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A Reexamination of the Factor Structure of the Center for Epidemiologic Studies Depression Scale: Is a One-Factor Model Plausible?

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Abstract

The Center for Epidemiologic Studies Depression Scale (CES–D) is one of the most widely used measures of depressive symptoms in research today. The original psychometric work in support of the CES–D (Radloff, 1977) described a 4-factor model underlying the 20 items on the scale. Despite a long history of evidence supporting this structure, researchers routinely report single-number summaries from the CES–D. The research described in this article examines the plausibility of 1-factor model using an initial sample of 595 subjects and a cross-validation sample of 661. After comparing a series of models found in the literature or suggested by analyses, we determined that the good fit of the 4-factor model is mostly due to its ability to model excess covariance associated with the 4 reverse-scored items. A 2-factor model that included a general depression factor and a positive wording method factor loading only on those 4 items had fit that was nearly as good as the original 4-factor model. We conclude that although a 1-factor model may not be the best model for the full 20-item CES–D, it is at least plausible. If a unidimensional set of items is required (e.g., for a unidimensional item response theory analysis), by dropping 5 items, we were able to find a 1-factor model that had very similar fit to the 4-factor model with the original 20 items.

Keywords

depression; CES–D; factor analysis; dimensionality

The Center for Epidemiologic Studies Depression Scale (CES–D; Radloff, 1977) is 20-item self-report questionnaire that is one of the most widely used measures of depressive symptoms in research today. According to Radloff (1977), the scale was constructed to measure the symptoms of depression in the general population on the basis of factors identified in both the clinical literature and factor analytic studies. The scale was designed to

represent multiple dimensions of depression as well as discourage response bias (through the use of reverse-scored items) and assess positive affect. Assessments using the CES–D typically focus on the preceding week, which is the time frame suggested in the original scale. However, researchers often use alternative time frames to accommodate their research questions, which may alter the psychometric properties of the scale.

In 1977, Radloff introduced the scale with support for adequate criterion-oriented validity, construct validity, internal consistency, and test–retest reliability. The underlying structure was examined using principle components analysis (PCA) with varimax rotation (Radloff, 1977). Four components were estimated, accounting for 48% of the variance, and items with component loadings of at least .40 were included. The four components and the corresponding items were reported as follows: (a) *depressed affect*, including feeling blue, feeling depressed, feeling lonely, crying spells, and feeling sad; (b) *positive affect*, including feeling as good as others, feeling hopeful, feeling happy, and enjoying life; (c) *somatic and retarded activity*, including being bothered more than usual, decreased appetite, feeling as if extra effort was required, reports of restless sleep, and difficulty getting going; and (d) *interpersonal*, including feeling that others were unfriendly and feeling disliked by others. The final four-component solution did not include difficulty concentrating, talking less than usual, feeling like a failure, or feeling fearful items.

Since 1977, the CES–D has become a very popular measure of depressive symptoms and is used frequently in both epidemiological and clinical research. There have been several attempts to determine the most appropriate factor structure, both in the general population and in unique populations. Support for the four-component structure has been replicated using PCA with several samples, including urban residents (Clark, Aneshensel, Frerichs, & Morgan, 1981), married men and women (Ross & Mirowsky, 1984), primary care patients (Devins, Orme, Costello, & Binik, 1988; Zich, Attkisson, & Greenfield, 1990), university students (Devins et al., 1988), and both English- and Spanish-speaking psychiatric inpatients (Roberts, Vernon, & Rhoades, 1989). Researchers using PCA have also found support for a three-component structure, specifically in ethnically diverse samples (e.g., Guarnaccia, Angel, & Worobey, 1989; Kuo, 1984; Manson, Ackerson, Dick, Baron, & Fleming, 1990; Stroup-Benham, Lawrence, & Trevino, 1992; Ying, 1988). The three-component structures combined the somatic and depressed affect domains (Guarnaccia et al., 1989; Kuo, 1984; Stroup-Benham et al., 1992; Ying, 1988) or the depressed affect and interpersonal domain (Manson et al., 1990). Finally, a five-component structure has been proposed (Thorson & Powell, 1993); however, this structure has not been widely supported elsewhere.

