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Journal of Psychosomatic Research, Vol. 46, No. 5, pp. 437–443, 1999

0022-3999/99 $–see front matter

S0022-3999(99)00004-5

MEASUREMENT OF DEPRESSIVE SYMPTOMS IN CANCER PATIENTS: EVALUATION OF THE CENTER FOR EPIDEMIOLOGICAL STUDIES DEPRESSION SCALE (CES-D)

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Abstract—The Center for Epidemiological Studies Depression Scale (CES-D) is commonly used to measure depressive symptomatology in cancer patients, yet there is little known about the psychometric properties of the measure when applied to a cancer population. The aim of this study was to examine the psychometric properties of the CES-D with cancer patients. For purposes of comparison, the psychometric properties of the CES-D were assessed both in women undergoing treatment for breast cancer and women with no history of cancer. The CES-D and other study measures were administered to women undergoing treatment for breast cancer on two occasions: prior to treatment and midway through treatment. The measures were also administered to a group of women similar in age to the cancer patients who had no history of any type of cancer. These healthy comparison subjects were also assessed on two separate occasions. The CES-D was found to have good internal consistency, with alpha coefficients >0.85 for both groups, as well as adequate test–retest reliability in both groups. Construct validity was demonstrated in two ways, via comparisons between the groups and by comparing the CES-D with measures of fatigue, anxiety, and global mental health functioning. The CES-D was established as a valid and reliable measure of depressive symptomatology in this sample of breast cancer patients. This measure may be appropriate for use in clinical psychosocial research with cancer patients, yet further research is needed to evaluate its usefulness in other cancer populations. The importance of measuring psychological symptoms with standard measures that have been validated with cancer patients is highlighted. © 1999 Elsevier Science Inc.

Keywords: Cancer; Depression; Measurement; Quality of life.

INTRODUCTION

It was recently reported that an average of 24% (range 1.5% to 50%) of cancer patients experience depressive symptoms [1], and that that as many as half of all cancer patients experience symptomatology that would qualify for clinical diagnosis [2]. Depressive symptoms can adversely affect a cancer patient in many ways: they can interfere with cancer treatment; increase length of hospital stay; reduce ability to care for oneself; impair quality of life; and possibly reduce overall survival time [1].

Because depressive symptoms are common and have a significant impact on cancer patients, a measure of depression is often included in psycho-oncology research studies. One instrument often used to measure depressive symptomatology in can-

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cer patients is the Center for Epidemiological Studies Depression Scale (CES-D) [3]. The CES-D has been used in many studies of cancer patients [4–10]. Because the measure focuses primarily on cognitive and affective components of depression rather than the physical manifestations of depression, it is a sensible tool to use with medically ill populations such as cancer patients. However, it was originally developed in the general population [3] and little is known about the reliability and validity of the CES-D in a cancer population.

There are a few studies in which the psychometric properties of the CES-D in a cancer population have been examined. In a study conducted by Devins et al. [4], the psychometric properties of the CES-D were examined in five groups that varied in physical health and illness. One of the groups consisted of 120 lung and gastrointestinal cancer out-patients. The internal consistency of the CES-D with cancer patients in this study was calculated at 0.88, supporting the measure's reliability. Ward et al. [9] reported the internal consistency of the CES-D was 0.89 when used with a small group (n=38) of breast cancer patients.

These reports provide limited information about the psychometric properties of the CES-D when it is used to measure depressive symptoms in a cancer population. In one study, the CES-D was administered as a structured interview, so reports about its psychometric properties may not be applicable to the use of the measure as a self-report scale [4]. In none of the studies was test–retest reliability of the measure reported. In summary, no known studies have reported on the reliability and validity of the CES-D based on multiple assessments of cancer patients. The goal of this report was to provide information about the psychometric properties of the CES-D in a cancer population. In this study the CES-D was administered, along with other measures, twice to both a group of cancer patients and a group of healthy individuals, thus allowing for a more thorough evaluation of the reliability and validity of the CES-D than has been included in previous reports.

