i.e., SA-C model). The factors for the undergraduate sample were labeled "cognitive-affective" (CA) and "somatic" (S) (i.e., CA-S model). Although several studies have supported these two-factor solutions using clinical populations^{14,26-32} and student populations,^{10,11,33-37} some reports were not supportive.^{5,6,18,38-40}

As a result of these conflicting studies, the factor structure of the BDI-II has been deemed inconsistent; with cognitive, affective, and somatic domains emerging differentially within factors across studies.¹³ This inconsistency is also evident in the few reports on the factor analysis of the BDI from the Middle East. While one Iranian report on students supported the two-factor model,¹⁰ another Iranian study reported a five-factor solution.⁴⁰ One study from the Arabian Gulf state of Bahrain⁷ found three oblique factors ("cognitive-affective," "overt emotional upset," and "somatic-vegetative"), which were much similar to the original three factors. However, in confirmatory factor analysis studies using all of the items of the BDI-II, Beck's two-factor models were confirmed for a clinically depressed outpatient group³² and for samples of undergraduate students.³⁴⁻³⁶

In a 1988 PCA study from Kuwait,⁴¹ 100 inpatients with depression were examined with the use of the World Health Organization schedule for Standardized Assessment of Depressive Disorders. The report found that a common core of symptoms is shared among patients in Western, Middle-Eastern, and international studies. In addition, the report also showed other symptoms, including infrequency of feelings of hopelessness and suicidal attempts, masking of guilt feelings by a front of somatization, and a linkage of body weight and sexual functions to health in general. There are no other factor-analytic studies of depression from the Arab world.

In the present study, our objective was to broaden the knowledge of the domains of depressive symptomatology in the Arab world, by assessing the factor structure of the BDI-II, using the responses of a sample of Arab college students in EFA, and by comparing the findings with the international data. The goal of our EFA was to examine factor structure in a specific population as opposed to applying it as a data-reduction technique for instrument-development purposes. Community-based studies can help to determine whether dimensions of depression are present in particular nonclinical population groups.⁴²

In view of the results of the earlier factor-analytic study from Kuwait,⁴¹ we hypothesized that our EFA would yield a factor structure in which somatic symptoms would predominate over psychological symptoms, in contrast to the findings in published reports for student populations from the Western world.^{4,35,36}

PATIENTS AND METHODS

Subjects and procedure

Study participants were students of the College of Education, Public Authority for Applied Education and Training (PAAET), Kuwait. This is a four-year, degree-awarding institution with a total population of 8,000 students (2,000 men; 6,000 women).

The 624 participants consisted of 182 (29.2%) men and 442 (70.8%) women from all years of study. Our ratio was fairly similar to the ratio of men to women in the entire student population. Participants ranged in age from 18 to 38 years (mean, 20.8; SD, 2.9; mode and median=20 years). About 30% (186) were aged 18 to 19 years, the majority (404, or 64.7%) were aged 20 to 25 years, and 11 (1.6%) were aged 31 to 38 years.

Participants completed the questionnaire, translated into Arabic, in class during the 2007-2008 academic session. They were approached in class at the end of lectures by the research team. In order to include students from all the disciplines, the classes chosen were those of the courses of compulsory general studies. One course of general studies was chosen per each year of the 4-year study program. Participants self-completed the questionnaire anonymously. First, the objectives of the study were explained. The students were duly informed that they were free to decline participation and that there would be no penalty for refusing to participate. Participants also gave verbal informed consent. We ensured that all items of the questionnaire were completed. The study was approved by the institutional review panel of the PAAET.

BDI-II

The Arabic translation of the BDI-II was produced by the method of back-translation. Like the original BDI, the BDI-II has 21 items, each of which consists of four self-evaluative statements in a time frame of 2 weeks, and is scored 0 to 3, with increasing scores indicating greater depression severity. Responses are summed to yield a total score that ranges from 0 to 63. To produce the BDI-II, four items were replaced by the following: "agitation," "worthlessness," "difficulty with concentration," and "energy loss."⁴ With the exception of the study from Bahrain,⁷ the other reports on the psychometric properties of the BDI-II from the Arab world focused on the internal consistency of the instrument, using samples of students.^{43,44} In a study in five Arab countries,⁴³ alpha coefficients were computed for samples of male and female undergraduates recruited from Egypt, Saudi Arabia, Kuwait, and Lebanon (n=100, 80, 100, 100, respectively). Values of alpha were 0.77, 0.82, 0.89, and 0.67, respectively. In another study that involved 18 Arab countries,⁴⁴ the alpha coefficients for the BDI-II were in the range of 0.82 to 0.93. Using the responses of our subjects (n=624), we calculated the internal consistency (Cronbach's alpha) for the 21 items to be 0.83.

