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Traumatic Stress, Perceived Global Stress, and Life Events: Prospectively Predicting Quality of Life in Breast Cancer Patients

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Abstract

The authors investigated the relationship between stress at initial cancer diagnosis and treatment and subsequent quality of life (QoL). Women (n = 112) randomized to the assessment-only arm of a clinical trial were initially assessed after breast cancer diagnosis and surgery and then reassessed at 4 months (during adjuvant treatment) and 12 months (postadjuvant treatment). There were 3 types of stress measured: number of stressful life events (K. A. Matthews et al., 1997), cancer-related traumatic stress symptoms (M. J. Horowitz, N. Wilner, & W. Alvarez, 1979), and perceived global stress (S. Cohen, T. Kamarck, & R. Mermelstein, 1983). Using hierarchical multiple regressions, the authors found that stress predicted both psychological and physical QoL (J. E. Ware, K. K. Snow, & M. Kosinski, 2000) at the follow-ups (all ps < .03). These findings substantiate the relationship between initial stress and later QoL and underscore the need for timely psychological intervention.

Keywords

stress; quality of life; breast cancer

The impact of a breast cancer diagnosis and its treatment on quality of life (QoL) is well documented (e.g., Ganz et al., 1996; Holzner et al., 2001). Shapiro et al. (2001), in their review of the relationship between QoL and psychosocial variables in breast cancer patients, noted that “the biomedical model of disease, though crucial, does not take into account all of the complex factors involved in cancer … a broader, more integrative framework, which includes psychosocial factors, is needed” (p. 502). The biobehavioral model of cancer stress and disease course offers such a framework (see Andersen, Kiecolt-Glaser, & Glaser, 1994, for a complete discussion). In this conceptual model, cancer diagnosis and cancer treatments are defined as objective, negative events. Although negative events do not always produce stress, data from many studies document severe acute stress at cancer diagnosis and treatment (e.g., Andersen, Anderson, & deProsse, 1989; Epping-Jordan et al., 1999; Maunsell, Brisson, & Deschenes, 1992). Even when stress declines from the peak at diagnosis (Edgar, Rosberger, & Nowlis, 1992), many QoL difficulties remain and new ones may arise during treatment and/or recovery (e.g., psychological distress; relationship, social, and occupational disruption; loss of physical stamina and fatigue; financial problems; Bleiker, Pouwer, van der Ploeg, Leer, & Ader, 2000; Ganz et al., 1996; Holzner et al., 2001). The biobehavioral model postulates that higher initial stress levels (i.e., stress at the time of cancer diagnosis and treatment) can, over time, contribute to lower QoL for cancer patients.

To examine the hypothesized longitudinal relationship between stress and QoL, we used stress at initial diagnosis and surgical treatment as a predictor of QoL outcomes as patients received

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additional difficult treatments (i.e., chemotherapy, radiation) and as they recovered (i.e., when treatments ended and medical follow-up began). As the biobehavioral model does not specify or define stress per se, a secondary goal of the present study was to compare the contribution of differing types of stress with cancer QoL outcomes. Such identification could point to specific risk factors, clinical targets for intervention, and types of interventions. Using both the psychosocial oncology and broader psychological literatures as guides, we selected three types of stress to assess. All reflect a potential source of stress at the time of cancer diagnosis and surgical treatment.

First, we assessed cancer-related traumatic stress symptoms. In the psychosocial oncology literature, stress is commonly conceptualized within a stress response model (see Gurevich, Devins, & Rodin, 2002, for a review). In particular, the experience of cancer diagnosis and treatment has been defined as a traumatic event capable of eliciting symptoms consistent with post-traumatic stress disorder (Alter et al., 1996; Cordova et al., 1995; Green et al., 1998). These symptoms can include recurrent and intrusive thoughts, behavioral–cognitive avoidance and numbing, and increased arousal (see American Psychiatric Association, 1994, for further information). Increased cancer-related traumatic stress symptoms are correlated with greater distress (e.g., Baider & Kaplan De-Nour, 1997; Classen et al., 2001; Cordova et al., 1995). Thus, the measurement of cancer-related trauma symptoms reflects a patient's stress response relative to cancer diagnosis and treatment.

