Stress and Quality of Life in Breast Cancer Recurrence: Moderation or Mediation of Coping?

Hae-Chung Yang, Ph.D., **Brittany M. Brothers, M.A.**, and **Barbara L. Andersen, Ph.D.**
Department of Psychology, The Ohio State University, 1835 Neil Avenue, Columbus, OH 43210 −1222, USA

Abstract

Background/Purpose—Diagnosis with breast cancer recurrence often brings high levels of stress. Successful coping to alleviate stress could improve patients' quality of life (QoL). The intervening role coping plays between stress and QoL may depend on the types of stress encountered and the types of coping strategies used. The present study investigates the longitudinal relationships between stress, coping, and mental health QoL.

Methods—Breast cancer patients recently diagnosed with recurrence (*N*=65) were assessed shortly after the diagnosis and 4 months later. Four moderation and four mediation models were tested using hierarchical multiple regressions and path analyses. In the models, either traumatic stress or symptom-related stress at recurrence diagnosis was a predictor of mental health QoL at follow-up. Both engagement and disengagement coping strategies were tested as moderators or mediators between stress and QoL.

Results—Engagement coping moderated the effect of symptom stress on mental health QoL, whereas disengagement coping mediated the effects of both traumatic stress and symptom stress on mental health QoL.

Conclusion—The findings imply that interventions teaching engagement coping strategies would be important for patients experiencing high symptom stress, while discouraging the use of disengagement coping strategies would be important for all patients.

Keywords

Breast cancer recurrence; Coping; Quality of life; Stress; Moderation/mediation

Introduction

The diagnosis of recurrent cancer is a significant stressor that is associated with worsened quality of life [1], depression [2], and poorer physical functioning [3]. Patients are challenged to cope as best as they can in the face of a difficult situation [4]. What coping strategies patients utilize for different stressors, and the success or failure of their corresponding efforts, is the focus of this manuscript.

B. L. Anderson Comprehensive Cancer Center, The Ohio State University, Columbus, OH, USA e-mail: Andersen.1@osu.edu.

Cancer Stressors

Recurrence brings significant stress, which is not unlike that which patients experienced when initially diagnosed. A controlled, prospective study [5] followed 30 patients with breast cancer from the time of their initial diagnosis until recurrence. They were compared with a matched sample of patients followed similarly but remaining disease-free. Women's traumatic stress (intrusive thoughts, avoidant thoughts and behaviors, and strong negative emotions regarding cancer diagnosis and treatments) at recurrence were as high as those which they reported when initially diagnosed, and, of course, significantly higher than of the disease-free survivors. In addition to traumatic stress, the recurrence diagnosis was coincident with new symptoms and signs of their disease, and symptom burden covaried with worsened quality of life. In this case, we use the term "symptom stress" to connote the burden of signs and symptoms of cancer and its therapies, as well as the interference in functioning that they cause. These longitudinal data are consistent with previous studies showing both traumatic stress and symptom stress to be associated with poorer concurrent [6,7] and subsequent [8] quality of life for cancer patients.

Strategies of Coping

Coping is the process of using emotional, cognitive, and/or behavioral strategies to manage one's stress in order to reduce its potential harmful impact on psychological adjustment [4,9]. Strategies can be as varied as the stressors which prompt them. Coping strategies have been categorized into two broad classes, engagement and disengagement coping [10,11]. Engagement coping strategies are those that change one's emotions or thoughts about a stressor or ones that involve effortful behavior to reduce the stressor. These have included active coping (i.e., attempting to find a solution for the problem) [12], positive reframing (i.e., viewing the problem in a more positive way) [13], acceptance [14,15], seeking support [15], and having a "fighting spirit" [16,17]. Such strategies have been associated with positive outcomes such as better quality of life [18], less psychological distress [13,14,16,17], and greater meaning in life [19]. Disengagement coping strategies, in contrast, include those emotions, cognitions, or behaviors that attempt to lessen the impact of the stressor through avoidance or escape. This has included emotional, cognitive, or behavioral distancing and denial [10,13,14]. Disengagement coping strategies have been associated with poorer quality of life [6,18,20] and more psychological distress [10,14].

In summary, data from cancer patients suggest that engagement-oriented strategies are coupled with better psychological outcomes, such as higher quality of life, while disengagement-oriented strategies are associated with worse outcomes. Fortunately, individuals are more apt to choose engagement rather than disengagement coping strategies [14]. Regarding outcomes, there is more empirical evidence for adverse effects of disengagement coping than beneficial effects of engagement coping [6,10,20].

However, the coping strategy (or strategies) an individual utilizes when facing a stressor may be dependent on the type of stressor encountered [21]. Returning to the context of cancer recurrence, intrusive/avoidant thoughts and negative emotions may prompt different ways to cope when there is a worsening of physical symptoms, for example. Seeking social support may be an obvious, easy choice to lessen one's anxiety, but it may not be as easy for those suffering from fatigue, pain, or nausea and vomiting from chemotherapy. Understanding the processes that govern the role of coping strategies in managing stress would provide important information about how and under what circumstances patients have more positive (or even successful) outcomes rather than negative (or more vulnerable) ones.

Moderation Versus Mediation Effects of Coping

Data show that stressors, coping, and quality of life outcomes covary, but exactly how coping intervenes between stressors and quality of life is not clear. Is the relationship between a stressor

and an outcome dependent upon differences among individuals (i.e., do those who generally use more vs. less of certain coping have better outcomes)? If the answer is yes, then coping is considered a "moderator", a variable influencing the direction and/or strength of the relationship between two other variables [22]. As in the example above, even if individuals have high levels of stress due to symptoms, those persons who are able to seek social support may have a better quality of life than those who do not seek social support. In this case, high stress would not always lead to worsened quality of life as long as adaptive coping buffers its harmful effects. Examining the literature, we found only one study testing coping as a moderator of stress. In a cross-sectional study of chronic disease patients, Schroder [23] reported that disengagement coping served as a moderator between symptom stress and depressive symptoms. For those with high symptom stress, patients who used disengagement coping (i.e., giving up) were also found to report higher levels of depressive symptoms; patients with the same level of symptom stress but who were not using disengagement coping had fewer depressive symptoms.