Data analyses

Data were analyzed using SPSS, version 15 (SPSS Inc., Chicago, Illinois). Of the methods of factor extraction, it has been suggested⁴⁵ that the best results would be obtained by either the maximum likelihood (ML) method for relatively normally distributed data or by principal axis factoring (PAF) if the assumption of multivariate normality is severely violated. An advantage of the ML method is that it allows for the computation of a wide range of indices of goodness of fit of the model to the data. Of the methods of rotation, oblique rotation is recommended for psychological data because behavior is normally correlated.^{45,46} Furthermore, the scree test and the cumulative/unique percent of explained variance ($\geq 5\%$) are better guides for the choice of number of factors to be rotated than the Kaiser-Guttman rule of factors with Eigen values above one (which is usually reserved for PCA).^{45,47} Finally, an item should load at least 0.3 on its factor, and a factor should be defined by at least three items.⁴⁵ We note that, in the original validation data for the BDI-II, factors were defined by items loading ≥ 0.35 .⁴

In view of the above recommendations, we used PAF for factor extraction (since the BDI-II is ordinal scaled), with promax (oblique) rotation for factors indicated by the scree test. However, we assessed the multivariate normality of our data in Analysis of Moment

Structures (AMOS, Version 16),⁴⁸ using recommendations for item skewness (± 3) and kurtosis (± 7).⁴⁹ We found that, for our sample, skew was 0.43 to 2.39 and kurtosis was -0.28 to 6.87, both of which were within the recommended ranges, thus indicating that the data did not significantly deviate from normality. In view of this, we repeated the EFA using the ML method and oblique rotation. All 21 items of the BDI-II were included in the analyses.

RESULTS*Factor analyses*

In the EFA by PAF, the scree test indicated four factors for rotation, which was done by promax rotation (Table 1), accounting for 41.8% of variance explained. The first factor was dominant, as it accounted for about four times as much variance as the next large one. The first three factors were judged to be strong because they each contained at least three items, each of which loaded ≥ 0.33 on their respective factors, except "worthlessness," "loss of interest," "tiredness," "loss of interest in sex," and "agitation" (which loaded 0.27 to 0.29). Thirteen items loaded > 0.40 . The fourth small factor had only two items (suggesting instability) with high loadings (0.55). There was parsimony or simple structure (i.e., no cross-loadings) because no item loaded > 0.3 on more than one factor. Rather, the vast majority of items loaded < 0.2 on factors that did not define them.

Factor 1 consisted of purely psychological symptoms of depression. Factor 2 comprised mainly somatic symptoms but also had some affective symptoms (loss of interest and irritability). Factor 3 also belonged to a purely psychological domain, whereas factor 4 was another mixture of somatic and psychological symptoms.

Therefore, from their constituent items, it was clear that each factor could be seen as closely resembling one-half of the two factors of the "CA-S" original model from North America, although we prefer to label them thus: "cognitive I," "somatic-affective I," "cognitive II," and "somatic-affective II".

The alpha coefficients were 0.77, 0.62, and 0.49, respectively, for factors 1, 2, and 3. The results of the Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy indicated that the input matrix was suitable for conducting the analyses.

The results were very similar when the EFA was done using the ML method (Table 2). Furthermore, the correlation between factors 1 and 2 (0.69) was adequate; from the ML method, the goodness-of-fit index ($\chi^2/df=1.21$) indicated excellent fit.⁵⁰

Table 1. Principal axis factoring with oblique (promax) rotation for BDI-II 21 items (n=624).