Second, we assessed recent life events. There is a long tradition in the psychological literature of measuring life events as indicators of stress (e.g., Dohrenwend & Dohrenwend, 1984; Holmes & Rahe, 1967). Although the relationship between life events and cancer risk has been examined (e.g., McKenna, Zevon, Corn, & Rounds, 1999; Protheroe et al., 1999), the measurement of life events as a contributor to psychosocial outcomes in cancer patients is uncommon. The few available data suggest that an increased number of recent life events is positively related to greater distress (e.g., Butler, Koopman, Classen, & Speigel, 1999; Grassi, Malacarne, Maestri, & Ramelli, 1997). Assessing life events occurring in the year prior to cancer diagnosis, therefore, considers the broader context of events within which the cancer event has occurred.

Third, we assessed the appraisal or perception of global stress. Global stress reflects the degree to which individuals appraise their lives as generally stressful, without reference to specific events or stressors. The assessment of global or general stress perceptions is common in health research, including studies with individuals who are not ill (e.g., Cohen, Tyrell, & Smith, 1993; Stoney, Niaura, Bausserman, & Matacin, 1999) as well as those with medical (e.g., rheumatoid arthritis: O'Leary, Shoor, Lorig, & Holman, 1988; cardiac rehabilitation: Pbert, Doerfler, & DeCosimo, 1992) and psychiatric (e.g., Hewitt, Flett, & Mosher, 1992; Martin, Kazarian, & Breiter, 1995) diagnoses. However, perceived global stress is infrequently examined in psychosocial oncology. One exception is a study by Varni, Katz, Colegrove, and Dolgin (1994), who found that higher levels of perceived global stress were associated with increased distress (depression and anxiety). Measuring a patient's appraisal of global stress is important, as the cancer experience does not occur in isolation but rather in the context of the patient's daily living (i.e., family, social, and occupational responsibilities).

Aims of Study

A prospective, longitudinal design was used to test the relationship between stress at the time of diagnosis/surgery and QoL in women diagnosed with breast cancer. Data were collected at three relevant time points in the cancer experience: initially, following diagnosis and surgery but prior to adjuvant treatment; 4 months, during adjuvant treatment; and 12 months, 1 year postdiagnosis/surgery and after adjuvant treatment had ended. Stress was measured at the initial

time point, whereas QoL was measured at all three time points. It is important to note that two basic dimensions of QoL (Moinpour et al., 1989) were assessed: psychological and physical functioning. To highlight the contribution of stress above and beyond other domains, we controlled for initial level of QoL as well as potential correlates (i.e., demographics, disease and treatment variables). In addition, this study examines the relative contribution of three types of stress to psychological and physical QoL: cancer-related traumatic stress symptoms, the number of life events in the prediagnosis year, and perceptions of global stress.

Method

Participants

Women diagnosed with Stage II or III breast cancer who were surgically treated and awaiting adjuvant therapy were eligible for participation in a randomized clinical trial testing the efficacy of a psychological–behavioral intervention. Exclusion criteria were prior cancer diagnosis; refusal of recommended cancer treatment; age younger than 20 years or older than 85 years; residence greater than 90 miles from the research site; and diagnoses of mental retardation, severe or untreated psychopathology (e.g., schizophrenia), neurologic disorders, dementia, or any immunologic condition or disease. The accrual rate was 57%, a rate comparable with or higher than rates reported for other clinical trials testing psychosocial interventions (e.g., Cunningham et al., 1998; Goodwin et al., 2001; Ilnyckyj, Farber, Cheag, & Weinerman, 1994).

Following the initial assessment, women (N = 227) were randomized into assessment-plus-intervention or assessment-only arms (see Golden-Kreutz & Andersen, 2004, for more detailed information regarding recruitment and accrual). Only women (n = 112) randomized to the assessment-only arm were included in the present study. Their data provided an observational study of stress and QoL. All 112 women were surgically treated prior to their initial assessment. At 4 months, 90% of the patients were receiving adjuvant treatment, and by 12 months, all had completed treatment. See Table 1 for demographic and disease or treatment description of the sample. Of note, women randomized to the assessment-only arm did not differ significantly (all ps > .23) from intervention participants on demographics (age, race, education, income, partner status), disease and prognostic characteristics (stage of disease, number of positive lymph nodes, tumor size, estrogen receptor status, menopausal status), or treatments received (type of surgery; receipt of radiation, chemotherapy, or hormonal treatment).

