Published in final edited form as:

West J Nurs Res. 2009 March ; 31(2): 219–234. doi:10.1177/0193945908326065.

Comparison of Short Scales to Measure Depressive Symptoms In Elders with Diabetes

Abstract

Depression is the most common mental health problem among American elders and it is also prevalent among those with diabetes. The 20-item Center for Epidemiological Studies Depression Scale (CES-D) is commonly used to measure depressive symptoms in elders, but its length is potentially burdensome. Twelve short forms of the CES-D (4–16 items) exist, but they have not been tested with elders with diabetes.

Purpose—This study compared reliability and validity estimates across the 12 short forms and investigated similarities in classifying elders with diabetes as clinically depressed using standardized cut scores.

Theoretical Framework—Beck’s theory provides a framework for identifying the affective, cognitive, behavioral, and somatic symptoms that are measured by the CES-D.

Methods—Data were merged from two studies, which yielded 80 elders with diabetes who completed the CES-D items during structured interviews.

Results—Cronbach’s alpha was .87 for the CES-D; it ranged from .60 (5-item) to .84 (16-item) for shorter forms. Correlations of the full CES-D and short forms ranged from .82 (4-item) to .98 (16-item). Using the CES-D cut score, 14% of the elders with diabetes had clinically significant depressive symptoms: 21% men, 11% women, 17% African Americans, and 13% Caucasians. A 5-item scale overestimated 29% as clinically depressed: 33% men, 27% women, 25% African Americans, and 29% Caucasians.

Conclusions—The findings suggest that shortened scales to measure depressive symptoms may be potentially useful with elders with diabetes. Further psychometric studies of the CES-D short forms are recommended with elders with chronic conditions.

Keywords

depression; diabetes; older adults; measurement

Although the prevalence of depression has been reported to be lower among elderly persons than younger adults (Steffens et al., 2000), it is increasing (Chapman & Perry, 2008). At the same time, the prevalence of diabetes is increasing most rapidly in the elderly population (age 65 and older; Trief). Although a link between diabetes and depression has been identified (Golden et al., 2008; Trief, 2007), researchers continue to work to determine the temporal sequencing of the two conditions. Whether depression precedes diabetes or diabetes precedes depression has been a “chicken versus egg” issue for centuries (Lustman & Clouse, 2007). Data from prospective studies have shown that the temporal order may go either way: diabetes to depression or depression to diabetes and comorbidity rates are fairly high (Eaton, 2002; Golden et al., 2008). Further, there is mounting evidence that mortality is greater in persons who have both depression and diabetes than in persons with only one of the conditions (Milano & Singer, 2007).

One of the challenges of studying depressive disorders in diabetic persons is that some of the somatic symptoms of depression (e.g., fatigue, sleep problems, weight gain or loss) may also occur with diabetes (McIntosh, Kjernisted, & Hammond, 2008). Although Lustman, Harper,

Griffith, and Clouse (1986) argued that diagnostic criteria for clinical depression are valid for persons with diabetes despite this overlap, when instruments used to measure depressive symptoms contain somatic symptoms that may also occur with diabetes, this can lead to overdiagnosis of depression and unnecessary treatment (Ellis, Robinson, & Crawford, 2006).

Many studies of depressive symptoms in older adults with chronic conditions, including diabetes, have used the Center for Epidemiological Studies Depression (CES-D) scale (Radloff, 1977). Researchers have used cut scores of 15, 16, and 22 on the 20-item scale to indicate clinically relevant depression in diabetic individuals (DeGroot, Pinkerman, Wagner, & Hockman, 2006; Fisher et al., 2007; Pouwer et al., 2003). Administration of the full 20-item CES-D scale to older adults has been reported to be potentially burdensome, especially for frail elders, and studies of elders have shown excessive missing data (Bono, Ried, Kimberlin, & Vogel, 2007; Smits, Cuijpers, Beekman, & Smit, 2007). As a result, a number of abbreviated forms of the CES-D have been developed. Two studies of elders with diabetes (Carnethon et al., 2007; Maraldi et al., 2007) used a 10-item CES-D scale (Andresen, Malmgren, Carter, & Patrick, 1994). However, no studies have compared use of the various shortened version of the CES-D with elders with diabetes.

Consistent with Beck's theory of depression, the 20-item CES-D scale includes symptoms in four categories: affective, cognitive, behavioral, and somatic (Beck, 1991). The seven somatic symptoms are feeling bothered talking less, problems with concentration, changes in appetite, changes in sleep, effort, and fatigue (Radloff, 1977). These symptoms can be present in elders with diabetes without depression. To date, however, no research has focused on the measurement of somatic depressive symptoms in persons with diabetes. In a study of cancer patients, VanWilgen, Dijkstra, Stewart, Ranchor, and Roodenburg (2006) found the total score on the somatic items of the 20-item CES-D differed significantly between persons with cancer and persons who did not have a cancer, but the researchers concluded that somatic morbidity depended on cancer type. The findings may differ for persons with diabetes, however, who may constitute a more homogeneous group.

