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DEPRESSIVE SYMPTOMS AFTER BREAST CANCER SURGERY: RELATIONSHIPS WITH GLOBAL, CANCER-RELATED, AND LIFE EVENT STRESS

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SUMMARY

For women with breast cancer, rates of depression are the third highest of any cancer diagnostic group. Stress, defined as life events or perceptions of stress, is associated with depressive symptoms. However, little is known about the relationships between different types of stress and these symptoms in women with breast cancer. This relationship was tested in 210 women assessed after initial surgical treatment for regional breast cancer. Using Hierarchical Multiple Regression, three types of stress were examined: the occurrence of five stressful life events in the year prior to cancer diagnosis, perceptions of global stress, and perceptions of cancer-related traumatic stress. Other potentially relevant correlates of depressive symptoms were also examined, including the personality trait neuroticism, sociodemographics, and disease/treatment characteristics. Fifty-three percent of the variance in depressive symptoms was accounted for by three stress variables (perceptions of global and cancer-related traumatic stress and the life event-major financial difficulty) and two control variables (neuroticism and racial group). Specifically, global stress perceptions coupled with cancer-related intrusive thoughts and financial concerns along with the tendency towards negativity (neuroticism) may conspire to heighten a women's risk for depressive symptoms. Assessing multiple sources of stress would improve our ability to identify women 'at risk' for depressive symptoms and provide appropriate intervention.

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[1]According to previous research, the short form of the CES-D has 4 factors (1-depressed affect; 2-postitive affect; 3-somatic complaints, and 4-interpersonal problems; Kohout *et al.*, 1993), while the PSS has 2 identified factors (1-distress; 2-coping; Hewitt *et al*., 1992; Martin *et al.*, 1995; Cohen and Williamson, 1988). With a sample size of 166, 21 total items, and an item to subject ratio of 1:8, we conducted a PACE factor analysis using the program CEFA (computer exploratory factor analysis; Browne *et al.*, 1998). An oblique rotation to a partially specified target (Browne, 1972) produced a factor structure and item loadings to test for item overlap and construct redundancy. Loadings anticipated to be zero were minimized in the rotation process and values of the remaining loadings were left unspecified. A pattern suggested by current research (6 factors: 4 for CES-D and 2 for PSS) was tested and a rotation to a solution as close to the target as possible was carried out. As an additional check, we also conducted factor analyses for 4 and 5 (i.e. underfactoring) and 7 (i.e. overfactoring) factor solutions.

The root mean square error of approximation (RMSEA; Steiger, 1989; Browne and Cudeck, 1993), measuring goodness of fit, for the factor solutions were as follows: 4 factors=0.072, 5 factors=0.067, 6 factors=0.058, and 7 factors=0.060. RMSEA values for the 4 and 5 factor solutions were unsatisfactory (only scores $\leq$ 0.05–0.06 are judged acceptable; Browne *et al.*, 1998). While the RMSEA values for the 6 and 7 factor solutions were both acceptable, the 7 factor solution showed evidence of overfactoring as indicated by the direct quartamin rotation in which there were two moderate loadings on the seventh factor and the other factor loadings were low, negative values (approximating zero). Therefore, the variance accounted for by the seventh factor was uninterpretable.

The six-factor solution, however, demonstrated high loadings that corresponded to the target and reflected previous findings. Additionally, the confidence intervals corresponding to the target zero loadings generally overlapped with zero and were not significant. These results were not only consistent with previous research (Cohen and Williamson, 1988; Hewitt *et al.*, 1992; Kohout *et al.*, 1993; Martin *et al.*, 1995) but, in fact, indicated no overlap among the factors.

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INTRODUCTION

Cancer diagnosis is described as one of the most stressful medical diagnoses a person can receive (Weisman and Worden, 1976). Indeed, data from many studies document acute emotional stress/distress at the time of diagnosis and early treatment (Andersen *et al.,* 1989; Epping-Jordan *et al.,* 1999; Maunsell *et al.,* 1992). Depressive symptoms are the most common affective symptoms reported by cancer patients (van't Spiker *et al.,* 1997). Research suggests that the majority of patients experience some degree of depressive symptoms and approximately 50% meet criteria for a psychiatric diagnosis (i.e. adjustment, mood and/or anxiety disorders; Derogatis *et al*., 1983). In a recent review on the prevalence of depression in cancer patients, McDaniel and colleagues (1997) found rates ranging from 1.5 to 50% (with a mean of 24% across studies), rates consistently higher than those for patients with other medical diagnoses.

