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Longitudinal Reciprocal Relationships between Quality of Life and Coping Strategies among Women with Breast Cancer

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Abstract

Background—Research on quality of life (QoL) among women with breast cancer has often examined the impact of coping strategies on QoL. However, the transactional model of stress and coping would argue that QoL can impact coping. This reciprocal relationship between QoL and coping has been inadequately studied.

Purpose—This study examined reciprocal relationships over 18 months between QoL and coping (positive and negative coping) among women with breast cancer.

Methods—Three-wave cross-lagged structural equation modelling (SEM) analysis was used over 3 timepoints post-diagnosis (T1–T3; N=637, 577, 553, respectively).

Results—SEM results revealed a significant reciprocal relationship between negative coping and QoL, indicating that negative coping predicted subsequent QoL, which in turn predicted later negative coping. Although QoL at cancer diagnosis predicted subsequent positive coping, we did not find a reciprocal relation between QoL and positive coping.

Conclusion—Findings expand our knowledge of the relation between QoL and coping by suggesting the reciprocal relationship between negative coping and QoL among women with breast cancer.

Keywords

Breast cancer survivors; Quality of life; Coping; Reciprocal relationship

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Authors' Statement of Conflict of Interest and Adherence to Ethical Standards

Authors Paek, Ip, Levine and Avis declare that they have no conflicts of interest to disclose. All study procedures were conducted in accordance with the ethical standards of the Institutional Review Boards of all participating institutions.

INTRODUCTION

Breast cancer is the most commonly diagnosed non-skin cancer among women in the U.S., with 231,840 estimated new cases expected in 2015 (1). Substantial improvements in early detection and breast cancer treatment have resulted in improved 5-year relative survival rates leading to over 3.1 million breast cancer survivors currently in the U.S (2). With improved survival, quality of life (QoL) issues during and after treatment have become increasingly important to women (3, 4). A substantial body of research focuses on understanding factors related to QoL, with coping strategies being one factor receiving considerable attention (5–13).

Previous research has generally shown that positive or adaptive types of coping strategies are linked with better QoL, whereas negative or less adaptive coping strategies are associated with poorer outcomes (5–8, 14, 15). Specifically, cross-sectional studies have shown that positive-adaptive types of coping strategies such as planning-problem solving (8, 15), positive reframing (5, 8, 15), and acceptance (16) are associated with better psychological and physical well-being. In contrast, negative or passive types of coping, including self-blame (17–19), denial (15, 17), behavioral disengagement (15), cognitive escape-avoidance (20), and emotional suppression and keeping to self (5, 17) are related to poorer psychosocial adjustment and greater depressive symptoms. Relatively few longitudinal studies have investigated the effects of coping on subsequent QoL, but findings are similar to those of cross-sectional studies (6, 11, 21–23). For example, one longitudinal study of 70 women with stage I and II breast cancer found that acceptance coping at cancer diagnosis was associated with better psychological well-being (e.g., decreased depression and increased positive mood) one year later, whereas avoidance coping was linked to greater fear of recurrence (21). Similarly, a study of 55 women with early stage breast cancer found that use of avoidance-based coping (e.g., resigned acceptance and cognitive avoidance) at cancer diagnosis and treatment was associated with worse psychological outcomes (e.g., depression and anger) at 3-year follow-up (23).

Although research generally focuses on the effects of coping on QoL, the Lazarus and Folkman (24) transactional theory of stress and coping would suggest that a reverse causal association may also exist. The transactional theory is a framework for assessing ways people cope with stress (e.g., cancer diagnosis and treatment) and hypothesizing how these processes influence a person’s emotional and adaptational outcomes (e.g., QoL) (24). According to the transactional theory, coping is not static, but changes over time (24). The theory also states that the overall process is recursive and posits a mutually reciprocal and dynamic interplay of factors in the process. The transactional theory would suggest that outcomes such as QoL are influenced by an individual’s coping, and that in turn, QoL may also influence subsequent coping.