In addition to the four categories of symptoms measured by the 20-item CES-D (Radloff, 1977), the scale includes four positively worded items that require reverse coding when creating a composite score. These items ask about feeling good, happy, hopeful, and enjoying life (Radloff). The other 16 items ask about the presence of depressive symptoms. Schroevers, Sandermann, VanSonderen, and Ranchor (2000) found that the 16 items reflecting negative affect were reliable and valid indicators of depressive symptoms, but the validity of the positive affect items was not confirmed; they therefore recommended that these items should not be included in the composite CES-D score.

Four shortened versions of the CES-D omit all of the positively phrased items (Bohannon, Maljanian, & Goethe, 2003; Lawton, Moss, Winter, & Hoffman, 2002; Melchior, Huba, Brown, & Reback, 1993). Seven abbreviated CES-D measures (Andresen et al., 1994; Cole, Rabin, Smith, & Kaufman, 2004; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993; Santor & Coyne, 1997; Shrout & Yager, 1989; Turvey, Wallace, & Herzog, 1999) include two of the four positively worded items, though the items retained are not the same; and one shortened scale contains a single positively phrased item (Lewisohn, Seeley, Roberts, & Allen, 1997). The effect of retaining or omitting the positive worded items from the CES-D scale with elders with diabetes has not been examined.

This study of elders with diabetes therefore examined the reliability and validity of the original 20-item CES-D (Radloff, 1977) and 12 CES-D short forms that varied in length from 4 to 16 items (Andresen et al., 1994; Bohannon et al., 2003; Cole et al., 2004; Kohout

et al., 1993; Lawton et al., 2002; Lewisohn et al., 1997; Melchior et al., 1993; Santor & Coyne, 1997; Shrout & Yager, 1989; Turvey et al., 1999). The study also looked at whether elders with diabetes would be similarly classified as depressed or not based on standardized cut scores for the 12 abbreviated measures, and evaluated the effects of including somatic depressive items and items phrased positively.

Methods

Design and sample

A descriptive, cross-sectional design was used to examine depressive symptoms in 80 older adults with diabetes. The study was a secondary analysis of data from two larger studies of elders in 29 Northeast Ohio retirement communities who reported that they had diabetes; the diagnosis of diabetes was not verified by a medical expert nor was the type of diabetes (type 1 or 2) noted. The two larger studies have been reported elsewhere (Zauszniewski, Chung, & Krafcik, 2001; Zauszniewski, Eggenschwiler, Preechawong, Roberts, & Morris, 2006).

The two samples of elders were chosen from the same pool of existing retirement communities in Northeast Ohio. The two studies from which they were chosen were conducted at the same time and the inclusion criteria for study participation were identical. However, one of the studies used a targeted recruitment plan to include as many males and minority elders as possible. Merging of the two samples of elders for this analysis created a sample with demographic characteristics that resemble those of elders in other published studies conducted in senior living facilities where 63-78% of the participants were women (Mihalko, Wickley, & Sharpe, 2006; Rossen & Gruber, 2007; Schumaker, 2006) and average ages ranged from 76-84 years (Mihalko et al.; Rossen & Gruber; Schumaker). While a number of researchers have reported that 92-97% of their samples were white elders, Howard et al. (2002) describe the distribution of African Americans in residential care and assisted living facilities and how targeted recruitment can increase the diversity of the sample.

Instruments

Demographic data on the older adults with diabetes included age recorded as the respondent's reported age in years and gender and race, recorded on the basis of each respondent's self report. The presence of diabetes was identified by the elders using a 26-item checklist of possible chronic conditions.

Depressive symptoms were measured by the CES-D and the short forms of the CES-D. Study participants completed the 20-item CES-D (Radloff, 1977), which asks them to rate the frequency of experiencing each of the symptoms listed during the week prior to completing the measure using a 4-point Likert-type scale ranging from "rarely" or "none of the time" (0), to "most" or "all of the time" (3). Scores can range from 0 to 60; after reverse coding for 4 items, higher scores indicate greater frequency of depressive symptoms. Alpha coefficients of .86 and .82 have been reported for frail elderly (Davidson, Feldman, Crawford, 1994) and healthy older adults (Zauszniewski, Morris, Preechawong, & Chang, 2004).), respectively.

We examined 12 short forms of the CES-D scale, each with 4 to 16 items taken from the original 20-item measure. A list of the specific items in each of the abbreviated scales has been published elsewhere (Zauszniewski & Bekhet, in press). Table 1 lists the authors of the shortened measures (Andresen et al., 1994; Bohannon et al., 2003; Cole et al., 2004; Kohout et al., 1993; Lawton et al., 2002; Lewisohn et al., 1997; Melchior et al., 1993; Santor & Coyne, 1997; Shrout & Yager, 1989; Turvey et al., 1999) and displays the CES-D items that

specifically measure somatic symptoms that may be present in persons with diabetes. The seven items are feeling bothered, appetite, concentration (mind), effort, sleep, talking less, and fatigue. These seven symptoms constituted a single factor in the original factor analysis of the CES-D conducted by Radloff (1977), which has been replicated across several populations (i.e., Blazer, Landerman, Hays, Simonsick, & Saunders, 1998) and confirmed with meta-analytic methods (Shafer, 2006).