Regarding participant retention, 83% (n = 93 of 112) of the sample remained in the clinical trial at 12 months. During the follow-up year, 7 women (6%; 7 of 112) experienced a breast cancer recurrence and/or died (4 months, n = 2; 12 months, n = 5). Twelve women (11%; 12 of 112) discontinued the study (4 months, n = 10; 12 months, n = 2). We found it notable that 50% (n = 6) of those who discontinued participation were also noncompliant with their medical follow-up. The remaining women reported time conflicts (n = 1), loss of interest (n = 1), or too much stress (n = 1) or provided no reason (n = 3) for discontinuing the clinical trial. Additional loss of follow-up data was due to patient noncompliance with a single assessment (4 months, n = 11; 12 months, n = 8). In all, data were collected for 112 women at the initial assessment, 89 at the 4-month assessment, and 85 at the 12-month assessment.

Procedure

Informed consent was obtained prior to the initial assessment (postsurgery and prior to beginning adjuvant treatment). All assessments, regardless of time point, followed the same protocol and were conducted in person by trained research assistants or nurses. Each assessment lasted approximately 2 hr and occurred at either the university's General Clinical Research Center or outpatient breast cancer clinic. Psychological, behavioral, and medical–treatment

information were collected by using interviews, questionnaires, and medical records. When necessary, physician consultation was used to verify medical–treatment information. Women were paid $25.00 per assessment.

Measures

Stress

Cancer-related traumatic stress symptoms The Impact of Events Scale (IES; Horowitz, Wilner, & Alvarez, 1979) is a 15-item standardized self-report measure used to examine reexperiencing cognitions (intrusion) and denial of thoughts and avoidant behaviors (avoidance) related to trauma. Consistent with previous research, the word "event" in the original measure was replaced with "cancer diagnosis and treatment" (e.g., Butler et al., 1999; Cordova et al., 1995). Examples of questions include the following: "I had trouble falling or staying asleep because pictures or thoughts about cancer or having cancer treatment came into my mind" and "I felt as if my cancer diagnosis/treatments hadn't happened or they were not real." Women rated each item as experienced in the previous week by using a 4-point Likert scale (0 = *not at all*, 1 = *rarely*, 3 = *sometimes*, 5 = *often*). Total scores range from 0 to 75, with higher scores reflecting increased symptom levels. In the present sample, coefficient alpha reliability was .88.

Life events A life-event scale from epidemiologic studies (e.g., Women's Health Initiative; Matthews et al., 1997) was used. To lessen participant burden, we assessed five of the most stressful events: (a) death or serious illness of a spouse or partner, family member, or close friend; (b) major financial difficulty; (c) divorce or other breakup involving spouse or partner, family members, or close friends; (d) major conflict with children or grandchildren, and (e) muggings, robberies, accidents, or similar events. The presence (vs. absence) of each event during the prediagnostic year was totaled (range = 0–5).

Perceived global stress The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a standardized, self-report questionnaire used to determine the extent to which a person perceives her or his life to be unpredictable, uncontrollable, and overloading. As recommended (Cohen & Williamson, 1988), the 10-item version was used. Examples of the questions include the following: "How often have you felt nervous or stressed?" and "How often have you felt confident about your ability to handle your personal problems?" Women rated how often they experienced the above feelings in the past month on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). Total scores range from 0 to 40, with higher scores indicating greater overall stress. In the present sample, coefficient alpha reliability was .87.

Psychological and Physical QoL—The Medical Outcomes Study–Short Form (SF-36; Ware, Snow, & Kosinski, 2000) is a 36-item questionnaire used to assess health-related psychological and physical QoL. Because of extensive reliability, validity, and normative data (Ware, Kosinski, & Keller, 1994; Ware et al., 2000), the SF-36 is frequently used for cancer clinical trials and for studies with patients experiencing chronic illness. Psychological and physical health component scores (SF-36 Mental and SF-36 Physical, respectively) are computed by differentially weighing the SF-36's eight primary subscales. The subscales are Social Functioning, Role Functioning Related to Emotional Health, Mental Health, Vitality, Physical Functioning, Role Functioning Related to Physical Health, Bodily Pain, and General Health. Despite similar operational definitions, the component scores are "distinct both conceptually and empirically" (see manual for further discussion; Ware et al., 2000, p. 7:2) as validated by extensive factor analytic studies (e.g., Dexter, Stump, Tierney, & Wolinsky, 1996; McHorney, Ware, & Raczek, 1993). On the basis of U.S. population norms, the component scores are standardized with a mean of 50 and a standard deviation of 10. Patients rated their QoL during the previous month. Lower scores, whether psychological or physical,

reflect substantial functional impairments, significant social and role limitations, and extremely poor health evaluations. In the present sample, the alpha reliabilities of the SF-36 Mental and Physical were .89 and .94, respectively.