Rather than this scenario, coping may instead serve as a "mediator", a variable "in the middle" serving as a mechanism through which one variable influences another [22]. While high stress has been shown to negatively impact quality of life, the mediation model of coping hypothesizes that coping use is the explanatory mechanism for this negative relationship. That is, higher levels of stress will lead to poorer coping (use of less engagement and/or more disengagement coping strategies), and poorer coping, in turn, will have a negative impact on quality of life. Unlike moderation, the mediation model assumes that individuals' coping use directly corresponds to the levels of stress they encounter. Previous research has not tested coping as a mediator between stress and quality of life. One prospective study has examined the effect of coping on quality of life [24] but used optimism, and not stress, as the predictor.

Why is it important to test coping both as a moderator and a mediator? First, it will help to clarify what exact role coping plays between stress and quality of life. There is previous evidence illustrating coping as both a moderator and a mediator using different, but related, predictors and outcomes [14,25]. These discrepant findings may be because different types of coping strategies play different roles under different circumstances. Therefore, testing both moderation and mediation models with the same sample and variables will contribute to theoretical clarification on the role of coping. Secondly, the findings would advance the clinical understanding of coping and have implications for interventions.

Focus of the Investigation

We ask this question: In the prediction of mental health quality of life, what is the role of coping, and does the role alter with different strategies of coping and/or different types of stressors? We used a longitudinal design in which the assessment of stress and coping preceded the assessment of quality of life. We chose the context of cancer recurrence, as it is known to be stressful, and as discussed above, it includes at least two distinct types of stress-traumatic and symptom-related. Women were assessed at the difficult time when learning of their diagnosis and quickly beginning their cancer treatments. We hypothesized that the two types of stressors might prompt different coping strategies. Thus, we assessed two types of coping —patients' engagement and disengagement coping. For both types, we tested if coping served as a moderator or a mediator of patients' subsequent mental quality of life. Thus, the design considers two types of stressors (traumatic or symptom-related) crossed with two types of coping (engagement vs. disengagement), with tests of competing mechanisms–moderation vs. mediation—in predicting mental health quality of life. Importantly, baseline quality of life is included, and sociodemographic, disease, and treatment variables are considered as control variables.

Methods

Participants and Procedures

Women diagnosed with their first recurrence of breast cancer were eligible to participate. Recurrence refers to the clinical detection of metastatic breast disease in the same area, adjacent to, or distant from the original site. Exclusion criteria were previous or current cancer diagnosis other than breast, prior or current refusal of cancer treatment, age ≤20 or >85 years, or diagnoses of mental retardation, severe or untreated psychopathology, neurological disorders, or dementia. Patients were consecutive cases at a medical oncology clinic in a university-affiliated National Cancer Institute designated Comprehensive Cancer Center. Among 104 eligible patients, 22 declined to participate and 82 (79%) were accrued. There were no significant differences between participants versus nonparticipants on sociodemographic and disease characteristics, or cancer treatments received (ps>0.11). One variable approached statistical significance–partner status (p=0.07); the participants were less likely to have a spouse or a partner.

The initial assessment was performed a median 9 weeks (range=0−30) after receiving the recurrence diagnosis. Female research assistants conducted individual, structured interviews that included questionnaire completion, and a research nurse conducted a health status assessment with medical chart inspection and physician consultation as needed. Approximately 4 months (median=18 weeks, range=9−38 weeks) after the initial assessment, the patients were similarly reassessed. The patients were paid $50.00 per assessment.

Seventeen (21%) women did not complete the follow-up assessment for reasons of scheduling difficulties (n=7), study dropout (n=6), and death (n=4). Analyses compared the participants who completed the follow-up (N=65) to the remainder (n=17) with respect to baseline (initial assessment) characteristics using chi-square or analysis of variance (ANOVA) as appropriate. The groups did not significantly differ in sociodemographics (age, education, employment, family income, and marital status), disease characteristics (stage, hormone receptor status, number of nodes at original diagnosis, disease free interval, and location of recurrent disease), or cancer treatment received for recurrence (surgery, radiation, hormonal, and chemotherapy; all ps>0.05). Thus, data from 65 patients who completed both initial and 4 month follow-up assessments were analyzed.

The sample was primarily Caucasian (94%), middle aged (M=54, SD=11 years), married (72%), with some college (68%). The average disease free interval was 46 months (median=33, range=6−254) and the majority (68%) had distant rather than loco-regional metastases. As treatment typically begins shortly after diagnosis, most (88%) had received or were continuing with some type of cancer treatment at the time of initial assessment (post-surgery=29%, chemotherapy=42%, radiation therapy=25%, hormonal therapy=37%). At 4 months follow-up, 80% were receiving cancer treatments (post-surgery=32%, chemotherapy=52%, radiation therapy=5%, hormonal therapy=40%, bone marrow transplantation=2%).