For those with breast cancer, the rates for depression symptoms are the third highest of any cancer diagnostic group (only patients with pancreatic or head and neck cancers have been identified with higher rates; McDaniel *et al*., 1997). Within six months of initial breast cancer diagnosis and treatment, rates of diagnosable depression have been estimated to be 20–30% (e.g. Fallowfield *et al*., 1990; Goldberg *et al*., 1992), with individual studies ranging from 6% (Watson *et al*., 1991) to 29% (Rijken *et al*., 1995). As breast cancer is the most commonly diagnosed cancer in women (i.e. over 192,000 new cases annually in the United States; American Cancer Society, 2001), upwards of 96,000 (50%) women may experience some depressive symptoms. A subset, 38,400–57,600 (20–30%), may have symptoms of a magnitude sufficient to suggest clinical depression. Such numbers clearly illustrate the need for appropriate identification of women 'at risk' for depressive symptoms as these symptoms are not only associated with lower quality of life (Ganz and Lerman, 1992) but may lead to other difficulties such as poorer treatment compliance (Ayers *et al*., 1994; Dimatteo *et al*., 2000) and shorter disease free intervals (Watson *et al*., 1999).

Stress has been conceptualized as *life events/stressors or as, perceptions of stress* (i.e. global perceptions or cancer-related perceptions). Regardless of the definition, stress is associated with poor psychological outcomes in cancer patients. For instance, increased recent life events are positively related to distress in cancer populations (Bukberg *et al*., 1984; Grassi *et al*., 1997). While well studied in non-cancer medical populations (Hewitt *et al*., 1992; Martin *et al*., 1995; O'Leary *et al*., 1988; Pbert *et al*., 1992), little is known about the association of global stress perceptions (i.e. the degree to which individuals perceive their lives, in general, as uncontrollable/unmanageable) to psychological outcomes in cancer populations. One exception (Varni *et al*., 1992) found that higher perceived global stress is associated with increased depression and anxiety in adolescent survivors of pediatric cancer. Much more is known about cancer-related stress perceptions. The Impact of Events Scale (Horowitz *et al*., 1979), a measure of traumatic stress, is commonly used to assess the severity of cancer-related intrusive and avoidant thoughts/behaviors. Research consistently reveals that increased perceptions of cancer-related traumatic stress are correlated with psychological distress (Butler *et al*., 1999). Intrusive symptoms (e.g. recurrent distressing thoughts, flashbacks), not avoidant ones (e.g. feelings of detachment, restricted range of affect), account for this significant relationship (Baider and De-Nour, 1997; Cordova *et al*., 1995). However, we are unaware of any cancer studies examining the relative contributions of these types of stress to depressive symptoms.

In the present study, depressive symptoms were examined in a sample of women recently diagnosed and surgically treated for regional breast cancer. Importantly, the relationship of three types of stress to these symptoms was examined—the occurrence of stressful life events in the year prior to cancer diagnosis, perceptions of global stress, and perceptions of cancer-

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related traumatic stress. Other potentially relevant correlates of depressive symptoms were also examined. An individual difference variable, the personality trait of neuroticism was tested. Positive associations between neuroticism, the tendency to be emotionally negative, and psychological outcomes have been found in heterogeneous cancer groups (Jenkins *et al*., 1991; VanderZee *et al*., 1996). However, the importance of a neurotic style to adjustment after surgery for breast cancer patients is unknown. Other control variables examined were those related to the general context (i.e. sociodemographics) as well as the specific context (i.e. disease and treatment characteristics) of the breast cancer experience. We used a conservative strategy (i.e. controlling for other variables) in order to examine the contribution of different types of stress to depressive symptoms above and beyond other variables.