Three longitudinal studies have provided empirical evidence supporting the reciprocal process between QoL and coping strategies (6, 12, 25). A study of 267 younger breast cancer survivors showed that coping strategies predicted subsequent QoL, which then predicted coping 6 months later (12). Two prospective longitudinal studies of 59 (6) and 131 (25) women with early stage breast cancer found bidirectional causality between coping and

psychological distress over a 12-month period (6, 25). These previous studies, however, had several limitations, including small sample sizes (6, 25) and/or restriction to younger women (12). These studies also focused only on the early months post-treatment and thus did not provide data on longer-term relationships. Further, methodological limitations of these studies include the use of separate regression models for QoL and for coping, which do not permit simultaneous analysis of bidirectional causality (6, 25), and separate observations for each coping subscale (6, 12, 25).

To further clarify the dynamic interplay between QoL and coping, the present research addresses these limitations by including a wide age range of women, a larger sample size of 637 women, a longer period of time post-treatment, and by using a more comprehensive reciprocal modeling analysis (cross-lagged structural equation model) in which bidirectional causality can be simultaneously tested within a model. Since a breast cancer survivor's QoL changes over time (26, 27) and coping processes may be amenable to change (28, 29), it is important to understand the dynamic process between coping and QoL. Understanding the potential reciprocity in this relationship could contribute to building a more coherent body of knowledge in QoL and coping research.

Study Objectives

Our first objective of the current study is to examine the time course of QOL and coping at three time points over an 18 month period following breast cancer diagnosis. The second objective is to examine the longitudinal reciprocal relationships between coping strategies and QoL over this time period. Specifically, we use a cross-lagged modeling approach to test the hypothesis that prior positive/negative coping will influence later QoL and prior QoL will influence later positive/negative coping.

METHODS

Study Sample

This is a secondary analysis of a longitudinal study that examined age-related differences in adjustment to breast cancer. Participants were recruited from two research sites, Memorial Sloan Kettering Cancer Center and the University of Texas-Southwestern Center for Breast Care, from 2002 to 2006. The data were collected in four waves: the first survey (within 8 months of breast cancer diagnosis), and at 6, 12, and 18 months following completion of the first survey. Participants completed a self-administered questionnaire that included questions on quality of life and coping at each assessment point. A medical chart review was performed 1 year after the first survey to obtain treatment-related data. Study eligibility criteria included age 18 or over (though no one was under age 25), first time diagnosis of breast cancer, and ability to speak and read English. Study design and sample criteria have been previously detailed (30).

The current analyses used data from the first survey (T1; 0–8 months post diagnosis, N=637), the 12-month later survey (T2; 12–20 months post diagnosis, N=577), and the 18-month later survey (T3; 18–26 months post diagnosis, N=553). Importantly, our analyses include the time period of 18–26 months post diagnosis as the transition following active

treatment has been recognized as an important phase in the trajectory of cancer survivorship (31). We excluded the 6-month survey data since many women were still in active treatment at this time and we wanted to avoid overlap with active treatment at T1. Our analyses excluded women who were in active treatment at T2 or T3 (n=13) and women who did not receive breast surgery (e.g., mastectomy or lumpectomy) (n=1) and those who received reconstruction after lumpectomy without mastectomy (n=2).

Measures

Quality of life was measured by the Functional Assessment of Cancer Therapy-Breast (FACT-B) (32) which is comprised of 35 items that assess five QoL domains: physical well-being, social/family well-being, emotional well-being, functional well-being and an —additional concerns domain specific to breast cancer. Each item is rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (very much) and the total FACT-B score ranges from 0 to 140. The domain scores are obtained by summing the responses, with higher scores representing better QOL. Cronbach's alpha for the domain scores ranged from .69 to .90.

Coping was measured using the Brief COPE (33) that assesses 14 different coping strategies: self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame. Each coping strategy is measured by two items, each scored 1–4 (from not doing at all to doing a lot). Scores on the two items are summed and divided by 2 to yield a mean subscale score. Cronbach's alpha for the subscales ranged from .46 (behavioral disengagement) to .82 (use of emotional support).