Using exploratory factor analysis, several studies replicated Radloff's four-component structure, including one using samples of undergraduates (Joseph & Lewis, 1995) and one using samples of chronically ill older adults (Callahan & Wolinsky, 1994). However, Stommel et al. (1993), using samples of cancer patients and caregivers, were not able to replicate the four-component structure using exploratory factor analysis. Using confirmatory factor analysis (CFA), Radloff's four-factor structure of the CES–D has been supported in several populations, including White, Black, and Hispanic adults (Roberts, 1980) and Mexican Americans (Garcia & Marks, 1989; Golding & Aneshensel, 1989; Posner, Stewart, Marín, & Pérez-Stable, 2001). However, several research groups using CFA reported a three-factor structure for samples of American Indian participants, including adolescents (Dick, Beals, Keane, & Manson, 1994), adults (Somervell et al., 1992), and elders (Chapleski, Lamphere, Kaczynski, Lichtenberg, & Dwyer, 1997). In addition to the four-factor and three-factor solutions, several research groups using CFA reported a four-factor structure with a single second-order factor; this structure was supported in samples of community adults (Hertzog, Van Alstine, Usala, Hultsch, & Dixon, 1990), adult women

(Knight, Williams, McGee, & Olaman, 1997), and rheumatoid arthritis patients (Sheehan, Fifield, Reisine, & Tennen, 1995).

Sheehan et al. (1995) found that the single, three-, four-, and single second-order factor models all provided good model fit to the data as assessed by fit measures such as the chi-square statistic and the ratio of chi-square over degrees of freedom (Wheaton, Muthén, Alwin, & Summers, 1977). The models were then compared using several additional indices, including chi-square, Akaike's information criterion (AIC; Akaike, 1974), consistent Akaike's information criterion (CAIC; Bozdogan, 1987), root mean square error of approximation (RMSEA; Steiger, 1990), and the comparative fit index (CFI; Bentler, 1990). After using these various measures to contrast fit, the authors ultimately endorsed the original four-factor model, $\chi^2(164) = 247$, $\chi^2/df = 1.51$, $RMSEA = .026$, $AIC = 339$, $CAIC = 597$, $CFI = .988$ (Sheehan et al., 1995). The authors reported that this fit was almost identical to that of the four-factor model with a single second-order factor and had no significant differences in fit, which is not surprising as these models are nearly equivalent. However, the authors indicated that the four-factor model may provide slightly more information and is in line with the scale's theoretical development.

Although the literature supports a four-factor structure for the CES-D, this is not the model generally used in research. Even though Radloff (1977) reported the best fit for four components and a high degree of structural similarity across samples, she argued that a total score should be used because all of the scale items were conceptually related to depression and thus should be included regardless of the component loadings. In line with this recommendation, it is common practice to report a total scale score in both clinical assessment and research. In a review of the literature across several notable journals (i.e., *Behaviour Research and Therapy*, *Health Psychology*, *Journal of Applied Psychology*, *Journal of Consulting and Clinical Psychology*, *Journal of Clinical Psychology*, *Journal of Personality Disorders*, *Journal of Personality and Social Psychology*, *Psychological Assessment*), all studies using the CES-D as a primary measure were identified and examined. Conducting a search using PsycINFO as well as Google Scholar, we were able to locate 114 studies published since 2000 that used the 20-item CES-D. Of these articles, only seven mentioned the factor structure of the measure; two of these studies were examining factor structure explicitly. The remaining 107 studies reported use of a total score that combined all items of the measure.

Although reporting the CES-D with a total score has become common practice, none of the known research conducted to date has demonstrated that the CES-D is unidimensional. Using a unidimensional score for data that cannot be adequately explained with a single factor can lead to several types of interpretation errors, resulting in faulty conclusions. For example, if the CES-D is, in fact, best conceptualized as a multidimensional model with four factors, analyses using a total score could lead to conclusions that misrepresent subtypes of depressive presentations or underappreciate the role of specific symptom clusters. Alternatively, if the CES-D can be adequately interpreted as measuring a single construct, individuals with different depressive symptom presentations can be equated in terms of depressive symptom severity. Thus, our primary aim is to examine the factor structure of the CES-D to determine if a one-factor solution is an adequate fit of the data as compared with the four-factor model suggested by Radloff (1977) as well as alternative models.