Control Variables—The demographic variables included age, race (Caucasian vs. minority), presence of spouse or partner (no vs. yes), education (years), and annual household income (dollars per year). Stage of disease (II vs. III) at diagnosis, extent of surgery (lumpectomy vs. mastectomy), and type of adjuvant treatment recommended (chemotherapy, radiation, and hormone therapy; no vs. yes) were included as the relevant disease and treatment variables.

Results

Descriptive Analyses

Stress at Diagnosis/Surgery—The average number of life events was 1.27 (*SD* = 1.12, range = 0–5), indicating that most participants (73%) experienced at least one negative event in the year preceding diagnosis. Death or serious illness of a spouse or partner, family member, or close friend was the most common event (56%), followed by major financial difficulty (21%); divorce or other breakup involving a spouse or partner, family members, or close friends (20%); major conflict with children or grandchildren (17%); and muggings, robberies, accidents, or similar events (13%). The PSS mean score was 18.13 (*SD* = 6.93, range = 0–36). This score is approximately one standard deviation higher than that reported for a national probability sample of adults (*M* = 13.02, *SD* = 6.35; Cohen & Williamson, 1988). The IES mean score was 26.28 (*SD* = 14.54, range = 0–61). Forty percent of the women had IES scores within the clinically significant range (≥30; R. Bryant & Harvey, 1996; Butler et al., 1999). Many women described the time surrounding diagnosis and surgery as “the worst days of my life.”

Psychological and Physical QoL Outcomes—The means for the SF-36 Mental and SF-36 Physical at the three assessment time points are shown in Table 2. We examined QoL scores by using repeated measures analyses of variance with initial, 4- and 12-month data. As expected, both types of QoL significantly (*p*s < .0001) improved with time. Although initial QoL mean scores were approximately one standard deviation below the mean of a healthy normal population (*M* = 50; Ware et al., 2000), by 12 months the QoL means were similar.

Regression Analyses

Analytic Strategy—A hierarchical multiple regression model was used to test the relationship between stress at initial cancer diagnosis/surgery and concurrent as well as subsequent (4- and 12-month) psychological and physical QoL. Only those stress and control variables significantly correlated ($p < .05$) with initial, 4-month, or 12-month QoL were included in the respective regressions. See Table 3 for correlations among the variables. If significant, variables were entered into the regression analyses in the following order: control variables (demographics followed by disease–treatment variables), initial QoL, and stress measures. We entered the stress measures in the same regression step to accomplish two goals: to test stress as a predictor of QoL outcomes and to determine the relative contribution of each stress variable to QoL.

Stress Predicting Psychological QoL—Each of the three regression models was significant (see Table 4). The regression model for psychological QoL at the initial assessment was significant, $F(3, 111) = 43.64$, $p < .0001$, and accounted for 55% (total adjusted $R^2 = .54$) of the total variance. The stress step was significant ($p < .001$), accounting for 47% of the variance in QoL scores. Forty-two percent (total adjusted $R^2 = .38$) of the total variance in psychological QoL at the 4-month assessment was accounted for by the final regression model,

$F(6, 89) = 9.92$, $p < .0001$. The stress step was significant ($p < .01$), accounting for 10% of the variance in QoL scores. Finally, the regression model for the 12-month assessment was also significant, $F(4, 85) = 8.95$, $p < .0001$, and accounted for 31% (total adjusted $R^2 = .27$) of the total variance. Again, the stress step was significant ($p < .01$), accounting for 12% of the variance in QoL scores. In sum, stress was a significant predictor of psychological QoL.

Individual Stress Measures Predicting Psychological QoL—In comparing the contribution of the three stress measures to psychological QoL, the following was observed: The number of life events did not correlate with QoL at the initial assessment ($p = .08$); however, it did correlate with QoL at both later assessments (ps $< .05$), and it was a significant predictor at 12 months ($p < .05$). Whereas perceived global stress was significantly correlated with QoL at all three assessments (ps $< .001$) and was therefore entered into each regression, it was significant only in the concurrent–initial regression ($p < .001$). It is important to note that cancer-related traumatic stress symptoms emerged as a significant correlate and predictor of psychological QoL at all time points (all ps $< .05$).