Measures

Stressors

Traumatic Stress: The impact of events scale (IES; [26]) is a 15-item scale which examines intrusive thoughts and avoidant thoughts and behaviors related to traumatic events. Items were modified to assess the stress of cancer diagnosis and treatment. Total scores range from 0 to 75, and scores above 19 reflect clinically relevant levels of traumatic stress [27]. To insure that the item content of the IES did not overlap with the coping measures (see description below), all items were inspected, and correlations with the disengagement coping items were conducted. On this basis, two IES items with moderate correlations (0.54 and 0.57) and similar

content (i.e., "I felt as if my diagnosis/treatments hadn't happened or they weren't real" and "I was aware that I still had a lot of feelings about cancer, but I didn't deal with them") were eliminated. Internal consistency reliability for the IES and all other measures described below are from the present sample; internal consistency for this shortened IES was 0.89.

Symptom Stress: Four measures were used. Each measure was standardized and then combined for a composite, with a higher score indicating higher symptom-related stress and burden. Measures (1) and (2) were nurse rated. (1) *Symptoms, signs, illnesses, and toxicities (SymS/Tox)*—a rating of common symptoms/signs of illness and cancer treatment toxicities was used [28]. Twenty-two body categories (e.g., gastrointestinal, cardiovascular, neurosensory) are evaluated, each with 4−7 symptom/sign (e.g., nausea, blood pressure, infection) items, and rated on a 5-point severity scale (0=none to 4=life threatening). Items were averaged for a total score. Internal consistency was 0.83. (2) *Performance status*—The Karnofsky performance status (KPS) [29] is a functional status scale ranging from 100 (Normal, no complaints, no evidence of disease) to 0 (Dead) with 10-point intervals. It evaluates overall disruption in daily activities and functioning due to symptoms/signs of illness or treatment. Inter-rater reliability ranges from 0.70 to 0.97 [30,31]. (3) Disruption due to pain —the brief pain questionnaire (BPQ) [32] is a self-report of the patient's history of pain and its relationship to their disease. Among twelve items of the BPQ, seven items measuring pain interference in activities of daily living were used. The patients rate pain interference with general activity, mood, walking ability, normal work, relationships, sleep, and enjoyment of life, respectively. Items are rated on the 11-point scale ranging from 0=does not interfere to 10= completely interferes. Internal consistency was 0.95. (4) *Disruption due to fatigue*—the fatigue symptom inventory (FSI) [33] is a 14-item measure designed to assess the frequency, severity, and daily pattern of fatigue as well as its impact on daily activities during the previous week. The disruption index, which is the sum of seven items measuring the impact of fatigue on daily life (e.g., general level of activity, ability to concentrate, enjoyment of life), was used. Patients rate on the 11-point scale ranging from 0=no interference to 10=extreme interference. Internal consistency was 0.93.

Coping—The Brief COPE [34] was used to assess frequency of engaging in 13 different coping strategies: active coping, planning, seeking emotional support, seeking instrumental support, positive reframing, acceptance, humor, religion, self-distraction, denial, venting, alcohol/drug use, and behavioral disengagement. Each strategy was measured with two items rated on the scale ranging from 0=not at all to 3=a lot. To determine the underlying factor structure of the 13 coping strategies with the current sample, exploratory factor analysis with oblique rotation was performed. Two-, three-, and four-factor solutions were extracted after examination of eigenvalues, scree plot, and a priori conceptualizations. A two-factor solution was supported based on interpretability, parsimony, and an adequate model fit [root mean square error of approximation (RMSEA)=0.096]. A two-factor structure is also consistent with those found by other researchers [10,25]. After further inspection of factor loadings, six coping strategies were eliminated due to low loadings (<0.30), adequate loadings on both factors, or poor specificity. Factor 1, labeled '*engagement coping*,' includes 8 items assessing four coping strategies: active coping, planning, seeking instrumental support, and positive reframing. Factor 2 with 6 items, labeled '*disengagement coping*,' includes three strategies: denial, alcohol/drug use, and behavioral disengagement. Internal consistency for the scales was 0.85 and 0.71, respectively.

Outcome

Quality of Life-Mental Health: The medical outcomes study-short form (SF-36) [35] has 36-items contributing to eight subscales for assessing psychological and physical quality of life. A mental health component summary (MCS) can be computed by summing all subscales but

using differential weights for the following: mental health, role functioning related to emotional health, social functioning, and vitality. The component score is converted to a *t* score relative to the population, with a mean of 50 and standard deviation of 10. Internal consistency was 0.86.

Analytic Strategy

Summary statistics and correlations among measures are reported. For description, change in mental quality of life from initial to follow-up using repeated measures ANOVA is provided. Any sociodemographic, disease, and treatment variables that correlated significantly with the outcome variable were included in all subsequent regressions and path analyses as control variables.

To test the role of coping as a moderator, four separate hierarchical multiple regression (HMR) analyses were conducted. Variables were entered into the regressions in the following order: (a) control variables, if any; (b) initial quality of life; (c) stress (traumatic or symptom-related); (d) coping (engagement or disengagement); and (e) the interaction term for stress and coping. The interaction term was computed as the product of *z* scores of stress and coping.

For the tests of coping as a mediator, four path analyses were conducted using AMOS 5.0 [36]. In the hypothesized models, stress at initial was specified as the predictor, coping strategy at initial was a mediator, and mental quality of life at follow-up was specified as the outcome. As in the moderation analyses, initial quality of life was controlled. The coefficient of the direct path from stress to quality of life at follow-up was estimated to allow for partial mediation. With 4.0% of overall missing data, a multiple imputation was conducted. The fit of the models was assessed with the following criteria: (a) chi-square statistic; (b) RMSEA: <0.05=a close fit, 0.05−0.08=a fair fit, 0.08−0.10=a mediocre fit, and >0.10=a poor fit [37]; and (c) comparative fit index (CFI; [38]), best if above 0.95. To test the significance of the indirect effects, a bootstrapping procedure was used. Bootstrapping is the method of choice [39,40] for sample sizes <200 rather than others (e.g., Sobel test). With bootstrapping, the indirect effect is estimated based on a large number of bootstrap samples generated from the original data by random sampling with replacement (e.g., this study used 1,000 bootstrap samples). If the 95% confidence interval (CI) for the estimates of indirect effect does not include zero, it suggests the significance of the mediation effect at the 0.05 level [40].

