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Screening Measure for Early Detection of Depressive Symptoms: The Depressive Cognition Scale

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Abstract

Nearly 10% of American adults experience depressive symptoms each year. Negative thought patterns associated with risk for depression can be identified using a psychometrically sound measure, such as the Depressive Cognition Scale (DCS). However, no meaningful cutoff score has been established for the DCS. This study used a receiver operating characteristic (ROC) curve to establish a DCS cutoff score for risk for depression, using the Center for Epidemiological Studies–Depression Scale (CES-D) as the gold standard measure. In a national nondepressed sample of 629 adults, the ROC showed that the DCS accurately discriminated between participants with and without serious depressive thinking in

80% of cases and established an optimum balance of sensitivity (73.9-76.6%) and specificity (69.0-75.3%) at a score of 7. Although findings indicate that the DCS may overidentify risk for clinical depression, the instrument is useful for screening and assessment, with possible initiation of psychological treatment to prevent clinical depression.

Keywords

depression, instrument development, mental health

Depression is the most common debilitating psychiatric disorder and the leading cause of disability in the United States (Hollon, Thase, & Markowitz, 2002). Depression is also the fourth leading cause of disability worldwide, and it is projected to become the second cause of disability by the year 2020 (Yeung, Overstreet, & Albert, 2007). Depression currently affects approximately 14 million American adults, or about 10% of the U.S. population in any given year (Kessler, Chiu, Demler, & Walters, 2005). Depression affects persons of all genders, ages, and backgrounds. However, depression affects women more than men; the female/male risk ratio is approximately 2:1 (Kessler, 2003) and it is significantly higher for Whites than African Americans and Mexican Americans (Riolo, Nguyen, Greden, & King, 2005). Depression is associated with human suffering, rising morbidity and mortality, and increasing health care costs (Charbonneau et al., 2004; Furlanetto, Mendlowicz, & Romildo Bueno, 2005; Yeung et al., 2007). Depression is a huge burden for industrialized countries because it affects work productivity through absenteeism, early retirement, and premature mortality (Berto, D'Ilario, Ruffo, Di Virgilio, & Rizzo, 2000); the costs to those who are depressed, their families and caregivers, and to society in general are substantial (Greenberg & Birnbaum, 2005).

Beck's cognitive theory of depression suggests that the cognitive symptoms of depression, that is, depressive cognitions, appear earlier than the affective, motivational, and somatic symptoms constituting clinical depression (Beck, Brown, Steer, Eidelson, & Riskind, 1987). In fact, Beck and colleagues have argued that depressive cognitions in the form of negative automatic thoughts, which are generated by dysfunctional beliefs, are the cause of depressive symptoms (Beck et al., 1987). Therefore, detecting and treating early depressive cognitions in adults is vital to prevent the development of clinical depression and suicide (Sousa, Zauszniewski, Mendes, & Zanetti, 2005). In addition, early recognition of depressive cognitions may lead to shorter, more focused/tailored psychotherapy, which has major implications for minimizing the cost of treatment.

To achieve the goal of early detection of depressive cognitions, a reliable and valid measure with defined cutoff scores is needed to distinguish persons at risk for developing serious depression from those who are not at risk. Thus, the purpose of this study was to determine a meaningful cutoff score on the Depressive Cognition Scale (DCS), an established reliable and valid measure of negative thoughts that may lead to clinical depression (Zauszniewski, 1995).

Measurement of Depressive Symptoms

Many instruments are currently used to measure the presence and severity of depression. However, they do not focus on the measurement of depressive cognitions. The Beck Depression Inventory (BDI) is composed of somatic symptoms, emotions, and behavioral changes and was originally designed to measure the intensity of depression in clinically depressed patients (Beck, Ward, Mendelson, Mook, &

Erbaugh, 1961). The Hamilton Rating Scale for depression (HRSD; Hamilton, 1960) is similar to the BDI in that it measures severity of depression in terms of behavioral and somatic symptoms in clinically depressed patients; however, the BDI does not measure affective or cognitive symptoms (Hamilton, 1960). The Center for Epidemiologic Studies–Depression Scale (CES-D) was developed to screen for depression in the general population, with an emphasis on affective components (Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977). The Zung Self-Rating Depression Scale (SDS) measures the severity of affective, somatic, psychomotor, and psychological symptoms in patients with a depressive disorder (Zung, 1965). All these instruments focus on measuring the affective, cognitive, behavioral, and physiological symptoms that may constitute clinical depression (Zauszniewski, 1995). However, these instruments do not focus on cognitive symptoms that may precede the development of clinical depression.