Higher-order exploratory factor analyses (EFA) on our data were conducted to determine the underlying factor structure. Consistent with the two-factor model proposed by Carver (33), the EFA results suggested that a two-factor solution provided the most interpretable and parsimonious description across all surveys. The first latent factor was defined by active coping, use of emotional support, use of instrumental support, and positive reframing and is called —positive coping. The second latent factor, defined by denial, behavioral disengagement, and self-blame, is called —negative coping. Other coping strategies did not consistently load on either factor across assessments and were therefore excluded.

Demographic and cancer related characteristics were included as covariates: age at diagnosis, cancer stage, time since breast cancer diagnosis, mastectomy (yes/no), and chemotherapy (yes/no).

Analyses

Descriptive Analyses—Descriptive statistics were used to summarize the demographic and medical characteristics of the sample. The linear mixed model analysis was used to assess the overall QoL, mean QoL domain, and coping subscale scores over the three time points: T1, T2, and T3.

Structural Equation Modeling (SEM) Analyses—Study main variables, QoL and coping strategies, were treated as latent variables estimated by multiple observed indicators. The benefits of using a latent variable structural equation modeling (SEM) approach include

simultaneously testing the relationships among multiple observed indicators and latent variables, and accounting for measurement errors in both latent and observed variables (34–36).

Measurement model: Prior to testing the cross-lagged model, a confirmatory factor analysis (CFA) was conducted to test the measurement model that defines the relations between observed indicators and latent constructs (35). Three latent constructs (QoL, positive coping, and negative coping) at each time point, 5 indicators for QoL, 4 indicators for positive coping, and 3 indicators of negative coping were included in the measurement model. The indicators of positive and negative coping were derived from the earlier higher-order EFA. The measurement model allowed the latent constructs to be correlated. The measurement errors between same observed indicators over time were also allowed to be correlated. In longitudinal analysis, establishing measurement invariance is necessary to ensure the instrument measures the same construct across assessment points (37). In order to test for measurement invariance, all parameters of the same indicator were constrained to be equal across measurement points (37).

Cross-lagged model: To examine the reciprocal relationships between QoL and positive coping and between QoL and negative coping strategies over time, a three-wave cross-lagged SEM model was then tested. Since the time interval varies between the two sets of waves (12 months vs. 6 months), the paths in the cross-lagged model were not constrained to be equal across measurement points. Age, cancer stage, time since diagnosis, adjuvant therapy (chemotherapy and radiation), and surgery (lumpectomy only, mastectomy without reconstruction, and mastectomy with breast reconstruction) were included as covariates in the cross-lagged model.

For descriptive statistics, SPSS 22.0 was used. The SEM analyses were conducted using Mplus 7.11 (38), with full information maximum likelihood (FIML) as the method of handling missing data. A non-significant χ^2 value ($p > .05$) is an indicator of good fit with the data, however, it is highly sensitive with a large sample and rejects the model inadequately when large samples are used (39). In this study, the model-data fit was evaluated using multiple fit indices: χ^2 goodness of fit statistic, the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA) (36, 40). CFI and TLI values above .90 and RMSEA values below .08 (36) were used as indicators of acceptable model fit.

RESULTS

Sample Characteristics

A total of 637 eligible breast cancer survivors were identified at T1. The sample was predominantly white (89.6%) and well educated (62.3% completed college), with higher household income (42.7% had household income >$100,000) (Table 1). The mean age at T1 was 55.5 years (range 26–97 years) and the majority of respondents (71.9%) were married or partnered. More than half of the respondents (52.4%) were diagnosed with stage I breast cancer, 72.2% received adjuvant radiation therapy and 66.4% received chemotherapy. The

majority (64.2%) received lumpectomy only and 35.8% received mastectomy. The mean time since breast cancer diagnosis at T1 was 4.5 months.