Acceptable estimates of reliability, ranging from .76 to .96, have been reported for all these scales in studies of older adults (Andresen et al., 1994; Bohannon et al., 2003; Cole et al., 2004; Kohout et al., 1993; Lawton et al., 2002; Lewisohn et al., 1997; Melchior et al., 1993; Santor & Coyne, 1997; Shrout & Yager, 1989; Turvey et al., 1999) and all of the 12 shortened scales have reported construct validity as indicated by significant correlations with theoretically related constructs (Andresen et al.; Bohannon et al.; Cole et al.; Kohout et al.; Lawton et al.; Lewisohn et al.; Melchior et al.; Santor & Coyne; Shrout & Yager; Turvey et al.). Although the authors of shortened CES-D scales have occasionally changed the response format from the original 4-point Likert-type scale to a trichotomized or dichotomized format, in the study reported here, we examined the validity and the reliability of the 12 scales using the original scaling with responses from “rarely” or “none of the time” (0), to “most” or “all of the time” (3). Normality was assessed for all the separate instruments by examining skewness (3 to -3) and kurtosis (8 to -8) scores based on recommendations from Kline (2005). All of these scores were within acceptable parameters for normal distribution.

Data collection procedures

Following approval by the Institutional Review Board and informed consent from study participants, data were collected by trained interviewers during face-to-face interviews. During the interviews, participants completed the 20-item CES-D (Radloff, 1997). There were no missing data on the 20-item measure in either of the two studies from which the data for this analysis were obtained.

Data analysis

Descriptive statistics were used to describe the sample of older adults who reported diabetes in the two parent studies. Reliability estimates were used to describe internal consistency for the 12 abbreviated versions of the CES-D and the full version. Construct validity was also evaluated for each of the short forms and the full CES-D. Pearson's correlations were examined for strength and direction between each of the abbreviated CES-D forms and the 20-item CES-D. In addition, we compared the 12 short forms with the 20-item CES-D on the percentage of elders who would be considered to have clinically significant depressive symptoms using standardized cut scores.

Because the sample was drawn from two different studies, relevant demographic characteristics were examined. The two samples were compared on gender, race/ethnicity, and age. Significant differences were found on gender ($X^2=16.25$; $p>.01$) and race/ethnicity ($X^2, = 8.47$; $p>.05$). Age was found to be also significantly higher in one group with a reported mean age of 83.3 (SD=6.6) in the first group and 78.6 (SD=7.3) in the other. The two groups were similar on the number of reported chronic conditions. After combining the two samples, there were no significant differences, based on age, between men and women. However, Caucasian elders were found to be significantly older than black respondents with mean ages of 82.4 (SD=6.8) and 76.4 (SD=7.4), respectively. The differences in age that were found between the Caucasian and African Americans might be expected given the known difference in life span between these two groups of elders (Lee et al., 2004).

There are published “cut scores” for many of the CES-D short forms (i.e. Kohout et al., 1993; Lawton et al., 2002; Melchior et al., 1993; Turvey et al., 1999). However, the methods used for determining those scores are inconsistent. For example, the 8-item Turvey scale has a published cut score of 6 (Turvey et al.) while the 8-item Melchoir scale has a published cut score of 7 (Melchior et al.). In addition, there are two shortened CES-D scales that have been modified to use a dichotomous (yes-no) or trichotomous (much of the time, some of the time, or hardly ever) (Kohout et al.). However, because our focus was on the analysis of item content (i.e. depressive symptoms), we maintain a consistent response format and retained the same four responses for all 12 short CES-D scales. We also developed a standardized “cut score” for each CES-D short form.

To develop the standardized cut scores for each of the 12 CES-D short scales, we used Kohout’s formula (Kohout et al., 1993). This formula is a simple arithmetic “conversion” based on the possible total score for each scale. Kohout and colleagues (1993) derived this formula from the cut score procedure used with the original 20-item CES-D. Radloff (1997) determined the cut score of 16 on the full 20-item CES-D based on the highest scoring 15% of respondents who completed the scale. The 20-item CES-D has four responses options for each item, scored 0-1-2-3 and a maximum possible score of 60.

Using Kohout’s formula (Kohout et al., 1993), standardized cut scores are determined by dividing the total possible score on a short CES-D scale by 60 (the total possible score on the full 20-item CES-D) and multiplying that number by 16 (the established cut score on the full 20-item CES-D). For example, on a 5-item scale, the total possible score is 15 (5 items multiplied by 3, the highest response). That total score is divided by 60, which equals .25. Then, .25 is multiplied by 16, resulting in a standardized cut score of 4 for the 5-item short form of the CES-D.