Results

Descriptive and Preliminary Analyses

As anticipated, the sample reported significant stress, both traumatic and symptom-related. The mean IES score (*Ms*=20.2 and 22.2 for the shortened and original IES, respectively) was above the suggested clinical cutoff of 19 [27]. The patients also reported high levels of interference due to fatigue (*M*=3.11, *SD*=2.38). The sample KPS score (*M*=78.13) corresponded to "normal activity with effort; some signs/symptoms of disease." Considering coping, patients reported using engagement coping more than disengagement coping (*M*s=1.84 vs. 0.24, respectively). Women's mental health quality of life scores (SF-36 MCS) improved over the 4-month follow-up interval. The mean score was 0.5 standard deviation below the expected population mean of 50 shortly after the diagnosis (*M*=44.72) but significantly improved (*M*=49.64) at the 4-month follow-up [F (1, 58)=13.959, *p*<0.001].

Table 1 provides intercorrelations among control, predictor, coping, and outcome variables. Of the control variables (age, race, disease free interval, location of metastases, current receipt of surgery, chemotherapy, hormonal therapy or radiation, *p*s>0.13), only marital status

(0=unmarried, 1=married; r=0.37, p=0.004) was significantly correlated with the SF-36 outcome and is thus included for control.

Tests of Coping as a Moderator

HMR results from the four moderation models are summarized in Table 2. In the first two models, traumatic stress is the predictor. In the tests of moderation, neither engagement coping (Model 1) nor disengagement coping (Model 2) were moderators for mental quality of life. Regarding direct effects, stress and engagement coping did not predict quality of life. Only disengagement coping (Model 2) had a significant (β=−0.367, p=0.005) direct effect: more frequent use of disengagement coping predicted poorer mental quality of life.

In the next models, symptom-related stress is the predictor. Here, engagement coping (Model 3) was a significant moderator (β=0.252, p=0.024), although disengagement coping (Model 4) was not. Thus, for those patients with high symptom stress, less engagement coping predicted significantly lower QoL. This relationship is graphically depicted in Fig. 1 (although a continuous variable, engagement coping is dichotomized for illustration of the interaction). Regarding the direct effects, symptom stress was not a predictor of quality of life, and only disengagement (but not engagement) coping predicted quality of life (β=−0.274, p=0.022; see Model 4).

Tests of Coping as a Mediator

Figure 2 presents the path diagrams of four mediation models (Models 5−8). Standardized path coefficients with significance levels are provided. For simplicity, unique and residual variances and correlations between predictor variables are omitted.

In the upper portion, traumatic stress is the predictor. Model 5, in which engagement coping is tested as a mediator between stress and QoL, did not fit the observed data adequately [χ^2 (2) =8.713, p=0.013; RMSEA=0.229; CFI=0.831], and none of the paths between stress, coping, and QoL were significant. Therefore, mediation was not tested.

Model 6, where disengagement coping is tested as a mediator, revealed a good fit to the data [χ^2 (2)=1.221, p=0.543; RMSEA=0.000; CFI=1.000]. Furthermore, the model explained 36% of the variance in mental quality of life at follow-up. The path from traumatic stress to disengagement coping was positive and significant (the standardized path coefficient β=0.407, p<0.001), and the path from disengagement coping to QoL was negative and significant (β= −0.304, p=0.006). The direct path from stress to QoL was not significant (β=.013, p=.916). In the test of mediation, results indicated that the mediation effect from traumatic stress to mental QoL through disengagement coping was significant (bias-corrected 95% CI: −0.275, −0.035, p=0.010).

In the lower portion of Fig. 2, symptom stress is the predictor. Model 7, where engagement coping is specified as a mediator between symptom stress and QoL, fit the data adequately [χ^2 (2)=2.423, p=0.298; RMSEA=0.057; CFI=0.991] and explained 36% of the variance in QoL. For the direct effects, the paths from symptom stress to both engagement coping and QoL were negative and significant (βs=−0.270, ps=0.025). However, the effect of engagement coping on QoL was not significant (β=0.109, p=0.294). The non-significant path from engagement coping to QoL indicated that this model did not meet the requirements for mediation so mediation was not tested.

When disengagement coping is tested as a mediator of symptom stress (Model 8), there was a close fit to the data [χ^2 (2)=1.326, p=0.515; RMSEA=0.000; CFI=1.000] and the model explained 40% of variance in QoL. The path from symptom stress to disengagement coping was positive and significant (β=0.349, p=0.003), and in turn, the path from disengagement

coping to QoL was negative and significant (β=−0.250, *p*=0.015). In the mediation test, the effect from symptom stress to QoL through disengagement coping was significant (95% CI: −0.209, −0.019, *p*=0.028).

Unlike the moderation models, the mediation models provide information on the relationship between stress and coping. Results suggest that high levels of traumatic stress covaried with more disengagement coping (Model 6), although not with engagement coping (Model 5). The levels of symptom stress covaried with both engagement and disengagement coping, although the direction of relationship was opposite: higher symptom stress was associated with less engagement and more disengagement coping.