METHOD

Subjects

Patient group. To be eligible for the patient group, women had to be scheduled to begin radiotherapy, chemotherapy, or BMT for treatment of breast cancer at Moffitt Cancer Center from March 1995 through June 1996. In addition, these women had to: (a) be 18 years or older; (b) have no known untreated or unstable major medical conditions; (c) have no known major psychiatric or neurological disorders that would interfere with completion of the measures; (d) be able to read English; and (e) have no history of treatment for other types of cancer. Four percent of radiotherapy patients, 17% of chemotherapy patients, and 3% of bone marrow transplantation (BMT) patients refused to participate. Complete data were obtained from 117 patients; 52 radiotherapy patients, 33 chemotherapy patients, and 32 BMT patients.

Healthy comparison group. The healthy comparison group was made up of female friends and relatives of patients who had completed BMT for breast cancer and had participated in another study [17]. To be eligible for this group, women had to: (a) have no history of any type of cancer; (b) be 18 years or older; (c) have no known untreated or unstable major medical conditions; (d) have no known major psychiatric or neurological disorders that would interfere with completion of the measures; and (e) be able to read English. Nine percent of eligible healthy women refused to participate, and 10% of the subjects withdrew from participation in the study, usually due to time constraints. Complete data were obtained from 62 healthy comparison subjects.

Procedure

Patient group. Breast cancer patients scheduled to undergo radiotherapy, chemotherapy, or BMT who met eligibility criteria were recruited to the study during an out-patient appointment prior to their

first scheduled treatment. Patients were given the baseline assessment packet during this appointment, and instructed to bring the completed measures to the Moffitt Cancer Center (MCC) on the first day of treatment. All patients were administered a second assessment approximately 2 to 3 weeks after the start of treatment.

Healthy comparison group. The healthy comparison subjects recruited at the MCC were contacted via telephone for consent, then mailed the questionnaires along with a stamped envelope to use in returning the measures. Healthy subjects were administered the questionnaire packet in a second assessment, which occurred approximately 2–3 weeks after the first assessment. The second assessment was preceded by a telephone contact.

Measures

The packet of questionnaires administered to all of the participants included a demographic data form, the CES-D [3], the Profile of Mood State Fatigue Scale (POMS-F) [11], the State version of the State–Trait Anxiety Inventory (STAI-S) [12], and the Mental Health Summary Scale from the Short-Form 36 Health Survey (SF-36 Vitality scale) [13].

The CES-D [3] contains 20 items selected from previously validated scales of depression. It includes six components: depressed mood; feelings of guilt and worthlessness; feelings of helplessness and hopelessness; psychomotor retardation; loss of appetite; and sleep disturbance. Respondents indicate how often within the last week they experienced the symptoms, responding: "rarely or none of the time" (0); "some or little of the time" (1); "occasionally or a moderate amount of time" (2); and "most or all of the time" (3). The scores for the 20 items are added, resulting in a range of possible total scores from 0 to 60.

Reliability and validity of the scale have been tested in general and clinical populations [3], yielding very good internal consistency with an alpha of 0.85 for the general population and 0.90 for a psychiatric population. Satisfactory test–retest reliability over a 2- to 8-week period ranged from 0.51 to 0.67 and from 0.32 to 0.54 over a 3- to 12-month period. Convergent validity was supported by significant correlations with other scales designed to measure depression. Last, differences between the psychiatric inpatients and the general population established construct validity.

The POMS-F [11]consists of seven that assess feelings of weariness and low energy. Respondents indicate the degree to which they have experienced each of these feelings during the previous week on five-point intensity scales (0="not at all" to 4="extremely"). The total score can range from 0 to 28.

The STAI-S [12] contains a 20-item scale that measures current or situational anxiety. Respondents rate each item on a four-point Likert scale (1="not at all" to 4="very much so"). Extensive data on reliability and validity support the utility of this test.

The Mental Health Summary Scale is a factorially derived subscale of the SF-36 Health Survey that measures global mental health functioning [13]. Scores on this summary scale are expressed as *T*-scores (mean=50; SD=10). Higher scores on this scale indicate a better health state. Evaluation of data on over 20,000 patients from the Medical Outcome Study was used to demonstrate the validity of this measure.

Statistical analyses

The reliability of the CES-D was evaluated through analysis of the measure's internal consistency and test–retest reliability. The internal consistency of the CES-D was evaluated by computing the alpha coefficient at the first assessment. Test–retest reliability was evaluated by calculating the correlation between the first and second assessments. Both forms of reliability were evaluated in the patient group and in the healthy comparison group.