Results

The sample for this analysis consisted of 80 elders who reported that they had diabetes. The majority of the sample were women (n=56, 70%) and Caucasians (n=68, 85%). Their ages ranged from 65 through 94, with an average age of 82 years. On average, they reported three chronic conditions; the most common were arthritis (67.5%), high blood pressure (53.8%), and heart trouble (48.8%); 28.7% (n=23) reported fewer than three conditions, 42.6% (n=34) reported three or four conditions, and 28.7% (n=23) reported five or more chronic conditions. The sample’s mean score on the 20-item CES-D ($M = 7.19$; $SD = 7.52$) indicated that these older adults with diabetes had few depressive symptoms. Their mean scores on the various short versions of the CES-D ranged from 1.29 to 5.49, with standard deviations ranging from 1.80 to 5.97; these scores also indicated few depressive symptoms (Table 2).

Reliability analyses revealed a Cronbach’s alpha of .87 for the 20-item CES-D scale and alphas for the abbreviated scales ranging from .60 (5-item Bohannon scale) to .84 (16-item Lawton scale). The average inter-item correlation was .25 for the 20-item scale; correlations for the others ranged from .21 (8-item Melchior scale) to .32 (9-item Santor scale) (Table 2). Correlations between the various abbreviated versions and the 20-item CES-D ranged from .82 (4-item Melchior scale) to .98 (16-item Lawton scale).

As shown in Table 3, using the cut score of 16 for the 20-item CES-D, almost 14% of these elders with diabetes would be considered to have clinically significant depressive symptoms, including almost 14% of men, 11% of women, 13% of Caucasians, and 17% of African Americans. Except for the 16-item Lawton scale and the 8-item Melchior scale, which classified 11% and nearly 14% of the elders with diabetes as having clinically significant depressive symptoms, respectively, the other short CES-D scales would identify a larger

percentage of the sample as having clinically relevant depressive symptoms. The 16-item Lawton scale identified a lower percentage of men, women, Caucasians, and African Americans than the full 20-item CES-D, while the 8-item Melchior scale identified a higher percentage of women with clinically relevant depressive symptoms than the 20-item CES-D.

The 5-item Lewisohn scale detected the largest percentage, close to 29% of the elders with diabetes as having clinically significant depressive symptoms, including 33% men, 27% women, 29% Caucasians, and 25% African Americans. Of all of the short CES-D scales, this scale identified the greatest percentage of men with clinically relevant depressive symptoms. Two other short CES-D scales, the 10-item Andresen scale and the 8-item Turvey scale, considered almost 28% of the elders with diabetes to have clinically relevant symptoms of depression. These two scales were similar in their classification of elderly women with diabetes. However, the 8-item Turvey scale identified more men, 29% as compared with 27%, and more Caucasians, 28% as compared with 26%, than the 10-item Andresen scale, while the Andresen scale identified more African Americans, 33% as compared to 25%, than the Turvey scale.

Three short CES-D scales identified the lowest percentage (17%) of diabetic elderly men: the 16-item Lawton scale, the 11-item Kohout scale, and the 8-item Melchior scale. Scales identifying the greatest percentage (27%) of diabetic elderly women were the 10-item Andresen scale, the 9-item Santor scale, the 8-item Turvey scale, and the 5-item Lewisohn scale. The 16-item Lawton scale identified the lowest percentage of diabetic women (9%) as having potentially significant depressive symptoms (Table 3). The 5-item Lewisohn scale identified the highest percentage (29%) of Caucasian elders with diabetes as having clinically relevant symptoms of depression, while the 10-item Andresen scale classified the highest percentage (33%) of African Americans with clinically significant depressive symptoms. The 16-item Lawton scale identified the lowest percentage of Caucasian elders (12%) and of African Americans (8%) with clinically significant symptoms of depression (Table 3). However, the trends identified for the total sample closely resembled the trends observed for men and women and for Caucasians and African Americans.

Discussion

The study reported here used secondary data from elders residing in retirement communities, who were fairly independent and required little assistance with daily activities. For these elders, completion of the full 20-item CES-D was not burdensome; there was no missing data. However, researchers have described its length as potentially burdensome, especially for more debilitated elders, and have raised concerns about excessive missing data (Bono et al., 2007; Smits et al., 2007). As a result, 12 shortened forms of the CES-D containing 4 to 16 of the 20 items have been developed; however, this is the first study to examine the psychometric properties of these abbreviated scales in older adults with diabetes.