QoL and coping strategies over time

Before proceeding with SEM results, we first examined FACT-B domain and total scores, and coping subscale scores over the three points of assessment. Total FACT-B scores improved over time (T1 = 102.0, T2 = 109.9, and T3 = 110.6, respectively) with significant increases from T1 to T2. Mean QoL scores for all domains, except social well-being, significantly improved from T1 to T2 (p <.01 or below), but showed no additional improvement from T2 to T3 (all ps > .05) (Figure 1). Although social well-being scores decreased over time, this change was not statistically significant. Seeking emotional support was the most frequently used coping strategy. Our study sample tended to utilize positive coping strategies (e.g., active coping, seeking emotional and instrumental support, and positive reframing) more often than negative coping strategies (denial, behavioral disengagement, and self-blame). Use of positive coping strategies, as well as use of denial, significantly decreased from T1 to T2 (all ps < .05), but did not decline significantly between T2 and T3 (all ps > .05) (Figure 2). Behavioral disengagement and self-blame were used less frequently and did not change significantly over time (all ps > .05).

Measurement model

The measurement model over 3 waves of longitudinal data on QoL, positive, and negative coping strategies was tested. The measurement model had a good fit to the data (χ^2 (522) = 1278.03, p = .000, CFI = .93, TLI = .91, and RMSEA = .047). The parameter-constrained model which assesses measurement invariance also yielded a good fit to the data, (χ^2 (540) = 1360.43, p = .000, CFI = .92, TLI = .91, and RMSEA = .048). Although the change in χ^2 between the measurement and the parameter-constrained model was statistically significant ($\Delta\chi^2$ = 82.4, Δdf = 18, p = .00), the changes in other fit indices were negligible (ΔCFI < .01, ΔTLI < .01, and ΔRMSEA < .001), supporting invariance of measurement over time. All factor loadings from observed indicators to each latent construct were significant, with standardized path coefficients ranging from .52 to .84 for QoL, .50 to .78 for positive coping, and .37 to .67 for negative coping.

Cross-lagged model

The cross-lagged model examined the reciprocal relationship between QoL and positive coping and between QoL and negative coping across three waves. The stability effects which refer to the autoregressive effects of each latent construct over time (i.e., QoL, positive, and negative coping), were also examined. Covariates included age, cancer stage, time since diagnosis, adjuvant therapy (chemotherapy, radiation), and surgery (lumpectomy only, mastectomy without reconstruction, and mastectomy with reconstruction). Figure 3 depicts the results of the structural model testing. The model yielded an adequate fit to the data: χ^2 (733) = 1677.73, p = .000, CFI = .91, TLI = .90, and RMSEA = .045.

The paths from prior QoL to subsequent QoL were highly significant, with .51 for the path from T1 to T2 and .98 for the path from T2 to T3, indicating that the stability effect of QoL was stronger between T2 and T3 than between T1 and T2. A high stability effect for positive

coping was observed over both timepoints (.67 and .62, respectively). The path from T1 negative coping to T2 negative coping was statistically significant (.64), whereas the path from T2 to T3 (.31) was not.

Three statistically significant cross-lagged effects were identified. First, negative coping at T1 predicted worse QoL at T2, $\beta = -.30$, $p < .05$. However, this cross-lagged path was not found from T2 to T3. Second, another significant cross-lagged relationship was found from T2 QoL to T3 negative coping, $\beta = -.47$, $p < .01$. That is, women who had better QoL at T2 reported less frequent use of negative coping at T3. The cross-path from T1 QoL to T2 negative coping was not significant, suggesting women's T1 QoL was not associated with subsequent use of negative coping earlier on. Lastly, T1 QoL had a small but statistically significant causal influence on subsequent use of positive coping, $\beta = -.12$, $p < .05$, suggesting that better QoL at T1 predicted less subsequent use of positive coping. However, the cross path was not replicated from T2 QoL to T3 positive coping. All other cross-paths did not reach significance.