There are a number of measures in the literature that do assess depressive cognitions that precede the development of depressive symptoms, including the Cognitive Bias Questionnaire (Krantz & Hammen, 1979), the Cognitive Triad Index (Beckham, Leber, Watkins, Boyer, & Cook, 1986), the Crandell Cognitions Inventory (Crandell & Chambless, 1986), Beck Depressive Cognitions Checklist (Beck et al., 1987), the Distressing Thoughts Questionnaire (Clark & de Silva, 1985), and the Automatic Thoughts Questionnaire (Hollon & Kendall, 1980). However, the most complete instrument, which is Zauszniewski’s (1995, 1997) Depressive Cognition Scale (DCS), includes eight depressive cognitions that reflect a broader spectrum of cognitive symptoms than other existing scales.

The Depressive Cognition Scale (DCS) is an eight-item instrument that measures hopelessness, helplessness, powerlessness, purposelessness, worthlessness, loneliness, emptiness, and meaninglessness (Zauszniewski, 1995). Based on Beck’s cognitive theory of depression and Erikson’s theory of psychosocial development (Zauszniewski, 1995), the DCS assesses depressive cognitions that may stem from the unsuccessful resolution of Erikson’s eight developmental stages (Zauszniewski, 1995). The instrument is a self-administered eight-item scale scored on a 6-point Likert-type scale ranging from 0 = *strongly disagree* to 5 = *strongly agree*. Each item in the scale reflects one depressive cognition when reverse coded. All the items are phrased in a positive direction because developers of other scales have suggested that negatively worded items are more challenging for participants because of aversion to negative emotional content (Hankins, 2008). Sample items of the DCS include the following: “I’m in control of my life” and “I’m a worthwhile human being.” Strong disagreement with any statement indicates the presence of a specific depressive cognition. Composite scale scores can range from 0 to 40, with higher scores indicating more depressive cognitions.

The Depressive Cognition Scale has been found reliable and valid with diverse populations in a number of studies (i.e., Sousa, Zanetti, Zauszniewski, Mendes, & Daguano, 2008; Zauszniewski, 1995, 1997; Zauszniewski, Chung, Krafcik, & Sousa, 2001; Zauszniewski, Picot, Debanne, Wykle, & Roberts, 2002; Zauszniewski & Suresky, 2010). Table 1 lists the studies that have tested the DCS, the populations in which they were conducted, and the estimates of reliability and validity that were reported.

Table 1. Psychometric Properties of the Depressive Cognition Scale Across Populations

Authors (Date)	Sample Description	Internal Consistency	Construct Validity: Correlations	Factor Analysis
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Zauszniewski (1995)	60 healthy elders (age ≥65 years)	.78	Psychosocial development (r = -.63, p < .001)	-
Zauszniewski (1997)	160 healthy elders (age ≥65 years)	.78	Depressive symptoms (r = .54, p < .001) Resourcefulness (r = -.37, p < .001) Adaptive functioning (r = -.60, p < .001) Life satisfaction (r = -.57, p < .001)	Single factor; 40% variance explained.
Zauszniewski, Chung, Krafcik, & Sousa (2001)	83 diabetic women (ages 21-60 years)	.85	Resourcefulness (r = -.55, p < .001) Depressive symptoms (r = .73, p < .001) Health practices (r = -.51, p < .001)	Single factor; 51% variance explained.
Zauszniewski, Picot, Debanne, Wykle, & Roberts (2002)	213 African American women caregivers (n = 102) and noncaregivers (n = 112) ages 24-84 years	75 (caregivers) 87 (noncaregivers)	Resourcefulness (r = -.36, p < .001) Depressive symptoms (r = .26, p < .001) Daily hassles (r = .31, p < .001)	Caregivers: two factors; 54% variance explained. Noncaregivers: single factor; 54% variance explained.
Sousa, Zanetti, Zauszniewski, Mendes, & Daguano (2008)	82 adults with diabetes (average age 61 years)	.88	Depressive symptoms (r = .24, p < .05).	Single factor; 57% variance explained.
Zauszniewski, & Suresky (2010)	60 women relatives of adults with mental illness (ages 21-65 years)	.87	Caregiver burden (r = .40, p < .001) Resourcefulness (r = -.65, p < .001) Sense of coherence (r = -.77, p < .001) Quality of life (r = -.70, p < .001)	Single factor; 48% variance explained.