In this study, scores on the 12 short forms of the CES-D were highly correlated (.82 to .98) with those on the 20-item CES-D scale, supporting their construct validity and potential usefulness for this population. The findings are consistent with those reported by Bohannon and colleagues (2003) for outpatients with asthma and diabetes; they found a correlation of .91 between their 5-item scale and the full 20-item CES-D. Similarly, Melchior and colleagues (1993) reported correlations of .87 and .93 between their 4-item and 8-item scales and the full 20-item scale in middle-aged women. In a sample of primary care patients (ages 17 to 80 years), Santor and Coyne (1997) reported a correlation of .97 between their 9-item scale and the full 20-item CES-D scale.

In this study, the internal consistency was $\alpha = .87$ for the full 20-item CES-D scale, and alphas for the abbreviated scales ranged from .61 (5 item Shrout scale) to .84 (16-item Lawton scale). The most obvious explanation for the modest reliability coefficients is the smaller number of items on the shorter scales (DeVellis, 2003). However, the scales that failed to meet the minimum criteria for acceptable reliability of $\alpha > .70$ (DeVellis, 2003) were also those that eliminated five to seven of the somatic symptom items. This finding is consistent with the conclusion drawn by VanWilgen and colleagues (2006) in their study of cancer patients: there was no confirmed evidence for removing the somatic items from the CES-D scale.

In addition, except for the 5-item Shrout scale, the shortened scales with alphas $< .70$, including the 4-item and 8-item Melchior scales and the 5-item scales by Bohannon and Lewisohn, contained one or none of the four positively worded items from the 20-item CES-D. Thus, although researchers have recommended the removal of these items from the CES-D (Schroevers et al., 2000), our findings suggest that this omission might affect reliability. The low alpha found in the 5-item Shrout scale might be expected since the developers of this measure (Shrout & Yager, 1989) purposely selected the highest loading item on each of five factors derived from factor analysis rather than selecting items that loaded together. They used this method to preserve the diverse aspects of the construct of depressive symptoms being measured (Shrout & Yager).

Some of the alphas found in this study were substantially lower than the alphas reported in the studies conducted by developers of the abbreviated forms. For example, alphas reported for the 10-item Andresen, 9-item Santor, 5-item Bohannon, and 4-item Melchior scales were .97, .87, .81, and .76 in the original studies, as compared to .82, .81, .60, and .65 for the same scales in our study. The differences in reliability estimates, however, may reflect differences in the ages, gender, or race/ethnicity of those who participated in the original studies and in this study, which focused on elders with diabetes.

Using the established cut score of 16 for the 20-item CES-D, nearly 14% of the total sample of elders with diabetes would be considered to have clinically significant depressive symptoms. The study showed substantial differences between the various shortened CES-D measures and the 20-item CES-D, including the possibility of detection of false positives (i.e., classification as depressed when not depressed) and false negatives (i.e., categorized as not depressed when depressed), which raises concern about the extent to which symptoms of diabetes that overlap with symptoms of depression are measured. For example, the 5-item Lewisohn scale classified the greatest percentages of the total sample and subgroups defined by gender and race/ethnicity with clinically relevant depressive symptoms. This scale was highly correlated with the full 20-item CES-D, but had marginal reliability (.65); also, it contains one of the seven somatic symptoms (the one asking about sleep) on the full 20-item CES-D but none of the positively phrased items. The 10-item Andresen scale showed a trend similar to the 5-item Lewisohn scale in categorizing large percentages of the total sample, men, women, Caucasians, and African Americans as having clinically relevant depressive symptoms. This scale, however, contains five of the seven somatic symptoms and two of the four positively phrased items. Taken together, these findings suggest that the differences observed in classifying elders with diabetes as having clinically relevant depressive symptoms may be unrelated to the measurement of specific somatic symptoms or to the positive or negative wording of items on a measuring scale.

The 8-item Melchoir scale was strikingly similar to the full 20-item CES-D in classifying the total sample and racial groups with clinically relevant depressive symptoms. In comparison with the 20-item CES-D, the 8-item Melchoir scale classified one less man and one more woman as having clinically significant depressive symptoms. Although this 8-item

scale contains none of the positively worded items and only one of the seven somatic items, it may be a reasonable alternative to the full 20-item CES-D, particularly when use of a shortened scale is appropriate.

One limitation of the current study is that only the full version of the CES-D was administered to study participants and their responses to the 20 items were used to calculate the scores for the various short forms. Previous studies have shown that the administration of a short form of the CES-D and a quality of life scale produced results similar to these with administration of the full version of the scale (Cheung, Liu, & Yip, 2007). Nevertheless, further studies that use the short forms of the CES-D are needed to determine whether responding to the instrument as a whole affects the responses to individual items.

A second limitation of this study was the use of standardized cut scores to compare the 12 short CES-D forms with the 20-item CES-D. While standardization facilitated the examination of the measures using the same 4-point response scale, determination of cut scores may have been somewhat arbitrary. Further examination of the sensitivity and specificity of the various CES-D short forms in relation to diagnostic measures of clinical depression is recommended.