Factor label	Constituent items	Loadings*	Eigen value	% Variance	Other items with loading ≥ 0.35 on factor**
Cognitive I	Sadness	0.60	5.1	24.1	All other items loaded < 0.20 , except loss of energy loaded 0.25
	Self-dislike	0.59			
	Punishment feelings	0.53			
	Suicidal thoughts	0.49			
	Indecisiveness	0.47			
	Past failure	0.45			
	Pessimism	0.41			
	Crying	0.40			
	Loss of pleasure	0.39			
	Worthlessness	0.29			
Somatic-affective I	Irritability	0.64	1.34	6.4	All other items loaded < 0.20 , except agitation and loss of pleasure and change in appetite loaded 0.26-0.29
	Sleep pattern	0.55			
	Loss of energy	0.37			
	Loss of interest	0.29			
	Tiredness/fatigue	0.29			
	Loss of interest: sex	0.27			
Cognitive II	Guilty feelings	0.62	1.20	5.7	All other items loaded < 0.2
	Self-criticalness	0.33			
	Agitation	0.27			
Somatic-affective II	Change in appetite	0.55	1.17	5.6	All other items loaded < 0.20
	Concentration difficulty	0.55			

*For clarity of presentation, loadings < 0.2 are not shown. **Loading of ≥ 0.35 recommended by Beck et al.⁴ KMO measure of sampling adequacy=0.89

In view of the fact that some items did not meet the 0.30 loading criterion, we repeated the analysis by excluding the three items from the ML method that did not meet this criterion. Table 3 shows four factors and loadings that were similar to the previous results. However, the last two factors were judged to be unstable because they were each defined by only two items.

DISCUSSION

We analyzed the responses of 624 Arab college students to the BDI-II, by examining the factor struc-

ture of the instrument. There is a paucity of such studies from the Arab world.⁷

Similar to the majority of studies reported in a meta-analytical study,² four domains emerged in our EFA operations, accounting for 41.8% of variance explained. In contrast to our hypothesis, the psychological symptoms predominated, and the domains were effectively one-half of each of the two domains of the data for college students from North America.^{4,35,36} In essence, the major factors fairly discriminated between cognitive and somatic symptoms in a manner that is in line with theory and clinical experience. The

Table 2. Maximum likelihood method with oblique rotation for BDI-II 21 items (n=624).

Factor label	Constituent items	Loadings*	Eigen value	% variance	Other items with loading ≥ 0.35 on factor**
Cognitive-I	Sadness	0.60	5.1	24.1	All other items loaded <0.20, except loss of energy loaded 0.25
	Self-dislike	0.58			
	Suicidal thoughts	0.52			
	Punishment feelings	0.52			
	Indecisiveness	0.45			
	Past failure	0.44			
	Crying	0.42			
	Pessimism	0.41			
	Loss of pleasure	0.39			
	Worthlessness	0.31			
Somatic-affective I	Irritability	0.69	1.34	6.4	All other items loaded <0.20, except change in appetite loaded 0.24, loss of pleasure loaded 0.25, and concentration difficulty loaded 0.29
	Sleep pattern	0.52			
	Loss of energy	0.39			
	Tiredness/fatigue	0.31			
	Loss of interest	0.26***			
	Loss of interest: sex	0.23***			
Cognitive II	Guilty feelings	0.63	1.20	5.7	All other items loaded <0.20
	Self-criticalness	0.33			
	Agitation	0.27			
Somatic-affective II	Change in appetite	0.57	1.17	5.6	All other items loaded <0.20
	Concentration difficulty	0.55			

*For clarity of presentation, loadings <0.2 are not shown. **Loading of ≥ 0.35 recommended by Beck et al.4 KMO measure of sampling adequacy = 0.89. Goodness of fit: Chi-square = 159.38; df = 132; $P < .049$; $\chi^2/df = 1.21$.

strength of this factor structure (i.e., a dominant first factor, high item loadings, most factors constituted by at least three items, parsimony or simple structure, and construct meaning) is an indication that the factors are robust within the data and not a measurement artifact. The apparent splitting of the factors from the original two-factor model does not suggest over-factoring because only one factor was unstable (i.e., defined by two items).¹⁶ Furthermore, when we selected only two factors for rotation, we did not obtain better structure because the first factor contained 19 items, whereas the second factor contained two items (“change in appe-

tite” and “concentration difficulty”). Even then, for this two-factor solution, “change in appetite” was found to cross-load on factor 1 (0.41). Similarly, rotating only three factors did not produce better structure because the third factor was equally unstable, with one of the two items (change in appetite) cross-loading (0.30) on the second factor.