The Depressive Cognition Scale has been translated into Portuguese as the Escala Cognitiva de Depressão, by Sousa et al. (2005) and into Arabic by Bekhet & Zauszniewski (2010). Acceptable estimates of reliability and validity have been reported for the translated scales (Bekhet, Fouad, & Zauszniewski, 2011; Bekhet & Zauszniewski, 2010; Sousa et al., 2008).

However, cutoff scores on the DCS for determining risk for clinical depression have not been established. To prevent clinical depression, it is important to establish the score at which referral, intervention, or treatment would be recommended. Therefore, the study reported here was designed to establish a meaningful DCS cutoff score, using a receiver operating characteristic (ROC) curve to identify serious negative thinking that may lead to clinical depression.

Method

Design and Sample

This secondary analysis used data collected via the Internet from a national sample of 629 healthy adults in 42 of the 50 states. To be included, participants had to be age 21 years or older; able to understand, speak, and write in English; and have access to a computer for completion of the study questionnaires. Information on the demographic characteristics of the sample has been reported elsewhere (Sousa, Zauszniewski, Bergquist-Beringer, et al., 2010; Sousa, Zauszniewski, & Jaber, 2010). The sample was recruited online using a study website hosted at the University of Kansas, where institutional review board approval for human subjects research was obtained for the parent study. The sample size for the study ($n = 629$ participants) exceeded the recommended sample size for an area under the curve (AUC) for the null hypothesis = .50 and a minimal acceptable AUC = .75, with $\alpha = .05$, and power = .80 (Fan, Upadhye, & Worster, 2006; Park, Goo, & Jo, 2004).

The ages of participants ranged from 21 to 84 years, with an average age of 35 years. Women constituted 70% of the sample. About 75% reported that they were Caucasian, with the others reporting race/ethnicity as African American, Hispanic/Latino, American Indian, or Asian American. Only 42% reported that they were married. The majority (70%) were college educated and half (50%) of the sample reported an annual income greater than \$40,001.

Instruments

Depressive cognitions were measured by the Depressive Cognition Scale (Zauszniewski, 1995), an eight-item instrument on which respondents rate each item on a 6-point Likert-type scale from *strongly agree* (0) to *strongly disagree* (5) to indicate the degree to which a particular statement describes their current thoughts. Each item reflects one depressive cognition (e.g., hopelessness, worthlessness); however, the items are phrased positively so that strong disagreement with an item indicates the presence of a depressive cognition. Sample items include "I am hopeful about the future" and "I am a worthwhile human being." DCS scale scores range from 0 to 40, and higher scores indicate more depressive cognitions, which may precede clinical depression. Copies of the DCS and permission to use it can be obtained from the corresponding author.

As noted above, acceptable estimates of internal consistency reliability of the DCS have been reported. The coefficient alpha for the DCS in this secondary analysis was .93. Also, as noted above, evidence for construct validity of the DCS has been shown by significant correlations in the expected directions with measures of depression, resourcefulness, adaptive functioning, and life satisfaction ($r_s = .54, -.37, -.60, -.57$, at $p < .001$, respectively; Zauszniewski, 1997) and with measures of self-care agency and health promotion ($r_s = -.40$ and $-.48$, at $p < .01$, respectively).