A third limitation of the current study is that information about the education level of the study participants was not collected in the parent studies. Although we were unable to compare the two samples from which these data were obtained on education, we may assume that their educational level was sufficient to complete the full 20-item CES-D measure using the four response option format. Other scoring formats for short CES-D scales that were suggested by Kohout et al. (1993), including the dichotomous (yes-no) and trichotomous (much of the time, some of the time, or hardly ever) formats, may be useful for elders who have little education. Other limitations included the self-reported diagnosis of diabetes by the study participants and the disproportionate number of Caucasian women in the study.

Despite these limitations, our findings point to a need for closer examination of item content on measures of depressive symptoms, including items measuring somatic symptoms, to determine whether the symptoms being measured truly reflect clinically significant depression or whether they reflect a coexisting chronic condition such as diabetes. Further testing of abbreviated measures of the CES-D in elderly persons who have been diagnosed with diabetes is therefore recommended. Given the possibility of symptom overlap between physical and mental conditions, it is critical to identify the measures that most accurately capture depressive symptoms in order to provide early intervention for elders with chronic conditions such as diabetes. Measures of depression that suggest false positives or false negatives in elders with diabetes may lead to unnecessary interventions that can complicate the treatment of diabetes, or withholding of treatment that is necessary and important for diabetes self-management.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

- Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine*. 1994; 10(2): 77–84. [PubMed: 8037935]
- Beck AT. Cognitive therapy: A 30-year retrospective. *American Psychologist*. 1991; 46(4):368–375. [PubMed: 2048795]

- Blazer D, Landerman L, Hays J, Simonsick E, Saunders W. Symptoms of depression among community-dwelling elderly African-American and White older adults. *Psychological Medicine*. 1998; 28:1311–1320. [PubMed: 9854272]
- Bohannon RW, Maljanian R, Goethe J. Screening for depression in clinical practice: reliability and validity of a five item subset of the CES-Depression. *Perceptual and Motor Skills*. 2003; 97(3, Pt. 1):855–861. [PubMed: 14738351]
- Bono CA, Ried LD, Kimberlin CA, Vogel WB. Missing data on the Center for Epidemiological Studies Depression scale: A comparison of four imputation techniques. *Research in Social & Administrative Pharmacy*. 2007; 3(1):1–27. [PubMed: 17350555]
- Carnethon MR, Biggs ML, Barzilay JI, Smith NL, Vaccarino V, Bertoni AG, et al. Longitudinal association between depressive symptoms and incident type 2 diabetes mellitus in older adults: The cardiovascular health study. *Archives of Internal Medicine*. 2007; 167(8):802–807. [PubMed: 17452543]
- Chapman DP, Perry GS. Depression as major component of public health for older adults. *Preventing Chronic Disease*. 2008; 5(1):1–9.
- Cheung YB, Liu KY, Yip PS. Performance of the CES-D and its short forms in screening suicidality and hopelessness in the community. *Suicide and Life Threatening Behavior*. 2007; 37(1):79–88. [PubMed: 17397282]
- Cole JC, Rabin AS, Smith TL, Kaufman AS. Development and validation of a Rasch-Derived CES-D short form. *Psychological Assessment*. 2004; 16(4):360–372. [PubMed: 15584795]
- Davidson H, Feldman PH, Crawford S. Measuring depressive symptoms in the frail elderly. *Journals of Gerontology*. 1994; 49(4):159–164.
- DeGroot M, Pinkerman B, Wagner J, Hockman E. Depression treatment and satisfaction in a multicultural sample of type 1 and type 2 diabetic patients. *Diabetes Care*. 2006; 29(3):549–553. [PubMed: 16505504]
- DeVellis, RF. Scale development: Theory and applications. 2nd ed.. Sage Publications; Thousand Oaks, CA: 2003.
- Eaton WW. Epidemiologic evidence on the comorbidity of depression and diabetes. *Psychosomatic Research*. 2002; 53:903–906.
- Ellis GK, Robinson JA, Crawford GB. When symptoms of disease overlap with symptoms of depression. *Australian Family Physician*. 2006; 35:647–649. [PubMed: 16894444]
- Fisher L, Skaff MM, Mullan JT, Arian P, Mohr D, Masharami U, et al. Clinical depression versus distress among patients with type 2 diabetes: Not just a question of semantics. *Diabetes Care*. 2007; 30(3):542–548. [PubMed: 17327318]
- Golden SH, Lazo M, Carnethon M, Bertoni AG, Schreiner PJ, Diez Roux AV, et al. Examining bidirectional associations between depressive symptoms and diabetes. *Journal of the American Medical Association*. 2008; 299(23):2751–2759. [PubMed: 18560002]
- Howard DL, Sloane PD, Zimmerman S, Eckert K, Walsh JF, Bule VC, et al. Distribution of African Americans in residential care/assisted living and nursing homes: More evidence of racial disparity? *Research and Practice*. 2002; 92(8):1272–1277.
- Kline, RB. Principles and Practice of Structural Equation Modeling. Guilford Press; New York: 2005.
- Kohout FJ, Berkman LF, Evans DA, Cornoni-Huntley J. Two shorter forms of the CES-D depression symptoms index. *Journal of Aging and Health*. 1993; 5(2):179–193. [PubMed: 10125443]
- Lawton MP, Moss MS, Winter L, Hoffman C. Motivation in later life: Personal projects and well-being. *Psychology and Aging*. 2002; 17(4):539–547. [PubMed: 12507352]
- Lee JH, Flaquer A, Costa R, Andrews H, Cross P, Lantigua R, et al. Genetic influences on life span and survival among elderly African-Americans, Caribbean Hispanics, and Caucasians. *American Journal of Medical Genetics*. 2004; 128(2):159–164. [PubMed: 15214008]
- Lewisohn PM, Seeley JR, Roberts RE, Allen NB. Center for Epidemiologic Studies Depression Scale (CES-D) as a screening instrument for depression among community-residing older adults. *Psychology and Ageing*. 1997; 12(2):277–287.
- Lustman PJ, Clouse RE. Depression in diabetes: The chicken or the egg? *Psychosomatic Medicine*. 2007; 69(4):297–299. [PubMed: 17517972]