Discussion

The context of study—the diagnosis of cancer recurrence—is an important one, and of all the points along the cancer trajectory, it has received the least behavioral study. In contrast, coping has long been regarded as a core concept in understanding stress effects [41] and has received significant study. Surprisingly then, this longitudinal study may be the first to examine the intervening role of coping on the impact of stress for quality of life in a cancer population. In addition, the contrast of moderation and mediation models may contribute to the understanding of how coping intervenes in the relationship between stress and quality of life. The inclusion of the two types of coping strategies, engagement and disengagement, adds complexity to the analysis and the inclusion of two types of stressors (traumatic and symptom) offers opportunities to examine the generalization of effects. Clinically, the data provide suggestions for tailoring interventions for specific circumstances or individuals.

Coping is multi-faceted, and two general types, engagement and disengagement, were studied here. Concurrent with stress, patients reported more frequent use of engagement coping, rather than disengagement, which is similar to previous research [14]. In the present study, engagement coping correlated with better mental quality of life and disengagement with poorer QoL. These findings support prior ones demonstrating associations between positive outcomes and engagement strategies (e.g., [19]) and negative outcomes with disengagement strategies (e.g., [6]) in female cancer patients. While some disengagement coping strategies have been shown to be adaptive, a recent review of coping in cancer patients [42] found specific ones related to poorer psychological functioning include refusing to believe it has happened, making oneself feel better by drinking, and giving up the attempt to cope. Our findings support this analysis. Here, only disengagement coping predicted quality of life after controlling for initial levels. This is consistent with the studies of cancer patients reporting adverse effects of disengagement coping, but not the beneficial effects of engagement coping, on quality of life [6,20].

The patients were, unfortunately, significantly stressed. Regarding traumatic stress (intrusive thoughts, avoidant thoughts and behaviors, and strong negative emotions regarding cancer diagnosis and treatments), the sample mean at baseline exceeded the suggested clinical cutoff, with over 50% of patients scoring above the clinical cutoff. Symptom stress, a composite of symptoms/signs of cancer treatment toxicities, functional status, and interference from fatigue and pain, was also elevated. While there are no norms for the fatigue interference scale, the current sample reported more interference from fatigue (*M*=3.1) than breast cancer patients undergoing active treatments and healthy comparisons (*M*s=2.3 and 1.3, respectively) [33]. Rather than a predictor, variables of this type are typically used as controls in cancer research [18]. Yet, toxicities from treatment and other disease-related symptoms (i.e., fatigue and pain) are clearly stressful on their own.

Two findings from the current data indicate that the type of stressor the patient experiences may matter. First, it was only with symptom stress that engagement coping correlated; the magnitude of traumatic stress had no relationship with the frequency of engagement coping. The data suggest that one powerful, negative effect of stress may be its impact on increasing the likelihood that individuals will disengage (i.e., deny, withdraw, or avoid) in the face of it. Here, as traumatic stress and symptom stress increased, so too did disengagement coping. Secondly, the stressors exerted different effects on quality of life. While both were correlated with concurrent and subsequent quality of life, only symptom stress predicted it in these models.

To understand the role of engagement and disengagement coping strategies between stress and quality of life, four moderation and four mediation models were tested. In these models, engagement and disengagement coping did not play the same role. While engagement coping was identified as a plausible moderator, disengagement coping served as a mediator. That is, patients were more likely to use disengagement coping strategies as their stress level (of either type) increased, and in turn, their higher use of disengagement coping predicted poorer quality of life. These mediation tests demonstrate that use of disengagement coping has adverse effects on quality of life. However, the mediation models did not provide us with much evidence for the beneficial effects of using engagement coping, and instead, the moderation tests were informative. For a subset of patients using frequent engagement coping in the face of various physical symptoms, their mental health quality of life was maintained. For their traumatic stress, however, frequent use of engagement coping was not as effective.

Regarding stressful circumstances, those patients with higher symptom stress (i.e., more negative health consequences) are particularly burdened. Beyond the adverse effects of symptoms on their quality of life, high symptom stress may also lead individuals to behave in ways which make the situation worse. That is, it becomes more likely that disengagement coping will arise and/or individuals will fail to utilize engagement coping strategies. Thus, patients with high levels of physical symptoms are at risk for significantly impaired quality of life. Interventions promoting the use of engagement coping, such as positive reframing and active coping, could be specifically targeted to those groups. More broadly, when either symptom stress or traumatic stress is high, disengagement becomes more likely. It is also possible that higher use of disengagement coping exacerbates symptom stress. The current data suggest that interventions that explicitly discourage the use of disengagement coping (i.e., denial and behavioral disengagement), rather than only teaching engagement coping, may be beneficial. Often patients are only told the beneficial consequences of engagement coping (e.g., social support, seeking information) and not the long-term negative consequences, namely poorer quality of life, of using disengagement strategies.

The study's prospective design enabled the use of baseline quality of life as a control when testing the effects of stress and coping on subsequent quality of life. The significant improvement in QoL highlights the importance of this baseline control and made the test of the role of coping more rigorous. Our sample was predominantly Caucasian, educated, and with above-average income. The generalizability of the findings to other ethnic/minority groups or the underserved is unknown. As socioeconomic disparities covary with cancer outcomes [8,43], these findings may actually underestimate any adverse effects of stress or poor coping for the underserved. Finally, Heim et al. [15] found that use of coping strategies varied across time in the cancer trajectory (i.e., initial diagnosis, recovery, recurrence, etc). Therefore, it is important to examine the intervening nature of coping on stress and quality of life in other cancer types and disease stages.

In conclusion, the present study used prospective data from a sample recently diagnosed with breast cancer recurrence to examine the role of coping in the relationship between stress and

mental health quality of life. We sought to clarify the mechanisms by which coping may exert its effects. Our results highlight the differential impact of stressors as well as the different ways of coping people use to meet stress challenges. In working with cancer patients, it is worthwhile to examine the coping strategies of those individuals reporting high levels of either traumatic stress or symptom stress in order to provide more effective interventions to improve patients' quality of life.