The construct validity of the CES-D was evaluated in two ways. First, comparisons were made between groups that were expected to differ in depressive symptomatology. Analysis of variance was used to evaluate the difference between the groups on the CES-D. Scores of the patient group were expected to be higher than those of the healthy comparison group at both assessments. In addition, based on some of our previous research, which indicates that depressive symptoms increase during the course of cancer treatment [14], it was expected that the patient group would report significantly greater increases in depressive symptoms from the first to second assessment as compared with the healthy comparison subjects.

Construct validity was also evaluated by comparing the CES-D with measures of constructs expected to vary with depressive symptoms. Because fatigue and anxiety have been found to be characteristic of depression [15, 16], scores on the CES-D were expected to be positively correlated with the POMS-F and STAI-S. In addition, depressive symptoms are inversely related to global mental health functioning [17], thus CES-D scores were expected to be negatively correlated with scores on the Mental Health Summary Scale of the SF-36. Scores from the first assessment were used to compute the correlations between the CES-D and the POMS-F, STAI-S , and SF-36 Mental Health Summary Scale for both groups.

Table I.—Demographic characteristics of the patient group and healthy comparison group

	Patient group (N = 117) n (%)	Health comparison group (N = 62) n (%)
Race		
White	103 (91)	58 (4)
African American	5 (4)	2 (3)
Hispanic	3 (3)	2 (3)
Asian	1 (1)	0 (0)
Other	1 (1)	0 (0)
Marital status		
Never married	3 (3)	3 (5)
Currently married	82 (72)	45 (72)
Separated	2 (2)	0 (0)
Divorced	14 (12)	8 (13)
Widowed	12 (11)	6 (10)
Education		
Some high school	3 (2)	0 (0)
High school graduate	28 (25)	15 (24)
Some college or specialized training	43 (38)	26 (42)
College graduate	19 (17)	14 (23)
Graduate training or degree	20 (18)	7 (11)
Employment status[a]		
Employed outside the home		
Working full time	22 (20)	30 (48)
Working part time	9 (8)	9 (15)
On leave with pay	19 (17)	0 (0)
Not employed outside the home		
On leave without pay	9 (8)	1 (2)
Disabled	8 (7)	0 (0)
Retired	28 (25)	18 (29)
Supported by other	16 (15)	4 (6)
Income		
Less than $10,000	8 (8)	1 (2)
$10,000 to $19,999	11 (10)	4 (6)
$20,000 to $39,999	35 (33)	21 (36)
$40,000 to $59,000	26 (24)	22 (38)
$60,000 to $100,000	22 (21)	5 (9)
Greater than $100,000	4 (4)	5 (9)

[a] Chi-square = 15.0, $p < 0.001$; all other comparisons were not significant ($p > 0.05$).

RESULTS

Demographic characteristics of samples

The demographic characteristics of the patient group and healthy comparison group are presented in Table I. The average age of patients was 53.7 (SD=12.4) years. Of the 117 subjects in the patient group, 72% were married, 91% were white, and 73% had attended college. Twenty percent of the patients were working full time outside the home and an additional 8% were working part time. Forty-nine percent of patients reported an annual household income over ;40,000. The average age of the 62 subjects in the healthy comparison group was 53.5 (SD=11.3), 72% were married, 94% were white, and 76% had attended college. Approximately half of the healthy subjects (48%) were employed outside the home on a full-time basis

Table II.—Mean CES-D scores of the patient group and healthy comparison group

	Patient group	Healthy comparison group	*F*
Time 1	10.9 (SD = 8.9)	8.1 (SD = 7.0)	4.71[a]
Time 2	12.8 (SD = 10.2)	7.8 (SD = 7.5)	11.72[b]

[a] $p < 0.05$; [b] $p < 0.001$.

and an additional 15% were working part time. Fifty-six percent of the healthy subjects reported an annual household income over $40,000. There were no significant differences between the two groups on demographic characteristics with the exception of employment status: a significantly greater proportion of the healthy subjects were employed full or part time outside the home ($p<0.001$). This difference is likely due to the fact that the patients were simply not working at the same time as being treated for their cancer.

Reliability of CES-D

The alpha coefficient in the patient group and the healthy comparison group was 0.89 and 0.87, respectively. These values are well above the acceptable range of 0.70–0.80 [18].