METHOD

Participants

Two hundred and ten women in a prospective, longitudinal study of women with breast cancer participated. Eligibility criteria for the study included: a confirmed diagnosis of regional (stage II or III) breast cancer, no previous cancer diagnoses, age between 20 and 85 years, no refusal of cancer treatment prior to accrual, and no adjuvant treatment (e.g. chemotherapy, radiation) prior to accrual. Women with mental retardation, severe or untreated psychopathology (e.g. schizophrenia, bipolar disorder), a current neurological disorder, dementia, and chronic fatigue syndrome or other immunologic conditions/diseases (e.g. rheumatoid arthritis) were excluded.

Consecutive breast cancer cases were screened from a university-affiliated, National Cancer Institute-designated Comprehensive Cancer Center (CCC). Once identified, the patient was approached in-person by project personnel (B.A. or M.A. level research assistants) at a postoperative appointment. To enhance the generalizability of the sample, the study was announced in the local community (e.g. press releases, newspaper advertisements, flyers in physician offices and libraries). Women self-referring were screened by telephone and also recruited in person. Eighty-two percent of the sample was accrued from the CCC and 18% from the community. Across recruitment strategies, the accrual rate was 52%, higher than similar longitudinal studies (Cunningham *et al*., 1998; Goodwin *et al*., 2001; Ilnyckyj *et al*., 1994). The common reasons for refusal were ‘too far to drive’ (i.e. ≥ 60 miles; 25%), ‘do not have time’ (20%), ‘not interested’ (17%) and ‘other’ (17%). ‘Other’ responses were scattered across items such as ‘too much stress’ (9%) and ‘no stress’ (2%). There were no significant differences (all *p*’s>0.05) between study participants versus non-participants in demographics (age, race, partner status), disease and prognostic characteristics (menopausal status, estrogen/progesterone receptor status, stage of disease, and number of positive lymph nodes), or treatment variables (extent of surgery, receipt of radiotherapy, type of adjuvant chemotherapy recommended). There were also no significant differences (all *p*’s>0.05) between recruitment strategies (CCC vs self-referral) in the same variables (sociodemographics, disease and prognostic characteristics, or treatment variables).

Procedures

All women were provided with oral and written informed consent, indicating their awareness of the investigational nature of the study, in keeping with the institutional guidelines and in accordance with an assurance filed with and approved by the US Department of Health and Human Services. Following informed consent, participants were scheduled for an assessment prior to beginning adjuvant treatment (i.e. chemotherapy, radiation). Assessments were conducted in-person by project personnel at the university’s General Clinical Research Center or breast cancer clinic. Data included psychological, behavioral, and medical/treatment information from interviews, questionnaires, summary of medical records, and when necessary, physician consultation. Patients were paid $25.00 for their participation.

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MEASURES

Depressive symptoms

The short form (Kohout *et al*., 1993) of the Center for Epidemiological Studies Depression scale (CES-D; Radloff, 1977) is a standardized self-report questionnaire used to identify current symptoms of depression, with emphasis on depressed affect. The CES-D, consisting of 11 items (e.g. 'I felt everything I did was an effort' and 'I felt sad'), is rated for the previous week on a three-point Likert scale (0='hardly ever or never' to 2='much or most of the time'). Higher scores (range 0–22) reflect greater depressive symptoms. The CES-D has been established as a valid and reliable measure of depressive symptoms in women with breast cancer (Hann *et al*., 1999). Coefficient alpha reliability was 0.77.

Stress

Life events—A life event scale from a nationwide epidemiology study and clinical trial (Women's Health Initiative) was used (Matthews *et al*., 1997). The events assessed were: (1) death or serious illness of a spouse/partner, family member, or close friend, (2) major financial difficulty, (3) divorce or other breakup involving spouse/partner, family members, or close friends, (4) major conflict with children or grandchildren, and (5) muggings, robberies, accidents, or similar events. These are five of the most stressful events included in similar, but lengthy, event lists (e.g. Social Readjustment Rating Questionnaire; Holmes and Rahe, 1967) or interviews (e.g. Structured Event Probe and Narrative Rating Method for Measuring Stressful Life Events-SEPRATE; Dohrenwend *et al*., 1984). To lessen participant burden and assessment time, the latter strategies were not employed. Participants were asked about the presence (vs absence) of each event during the year prior to cancer diagnosis.