References

1. Okamura M, Yamawaki S, Akechi T, Taniguchi K, Uchitomi Y. Psychiatric disorders following first breast cancer recurrence: Prevalence, associated factors and relationship to quality of life. Jpn J Clin Oncol 2005;35:302–309. [PubMed: 15961434]

2. Hotopf M, Chidgey J, Addington-Hall J, Ly KL. Depression in advanced disease: A systematic review. Part 1. Prevalence and case finding. Palliat Med 2002;16:81–97. [PubMed: 11969152]

3. Mahon SM, Cella DF, Donovan MI. Psychosocial adjustment to recurrent cancer. Oncol Nurs Forum 1990;17:47–52. [PubMed: 2342982]discussion 53−44

4. Folkman, S.; Lazarus, RS. Coping and Emotion.. In: Monat, A.; Lazarus, RS., editors. Stress and Coping: An Anthology. Columbia University Press; New York: 1991. p. 207-227.

5. Andersen BL, Shapiro CL, Farrar WB, Crespin T, Wells-DiGregorio S. Psychological responses to cancer recurrence: A controlled prospective study. Cancer 2005;104:1540–1547. [PubMed: 16118802]

6. Lutgendorf SK, Anderson B, Rothrock N, et al. Quality of life and mood in women receiving extensive chemotherapy for gynecologic cancer. Cancer 2000;89:1402–1411. [PubMed: 11002237]

7. Sprangers MAG, Tempelaar R, van den Heuvel WJA, de Haes HCJM. Explaining quality of life with crisis theory. Psycho-oncology 2002;11:419–426. [PubMed: 12228875]

8. Golden-Kreutz DM, Thornton LM, Wells-DiGregorio S, et al. Traumatic stress, perceived global stress, and life events: Prospectively predicting quality of life in breast cancer patients. Health Psychol 2005;24:288–296. [PubMed: 15898865]

9. Lazarus RS. Coping theory and research: Past, present, and future. Psychosom Med 1993;55:234–247. [PubMed: 8346332]

10. Perczek RE, Burke MA, Carver CS, Krongrad A, Terris MK. Facing a prostate cancer diagnosis: Who is at risk for increased distress? Cancer 2002;94:2923–2929. [PubMed: 12115380]

11. Roesch SC, Adams L, Hines A, et al. Coping with prostate cancer: A meta-analytic review. J Behav Med 2005;28:281–293. [PubMed: 16015462]

12. Rogers ME, Hansen NB, Levy BR, Tate DC, Sikkema KJ. Optimism and coping with loss in bereaved HIV-infected men and women. J Soc Clin Psychol 2005;24:341–360.

13. Cohen M. Coping and emotional distress in primary and recurrent breast cancer patients. J Clin Psychol Med Settings 2002;9:245–251.

14. Carver CS, Pozo C, Harris SD, et al. How coping mediates the effect of optimism on distress: A study of women with early stage breast cancer. J Pers Soc Psychol 1993;65:375–390. [PubMed: 8366426]

15. Heim E, Valach L, Schaffner L. Coping and psychosocial adaptation: Longitudinal effects over time and stages in breast cancer. Psychosom Med 1997;59:408–418. [PubMed: 9251161]

16. Cordova MJ, Giese-Davis J, Golant M, et al. Mood disturbance in community cancer support groups: The role of emotional suppression and fighting spirit. J Psychosom Res 2003;55:461–467. [PubMed: 14581101]

17. Nordin K, Glimelius B. Reactions to gastrointestinal cancer: Variation in mental adjustment and emotional well-being over time in patients with different prognoses. Psycho-oncology 1998;7:413–423. [PubMed: 9809332]

18. Ransom S, Jacobsen PB, Schmidt JE, Andrykowski MA. Relationship of problem-focused coping strategies to changes in quality of life following treatment for early stage breast cancer. J Pain Symptom Manage 2005;30:243–253. [PubMed: 16183008]

19. Jim HS, Richardson SA, Golden-Kreutz DM, Andersen BL. Strategies used in coping with a cancer diagnosis predict meaning in life for survivors. Health Psychol 2006;25:753–761. [PubMed: 17100503]

20. McCaul KD, Sandgren AK, King B, et al. Coping and adjustment to breast cancer. Psycho-oncology 1999;8:230–236. [PubMed: 10390735]

21. Lazarus, RS.; Folkman, S. The Concept of Coping.. In: Monat, A.; Lazarus, RS., editors. Stress and Coping: An Anthology. Columbia University Press; New York: 1991. p. 189-206.

22. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. J Pers Soc Psychol 1986;51:1173–1182. [PubMed: 3806354]

23. Schroder KEE. Coping competence as predictor and moderator of depression among chronic disease patients. J Behav Med 2004;27:123–145. [PubMed: 15171103]

24. Schou I, Ekeberg O, Ruland CM. The mediating role of appraisal and coping in the relationship between optimism-pessimism and quality of life. Psycho-oncology 2005;14:718–727. [PubMed: 15669084]

25. Kershaw T, Northouse L, Kritpracha C, Schafenacker A, Mood D. Coping strategies and quality of life in women with advanced breast cancer and their family caregivers. Psychol Health 2004;19:139–155.

26. Horowitz MJ, Wilner N, Alvarez W. Impact of Events Scale: A measure of subjective stress. Psychosom. Med 1979;41:209–218. [PubMed: 472086]

27. Horowitz, MJ. Stress response syndromes and their treatment.. In: Goldberger, L.; Breznitz, S., editors. Handbook of Stress: Theoretical and Clinical Aspects. Free Press; New York: 1982. p. 711-732.