Some readers might be interested in evaluating whether each stress measure would emerge as a significant predictor of psychological QoL in the absence of other stress measures. As a follow-up, we reran the regression models by testing each stress measure individually. Only those stress measures significantly correlated with the outcome were tested. In the majority of the follow-up regressions, each stress measure added significant variance to the model (all ps $< .04$). The variance accounted for when using the stress measures individually ranged from 29% to 46% at the initial assessment (concurrent regression) and from 4% to 8% at the later assessments (longitudinal regressions). There were two exceptions to this pattern: Number of life events was not a significant predictor at 4 months ($p = .21$), and perceived global stress was not significant at 12 months ($p < .07$). Again, traumatic stress symptoms emerged as a consistent predictor of QoL (all ps $< .001$).

Stress Predicting Physical QoL—See Table 5 for physical QoL regression results. As there were no significant correlates of initial physical QoL (all ps $> .12$; see Table 3), a regression analysis was not conducted. The regression model for physical QoL at the 4-month assessment was significant, $F(5, 89) = 10.11$, $p < .0001$, and accounted for 38% (total adjusted $R^2 = .34$) of the total variance. The stress step was significant ($p < .05$), accounting for 7% of the variance in QoL scores. Forty-two percent (total adjusted $R^2 = .39$) of the total variance in physical QoL at the 12-month assessment was accounted for by the final regression model, $F(4, 85) = 14.43$, $p < .0001$. Again, the stress step was significant ($p < .001$), accounting for 12% of the variance in QoL scores. In sum, stress was a significant predictor of physical QoL.

Individual Stress Measures Predicting Physical QoL—In comparing the contribution of the three stress measures to physical QoL over time, the following was observed: The number of life events was significantly correlated only with physical QoL at 4 months ($p < .05$). Although cancer-related traumatic stress symptoms and perceived global stress were significantly correlated with QoL at both 4- and 12-month assessments (all ps $< .05$), when entered together in the same regression step, neither had significant beta weights (all ps $> .06$). These comparisons did not reveal the contribution of one type of stress over another in predicting physical QoL.

As with the psychological QoL regressions, we reran the physical QoL regressions by entering the stress measures individually in the final regression step.[1] When entered separately, all of the stress measures were significant predictors of 4-month QoL (all ps $< .05$) and accounted for similar amounts of variance (4%). At 12 months, both traumatic stress symptoms and perceived global stress, individually, significantly accounted for 9% of the variance in QoL scores (both ps $< .001$). These results suggest that traumatic stress symptoms and perceived

global stress capture similar variance in physical QoL scores and that both are significant predictors when tested as an individual stress measure.

Discussion

The present study confirms the hypothesized relationship between stress at initial cancer diagnosis/surgery and reduced QoL as proposed by the biobehavioral model of cancer stress and disease course (Andersen et al., 1994). The sample consisted of women diagnosed with regional breast cancer. Participants were interviewed soon after surgical treatment and then reassessed at 4 months (during adjuvant treatment) and again at 12 months (postadjuvant treatment). Analyses revealed that initial levels of stress were related to concurrent psychological QoL and, more important, predicted subsequent psychological and physical QoL. This study provided a rigorous test of the impact of stress on QoL, as the analyses also controlled for demographics and disease and treatment variables and, most important, initial levels of QoL. Many studies have reported correlations between stress and QoL, but predictive analyses are uncommon and seldom tested within a theoretical model.

Cancer-related traumatic stress symptoms at initial diagnosis/surgery were a powerful predictor of psychological QoL. Initial traumatic symptoms remained significant even as psychological QoL improved over time and became more difficult to predict (i.e., the variance accounted for by the total model [TR^2] declined from 55% [initial assessment] to 42% [4 months] and finally to 31% [12 months]). The importance of the IES was replicated with the follow-up regressions as well. Thus, women with more symptoms of traumatic stress at diagnosis were more likely to have lower levels of psychological QoL during their adjuvant treatment and early recovery.

An interesting pattern was found with the life-event data. The number of life events, not even correlated with initial psychological QoL, was a significant predictor at 12 months (a pattern