Confirmatory factor analysis produced a single factor structure for the DCS in older adults (Zauszniewski, 1997), African American women (Zauszniewski et al., 2002), women with type 2 diabetes (Zauszniewski et al., 2001), female family member of mentally ill adults (Zauszniewski & Suresky, 2010), and healthy adults (Sousa, Zauszniewski, & Jaber, 2010).

The CES-D (Radloff, 1977) was used to measure depressive symptoms and served as the criterion measure for classifying study participants into those with clinically relevant depressive symptoms and those without clinically relevant symptoms. The well-known CES-D was designed for use with the

general population and is the most widely used measure of depressive symptoms in the field of psychiatric epidemiology (Murphy, 2002). The 20-item scale asks respondents to rate the frequency with which they have experienced each listed symptom during the prior week using a 4-point Likert-type scale ranging from *rarely or not at all* to *most or all of the time*. Scores can range from 0 to 60, with higher scores indicating more depressive symptoms.

The scale has been normed for a variety of age and racial/ethnic groups and has a standardized alpha of .88 (Radloff, 2007). Alpha for the CES-D in this study was .92. Validity has been established by correlations with other self-report measures of closely related constructs, including measures of affect and social functioning, and with clinical ratings of depression (Radloff, 2007). A score of 16 is the cut-off point used to differentiate between those with and without clinically relevant depressive symptoms (Radloff, 2007). In this study, 58% of the participants scored less than 16 whereas 42% scored 16 or more on the CES-D scale.

Analysis

Data were analyzed using Predictive Analytics SoftWare (PASW) 17.0, formerly known as Statistical Package for the Social Sciences (SPSS). Preliminary data analysis included examination of descriptive statistics (e.g., means, standard deviations, and ranges) and estimates of reliability for the CES-D and DCS measures. The CES-D was used for classifying the study participants into those with and those without clinically relevant depressive symptoms so that cut scores on the DCS could be determined using receiver operating characteristic (ROC) curve analysis. In the analysis reported here, the ROC curve was used to determine the ability of the DCS to differentiate between persons with fewer depressive cognitions (noncases) and those with more depressive cognitions (cases), who may be at greater risk for developing more serious depressive symptoms. ROC analysis involves plotting the sensitivity and specificity for every possible cutoff point on a measure to establish an optimum score that will distinguish cases from noncases.

Results

On average, the study participants scored 7.59 ($SD = 6.80$) and 15.45 ($SD = 11.12$) on the DCS and CES-D measures, respectively. Descriptive analysis indicated full use of the DCS scoring range (0 to 40) and nearly full use of the CES-D scoring range (0-53 of 60). Participants were categorized as cases if they had a CES-D score equal to or greater than 16 and noncases if they scored less than 16 (Radloff, 2007); there were 261 cases and 368 noncases. The cases differed significantly from noncases, $t(1, 267) = 37.65$, $p < .001$, in depressive cognitions. They did not differ significantly in age, gender, or race/ethnicity. Cronbach's alphas for both the DCS and CES-D for cases and noncases were .93, showing high internal consistency in both groups on the two measures used in this analysis.

A ROC analysis was conducted to determine the optimum cutoff score for the DCS that is associated with the highest possible sensitivity and specificity. ROC analysis is a statistical technique for determining appropriate cutoff scores on a measuring instrument. ROC analysis involves plotting the sensitivity against the false-positive fraction (i.e., $1 - \text{specificity}$) for every possible cutoff point on a measure. Typically, optimum cutoff scores are those that yield the greatest sensitivity and specificity while remaining balanced (i.e., one value is not very high while the other is very low); perfect specificity and sensitivity would equal 100% for each.

The ROC analysis provides a summary measure known as “area under the curve” (AUC) that indicates how well the measure discriminates between the cases and noncases on a particular characteristic, in this instance, depressive symptoms as measured by the CES-D. An AUC of 1.00 indicates perfectly accurate discrimination between cases and noncases; the accuracy of the AUC has been evaluated as 0.50 to 0.70 = low; 0.70 to 0.90 = moderate; and greater than .90 = high (Streiner & Cairney, 2007). Then, the 95% confidence interval (CI) is examined to support that one could be 95% confident in the findings.