Method

Participants

The initial sample consisted of 595 adults (67.5% women) who were recruited for a variety of smaller studies, each assessing depressive experiences as one of the aims. Participants were recruited from a variety of sources, including university settings, outpatient hospital settings, and advertisements posted in local communities. All participants consented to participate in research that included CES–D assessments, and samples were amalgamated to increase the sample size necessary for factor analysis as well as increase the generalizability of the results. The age range of individuals in the sample was from 18 to 82 years ($M = 25.13$ years, $SD = 10.07$). Of the total sample, 46.54% reported being married or in a committed relationship with a significant other. The sample was predominantly Caucasian (77.40%), with the remainder of the sample self-identifying as Asian (10.29%), African American (4.05%), Hispanic (3.88%), American Indian (0.84%), and other/nondisclosed (3.37%).

To validate the results of the analyses described below, we used a second sample of 661 adults (46.16% women). These participants were recruited from the Introduction to Psychology course at the Ohio State University and ranged in age from 18 to 42 years ($M = 19.26$ years, $SD = 2.10$). In this sample, only 18.31% of individuals reported being married or in a committed relationship. Participants in the sample self-identified as Caucasian (76.55%), Asian (5.14%), African American (6.89%), Hispanic (5.57%), American Indian (0.66%), and other/nondisclosed (6.72%).

Measures

Demographic information—A short self-report questionnaire was administered to obtain demographic information, including age, race, marital status, and gender.

CES–D—As previously described, the CES–D is a 20-item self-report measure of symptoms of depression. The instructions ask respondents to use the time frame of the past week when indicating the frequency of each feeling or behavior on a scale of 0 (*rarely or none of the time*) to 3 (*most or all of the time*). CES–D scores have evidenced high internal reliability in both patient ($\alpha = .90$) and general population ($\alpha = .85$) samples (Radloff, 1977). In addition to internal consistency, CES–D scores have demonstrated acceptable test–retest reliability, with correlations ranging from .45 to .70 for two- to eight-week intervals, respectively.

Procedure: Data Analytic Plan

In our analyses of the CES–D, we used CFA as implemented in the LISREL software package (Jöreskog & Sörbom, 2003). Because of the categorical nature of the data, we used polychoric correlations as measures of association between the items (as opposed to Pearson product moment correlations or covariances) and a diagonally weighted least squares estimator. For a more detailed description of polychoric correlations and the diagonally weighted least squares estimator, see Wirth and Edwards (2007).

We relied on several measures of fit to evaluate the CFA models: CFI, goodness-of-fit index (GFI), RMSEA, and root mean square residual (RMSR). On the basis of extensive simulation studies conducted by Hu and Bentler (1999), it appears that good-fitting models will have CFI and GFI values greater than .95, RMSEA values less than .06, and RMSR values less than .08.

Results

We began the analyses by fitting the four-factor model originally suggested by Radloff (1977). The fit statistics for all of the models described in this section can be found in Table 1. On the basis of the guidelines for model fit described above, the four-factor model does appear to fit the data quite well. Of interest to the current discussion is the interfactor correlation matrix, which is shown in Table 2. The correlations range from .75 to .92, implying that between 56% and 84% of the variance in a given factor was overlapping with another. We next moved to a one-factor model of the full 20-item CES-D. As can be seen by the fit statistics contained in Table 1, the one-factor model appears to fit the data appreciably worse than does the four-factor model. The nonoverlapping confidence intervals for the RMSEA imply that, at least on the basis of how the RMSEA defines model fit, the four-factor model is statistically significantly better than the one-factor model. We examined modification indices to gain a better understanding of the potential sources of misfit in the one-factor model. Modification indices provide an estimate of how much better the model would fit if a parameter currently constrained (usually to zero) was instead freely estimated. For the one-factor model, the only place where constraints could be lifted is in the covariance matrix among the item residuals. This matrix is typically assumed to be diagonal, which allows items to have residuals but does not allow those residuals to covary. There were several larger modification indices between the four reverse-scored items: Item 4, feeling that one is as good as other people; Item 8, feeling hopeful; Item 12, being happy; and Item 16, enjoying life. This indicates that those four items are more related to one another than the model would predict on the basis of their relationship to the latent factor. We fit a two-factor model, which added an additional factor loading on the four reverse-scored items. This factor was constrained to be uncorrelated with the primary factor, as we viewed this additional factor as a methodological factor related to the wording of the items (i.e., positively valenced vs. negatively valenced). This model had superior fit to the one-factor model and was quite close to the Radloff (1977) four-factor model. The RMSEA for the two-factor model was significantly lower than the RMSEA of the one-factor model, but the RMSEA for the four-factor model was not statistically significantly lower than that of the two-factor model. The factor loadings for the four reverse-coded items on the reverse-coded factor were 40% smaller than their loadings on the primary factor. Three of the four were very close in magnitude to other items' primary factor loadings. Adding the second factor increases the item-level variance accounted for by 5%, 11%, 13%, and 12% for Items 4, 8, 12, and 16, respectively.