The predominance of psychological symptoms (i.e., “cognitive” factor emerged as factor 1, with the largest variance explained) in this culture is noteworthy because cross-cultural studies have usually noted the predominance of somatic symptoms of depression in

Table 3. Principal axis factoring method with promax rotation for BDI-II 21 items (n=624) with three items loading <0.3 from maximum likelihood method removed*

Factor label	Constituent items	Loadings**	Eigen value	% variance	Other items with loading ≥ 0.35 or >0.30 on factor***
Cognitive I	Sadness	0.61	5.1	24.1	All other items loaded <0.20, except loss of energy loaded 0.25
	Self-dislike	0.58			
	Suicidal thoughts	0.54			
	Punishment feelings	0.49			
	Loss of pleasure	0.48			
	Past failure	0.48			
	Crying	0.47			
	Indecisiveness	0.45			
	Pessimism	0.41			
	Worthlessness	0.31			
Somatic-affective I	Irritability	0.78	1.34	6.4	All other items loaded <0.20, except change in appetite loaded 0.25
	Sleep pattern	0.41			
	Loss of energy	0.37			
	Tiredness/fatigue	0.28			
Cognitive-II	Guilty feelings	0.64	1.20	5.7	All other items loaded < 0.20
	Self-criticalness	0.31			
Somatic II	Change in appetite	0.64	1.17	5.6	All other items loaded <0.20
	Concentration difficulty	0.51			

*Loss of pleasure, loss of interest in sex, and agitation not included. **For clarity of presentation, loadings <0.2 are not shown. ***Loading of ≥ 0.35 recommended by Beck et al.⁴

developing countries.^{51,52} In particular, our results are markedly similar to the reports of college students from North America, wherein the cognitive factor was predominant.^{4,35,36} In a 1982 review, El-Islam⁵³ noted as follows:

“Affective disorders among Arabs have been reported to show a low incidence of undisguised affective symptoms in both depressive and manic forms. Guilt feelings have been reported to be rare in depressed Arab patients. One study found that if depressed patients are allowed to elaborate on their feelings beyond the somatic facade, guilt feelings could be demonstrated in many, especially among the educated. The clinical picture of depression in the urbanized Arab is approaching that in the West, a finding which is not surprising.” (p. 10).

Thus, our finding of the prominence of the cognitive domain among the students is probably attributed to the fact that the questionnaire had been revised to contain universal symptoms of depression (as in the DSM-IV and International Classification of Diseases, 10th Edition). We studied an urbanized population that could articulate their problems psychologically, and the rich Arabic language contains words that can easily and specifically describe mood states, such as depression (as distinct from cultures where depression is expressed in somatic style⁵²).

Although the loadings (0.27-0.29) on worthlessness, loss of interest, loss of interest in sex, and agitation only approximated to the recommended threshold (i.e., 0.30),⁴⁵ it is noteworthy that these items loaded <0.20 on other factors, indicating that they are most

relevant to their respective factors. Furthermore, “worthlessness” and “agitation” are new additions to the questionnaire. As proof of their salience in the total questionnaire, when the analysis was repeated with the exclusion of three items, the resulting four-factor structure was rather unstable because the last two factors each contained only two items (Table 3).

It is noteworthy that a number of studies have commented on the problem of the item on sex.^{17,42} For example, in the original report by Beck et al.,⁴ the item “loss of interest in sex” did not load significantly; in the report by Byrne,⁴⁶ the item on sex was not included because of consideration of its relevance in the age group studied. However, the item was retained because, among other reasons, its corrected item-total correlation was always highly significant.¹⁷

In factor analysis terminology, a variable with the highest factor loading can be viewed as a surrogate representative for a particular factor dimension.⁴² In line with this view, our factor structure can be said to have defined depression in a manner consistent with theory, because sadness, self-dislike (factor 1), and guilt feelings (factor 3) were the most definitive of the cognitive domain, whereas irritability and change in sleep pattern and appetite (factors 2 and 4) mostly defined the somatic-affective domain. We have thus replicated the robust finding in the published data that the BDI-II has construct validity across cultures. In addition, the internal consistency for the entire questionnaire was adequate.