[1]Some readers may be concerned about content similarity among the IES, PSS, and the SF-36—in particular, the Mental Health subscale component (*r*s ranging from −.42 to −.71; see Table 3). To illustrate our control for redundancy in the present study, we followed the example of Cohen and colleagues (Cohen, 1986;Cohen et al., 1983). They used partial correlations to demonstrate that the correlation between initial PSS and later Center for Epidemiological Studies–Depression Scale (CES–D) scores was not entirely due to measurement overlap. Specifically, they showed that the correlation between PSS at Time 1 and CES-D at Time 2 (10 weeks later) was reduced but still significant after partialing out the effect of CES-D scores at Time 1. We used this methodology by controlling for initial QoL scores in the 4- and 12-month regression equations. For illustration, we reran the regressions without the initial QoL control. As expected, the relationships between the stress predictors (IES and PSS) and psychological QoL at 4 and 12 months, as indicated by the beta weights, were stronger without this control. Standardized beta weights ranged from −.15 to −.35 when initial QoL scores were not entered and then were reduced to −.03 to −.31 when initial scores were entered (see Table 4). These additional regression analyses substantiate the fact that by entering initial SF-36 scores, we accounted for redundancy among the stress predictors and later psychological QoL.
To be as thorough as possible, we further conducted an exploratory factor analysis (comprehensive exploratory factor analysis; Browne, Cudeck, Tateneni, & Mels, 1998) testing for item redundancy among the PSS, IES, and SF-36. An oblique rotation to a partially specified target (Browne, 1972) was used to produce the factor solution and item loadings. To improve the subject-to-item ratio, we used initial data (collected prior to randomization and adjuvant treatment) from the entire clinical trial sample ($N = 227$) to conduct the factor analysis. A 12-factor solution model, based on previous research, was tested: The IES has 2 factors (Horowitz et al., 1979), the PSS has 2 factors (Cohen & Williamson, 1988), and the SF-36 has 8 subscales–factors (Ware et al., 2000).
Goodness-of-fit indices revealed a close fit of the model (root-mean-square error of approximation = .044; 90% confidence interval = .039–.048; Browne & Cudeck, 1993; Steiger, 1989). It is important to note that all IES and PSS items loaded (≥ .30; F. Bryant & Yarnold, 1995) on their expected factors. To be conservative, we deleted three SF-36 items (assessing participants' feelings of nervousness, despondency, and peacefulness) and one PSS item (assessing nervousness and stress) because of loadings greater than .20 across all three measures. A fourth SF-36 item (assessing happiness) was also deleted because of similar loadings on both the SF-36 (−.298) and the IES (−.286). Of note, all four of the eliminated SF-36 items were part of the Mental Health subscale. Correlations among the factor-analyzed measures were reduced; specifically, correlations among the PSS, IES, and Mental Health subscale component of the SF-36 ranged from −.35 to −.64. Again, correlations prior to the factor analysis ranged from −.42 to −.71 (see Table 3).
The regression analyses were then rerun with the five items removed from the respective measures. As before, only those control variables (demographics, disease, and treatment variables) significantly correlated ($p < .05$) with the relevant SF-36 outcomes were entered in the analyses. One of the variables entered was different from the original analyses; race ($r = -.22$, $p = .04$) was added to the 4-month psychological QoL regression. The significant results for both psychological and physical QoL at each time point remained the same as those originally reported in Tables 4 and 5. Taken together, the above analyses rule out the possibility that the effects reported in the present study are due to content similarity between the stress predictors and the QoL outcomes.

replicated by the follow-up analyses). It may be that the impact of life events (i.e., death of a family member or friend, major financial difficulty) is more salient after the diagnostic–treatment period has ended. For instance, the immediacy created by the cancer diagnosis (i.e., the need for surgery and adjuvant treatments) may delay the emotional experience surrounding other life events. It is also possible that life events prior to breast cancer diagnosis/surgery persist or even contribute to additional events throughout the first postdiagnosis year. Regardless, the current data highlight the clinical need to consider life events other than cancer as impacting psychological outcomes for cancer patients.

On the other hand, perceptions of global stress (i.e., PSS), although correlated with later psychological QoL, were significant in only the initial and/or concurrent regression. This strong relationship was confirmed by the follow-up regression in which perceived global stress, tested alone, significantly accounted for 46% of the variance in QoL at the initial assessment. The significance of perceived global stress at this time appears clear, as the women were dealing with the demands of daily life (e.g., partner or family responsibilities, social obligations, and employment duties) in the context of recently receiving a breast cancer diagnosis, having surgery, and awaiting adjuvant treatment. Thus, the extent to which women felt that their lives, in general, were “unpredictable, uncontrollable, and overloading” at diagnosis/surgery was common and understandably associated with poorer psychological QoL at that time.

It is notable that none of the stress or control variables were correlated with physical QoL reports at diagnosis/surgery. In contrast, stress was related to later physical QoL, with higher initial stress predicting poorer physical well-being during and following adjuvant treatment. The total amount of variance accounted for in physical QoL remained consistent over time (TR^2 = 38% of the variance at 4 months and 42% at 12 months). Stress effects on physical QoL were found even after controlling for age as well as income, partner status, disease stage, and type of surgery. Last, the results suggest that it is the presence or level of stress that is important in predicting physical QoL, not the type of stress.