- Lustman PJ, Harper GW, Griffith LS, Clouse RE. Use of the diagnostic interview schedule in patients with diabetes mellitus. *Journal of Nervous and Mental Disease*. 1986; 174:743–746. [PubMed: 3783142]
- Maraldi C, Volpato S, Penninx BW, Yaffe K, Simonsick EM, Strotmeyer ES, et al. Diabetes mellitus, glycemic control, and incident depressive symptoms among 70 to 79-year-old persons: The health, aging, and body composition study. *Archives of Internal Medicine*. 2007; 167(11):1137–1144. [PubMed: 17563021]
- McIntosh D, Kjernisted MD, Hammond J. Diabetes and depression: What is the association between these common chronic illnesses? *Canadian Diabetes*. 2008; 21(1):3–7.
- Melchior LA, Huba GJ, Brown VB, Reback CJ. A short depression index for women. *Educational and Psychological Measurement*. 1993; 53:1117–1125.
- Mihalko SL, Wickley KL, Sharpe BL. Promoting physical activity in independent living communities. *Medicine and Science in Sports and Exercise*. 2006; 38(1):112–115. [PubMed: 16394962]
- Milano AF, Singer RB. Mortality in comorbidity: Excess death rates derived from a follow-up on 10,025 subjects divided into 4 groups with or without depression and diabetes mellitus. *Journal of Insurance Medicine*. 2007; 39(3):160–166. [PubMed: 18251374]
- Pouwer F, Beekman AT, Nijpels G, Dekker JM, Snoek FJ, Kostense PJ, et al. Rates and risks for co-morbid depression in patients with type 2 diabetes mellitus: Results from a community-based study. *Diabetologia*. 2003; 46(7):892–898. [PubMed: 12819896]
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1(3):385–401.
- Rossen EK, Gruber KJ. Development and psychometric testing of the relocation self-efficacy scale. *Nursing Research*. 2007; 56(4):244–251. [PubMed: 17625463]
- Santor DA, Coyne JC. Shortening the CES-D to improve its ability to detect cases of depression. *Psychological Assessment*. 1997; 9(3):233–243.
- Schroevers MJ, Sandermann R, Van Sonderen E, Ranchor AV. The evaluation of the Center for Epidemiological Studies Depression (CES-D) scale: Depressed and positive affect in cancer patients and healthy reference subjects. *Quality of Life Research*. 2000; 9:1015–1029. [PubMed: 11332223]
- Schumaker JG. Examining the physician's role with assisted living residents. *Journal of the American Medical Directors Association*. 2006; 7:377–382. [PubMed: 16843238]
- Shafer A. Meta-analysis of the factor structures of four depression questionnaires: Beck, CES-D, Hamilton, and Zung. *Journal of Clinical Psychology*. 2006; 62(1):123–146. [PubMed: 16287149]
- Shrout PE, Yager TJ. Reliability and validity of screening scales: Effect of reducing scale length. *Journal of Clinical Epidemiology*. 1989; 42(1):69–78. [PubMed: 2913189]
- Smits N, Cuijpers P, Beekman ATF, Smit JH. Reducing the length of mental health instruments through structurally incomplete designs. *International Journal of Methods in Psychiatric Research*. 2007; 16(3):150–60. [PubMed: 17849433]
- Steffens DC, Skoog I, Norton MC, Hart AD, Tschanz JT, Plassman BL, et al. Prevalence of depression and its treatment in an elderly population. The Cache County, Utah Study. *Archives of General Psychiatry*. 2000; 57(6):601–7. [PubMed: 10839339]
- Trief PM. Depression in elderly diabetes patients. *Diabetes Spectrum*. 2007; 20(2):71–75.
- Turvey CL, Wallace RB, Herzog R. Depression: A revised CES-D measure of depressive symptoms and a DSM-based measure of major depressive episodes in the elderly. *International Psychogeriatrics*. 1999; 11(2):139–148. [PubMed: 11475428]
- VanWilgen CP, Dijkstra PU, Stewart RE, Ranchor AV, Roodenburg JLN. Measuring somatic symptoms with the CES-D to assess depression in cancer patients after treatment: Comparison among patients with oral/oropharyngeal, gynecological, colorectal, and breast cancer. *Psychosomatics*. 2006; 47(6):465–470. [PubMed: 17116946]
- Zauszniewski JA, Bekhet AK. Depressive symptoms in elderly women with chronic conditions: Measurement issues. *Aging and Mental Health*. in press.
- Zauszniewski JA, Chung C, Krafcik K. Social cognitive factors in predicting health of elders. *Western Journal of Nursing Research*. 2001; 23(5):490–503. [PubMed: 11482053]