The insignificant stability of negative coping between T2 and T3 was unexpected given the stability of coping from T2 to T3 in Figure 2. To further investigate what might account for this finding, two separate structural models were tested. We first tested the autoregressive model for negative coping only (Figure 4a) and found significant stability coefficients for the two time intervals ($\beta = .81$, $p < .001$; $\beta = .70$, $p < .001$, respectively). However, when T2 QoL was included as a mediator of the relationship between T1 and T3 negative coping (Figure 4b), the stability coefficient between T2 and T3 was non-significant ($\beta = .33$, $p > .05$). The direct paths from T1 negative coping to T2 QoL and T2 QoL to T3 negative coping were both statistically significant ($\beta = -.86$, $p < .001$ and $\beta = -.46$, $p < .01$, respectively). These findings indicated that stability effect of negative coping in our full model was at least partially mediated by T2 QoL. The results of these additional analyses confirmed the significant effect of T2 QoL on T3 negative coping and the insignificant path of T2 and T3 negative coping.

DISCUSSION

Study results showed that physical, emotional, and functional well-being and breast cancer concerns all improved from T1 to T2 (corresponding to a time period of 1–8 months post diagnosis to 12–20 months post diagnosis), but then stabilized or improved only slightly afterwards. However social well-being showed a different pattern with a decrease from T1 to T2. Our findings are similar to earlier studies that found improvement in overall QoL over one year (41–43), but no significant changes in most QoL domains between 1- and 2-years (44) or beyond (43). The decline in social/family well-being from end of treatment to the 12 or 24-month follow-up period has also been found by others (42, 45) and reinforces the feeling expressed by survivors that they experience a decline in support from family and friends when they are further from diagnosis (46). The overall QoL and change in QoL scores over time for this study population has been found to be comparable to other studies (12, 47, 48). Consistent with previous studies (6, 25, 49), the use of coping strategies decreased from cancer diagnosis to one year later or remained stable over time; we also

found that women with breast cancer used positive coping strategies more frequently, whereas use of negative coping strategies were relatively infrequent (6, 25, 50, 51).

We also found that greater use of negative coping strategies at cancer diagnosis was associated with subsequently poorer QoL soon after diagnosis, as found in previous longitudinal investigations (6, 12, 25). Adding to this research, we also found that lower QoL was associated with greater negative coping even further from diagnosis. These consistent findings suggested that the longitudinal reciprocal relationship exists between negative coping and QoL in women with breast cancer.

In this study, we observed that better QoL at T1 predicted less use of positive coping at T2, suggesting women who had better QoL during diagnosis and treatment of breast cancer made less use of positive coping strategies (e.g., active coping, positive reframing, and seeking emotional and instrumental support). This finding replicated and extended previous research indicating that better post-surgery QoL predicts less subsequent use of positive type of coping (e.g., seeking social support) (12). It is likely that survivors who have better QoL may need to use fewer coping strategies. However, contrary to our hypothesis, positive coping was not a significant predictor of later QoL at any time point. Although a number of cross-sectional and longitudinal studies have shown that greater use of positive/adaptive types of coping is related to better QoL (5, 7, 8, 11), other studies have not found a relationship (49, 50). Possible explanations for these inconsistent findings may be the variation across studies in the constructs used to measure positive types of coping strategies, variation in the higher order coping subscales of the Brief COPE, our latent variable approach, and/or sample characteristics. In sum, although we hypothesized a reciprocal relationship between positive coping and QoL, positive coping yielded no significant effect on the subsequent QoL and no evidence was found to support the reciprocal relationship. Our finding is similar to previous studies that have shown no significant reciprocal or bidirectional relationship between QoL and positive types of coping during slightly shorter time period (6, 12, 25).