Although our results are based on only one population, our findings have merit because we performed the

EFA in a standard manner, using an adequate sample size, and the goodness-of-fit index was excellent. Since the sample was drawn from a nonclinical population, it is not clear how these results might generalize to a clinical population. The results of our factor analyses are not attributable to measurement variance, as the BDI-II was found to have highly adequate psychometric characteristics and our results were robust and much in line with the international published data.⁵⁴ In addition, our factor solution is one of the most parsimonious among published reports, with no items cross-loading significantly.

Our findings support the multidomain construct of depression. Our four-factor solution (versus the alternative 2-factor and 3-factor solutions) is judged to be valid because we used appropriate statistics (PAF with oblique rotation), the sample size was adequate, and the solution fulfilled the recommended criteria, namely, a strong first factor, simple structure, and mostly stable factors with construct meanings that are in line with theory and clinical experience. Although the items of the BDI-II did not have the same level of salience in defining the construct of depression, they were all relevant for representing the range of symptoms and domains of the disorder. Our data support the impression that the domains “cognitive” and “somatic-affective” are basic in the construct of depression, thus helping to clarify the interpretation of BDI-II subscale scores in physical and mental illness settings.^{16,23,55} The findings need to be confirmed in another sample using the technique of confirmatory factor analysis.

REFERENCES

1. Demyttenaere K, De Fruyt J. Getting what you ask for: On the selectivity of depression rating scales. *Psychother Psychosom* 2003;72:61-70.
2. Shafer AB. Meta-analysis of the factor structures of four depression questionnaires: Beck, CES-D, Hamilton and Zung. *J Clin Psychol* 2006;62:123-46.
3. American Psychiatric Association. Diagnostic and statistical manual for mental disorders. 4th ed. [1]??? 1994.
4. Beck AT, Steer RA, Brown GK. Beck Depression Inventory manual. 2nd ed. San Antonio, TX: Psychological Corporation; 1996.
5. Dunkel D, Froehlich S, Antretter E, Haring C. Replication of a two-factor model of the Beck Depression Inventory in alcohol dependents and suicide attempters. *Psychopathol* 2002;35:228-33.
6. Richter P, Werner J, Heerlein A, Kraus A, Sauer H. On the validity of the Beck Depression Inventory: A review. *Psychopathol* 1998;31:160-8.
7. Al-Musawi NM. Psychometric properties of the Beck Depression Inventory-II with university students in Bahrain. *J Person Assess* 2001;77:568-79.
8. Bos SC, Pereira AT, Marques M, Maia B, Soares MJ, Valente J, et al. The BDI-II factor structure in pregnancy and postpartum: Two or three factors? *Eur Psychiatry* 2009;24:334-40.
9. De Souza J, Jones LA, Rickards H. Validation of self-report depression rating scales in Huntington's disease. *Mov Disord* 2010;25:91-6.
10. Ghassemzadeh H, Mojtabai R, Karamghadiri N, Ebrahimkhani N. Psychometric properties of a Persian-language version of the Beck Depression Inventory--Second edition: BDI-II-PERSIAN. *Depress Anxiety* 2005;21:185-92.
11. Gorenstein C, Andrade L, Zanolo E, Artes R. Expression of depressive symptoms in a nonclinical Brazilian adolescent sample. *Can J Psychiatry* 2005;50:129-36.
12. Grothe KB, Dutton GR, Jones GN, Bodenlos J, Ancona M, Brantley PJ. Validation of the Beck Depression Inventory-II in a low-income African American sample of medical outpatients. *Psychol Assess* 2005;17:110-4.
