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### Authors

Kim, Jacqueline HJ  
Bright, Emma E  
Williamson, Timothy J  
[et al.](#)

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## Transitions in coping profiles after breast cancer diagnosis: implications for depressive and physical symptoms

**Jacqueline H. J. Kim, Ph.D.,**

University of California, Los Angeles

**Emma E. Bright, Ph.D.,**

University of California, Los Angeles

**Timothy J. Williamson, Ph.D., M.P.H.,**

University of California, Los Angeles

**Jennifer L. Krull, Ph.D.,**

University of California, Los Angeles

**Karen L. Weihs, M.D.,**

The University of Arizona

**Annette L. Stanton, Ph.D.**

University of California, Los Angeles

### Abstract

**Objective:** Determine whether: (a) cancer-related coping profiles change across time; (b) coping profile transition types predict changes in depressive and physical symptoms.

**Methods:** Latent transition analysis was conducted with repeated measures of seven cancer-related coping processes from 460 women recently diagnosed with breast cancer. In multilevel models, coping profile transition groups were entered as predictors of symptoms across 12 months.

**Results:** Three coping profiles emerged at study entry, with two profiles at later assessments. Forty-eight percent of women maintained high-moderate approach-oriented coping over time. Specific factors (e.g., age, acceptance of emotions) differentiated the transition groups. Women who increased and then maintained high-moderate approach-oriented coping had relatively high initial depressive symptoms that declined steeply. When cancer-related acceptance predominated, women experienced increasing physical symptoms.

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Correspondence to: Jacqueline H. J. Kim, Ph.D., Department of Psychology, Psychology Building 1285, Box 951563, UCLA, Los Angeles, CA 90095-1563; jhkim@psych.ucla.edu.

Jacqueline H. J. Kim, Department of Psychology, University of California, Los Angeles; Emma E. Bright, Department of Psychology, University of California, Los Angeles; Timothy J. Williamson, Department of Psychology, University of California, Los Angeles; Jennifer L. Krull, Department of Psychology, University of California, Los Angeles; Annette L. Stanton, Department of Psychology, Jonsson Comprehensive Cancer Center, Cousins Center for Psychoneuroimmunology, and Department of Psychiatry and Biobehavioral Sciences, University of California, Los Angeles; Karen L. Weihs, University of Arizona Cancer Center, Department of Psychiatry, University of Arizona.

**Conclusions:** Changes in distinct cancer-related coping profiles are related to the level of and changes in depressive and physical symptoms. Early intervention to increase approach-oriented coping strategies could yield favorable outcomes.

### Keywords

coping; cancer; depression; physical symptoms; profiles

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## Introduction

How people cope with chronic stressors influences long-term quality of life (Taylor & Stanton, 2007). Coping strategies can be organized within higher-order classifications reflecting more general approach- and avoidance-directed motivational systems (e.g., Stanton et al., 2000; Tobin et al., 1989). In individuals with chronic illness, approach-oriented coping focused on actively approaching the stressor (e.g., seeking social support, problem solving, active acceptance) is often linked to positive physical and mental health outcomes, although findings are not entirely consistent (e.g., Dunkel-Schetter et al., 1992; Heim et al., 1997). Coping processes focused on avoiding the stressor (e.g., denial, behavioral disengagement), reliably predict poorer adjustment (Carver et al., 1993; Duangdao & Roesch, 2008; Holahan et al., 2005). The risk conferred by avoidant coping on symptom burden remains after accounting for dispositional emotion-related tendencies, such as nonacceptance of feeling upset or acceptance of feelings more generally (Bauer et al., 2016). In studies of adults with cancer, the relationship between approach-oriented and avoidance-oriented coping varies, with no significant relationships observed in some studies (Bauer et al., 2016; Bright & Stanton, 2018) and small-to-modest positive relationships in others (Hoyt, Thomas, Epstein, & Dirksen, 2009; Moreno et al., 2016).

Such findings, primarily derived from variable-centered methods (i.e., assessing associations among variables across individuals) as opposed to person-centered methods (i.e., finding relationships among individuals across variables) (Magnusson, 2003; Muthen & Muthen, 2000), have advanced the understanding of coping and well-being in cancer survivors. Yet, the isolated effects of specific coping strategies or higher-order coping domains on outcomes do not capture the heterogeneity in simultaneous use of multiple coping strategies (e.g., Folkman & Lazarus, 1980; Stone & Neale, 1984), which may be more ecologically valid (Dunkel-Schetter et al., 1992). Whether patterns of coping are maintained or altered across time is unknown, as is whether transitions in coping profiles are related to psychological and physical symptom outcomes. Primary goals of this study were to (1) illuminate the combinations of women's cancer-related coping strategies over the year after cancer diagnosis and (2) examine change or maintenance of coping profiles that exacerbate or reduce depressive and physical symptom burden.