To our knowledge, the current study is the first to investigate the dynamic relationship between QoL and coping among women with breast cancer, using a three-wave latent factor SEM approach. Study findings add to existing research by simultaneously examining the longitudinal reciprocal relationships between QoL and positive/negative coping. Our findings suggest that in addition to the usual view that coping strategies impact QoL, and QoL also influences coping strategies. The findings provide further support for the Lazarus and Folkman transactional theory of stress and coping and extend the application of this theoretical approach to breast cancer population. This alternative point of view would be useful for researchers trying to better understand the relationship between coping and QoL. It is recommended that future research examine the dynamic nature of coping and QoL in cancer survivors.

The significant reciprocal process between negative coping and QoL has several implications for clinical practice. Although previous studies have suggested that interventions focused on positive coping might improve QoL (52, 53), our findings suggest that interventions targeted at reducing negative coping strategies may be particularly

beneficial to improve QoL in cancer survivors. Findings also suggest that interventions should target survivors who have poor QoL. Additionally, psycho-educational interventions are needed to break the cycle of negative coping and poor QoL throughout the survival period.

The main strengths of our study include its longitudinal design and use of a comprehensive analytical model allowing for simultaneous examination of the causality between positive/negative coping and QoL. In addition, the study observed coping and QoL substantially over a longer time period than in previous research. A key limitation is that the study sample was predominantly White and well-educated. The underrepresentation of ethnic minority women and low socioeconomic women might limit the generalizability of our results. Another limitation is the different time length between measurement points. Twelve months elapsed between T1 and T2 and there were only 6 months between T2 and T3. This may explain why there was greater change in both QoL and coping from T1 to T2 than from T2 to T3. The two-item scales for each coping measure and low to moderate alpha coefficients for some of the subscales are also the limitations of this study. The use of these very short scales may not be sensitive enough to detect subtle changes in coping responses over time.

In conclusion, our findings provide converging evidence for the longitudinal reciprocal relationship between QoL and negative coping, but not between QoL and positive coping. Taken together, these findings contribute to our knowledge about the reciprocal pathways and highlight an additional avenue for future research.

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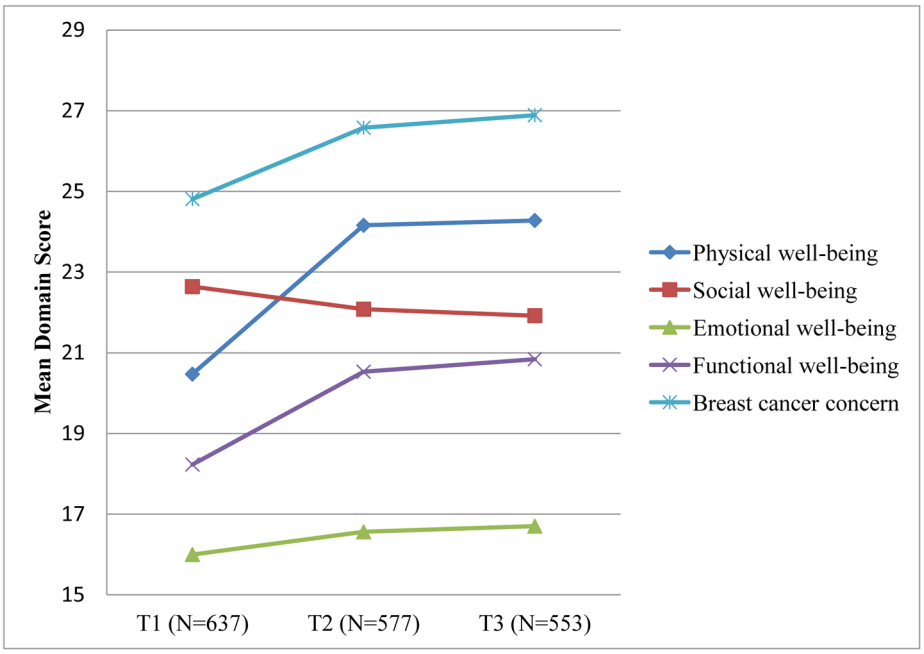