Global stress—The Perceived Stress Scale (PSS; Cohen *et al*., 1983) is a standardized self-report questionnaire used to assess a person's perception of her/his life, in general, as unpredictable, uncontrollable, or overloading. The ten-item version was used for its improved internal reliability and factor structure (Cohen and Williamson, 1988). Examples of the questions include: 'How often have you felt nervous or stressed?' and 'How often have you felt confident about your ability to handle your personal problems?' The items are rated for the past month on a five-point Likert scale (0='never' to 4='very often'). Higher scores (range 0–40) indicate greater overall stress. An item differential analysis conducted with over 2000 subjects found the items to be invariant with respect to race, sex, and education (Cole, 1999). Coefficient alpha reliability was 0.87.

Cancer-related traumatic stress—The Impact of Events Scale (IES; Horowitz *et al*., 1979) is a 15-item standardized self-report measure used to examine cognitions involving the re-experiencing (Intrusion subscale—seven items) and denial of thoughts and avoidant behaviors (Avoidance subscale—eight items) related to traumatic stress. Similar to previous studies of cancer stress (Baider and De-Nour, 1997; Butler *et al*., 1999; Cordova *et al*., 1995) items were slightly reworded to ensure the respondent's focus upon cancer-related thoughts and behaviors (Intrusion item, 'I had trouble falling or staying asleep because pictures or thoughts about cancer or having cancer treatment came into my mind' and avoidance item, 'I felt as if my cancer diagnosis/treatments hadn't happened or they weren't real).' Items are rated for the previous week with a four-point Likert scale (0='not at all', 1='rarely', 3='sometimes', and 5='often'). Higher scores (total range 0–75) indicate increased levels of cancer-related stress. A psychometric review of the IES literature found the measure has satisfactory reliability and validity properties as a measure of intrusive and avoidant processes (Joseph, 2000). Coefficient alpha reliability ranged from 0.78 to 0.84 for the total scale and two subscales.

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Control variables

Neuroticism—Neuroticism was assessed using Goldberg's Big-Five Factor Measure (Goldberg, 1992). As suggested by Goldberg, a confirmatory factor analysis was conducted to confirm the assignment of items to the neuroticism scale. The neuroticism factor consisted of 15 trait adjectives, 9 scored in the positive direction (e.g. irritable, nervous) and 6 scored in the negative direction (e.g. even-tempered, at-ease). Each woman rated the extent to which these trait adjectives described her, as compared to others of the same sex and age, on a ten-point Likert scale (from 0='extremely accurate' to 9='extremely inaccurate'). Higher scores (range −63 to 81) indicate stronger trait neuroticism. Coefficient alpha reliability was 0.90.

Sociodemographics—The sociodemographic variables included age (years), racial group (Caucasian vs Minority), partner status (yes vs no), education (years), and annual household income (dollars per year).

Disease/treatment characteristics—Stage of disease (stage II vs stage III), extent of surgery (lumpectomy vs. mastectomy), and time since surgery (in days) were examined. Disease staging was based on the American Joint Committee on Cancer and the International Union Against Cancer staging systems. Days since surgery was calculated as the number of days between surgery and the initial assessment.

RESULTS

Descriptive analyses

Participant characteristics—Participants were 210 women diagnosed with Stage II (89%) or III (11%) breast cancer. All had been surgically treated (lumpectomy=41%; mastectomy=59%) within the preceding three months (days since surgery: M = 36.20; S.D.=16.89) and were awaiting the start of adjuvant therapy. Sociodemographic description of the sample was as follows: age (M=51 years, S.D.=10.83), racial group (Caucasian=90%; African American=9%; Hispanic=1%), and partner status (72% with a partner). The distribution of the total years of education was <12 years=4%; 12 years=25%; 13–15 years=28%; 16 years=18%; and >16 years=25%. Distribution of annual household income was <$ 15,000=9%; $15–29,000=16%; $30–49,000=23%; $50–79,000=24%; and ≥ $80,000=28%. Eleven women declined to give information about income. The average neuroticism score was 49 (S.D.=17.66; range −36 to 68).