13. Kneipp SM, Kairalla JA, Stacciarini J, Pereira D. The Beck Depression Inventory II factor structure among low-income women. *Nurs Res* 2009;58:400-9.
14. Kojima M, Furukawa TA, Takahashi H, Kawai M, Nagaya T, Tokudome S. Cross-cultural validation of the Beck Depression Inventory-II in Japan. *Psychiatry Res* 2002;110:291-9.
15. Osman A, Barrios FX, Gutierrez PM, Williams JE, Bailey J. Psychometric properties of the Beck Depression Inventory-II in nonclinical adolescent samples. *J Clin Psychol* 2008;64:83-102.
16. Siegert RJ, Walkey FH, Turner-Stokes L. An examination of the factor structure of the Beck Depression Inventory-II in a neurorehabilitation inpatient sample. *J Int Neuropsychol Soc* 2009;15:142-7.
17. Uslu RI, Kapci EG, Oncu B, Ugurlu M, Turkcapar H. Psychometric properties and cut-off scores of the Beck Depression Inventory-II in Turkish adolescents. *J Clin Psychol Med Settings* 2008;15:225-33.
18. Vanheule S, Desmet M, Groenvynck H, Rosseel Y, Fontaine J. The factor structure of the Beck Depression Inventory-II: An evaluation. *Assess* 2008;15:177-87.
19. Nuevo R, Dunn G, Dowrick C, Vázquez-Barquero JL, Casey P, Dalgard OS, et al. Cross-cultural equivalence of the Beck Depression Inventory: A five-country analysis from the ODIN study. *J Affect Disord* 2009;114:156-62.
20. Duncan LE, Hutchison KE, Carey G, Craighead WE. Variation in brain-derived neurotrophic factor (BDNF) gene is associated with symptoms of depression. *J Affect Disord* 2009;115:215-9.
21. Schotte CK, Maes M, Cluydts R, De Doncker D, Cosyns P. Construct validity of the Beck Depression Inventory in a depressive population. *J Affect Disord* 1997;46:115-25.
22. Pujol J, Bello J, Deus J, Cardoner N, Martí-Vilalta JL, Capdevila A. Beck Depression Inventory factors related to demyelinating lesions of the left arcuate fasciculus region. *Psychiatry Res* 2000;99:151-9.
23. Thombs BD, Ziegelstein RC, Parakh K, Stewart DE, Abbey SE, Grace SL. Probit structural equation regression model: General depressive symptoms predicted post-myocardial infarction mortality after controlling for somatic symptoms of depression. *J Clin Epidemiol* 2008;61:832-9.
24. Bennett DS, Ambrosini PJ, Bianchi M, Barnett D, Metz C, Rabinovich H. Relationship of Beck Depression Inventory factors to depression among adolescents. *J Affect Disord* 1997;45:127-34.
25. Grunebaum MF, Keilp J, Li S, Ellis SP, Burke AK, Oquendo MA, et al. Symptom components of standard depression scales and past suicidal behavior. *J Affect Disord* 2005;87:73-82.
26. Basker M, Moses PD, Russell S, Russell PS. The psychometric properties of Beck Depression Inventory for adolescent depression in a primary-care paediatric setting in India. *Child Adolesc Psychiatry Ment Health* 2007;1:8.
27. Munoz DJ, Chen E, Fischer S, Roehrig M, Sanchez-Johnson L, Alverdy J, et al. Considerations for the use of the Beck Depression Inventory in the assessment of weight-loss surgery seeking patients. *Obes Surg* 2007;17:1097-101.
28. Palmer EJ, Binks C. Psychometric properties of the Beck Depression Inventory-II with incarcerated male offenders aged 18-21 years. *Crim Behav Ment Health* 2008;18:232-42.
29. Penley JA, Wiebe JS, Nwosu A. Psychometric properties of the Spanish Beck Depression Inventory-II in a medical sample. *Psychol Assess* 2003;15:569-77.
30. Poole H, Bramwell R, Murphy P. Factor Structure of the Beck Depression Inventory-II in patients With chronic pain. *Clin J Pain* 2006;22:790-8.
31. Steer RA, Ball R, Ranieri WF. Dimensions of the Beck Depression Inventory -II in clinically depressed outpatients. *J Clin Psychol* 1999;55:117-28.
32. Visser M, Leentjens AF, Marinus J, Stiggelbout AM, van Hilten JJ. Reliability and validity of the Beck depression inventory in patients with Parkinson's disease. *Mov Disord* 2006;21:668-72.