- Zauszniewski JA, Eggenschwiler K, Preechawong S, Roberts BL, Morris DL. Effects of teaching resourcefulness skills in elders. *Aging and Mental Health*. 2006; 10(4):1–9. [PubMed: 16338807]
- Zauszniewski JA, Morris DL, Preechawong S, Chang H. Reports on depressive symptoms in older adults with chronic conditions. *Research and Theory for Nursing Practice*. 2004; 18(2-3):185–196. [PubMed: 15553346]

Items reflecting somatic symptoms measured by the 20-item CES-D and the a12 abbreviated CES-D scales

Table 1

Scale by Author (number of items)	Bothered	Appetite	Mind	Effort	Sleep	Talk	Fatigue
Radloff (20)	X	X	X	X	X	X	X
Lawton (16)	X	X	X	X	X	X	X
Kohout (11)		X		X	X		X
Andresen (10)	X		X	X	X		X
Kohout (10)				X	X		X
Cole (10)	X		X	X			
Santor (9)	X		X	X	X		
Melchoir (8)					X		
Turvey (8)				X	X	X	X
Bohannon (5)					X		X
Lewisohn (5)							
Shrout (5)					X		
Melchoir (4)							

Table 2
Scale statistics, standardized cut scores, and estimates of reliability and validity for CES-D scales

	20-item Radloff	16-item Lawton	11-item Kohout	10-item Andresen	10-item Kohout	10-item Cole	9-item Santor	8-item Melchior	8-item Turvey	5-item Bohannon	5-item Lewisohn	5-item Shrout	4-item Melchior
Scale statistics													
Mean	7.19	5.49	4.41	4.85	4.08	3.60	3.83	2.54	3.63	2.10	2.24	1.80	1.29
St. Dev.	7.52	5.97	4.76	4.94	4.49	3.97	4.25	2.88	3.89	2.38	2.47	2.21	1.80
Median	4.00	3.00	3.00	3.50	3.00	3.00	2.50	2.00	2.00	1.00	1.00	1.00	0.50
Standardized cut scores													
Score	16	13	9	8	8	8	7	6	6	4	4	4	3
Reliability estimates													
Alpha	.87	.84	.81	.82	.81	.75	.81	.68	.77	.60	.65	.61	.65
Inter-item <i>r</i>	.25	.25	.28	.31	.30	.23	.32	.21	.30	.23	.27	.24	.31
Validity estimates													
<i>r</i> with													
20-item	-----	.98	.96	.96	.96	.96	.95	.94	.94	.85	.84	.88	.82
CES-D													

r = correlation coefficient

Percent classified with clinically significant depressive symptoms using astandardized cut scores for the 20-item CESD and 12 abbreviated scales

Table 3

CES-D scale (cut score)	Total Sample (N=80)	Men (n=24)	Women (n=56)	White Caucasian (n=68)	African American (n=12)
Radloff 20 (16+)	13.8	20.8	10.7	13.2	16.7
Lawton 16 (13+)	11.3	16.7	8.9	11.8	8.3
Kohout 11 (9+)	17.5	16.7	17.9	16.2	25.0
Andresen 10 (8+)	27.5	27.2	26.8	26.5	33.3
Cole 10 (8+)	15.0	25.0	10.7	14.7	16.7
Kohout 10 (8+)	21.3	25.0	19.6	20.6	25.0
Santor 9 (7+)	26.3	25.0	26.8	26.5	25.0
Melchior 8 (6+)	13.8	16.7	12.5	13.2	16.7
Turvey 8 (6+)	27.5	29.2	26.8	27.9	25.0
Bohannon 5 (4+)	23.8	25.0	23.2	25.0	16.7
Lewisohn 5 (4+)	28.8	33.3	26.8	29.4	25.0
Shrout 5 (4+)	17.5	25.0	14.3	16.2	25.0
Melchior 4 (3+)	21.3	20.8	21.4	20.6	25.0

Note: All values are reported as percentages