Figure 1.
Mean FACT-B domain scores by survey time points

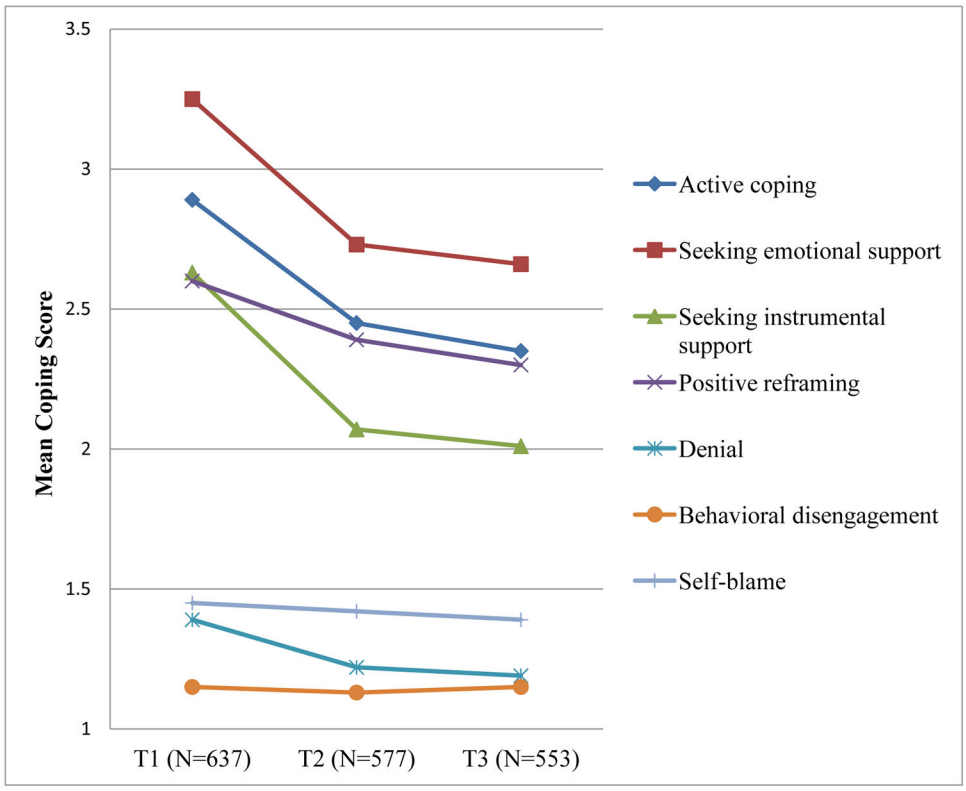

Figure 2.

Mean coping subscale scores by survey time points. Positive coping includes active coping, seeking emotional support, seeking instrumental support, and positive reframing. Negative coping includes denial, behavioral disengagement, and self-blame.

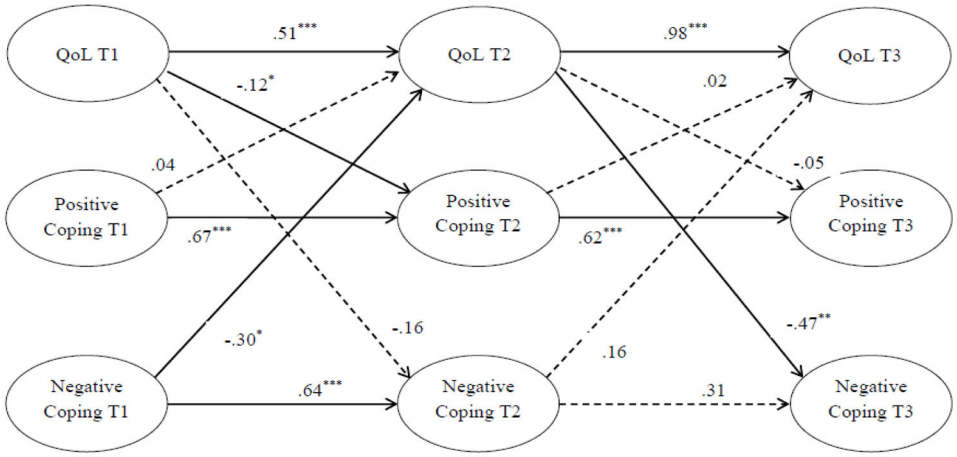

Figure 3.