28. Moinpour CM, Feigl P, Metch B, et al. Quality of life end points in cancer clinical trials: Review and recommendations. J Natl Cancer Inst 1989;81:485–495. [PubMed: 2646455]

29. Karnofsky, DA.; Burchenal, JH. The clinical evaluation of chemotherapeutic agents in cancer.. In: Macleod, CM., editor. Evaluation of Chemotherapeutic Agents. Columbial; New York, NY: 1949.

30. Mor V, Laliberte L, Morris JN, Wiemann M. The Karnofsky Performance Status Scale: An examination of its reliability and validity in a research setting. Cancer 1984;53:2002–2007. [PubMed: 6704925]

31. Yates JW, Chalmer B, McKegney FP. Evaluation of patients with advanced cancer using the Karnofsky Performance Status. Cancer 1980;45:2220–2224. [PubMed: 7370963]

32. Daut RL, Cleeland CS, Flanery RC. Development of the Wisconsin Brief Pain Questionnaire to assess pain in cancer and other diseases. Pain 1983;17:197–210. [PubMed: 6646795]

33. Hann DM, Jacobsen PB, Azzarello LM, et al. Measurement of fatigue in cancer patients: Development and validation of the Fatigue Symptom Inventory. Qual Life Res 1998;7:301–310. [PubMed: 9610214]

34. Carver CS. You want to measure coping but your protocol's too long: Consider the brief COPE. Int J Behav Med 1997;4:92–100. [PubMed: 16250744]

35. Ware JE, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): I. Conceptual framework and item selection. Med Care 1992;30:473–483. [PubMed: 1593914]

36. Arbuckle, JL. Amos 5.0 [Computer software]. SPSS. , editor. SPSS; Chicago, IL: 2003.

37. Browne MW, Cudeck R. Alternative ways of assessing model fit. Sociol Methods Res 1992;21:230–258.

38. Bentler PM. Comparative fit indexes in structural models. Psychol Bull 1990;107:238–246. [PubMed: 2320703]

39. Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behav Res Meth Instrum Comput 2004;36:717–731.

40. Shrout PE, Bolger N. Mediation in experimental and nonexperimental studies: New procedures and recommendations. Psychol Methods 2002;7:422–445. [PubMed: 12530702]

41. Lazarus, RS.; Folkman, S. Stress, appraisal, and coping. McGraw-Hill; New York: 1984.

42. Vos MS, de Haes JCJM. Denial in cancer patients, an explorative review. Psycho-oncology 2007;16:12–25. [PubMed: 16868929]

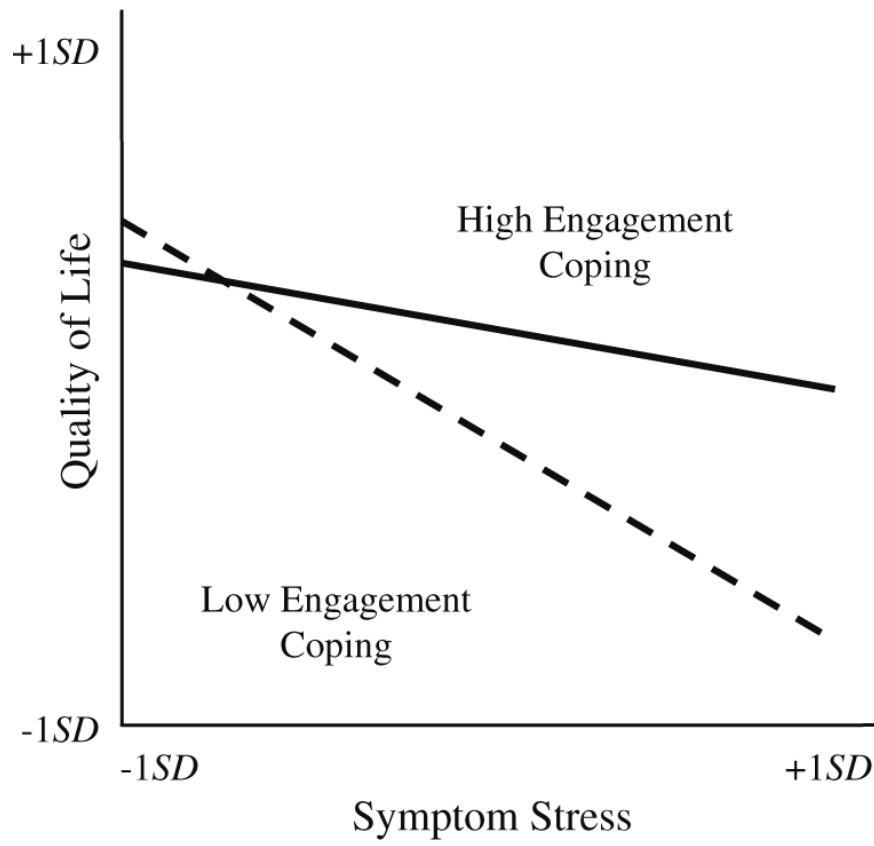43. American Cancer Society. Cancer facts & figures for African Americans. American Cancer Society; Atlanta, GA: 2006.