Although the study has the advantages of a longitudinal design, limitations regarding generalizability should be noted. The sample was comprised of predominately Caucasian women who were well educated, middle class or above, and willing to participate in a randomized clinical trial. Although minority women (n = 11, 10% of sample) reported lower psychological QoL at diagnosis/surgery, this finding requires replication with a racially balanced sample before a general conclusion can be made. Some may also regard the life-events measure, assessing only the more common events, as limited. However, the brief strategy was successful in discerning a role for life events in QoL outcomes. Although important information regarding the contribution of self-reported stress to lower QoL was revealed, the current results remain to be corroborated with behavioral measures or physiological indices.

In conclusion, these data show that higher stress at cancer diagnosis/surgery portend a lower level of psychological and physical QoL not only as patients undergo adjuvant cancer treatments but also as these treatments end and recovery begins. QoL for cancer patients might be improved if psychological–behavioral interventions are offered to patients when stress is high or when symptoms are present—at the time of initial diagnosis/surgical treatment. The data suggest that early intervention could not only enhance short-term QoL but would likely decrease the negative impact of stress on long-term QoL for these patients. Furthermore, our previous work has found that traumatic stress symptoms (IES scores) measured at diagnosis/surgery are also associated with a broad band of immune effects, including decreased natural killer cell lysis, natural killer responsiveness to biologic response modifiers, and T-cell blastogenesis (Andersen et al., 1998). With stress at diagnosis/surgery having such sweeping effects, interventions aimed at reducing stress (i.e., relaxation training, stress management,

coping skills) appear especially important. Specifically, the reduction of cancer-related traumatic stress symptoms (i.e., intrusive thoughts and avoidant behaviors) is important intervention targets for improving cancer outcomes.

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Table 1

Demographic and Disease and Treatment Description of Sample (n = 112)

Variable	*n*	%	*M*	*SD*
	Demographic			
Age (years)			51.23	10.80
Education				
< 12 years	7	6		
High school graduate	29	26		
Some college	33	30		
College graduate	21	19		
Postgraduate	22	19		
Annual household income				
< $15,000	9	8		
$15,000–$29,999	19	17		
$30,000–$49,999	25	22		
$50,000–$79,999	23	21		
≥ $80,000	27	24		
Not reported	9	8		
Partner: Yes	80	71		
Race				
Caucasian	101	90		
African American	10	9		
Hispanic	1	1		
Employed full-/part-time	77	69		
	Disease and treatment			
Days between surgery and assessment			37.80	16.79
Stage of disease				
II	103	92		
III	9	8		
Extent of surgery				
Lumpectomy	61	55		
Mastectomy	51	45		
Adjuvant treatment				
Chemotherapy	95	85		
Radiation	58	52		
Hormone	89	80		

Table 2

Psychological and Physical Quality of Life (QoL) Significantly Increase Across Time

	Psychological QoL[a]		Physical QoL[b]	
Assessment time point	***M***	***SD***	***M***	***SD***
Initial	43.69	11.07	40.53	8.37
4 months	49.42	8.24	44.75	10.25
12 months	52.03	7.69	47.20	10.23

Note. Change over time in QoL scores was examined with repeated measures analysis of variance.

[a] $F(2, 160) = 29.33$, $p < .0001$.

[b] $F(2, 160) = 22.50$, $p < .0001$.

Table 3

Correlation Coefficients Among Control Variables (Demographics, Disease, and Treatment). Stress Predictors, and Quality of Life (QoL) Outcomes