Depressive symptoms

CES-D scores ranged from 0 to 18 with a sample mean of 5.96 (S.D.=3.67). Based on previous psychometric studies of the CES-D, a cut-off score of ≥ 10 is considered suggestive of clinical depression (Andresen *et al*., 1994). In the current study, a score of 10 was 1 S.D. above the sample mean. Eighteen percent (n = 38) of the participants had CES-D scores meeting/ exceeding the cut-off.

Stress

Life events, global stress, and cancer-related traumatic stress—The majority (74%) of participants experienced at least one major life event in the year prior to their breast cancer diagnosis (0 events=26%; 1 event=41%; 2 events=18%; 3 events=10%; 4 events=4%; and 5 events=1%). The most common event reported was the death or serious illness of a spouse/partner, family member, or close friend (50%), followed by major financial difficulty (24%), divorce or other breakup involving spouse/partner, family members, or close friends (20%), major conflict with children/grandchildren (18%), and muggings, robberies, accidents or similar events (12%). The mean PSS score was 18.32 (S.D.=6.96, range=1–36). The mean

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IES score was 25.23 (S.D.=14.06, range=0–65). Avoidance and Intrusion subscale means were 12.41 (S.D.=7.78, range 0–36) and 12.81 (S.D.=8.29, range 0–35), respectively.

Regression analyses

Hierarchical multiple regression (HMR) analyses along with squared semi-partials were used to examine how the stress measures and control variables were related to depressive symptomatology. First, the nine control variables (i.e. neuroticism, age, racial group, partner status, education, annual household income, stage of disease, extent of surgery, and days since surgery) were tested for their correlation with depressive symptoms. Only two were significantly correlated ($p<0.05$), neuroticism ($r = 0.44$, $p<0.0001$) and racial group ($r = 0.17$, $p<0.02$). Next, we examined the correlations among the life events, global stress, cancer-related traumatic stress measures and depressive symptoms. Only the life event 'major financial difficulty' was significantly correlated ($r = 0.25$, $p<0.05$) with CES-D scores. As expected, IES total and subscale scores as well as PSS scores were significantly ($p<0.05$) correlated with CES-D scores. As the shared variance between the PSS and CES-D was noteworthy ($r = 0.65$, 42%), it was important to rule out the possibility of measure overlap at the item level. Results of a factor analysis verified that items loaded highest onto their own measures (See Note 1). Thus, the results in the present study are not confounded by shared item/content variance among measures.

Finally, variables significantly correlated with depressive symptoms were tested in the regression analyses. Variable entry was determined by a priori theoretical and empirical rationale. Control variables were entered first. Regarding the stress variables, prior research has found perception-based stress measures are stronger predictors of psychological and physical outcomes than life event measures (Cohen *et al*., 1983; Martin *et al*., 1995; O'Leary *et al*., 1988). Therefore, life event/s was entered first. Next, cancer-related traumatic stress was entered and finally, global stress. Entering global stress last in the regression analysis allowed for a more rigorous test of its correlation with depressive symptoms. In sum, variable entry was as follows: (1) the control variables (i.e. neuroticism and racial group); (2) life events (i.e. major financial difficulty), (3) cancer-related traumatic stress (IES), and (4) global stress (PSS). As a follow-up to any significant results, we calculated squared semi-partial correlations, sr^2, for each variable in the equation. These correlations indicate the amount of variance accounted by each variable above and beyond all other variables in the regression model (i.e. the amount of variance accounted for by the variable as if it had been entered last in the regression equation; Cohen and Cohen, 1983).

Significant regression results for the final model are shown in Table 1; $F(5, 204)=45.84$, $p<0.0001$. Fifty-three percent of the variance (total adjusted $R^2 = 0.518$) in depressive symptoms was accounted for by the tested variables. Specifically, the control factors accounted for 20% of the variance, whereas the addition of the life events and perceived stress measures accounted for the larger portion of the total, 33%. Life events, cancer-related traumatic stress, and global stress, accounted for the following increments in total variance: 4, 18, and 10%, respectively. Considering the sr^2 data, global stress (11%) accounted for the most unique variance, followed by cancer-related traumatic stress (5%), and then major financial difficulty (2%). The control variables, neuroticism and racial group, each accounted uniquely for approximately 1% of the variance in the regression model.