A further examination of modification indices found under the two-factor model showed one larger value for the residual correlation between Items 15 ("People were unfriendly") and 19 ("I felt that people dislike me"). We reestimated the two-factor model, allowing the residuals of these two items to covary, and obtained the fit indices reported in Table 1. A comparison of the fit for this model (two factors plus a correlated error) and the four-factor model put forth by Radloff (1977) shows that they are nearly identical.

We fit one final model to determine if there was a subset of CES-D items for which a one-factor model fit well. We omitted the positively worded items (Items 4, 8, 12, and 16) and chose to retain Item 19 from the 15/19 pair. This left us with a shortened 15-item CES-D. The fit for this model is reported in the last row of Table 1. The fit of the one-factor model to this shortened set of CES-D items is very similar to that of the basic two-factor model described above. With this particular 15-item subset, it appears that a very strong case could be made that the items are primarily assessing one common construct. The factor loadings from this analysis are provided in Table 3.

Given the use of modification indices in the above analyses, this shifts the models from confirmatory to exploratory in nature.¹ It is desirable to see how well the results hold in another sample. We reran the 15-item one-factor model in a cross-validation sample and observed similar levels of model fit, which are reported in the final row of Table 1. This suggests the 15-item shortened version of the CES–D can be adequately explained by one factor.

Discussion

If researchers want to obtain a single score from the CES–D, there are, broadly speaking, two options. The simpler option is to omit the positively worded items and sum the remaining items. The data suggest that these four items are tapping into a different dimension, which is likely related to depressive experiences, but it does not contribute to a unidimensional model of depressive symptoms. We also argue that Item 15 should be discarded because of its statistical and conceptual overlap with Item 19. The correlated residuals from these two items imply that respondents are answering these questions more similarly than would be expected on the basis of the severity of their depressive experience alone. An examination of the item content suggests that respondents could have a difficult time understanding conceptual distinctions between the questions. Additionally, the four positively worded items appear to be measuring more than just depression. These items may be tapping into the experience of positive affect, which has been shown to contribute unique variance to depressive symptoms when included in models with negative affect (e.g., Brown, 2007). However, whatever this other factor is, it is not the primary factor being assessed by the CES–D, and including those items in the total score will add variability that is not attributable to depressive symptoms as assessed with the CES–D. In our validation sample, scores from the full 20-item CES–D had a reliability of .90 and scores from the 15-item version had a reliability of .87. This suggests that removing these items has little decrement to the reliability of total scores from the CES–D.

Another option, which would enable researchers to retain all 20 items, would be to use a more advanced psychometric model such as CFA or item response theory (IRT) to score individuals' responses. Either of these two frameworks would provide scores that take into account the more dimensionally complex structure of the full 20-item CES–D. This is not to suggest that CFA or IRT would not be advantageous with any subset of the original item set; we feel there would be great benefits to doing so (see Edwards, 2009, for a full explanation of these benefits). If a unidimensional IRT model is used with the CES–D, we strongly recommend using the shorter 15-item version, where stronger evidence of unidimensionality was found. It would be possible to simply ignore the reverse-scoring factor (and potential redundancy between Items 15 and 19) and create a single summed score. This approach has some support that is based on the fit of the one-factor model, which is encouraging given the widespread usage of this mode of scoring. However, on the basis of the results above, simply adding all 20 items together is not likely to produce the most valid score.

The current study has several limitations. First, our results depend to some extent on our sample compositions. As mentioned previously, there does seem to be some variability in the dimensional structure of the CES–D depending on the population from which the sample is being drawn. Our samples aggregate over age; gender; and, to some extent, ethnicity. Differences within these categories would not be detectable with the approach we pursued in

¹The name *confirmatory factor analysis* is somewhat unfortunate in that there is nothing in the model which makes it inherently confirmatory. CFA can be used in an exploratory fashion, as we have here. A better name would be *restricted factor analysis*, to differentiate it from *unrestricted factor analysis* (commonly called *exploratory factor analysis*). However, we adhere to the most commonly used terms to avoid confusion.

this article. Finally, our modifications to the CES–D are data driven in that they do not consider the content validity of the resulting scale.