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Demographic																			
1. Age (years)	—																		
2. Race[a]	.13	—																	
3. Support status[b]	−.29*	−.13	—																
4. Education (years)	−.25*	−.21*	.18	—															
5. Annual family Income	−.08	−.12	.29*	.33***	—														
Disease and Treatment																			
6. Disease stage[c]	−.01	.12	−.03	.13	−.02	—													
7. Surgery type[d]	−.05	.12	−.14	−.06	.07	−.27***	—												
8. Chemotherapy[e]	−.37***	−.11	.07	.16	.11	.12	.03	—											
9. Radiation therapy[e]	−.13	.14	−.18	−.10	.02	.02	.74***	.13	—										
10. Hormonal therapy[e]	.18	.09	−.03	.04	.09	.07	−.03	−.21*	.04	—									
Stress predictor																			
11. Life events (no.)	.00	.11	−.24*	.08	.06	.14	.12	.08	.14	−.12	—								
12. Traumatic stress (IES)	−.08	.00	.04	−.18	−.11	−.06	−.07	.02	−.06	−.14	.09	—							
13. Global stress (PSS)	−.06	.15	−.09	−.14	.00	.02	.04	.06	.00	.02	.23*	.62***	—						
QoL outcome (SF-36)																			
14. Mental: Initial	.08	−.27*	.03	.18	−.04	−.07	−.04	.04	−.05	.02	−.13	−.54***	−.71***	—					
15. Mental: 4 months	−.10	−.20	.23*	.23*	.09	.03	.04	.01	−.01	−.12	−.22*	−.53***	−.54***	−.53***	—				
16. Mental: 12 months	.00	−.14	.04	.09	.06	.04	.01	.16	−.10	−.08	−.26*	−.46***	−.42***	−.43***	−.55***	—			
17. Physical: Initial	−.05	.02	.11	−.10	.05	−.01	.02	−.01	.08	.07	−.11	−.10	−.15	−.03	.10	.01	—		
18. Physical: 4 months	−.32*	−.06	.16	−.03	.07	−.04	.14	−.09	.12	−.06	−.23*	−.20*	−.31*	.17	.21*	.20	.48***	—	
19. Physical: 12 months	−.36***	−.16	.15	.17	.16	−.06	.04	.08	.14	−.20	−.17	−.29*	−.43***	.25*	.38***	.11	.46***	.72***	—

Note. IES = Impact of Events Scale; PSS = Perceived Stress Scale; SF-36 = Medical Outcomes Study 36-Item Short Form Health Survey.

[a] 1 = Caucasian, 2 = Minority.

[b] 1 = no partner, 2 = partner.

[c] 1 = stage II, 2 = stage III.

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[d] 1 = lumpectomy, 2 = mastectomy.

[e] 0 = no, 1 = Yes.

* $p < .05$.

*** $p < .001$.

Table 4

Stress at Diagnosis/Surgery Predicting Psychological Quality of Life (SF-36 Mental)

Step and predictor	Statistics by step		Statistics by predictor	
	TR^2	ΔR^2	β	*t*
Outcome: SF-36 Mental at initial assessment (n = 112)				
Step 1				
Race[a]	.07	.07**	−.19	−2.83**
Step 2				
Traumatic symptoms	.55	.47***	−.19	−2.32*
Perceived global stress			−.56	−6.70***
Outcome: SF-36 Mental at 4 months (n = 89)				
Step 1				
Education (years)	.10	.10*	.08	0.91
Partner status[b]			.13	1.46
Step 2				
Initial SF-36 Mental	.32	.23***	.24	2.08*
Step 3				
Life events	.42	.10**	−.09	−0.96
Traumatic symptoms			−.28	−2.39*
Perceived global stress			−.14	−1.05
Outcome: SF-36 Mental at 12 months (n = 85)				
Step 1				
Initial SF-36 Mental	.19	.19***	.23	1.82
Step 2				
Life events	.31	.12**	−.21	−2.26*
Traumatic symptoms			−.31	−2.47*
Perceived global stress			−.03	−0.20

Note. SF-36 = Medical Outcomes Study 36-item Short Form Health Survey. TR^2 = squared multiple correlation for total equation; β = standardized beta weight from the final model.

[a] 1 = Caucasian, 2 = minority.

[b] 1 = no partner, 2 = partner.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 5

Stress at Diagnosis Surgery Predicting Physical Quality of Life (SF-36 Physical)

Step and predictor	Statistics by step		Statistics by predictor	
	TR^2	ΔR^2	β	t
Outcome: SF-36 Physical at 4 months (n = 89)				
Step 1				
Age (years)	.10	.10**	−.29	−3.30**
Step 2				
Initial SF-36 Physical	.31	.20***	.41	4.52***
Step 3				
Life events	.38	.07*	−.16	−1.75
Traumatic symptoms			−.14	−1.17
Perceived global stress			−.08	−0.63
Outcome: SF-36 Physical at 12 months (n = 85)				
Step 1				
Age (years)	.13	.13***	−.31	−3.63***
Step 2				
Initial SF-36 Physical	.30	.17***	.36	4.03***
Step 3				
Traumatic symptoms	.42	.12***	−.15	−1.33
Perceived global stress			−.23	−1.90

Note. SF-36 = Medical Outcomes Study 36-Item Short Form Health Survey. TR^2 = squared multiple correlation for total equation; β = standardized beta weight from the final model.

* $p < .05$.

** $p < .01$.

*** $p < .001$.