Test–retest reliability coefficients for the active treatment group and healthy comparison group were 0.57 ($p<0.001$) and 0.51 ($p<0.001$), respectively. These moderate and significant correlations support the test–retest reliability of the CES-D over an average time of 2.5 weeks.

Validity of CES-D

Scores of the patients and healthy comparison subjects on the CES-D are presented in Table II. As expected, the patients scored significantly higher, that is, reported more depressive symptomatology, than the healthy subjects at the first assessment ($p<0.05$) and at the second assessment ($p<0.001$). Also, patients reported a significant increase in depressive symptomatology from the first to second assessment ($p<0.05$), whereas scores for the healthy subjects did not significantly change from Time 1 to Time 2 (Group×Time interaction: $F=2.8$, $p<0.10$).

The correlations among the CES-D, POMS-F, STAI-S, and SF-36 Mental Health Summary Scale for both groups at the first assessment are shown in Table III. As expected, moderate and significant correlations among the measures reflect that more depressive symptomatology was associated with worse fatigue, more severe

Table III.—Correlations of the CES-D with POMS-F, STAI-S and SF-36 Mental Health Summary Scale

	Patient group Time 1	Healthy comparison group Time 1
POMS-F	0.66	0.54
STAI-S	0.77	0.65
SF-36 Mental Health Summary Scale	−0.65	−0.67

[a] $p < 0.001$ for all correlations.

anxiety, and impaired mental health functioning. The direction and significance of the correlations were similar in the patient group and healthy comparison group.

DISCUSSION

Depressive symptoms are a common and disruptive problem for cancer patients, and it is important to assess depressive symptomatology in psycho-oncology research. It is also important to remember that, when applying the measurement of any construct to a cancer population that has been originally validated in a nonmedical sample, the measure should be cross-validated in a sample of cancer patients (e.g., refs. 19–21). According to Bieliauskas and Garron [22], "Psychometrically based studies of depression offer the best opportunity to elucidate the depression/cancer relationship." In this study, the CES-D, a self-report scale originally designed to measure depressive symptomatology in the general population, was evaluated for its reliability and validity when used in a sample of breast cancer patients. For purposes of comparison, the psychometric properties of the measure were evaluated in both this cancer population and a non-cancer population. What follows is a summary of our findings regarding the psychometric properties the CES-D and discussion of the application of the CES-D to cancer patients.

With regard to reliability, the CES-D demonstrated excellent internal consistency. Overall, the measure also showed satisfactory test–retest reliability over a short period of time (2 to 3 weeks). These findings suggest that the CES-D is a reliable measure when used with cancer patients in active treatment as well as with a noncancer population.

With regard to validity, the construct validity of the CES-D was supported by findings indicating that patients undergoing cancer treatment reported more depressive symptomatology than healthy individuals. In addition, construct validity was demonstrated by moderate to high correlations with measures of fatigue, anxiety, and global mental health functioning. The relationship of depressive symptoms with both physical symptoms such as fatigue as well as with psychological symptoms have been demonstrated previously [14, 17]. Overall, the CESD was found to be a valid and reliable measure of depressive symptomatology in breast cancer patients.

This study was unique from other validational reports of the CES-D as a measure of depressive symptoms in cancer patients in that we included a comparison group of individuals with cancer. By doing so, we demonstrated that women undergoing cancer treatment experience significantly worse depressive symptomatology than healthy women of about the same age. We also demonstrated that the CES-D is sensitive to the differences between breast cancer patients and healthy individuals. Further reports should focus on the usefulness of the CES-D with other cancer populations. In addition, to understand further the experience of depression in cancer patients, future research should assess the relationship of scores on the CES-D to clinical depression as diagnosed by a mental health professional.

One goal of psychosocial research with cancer patients is to develop interventions that may alleviate symptoms associated with the disease and its treatment. Previous studies suggest that psychotherapeutic intervention has been found to reduce depressive symptoms, thereby improving adjustment and quality of life (e.g., refs. 2 and 23). Use of the CES-D would provide standard evaluation of the effectiveness

of interventions designed to alleviate depressive symptoms. In summary, it is best to use an instrument that has been well validated in the population being studied when assessing the psychosocial aspects of cancer. Psychometric evaluation of any instrument used in psycho-oncology research should be done routinely to insure the applicability of the measure to a cancer population.

Acknowledgments—This study was supported by an institutional research grant from the American Cancer Society to the Moffitt Cancer Center (ACS IRG #202).

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