Conclusion

We set out to assess the plausibility of a one-factor model for the CES–D. This is the way the scale is overwhelmingly scored despite a large number of studies suggesting a four-factor structure is more appropriate. Our results indicate that although a one-factor model may not be the best model for the full 20-item CES–D, it is at least plausible. If a unidimensional set of items is required for something like an IRT analysis, by dropping five items, we were able to find a one-factor model that fit the data nearly as well as the four-factor model comprising the original 20 items. If a simple summed score is going to be used by researchers, it is advisable to only score these 15 items. If all 20 items are desired, a more complex psychometric model is likely to provide more valid scores.

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References

- Akaike H. A new look at the statistical model identification. *IEEE Transactions on Automatic Control*. 1974; 19:716–723.
- Bentler PM. Fit indexes, Lagrange multipliers, constraint changes and incomplete data in structural models. *Multivariate Behavioral Research*. 1990; 25:163–172.
- Bozdogan H. Model selection and Akaike's information criterion (AIC): The general theory and its analytical extensions. *Psychometrika*. 1987; 52:345–370.
- Brown TA. Temporal course and structural relationships among dimensions of temperament and *DSM–IV* anxiety and mood disorder constructs. *Journal of Abnormal Psychology*. 2007; 116:313–328. [PubMed: 17516764]
- Callahan CM, Wolinsky FD. The effect of gender and race on the measurement properties of the CES–D in older adults. *Medical Care*. 1994; 32:341–356. [PubMed: 8139299]
- Chapleski EE, Lamphere JK, Kaczynski R, Lichtenberg PA, Dwyer JW. Structure of a depression measure among American Indian elders: Confirmatory factor analysis of the CES–D Scale. *Research on Aging*. 1997; 19:462–485.
- Clark VA, Aneshensel CS, Frerichs RR, Morgan TM. Analysis of effects of sex and age in response to items on the CES–D Scale. *Psychiatry Research*. 1981; 5:171–181. [PubMed: 6945612]
- Devins GM, Orme CM, Costello CG, Binik YM. Measuring depressive symptoms in illness populations: Psychometric properties of the Center for Epidemiologic Studies Depression (CES–D) scale. *Psychology & Health*. 1988; 2:139–156.
- Dick RW, Beals J, Keane EM, Manson SM. Factorial structure of the CES–D among American Indian adolescents. *Journal of Adolescence*. 1994; 17:73–79.
- Edwards MC. An introduction to item response theory using the Need for Cognition Scale. *Social and Personality Psychology Compass*. 2009; 3:507–529.
- Garcia M, Marks G. Depressive symptomatology among Mexican-American adults: An examination with the CES–D Scale. *Psychiatry Research*. 1989; 27:137–148. [PubMed: 2710862]
- Golding JM, Aneshensel CS. Factor structure of the Center for Epidemiologic Studies Depression Scale among Mexican Americans and non-Hispanic Whites. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1989; 1:163–168.
- Guarnaccia PJ, Angel R, Worobey JL. The factor structure of the CES–D in the Hispanic health and nutrition examination survey: The influences of ethnicity, gender, and language. *Social Science & Medicine*. 1989; 29:85–94. [PubMed: 2740931]