The ROC analysis for this study provided an AUC = .80, with a 95% CI between .76 and .83 (Figure 1). The AUC and CI thus suggest that the DCS is moderately accurate in discriminating between cases with clinically relevant depressive symptoms and noncases without clinically relevant depressive symptoms, based on these parameters (Streiner & Cairney, 2007).

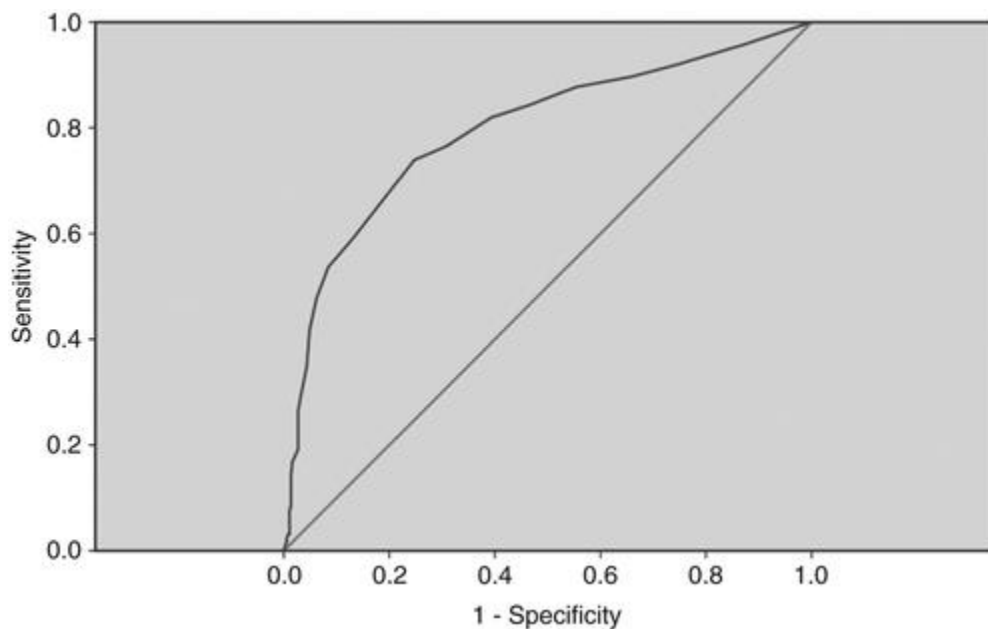


Figure 1. Receiver operating characteristic (ROC) curve for analysis of cut scores on the depressive cognition scale

The sensitivity and specificity of the DCS measure were also examined. Sensitivity and specificity are important factors to consider when determining appropriate cut scores for measuring instruments. Sensitivity reflected the proportion of cases (i.e., individuals with clinically relevant depressive symptoms) who scored above a certain cut score on the DCS. Specificity reflected the proportion of noncases (i.e., individuals without clinically relevant depressive symptoms) who scored below a particular cut score on the DCS. The goal was to develop a cutoff score for the DCS with optimal sensitivity and specificity that would identify the probable presence of significant depressive thinking patterns that might lead to clinical depression while limiting the overidentification of persons not likely to have clinically significant depressive symptoms (i.e., false positives). At the same time, although it is important to keep false positives to a minimum, accurate identification of persons with considerable depressive thinking patterns may lead to appropriate referrals for intervention to minimize these depressive cognitions, and enhance positive cognitions.

In our analysis, the cut point of 7 to 8 (the PASW program does not report cut points as discrete scores) on the DCS yielded a sensitivity of 73.9% and specificity of 75.3% (Table 2). Although the cut point of 7 to 8 reflected the best balance of sensitivity and specificity, we also considered the cut point of 6 to 7 because sensitivity was higher (76.6%) and this is considered important when evaluating an instrument for screening purposes, in order to minimize the risk of false negatives (Uslu, Kapci, Oncu, Ugurlu, & Turkcapar, 2008). Thus, we concluded that the optimal cut score for the DCS was 7.