Post-hoc analyses

In order to test the relative contribution of intrusive versus avoidant thoughts/behaviors to depressive symptoms in the present sample as well as to conduct a replication of previous research, a second regression was conducted using the IES subscales, IES-A and IES-I. As avoidance has a suggested weaker relationship with psychological outcomes (Baider and De-

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Nour, 1997; Cordova *et al*., 1995), IES-A was entered prior to IES-I. Therefore, variable entry was the following: Step (1) neuroticism and racial group, (2) major financial difficulty, (3) IES-A, (4) IES-I, and (5) PSS. Results indicate that 54% of the variance (total adjusted R^2 = 0.527) in depressive symptoms was accounted for by the HMR, $F(6, 203)=39.83$, $p<0.0001$. Specifically, avoidance did not contribute a significant increment of unique variance to the final model (beta=0.045; $t<1.00$; $sr^2 = 0.005$) whereas intrusion did (beta=0.285; $t = 4.51$; $sr^2 = 0.05$). As before, all of the remaining variables were significantly associated ($p<0.05$) with depressive symptoms in the final regression model. The amount of unique variance (sr^2) accounted for was as follows: PSS=9%; IES-I=5%; life events (major financial difficulty) =2%; and for both control variables (neuroticism and racial group)=2%.

DISCUSSION

Research has suggested that the experience of depressive symptoms is a common one for many cancer patients (Derogatis *et al*., 1983; McDaniel *et al*., 1997). One fifth (18%) of the women in the present sample, all assessed post-surgery and prior to beginning adjuvant treatment, reported experiencing depressive symptoms of possible clinical significance, consistent with previous studies of depression in women with breast cancer (Fallowfield *et al*., 1990; Goldberg *et al*., 1992; Rijken *et al*., 1995). Interestingly, stress was found to have multiple significant relationships with depressive symptoms. These important correlates include: (1) perceptions of global stress, (2) perceptions of cancer-related traumatic stress, as manifest by intrusive thoughts, and (3) stressful life events, specifically major financial difficulty in the year prior to diagnosis, along with (4) the control variables, neuroticism and racial group (i.e. minority status).

Regarding life events, while half of the participants experienced the death or serious illness of a close friend or relative in the previous 12 months (a fact found to correlate with breast cancer development; McKenna *et al*., 1999), it was ‘major financial difficulty’ that was a significant correlate of depressive symptoms in the HMR model ($p<0.01$). We do not know if this life event represents a chronic or recent stressor as the time frame for these items was ‘the last 12 months.’ Research has indicated that the cancer experience can have detrimental consequences on finances (e.g. loss of income due to work absences, increased insurance costs; Hewitt *et al*., 1999). For our participants, however, these cancer specific effects may not have accumulated as they were in the earliest stages of their diagnosis/treatment (i.e. 36 mean days since surgery, S.D.=17). Nevertheless, considering this finding in the context of other important information, 28% of all US households are headed by unmarried women and 57% of all women work outside the home (US Bureau of the Census, 1995, 1996), it may be that the stressor of ‘major financial difficulty’ is a common one for a subset of the thousands of women diagnosed with breast cancer each year.

A testimony to the impact of the cancer experience (i.e. cancer-related traumatic stress) is from the study participants themselves, as many women related during the assessment that these were ‘the worst days of my life.’ Such a characterization is consistent with the IES follow-up analysis indicating intrusive thoughts rather than avoidance were a stronger correlate of depressive symptoms. This finding is consistent with previous literature (Baider and De-Nour, 1997; Cordova *et al*., 1995) showing stronger relationships between intrusive thoughts and psychological distress in cancer patients. Global stress was also related to depressive symptoms. This finding suggests that women were not only stressed by their cancer experience but more generally as well. This situation is understandable as they were dealing with their recent breast cancer diagnosis, surgery, and beginning of adjuvant treatment in the continuing context of their daily lives (family and work responsibilities). Additionally, the mean values on the PSS and IES were, at a minimum, one-half to one standard deviation higher than values from normative samples (e.g. PSS; Cohen and Williamson, 1988) and cancer samples assessed

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during and/or after treatment (e.g. IES; Cordova *et al*., 1995). Together, these data underscore the importance of assessing perceptions or appraisals of stress both cancer-related and global in addition to the assessment of life events, per se. Unfortunately, the contribution of global stress to cancer patient outcomes is rarely studied.