- Hertzog C, Van Alstine J, Usala PD, Hultsch DF, Dixon R. Measurement properties of the Center for Epidemiological Studies Depression Scale (CES-D) in older populations. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1990; 2:64–72.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structural analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6:1–55.
- Jöreskog, KG.; Sörbom, D. LISREL 8.54 [Computer software]. Chicago, IL: Scientific Software International; 2003.
- Joseph S, Lewis CA. Factor analysis of the Center for Epidemiological Studies–Depression Scale. *Psychological Reports*. 1995; 76:40–42. [PubMed: 7770591]
- Knight RG, Williams S, McGee R, Olan S. Psychometric properties of the Center for Epidemiologic Studies Depression Scale (CES-D) in a sample of women in middle life. *Behaviour Research and Therapy*. 1997; 35:373–380. [PubMed: 9134792]
- Kuo WH. Prevalence of depression among Asian-Americans. *Journal of Nervous and Mental Disease*. 1984; 172:449–457. [PubMed: 6747614]
- Manson SM, Ackerson LM, Dick RW, Baron AE, Fleming CM. Depressive symptoms among American Indian adolescents: Psychometric characteristics of the Center for Epidemiologic Studies Depression Scale (CES-D). *Psychological Assessment: A Journal of Consulting and Clinical Psychology*. 1990; 2:231–237.
- Posner SF, Stewart AL, Marín G, Pérez-Stable EJ. Factor variability of the Center for Epidemiological Studies Depression Scale among urban Latinos. *Ethnicity & Health*. 2001; 6:137–144. [PubMed: 11488294]
- Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Roberts RE. Reliability of the CES-D scale in different ethnic contexts. *Psychiatry Research*. 1980; 2:125–134. [PubMed: 6932058]
- Roberts RE, Vernon SW, Rhoades HM. Effects of language and ethnic status on reliability and validity of the Center for Epidemiologic Studies Depression Scale with psychiatric patients. *Journal of Nervous and Mental Disease*. 1989; 177:581–592. [PubMed: 2677237]
- Ross CE, Mirowsky J. Men who cry. *Social Psychology Quarterly*. 1984; 47:138–146.
- Sheehan TJ, Fifield J, Reisine S, Tennen H. The measurement structure of the Center for Epidemiologic Studies Depression Scale. *Journal of Personality Assessment*. 1995; 64:507–521. [PubMed: 7760258]
- Somervell PD, Beals J, Kinzie JD, Boehnlein J, Leung P, Manson SM. Use of the CES-D in an American Indian village. *Culture, Medicine and Psychiatry*. 1992; 16:503–517.
- Steiger JH. Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research*. 1990; 25:173–180.
- Stommel M, Given BA, Given CW, Kalaian HA, Schulz R, McCorkle R. Gender bias in the measurement properties of the Center for Epidemiologic Studies Depression Scale (CES-D). *Psychiatry Research*. 1993; 49:239–250. [PubMed: 8177918]
- Stroup-Benham CA, Lawrence RH, Trevino FM. CES-D factor structures among Mexican Americans and Puerto Rican women from single- and couple-headed households. *Hispanic Journal of Behavioral Sciences*. 1992; 14:310–326.
- Thorson JA, Powell FC. The CES-D: Four or five factors? *Bulletin of the Psychonomic Society*. 1993; 31:577–578.
- Wheaton, B.; Muthén, B.; Alwin, DF.; Summers, GF. Assessing reliability and stability in panel models. In: Heise, DR., editor. *Sociological methodology*. San Francisco, CA: Jossey- Bass; 1977. p. 84-136.
- Wirth RJ, Edwards MC. Item factor analysis: Current approaches and future directions. *Psychological Methods*. 2007; 12:58–79. [PubMed: 17402812]
- Ying Y. Depressive symptomatology among Chinese-Americans as measured by the CES-D. *Journal of Clinical Psychology*. 1988; 44:739–746. [PubMed: 3192712]

Zich JM, Attkisson CC, Greenfield TK. Screening for depression in primary care clinics: The CES-D and the BDI. *International Journal of Psychiatry in Medicine*. 1990; 20:259–277. [PubMed: 2265888]

Table 1

Fit Indices for Competing Center for Epidemiologic Studies Depression Scale Models

Model	RMSEA	RMSEA 90% CI	CFI	GFI	RMSR
4 factor (Radloff, 1977)	.045	[0.034, 0.055]	.994	.995	.044
1 factor	.084	[0.076, 0.092]	.978	.991	.084
2 factor	.057	[0.048, 0.066]	.990	.994	.051
2 factor (correlated residuals)	.048	[0.038, 0.055]	.993	.995	.048
1 factor (15 items)	.056	[0.043, 0.068]	.991	.995	.046
1 factor (15 items, second sample)	.060	[0.052, 0.068]	.983	.990	.056

Note. RMSEA = root mean square error of approximation; CI = confidence interval; CFI = comparative fit index; GFI = goodness-of-fit index; RMSR = root mean square residual.

Table 2

Interfactor Correlations From the Four-Factor Center for Epidemiologic Studies Depression Scale Model

Factor	1	2	3	4
1	1.00			
2	.85	1.00		
3	.92	.75	1.00	
4	.85	.83	.83	1.00

Note. Factor 1 corresponds to depressed affect, Factor 2 corresponds to positive affect, Factor 3 corresponds to somatic and retarded activity, and Factor 4 corresponds to interpersonal.

Table 3

Factor Loadings for Unidimensional 15-Item Center for Epidemiologic Studies Depression Scale

Item	Factor loading
1	.71
2	.58
3	.89
5	.61
6	.92
7	.60
9	.74
10	.63
11	.60
13	.64
14	.82
17	.73
18	.91
19	.73
20	.69