Fig. 1.
Interaction between symptom stress and engagement coping at diagnosis of breast cancer recurrence predicting mental quality of life 4 months later. *SD* standard deviation
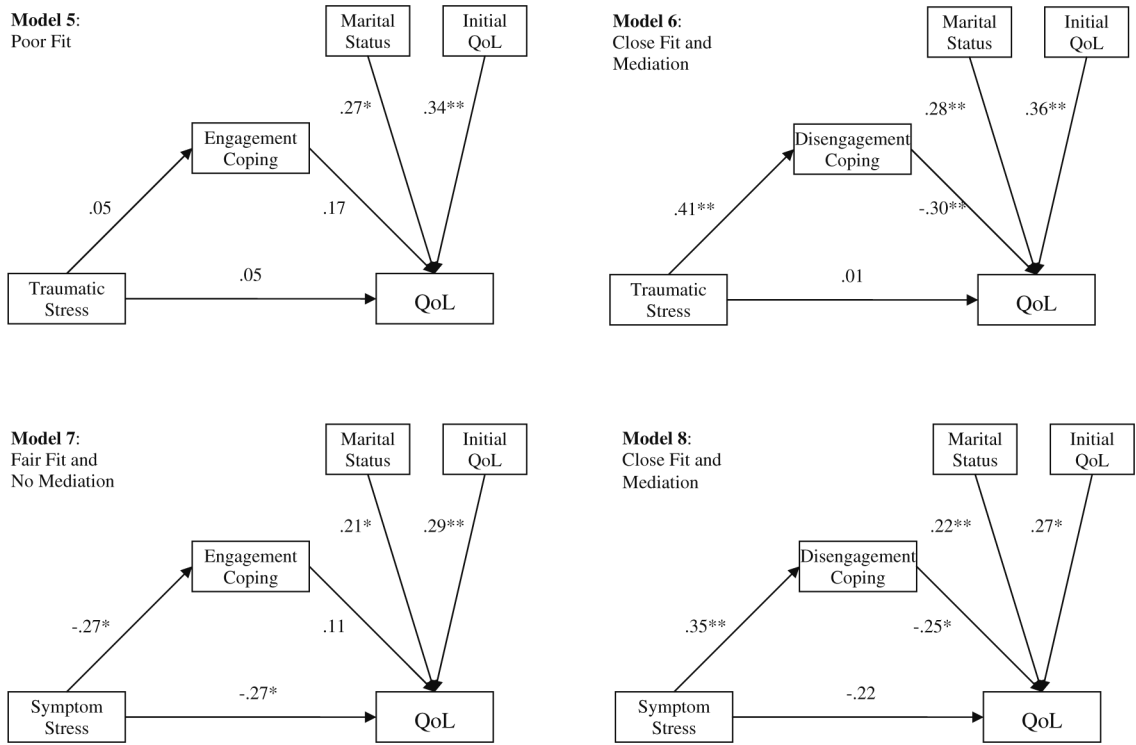
Fig. 2.
Path models testing coping as a mediator between stress at diagnosis of breast cancer recurrence and mental quality of life 4 months later. Standardized path coefficients are provided. *QoL* quality of life. *p<0.05. **p<0.01

Table 1

Descriptive statistics and correlations among control, stress, coping strategy, and quality of life variables ($N=65$)

Variable	Mean/% (SD)	Correlation coefficient						
		1	2	3	4	5	6	7
Control								
1. Marital status (percent married)	72.3	—						
Stress								
2. Traumatic Stress (IES)	20.24 (13.98)	−0.18	—					
3. Symptom Stress	−.003 (3.09)	−0.34**	0.25*	—				
Coping strategy								
4. Engagement	1.84 (0.70)	0.16	0.06	−0.26*	—			
5. Disengagement	0.24 (0.34)	−0.12	0.37**	0.33*	−0.18	—		
Quality of life								
6. SF-36 MCS at Initial	44.72 (10.69)	0.12	−0.41*	−0.44**	0.26*	−0.27*	—	
7. SF-36 MCS at 4 months	49.64 (10.46)	0.37**	−0.26*	−0.49**	0.28*	−0.45**	0.44**	—

IES impact of event scale (shortened); *SF-36 MCS* medical outcomes study short form, mental component summary.

*
$p<0.05$.

**
$p<0.01$.

Table 2

Summary of hierarchical regressions testing coping (engagement vs. disengagement) as a moderator between stress (traumatic vs. symptom) and mental health quality of life (QoL) for patients coping with breast cancer recurrence (*N*=65)

Predictor	Adjusted R^2	ΔR^2	β	*t*
Model 1: traumatic stress and engagement coping				
Marital status	0.119	0.135[**]	0.287	2.362[*]
Initial QoL	0.269	0.161[**]	0.346	2.510[*]
Traumatic Stress (IES)	0.256	0.002	−0.073	−0.539
Engagement Coping (EC)	0.263	0.020	0.158	1.246
IES × EC	0.252	0.003	0.057	0.471
Model 2: traumatic stress and disengagement coping				
Marital Status	0.119	0.135[**]	0.292	2.599[*]
Initial QoL	0.269	0.161[**]	0.324	2.619[*]
Traumatic Stress (IES)	0.256	0.002	0.039	0.298
Disengagement Coping (DC)	0.351	0.101[**]	−0.367	−2.963[**]
IES × DC	0.344	0.005	0.078	0.662
Model 3: symptom stress and engagement coping				
Marital Status	0.119	0.135[**]	0.222	1.928
Initial QoL	0.269	0.161[**]	0.281	2.301[*]
Symptom Stress (SS)	0.317	0.059[*]	−0.253	−1.978
Engagement Coping (EC)	0.313	0.009	0.100	0.876
SS × EC	0.369	0.063[*]	0.252	2.326[*]
Model 4: symptom stress and disengagement coping				
Marital Status	0.119	0.135[**]	0.201	1.697
Initial QoL	0.269	0.161[**]	0.223	1.819
Symptom Stress (SS)	0.317	0.059[*]	−0.207	−1.609
Disengagement Coping (DC)	0.382	0.072[*]	−0.274	−2.368[*]
SS × DC	0.381	0.011	−0.113	−0.958

Beta weights and *t* statistics are from the final step.

[*] *p*<0.05.

[**] *p*<0.01.