Of the control variables (personality, sociodemographics, and disease/treatment characteristics) examined, only neuroticism and racial group were significant. The current data are consistent with reports linking neuroticism and psychological outcomes among cancer patients (Jenkins *et al*., 1991; VanderZee *et al*., 1996). Furthermore, these data suggest that the trait of neuroticism may heighten risk for depressive symptoms in women with breast cancer as has been suggested in non-cancer populations (Clark *et al*., 1994; Watson and Pennebaker, 1989). Of note are other analyses we conducted to test for moderating effects of neuroticism on stress. With three additional regressions, we added an interaction term (i.e. neuroticism × major financial difficulty; neuroticism × cancer-related traumatic stress; and neuroticism × global stress), but none were significant, suggesting the effect of neuroticism on depressive symptoms may be a direct one. A relationship between minority status and depressive symptoms was also found. As the number of minority participants in the present study was small (n=22, 10% of the total sample), this finding will require replication with a more racially balanced sample before a general conclusion can be made.

Strengths and limitations

The present study has a number of strengths: a design controlling the timing of the assessment to post diagnosis/surgery yet prior to beginning adjuvant treatment (i.e. an optimal time in the cancer experience for assessing risk), a large homogeneous sample in terms of disease diagnosis and severity, and the use of reliable/valid measures. The examination of three types of stress simultaneously is unique in the cancer literature and provided new findings. While the life events measure was brief, focusing only on the more important life stressors, it was successful in distinguishing a role of some events (i.e. financial difficulties), even in relationship to more common ones (i.e. death of a spouse/partner, family member, or close friend), as potentially more relevant to depressive symptoms at the time of initial diagnosis and surgery. Additionally, the role of three important categories of variables (personality, sociodemographics, and disease/treatment characteristics) were examined and controlled for in the statistical analyses.

This study used a self-report measure of depressive symptoms, whereas a diagnostic interview would provide information of how severe symptoms were to yield a psychiatric diagnosis. With concurrent assessments of stress and depressive symptoms, causal inferences cannot be made. Nevertheless, important information regarding the contribution of stress (operationalized broadly as life events, cancer-related traumatic stress and global stress) as well as other potentially important variables (neuroticism), to depressive symptoms (a cancer quality of life issue), was revealed. Our follow-up studies as well as the work of other investigators will test reliability of these relationships, their importance in predicting post-diagnosis and treatment quality of life, and their generalizability with other cancer groups.

CONCLUDING REMARKS

An important look at the multiple relationships between stress and depressive symptoms at the time of initial cancer diagnosis and surgery in women with regional breast cancer was provided. The data indicate that global stress perceptions coupled with cancer-related traumatic stress and the life event, major financial difficulty, along with the tendency towards negativity (neuroticism) may conspire to heighten women's risk for depressive symptoms. Assessing multiple sources of stress would improve our ability to identify women 'at risk' for depressive symptoms. Recently, Prieto and colleagues (2002) reported that it is not uncommon for psychological symptoms in cancer patients to wax and wane over time with initial adjustment

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disorders developing into depressive or anxiety disorders. Thus, the need to identify and treat 'at risk' women is imperative if quality of life outcomes are to be impacted. The literature indicates that psychosocial interventions targeted to these individuals are effective in reducing psychological distress (Sheard and Maguire, 1999) and that stress reduction is a component of successful interventions (Andersen, 2002).

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Table 1

Results of final HMR model examining depressive symptoms

Step	TR^2	Beta	*t*	sr^2
1. Racial group	0.202	0.100	2.06*	0.010
Neuroticism		0.114	2.06*	0.010
2. Financial difficulty	0.240	0.137	2.82**	0.018
3. Cancer-related stress	0.423	0.280	4.75***	0.052
4. Global stress	0.529	0.415	6.78***	0.106

N=209; TR^2=squared multiple correlation for total equation; sr^2=squared semi-partial correlation.

* $p<0.05$.

** $p<0.01$.

*** $p<0.0001$.