Structural model of QoL, positive, and negative coping strategies. Solid lines represent statistically significant paths ($p < .05$). The dashed lines indicate statistically not significant paths ($p > .05$). Factor loadings of the latent constructs and measurement errors are not presented. Age, cancer stage, time since diagnosis, adjuvant therapy (chemotherapy, radiation), and surgery (lumpectomy only, mastectomy without reconstruction, and mastectomy with breast reconstruction) were included as covariates in the analysis.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

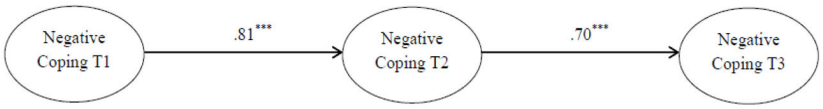

Figure 4a.

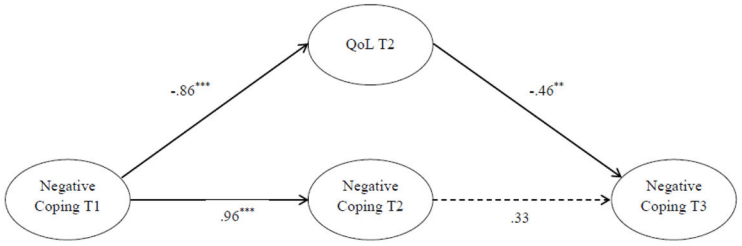

Figure 4b.

Figure 4.

Figure 4a. Autoregressive models of negative coping over time. Age, cancer stage, time since diagnosis, adjuvant therapy (chemotherapy, radiation), and surgery (lumpectomy only, mastectomy without reconstruction, and mastectomy with breast reconstruction) were included as covariates.

$^{***}p < .001$.

Figure 4b. Autoregressive models of negative coping over time and the effect of 12-month QoL. Age, cancer stage, time since diagnosis, adjuvant therapy (chemotherapy, radiation), and surgery (lumpectomy only, mastectomy without reconstruction, and mastectomy with breast reconstruction) were included as covariates. The dashed lines indicate statistically not significant paths ($p > .05$).

$^{**}p < .01$. $^{***}p < .001$.

Table 1

Characteristics of Study Participants at T1 (N = 637)

Characteristics	N (%)	Mean (SD)	Range
Age (years)		55.5 (12.6)	25.6 – 97.1
Ethnicity			
White	571 (89.6)		
Black	35 (5.5)		
Other	31 (4.9)		
Education			
High school graduate or less	80 (12.6)		
Some college/vocational	160 (25.1)		
College/post-college graduate	397 (62.3)		
Household Income			
< $20,000	44 (6.9)		
$20,000–$49,999	109 (17.1)		
$50,000–$100,000	192 (30.1)		
> $100,000	272 (42.7)		
Employment status			
Full-time employed	181 (28.4)		
Part-time employed	83 (13.0)		
Unemployed/retired	373 (58.6)		
Marital status			
Married/partner	458 (71.9)		
Non-married	179 (28.1)		
Time since diagnosis (months)		4.5 (1.3)	.10 – 7.3
Cancer stage			
1	334 (52.4)		
2	253 (39.7)		
3	50 (7.8)		
Adjuvant therapy			
Radiation (yes)	460 (72.2)		
Chemotherapy (yes)	423 (66.4)		
Surgery			
Lumpectomy only (yes)	409 (64.2)		
Mastectomy without reconstruction (yes)	133 (20.9)		
Mastectomy with reconstruction (yes)	95 (14.9)		