Table 2. Analysis of Scale Parameters Across Possible Cutoff Scores for the Depressive Cognition Scale

	Cutoff Scores				
Parameter	5-6	6-7	7-8	8-9	9-10
Sensitivity	82.0	76.6	73.9	59.0	53.6
Specificity	60.6	69.0	75.3	87.0	91.6
Positive predictive value	75.4	70.4	68.0	54.2	49.3
Negative predictive value	64.6	73.6	80.3	92.8	97.7
Misclassification	31	28	25	25	24

In terms of predictive value, that is, the probability of substantial depressive thought patterns, expressed as a percentage, the findings showed that for cases (i.e., those categorized by the CES-D score as having clinically relevant depressive symptoms), the positive predictive values at cut scores of 6 to 7 and 7 to 8 were 70.4% and 68.0%, respectively. The negative predictive values at cut scores of 6 to 7 and 7 to 8 were 73.6% and 80.3%, respectively. The positive predictive value reflects the rate of false positives, whereas the negative predictive value reflects the rate of false negatives. The overall misclassification rates, or the percentages of persons who would be classified as cases when they are not (i.e., do not report clinically relevant depressive symptoms when they score high on the DCS) or noncases when they really are (i.e., report clinically relevant depressive symptoms but do not score high on the DCS) are shown in Table 2 for the various cutoff scores on the DCS.

Discussion

Cutoff scores on depression scales are vital in determining risk for clinical depression so that clinicians can recommend referral, intervention, or treatment to prevent clinical depression and the huge costs and burden associated with it. This study represents a first attempt to establish a cutoff score on the Depressive Cognition Scale (DCS). For primary prevention, many clinicians are seeking to identify serious negative thinking that may lead to clinical depression. Our results provide empirical data that can assist in assessment of the probability of developing depression across a range of populations. The ages of our participants ranged from 21 to 84 years, and the sample included Caucasian, African American, Hispanic, American Indian, and Asian Americans as well as those with a wide range of education. Identification of a meaningful cutoff score on the DCS, which can differentiate cases from noncases, supports its usefulness as a screening measure for negative thinking that may lead to serious clinical depression. Early recognition of depressive cognitions may lead to shorter, more focused/tailored psychotherapy, which has major implications for minimizing the cost of treatment.

The internal consistency of the DCS in the study reported here was .93, somewhat higher than those previously reported for elders (Zauszniewski, 1995, 1997), caregivers of elders (Zauszniewski et al.,

2002), women with diabetes (Zauszniewski et al., 2001), relocated elders (Bekhet, Zauszniewski, & Wykle, 2008), and women caregivers of persons with mental illness (Zauszniewski, Bekhet, & Suresky, 2009). The improved alpha may be associated with the larger sample size and greater diversity in this Internet-based national sample.

In order to determine the cutoff score, we used the AUC, which yielded a moderate level of accuracy. The DCS discriminated 80% of individuals with and without clinical depressive symptoms, which is considered a good level of accuracy. This is, in fact, similar to the results of Uslu and colleagues (2008) who used AUC to determine the cutoff scores for the Beck Depression Inventory–II in adolescents; they found that the AUC discriminated 86% of adolescents with and without clinical depression and concluded that the AUC yielded a good level of accuracy (Uslu et al., 2008).

This study supports the cut score of 7 as optimal. Sensitivity is higher at this score, which is important in minimizing the risk of false negatives (Uslu et al., 2008). Additional research is needed to address the ability of the DCS to detect negative thinking that might precede the development of clinical depression at this cutoff score. Future studies may also illuminate whether the cutoff score found with this sample is applicable to people in other countries. Translation and validation of the DCS will provide clinicians around the world with a valid and reliable means of assessing the negative thinking that might precede the development of clinical depression. It is also important to develop cross-cultural comparisons of the cutoff scores for depressive thinking among Americans and people from various other cultures for which the instrument has been translated and validated, such as Egyptian and Brazilian populations (Bekhet & Zauszniewski, 2010; Sousa et al., 2005).

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