33. Bonilla J, Bernal G, Santos A, Santos D. A revised Spanish version of the Beck Depression Inventory: Psychometric properties with a Puerto Rican sample of college students. *J Clin Psychol* 2004;60:119-30.
34. Dozois DJ, Dobson KS, Ahnberg JL. A psychometric evaluation of the Beck Depression Inventory-II. *Psychol Assess* 1998;10:83-9.
35. Storch EA, Roberti JW, Roth DA. Factor structure, concurrent validity, and internal consistency of the Beck Depression Inventory -second edition in a sample of college students. *Depress Anx* 2004;19:187-9.
36. Whisman MA, Perez JE, Ramel W. Factor structure of the Beck Depression Inventory- second edition (BDI-II) in a student sample. *J Clin Psychol* 2000;56:545-51.
37. Wiebe JS, Penley JA. A psychometric comparison of the Beck Depression Inventory-II in English and Spanish. *Psychol Assess* 2005;17:481-5.
38. Buckley TC, Parker JD, Heggie J. A psychometric evaluation of the BDI-II in treatment-seeking substance abusers. *J Substance Abuse Treat* 2001;20:197-204.
39. Hayden MJ, Dixon JB, Dixon ME, O'Brien PE. Confirmatory Factor Analysis of the Beck Depression Inventory in Obese Individuals Seeking Surgery. *Obes Surg* 2010;20:432-9.
40. Tashakkori A, Barefoot J, Mehryar AH. What does the Beck Depression Inventory measure in college students? Evidence from a non-western culture. *J Clin Psychol* 1989;45:595-602.
41. El-Islam MF, Moussa MA, Malasi TH, Suleiman MA, Mirza IA. Assessment of depression in Kuwait by principal component analysis. *J Affect Disord* 1988;14:109-14.
42. Gary FA, Yarandi HN. Depression among southern rural African American women: A factor analysis of the Beck Depression Inventory-II. *Nur Res* 2004;53:251-9.
43. Abdel-Khalek AM. Internal consistency of an Arabic Adaptation of the Beck Depression Inventory in four Arab countries. *Psychol Rep* 1998;82:264-6.
44. Alansari BM. Internal consistency of an Arabic adaptation of the Beck Depression Inventory-II with college students in eighteen Arab countries. *Soc Behav Pers* 2006;34:425-30.
45. Costello AB, Osborne JW. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Pract Assess Eval* 2005;10:7.
46. Byrne BM. Factor analytic models: Viewing the structure of an assessment instrument from three perspectives. *J Pers Assess* 2005;85:17-32.
47. Pett MA, Lackey NR, Sullivan JJ. Making sense of factor analysis. The use of factor analysis for instrument development in health care research. Thousand Oaks, CA: Sage; 2003.
48. Arbuckle JL, Wothke W. AMOS 4.0 User's Guide. Chicago, IL: SmallWaters, Corporation; 1999.
49. West SG, Finch JF, Curran PJ. Structural equation models with non-normal variables. Problems and remedies. In: Hoyle R, editor. *Structural Equation Modeling: concepts, issues and applications*. Newbury Park, CA: Sage; 1995. p. 56-75.
50. Hooper D, Coughlan J, Mullen MR. *Structural Equation Modelling: Guidelines for Determining Model Fit*. *Electronic J Business Res Methods* 2008;6:53-60.
51. El-Islam MF, Malasi TA, Suleiman MA, Mirza IA. The correlates of hypochondriasis in depressed patients. *Int J Psychiatry Med* 1988;18:253-61.
52. Odejide AO, Oyewunmi LK, Ohaeri JU. Psychiatry in Africa: an overview. *Am J Psychiatry* 1989;146:708-16.
53. El-Islam MF. Overview: Arabic cultural psychiatry. *Transcult Psychiatry Res Rev* 1982;19:5-23.
54. Brown TA, Chorpita BF, Barlow DH. Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect and autonomic arousal. *J Abnorm Psychol* 1998;107:179-92.
55. Harris CA, D'Onofrio JL. Psychometric properties of the Beck Depression Inventory - second edition (BDI-II) in individuals with chronic pain. *Pain* 2008;137:609-22.