### The Nature of Coping Profiles in Cancer Survivors

Studies using person-centered methods to examine coping profiles in cancer survivors (Cheng et al., 2019; Hack & Degner, 1999, 2004; Hamilton et al., 2011; Li et al., 2017; Luszczynska et al., 2007; Roussi et al., 2007; Shapiro et al., 1997) have primarily used cluster analysis. Only two studies used latent profile analysis (Cheng et al., 2019; Li et al.,

2017), a model-based approach using probabilistic membership assignment (Ruscio & Ruscio, 2008; Vermunt & Magidson, 2002). Person-centered methods typically yield two to four coping profiles with various combinations of: primarily avoidance-oriented, primarily approach-oriented, approach-avoidance hybrid, low overall coping, and primarily acceptance-focused coping. The most prevalent profiles are approach-oriented or acceptance-focused, which are associated with lower concurrent psychological distress than are primarily avoidant or hybrid coping profiles (Hack & Degner, 1999; Li et al., 2017; Luszczynska et al., 2007; Shapiro et al., 1997). The acceptance-focused coping profile appears more common in older adults than do hybrid or avoidance-oriented profiles (Luszczynska et al., 2007); cancer survivors who cope primarily through acceptance also report the lowest concurrent distress compared to those seeking social support and venting emotions or reporting low levels of coping overall (Roussi et al., 2007).

Dispositional emotion-related tendencies (e.g., acceptance/nonacceptance of emotions) also likely guide multifaceted coping in cancer, in that they predict situational coping (Moreno et al., 2016) and bothersome physical symptoms in cancer (Bauer et al., 2016). Additionally, emotional approach coping (i.e., actively processing and expressing one's emotions) predicts health benefits in cancer (Stanton et al., 2000). Yet, no coping profile research has included emotional approach coping strategies or considered the influence of dispositional emotion-related tendencies. This study addresses these gaps by including emotional approach coping in uncovering cancer-related coping profiles longitudinally, examining dispositional emotion-related tendencies across the types of coping profile transitions, and prospectively examining depressive and physical symptom outcomes.

### **Coping Profile Stability and Transition**

Theoretically, coping processes are expected to vary over time as a function of the changing demands of the stressor (Lazarus & Folkman, 1984). In the first year following cancer diagnosis, the beginning and end of primary oncologic treatment likely change coping demands, particularly after oncologic treatment is complete, when structural support is reduced (Stanton et al., 2005). To evaluate shifts in coping, examining coping profile transition probabilities across multiple time points is appropriate, but rare. To our knowledge, only two studies have used latent transition analysis. In a study of French athletes before and after a competition (Martinent & Nicolas, 2016), approximately half transitioned from their initial coping profiles to another profile after the competition stress, and others had stable, predominantly approach-oriented coping or low overall coping profiles. In adolescents coping with discrimination over three years, in which resolution of the stressor is less clear, relatively fewer participants transitioned from their initial coping profile to another profile (McDermott et al., 2018). These two studies suggest that the nature and duration of the stressor influences whether coping profiles change. A study of adaptation profiles (i.e., coping, posttraumatic growth, depression, PTSD) in breast cancer survivors after the year following diagnosis also supports the hypothesis that transitions depend on the stressor's context (Pat-Horenczyk et al., 2016). Adaptation profiles were most stable 2-3 years following diagnosis, being further removed from the onset of cancer-related stress and the offset of oncologic treatments.

Variable-centered studies with multiple assessments also provide some evidence about change in coping profiles. On average, the use of most coping strategies declines following diagnosis into survivorship (e.g., Stanton et al., 2018), with some strategies maintained at a high level or increased (e.g., acceptance (Heim et al., 1993; Stanton et al., 2018)).

Accordingly, we expected coping processes to decline as women moved into survivorship following primary oncologic treatment, but coping through acceptance to remain stable or to increase.

### **Juxtaposing Coping Profiles with Cancer-related Symptoms Across Time**

Understanding the relevance of coping profiles for psychological and physical symptoms is important for identifying malleable psychosocial intervention targets. Increases in approach-oriented coping strategies predict recovery from depressive symptoms (present sample; Stanton, et al., 2018) and mediate the improvement in symptoms and quality of life resulting from early palliative care (Greer et al., 2018). Accordingly, maintaining relatively high levels of increasing in approach-oriented coping were hypothesized to predict a reduction in cancer-related symptoms. Although cancer- and treatment-related symptoms often co-occur, longitudinal, person-centered analyses show that psychological and physical functioning trajectories do not entirely overlap in breast cancer (Helgeson et al., 2004), and specific coping strategies are associated differentially with psychological and physical well-being in chronic illness (Moskowitz et al., 2009). As such, to develop a better understanding of the heterogeneity in cancer patients' multifaceted coping and symptoms over time, this study examined coping transition patterns with primarily psychological (i.e., depressive symptoms measured by the CES-D) and primarily physical<sup>1</sup> (i.e., pain, fatigue, insomnia) symptoms separately.

Based on prior findings, we expected to find: (a) two or more distinct profiles of cancer-related coping at each assessment, resembling coping profiles in the literature (e.g., primarily approach- or avoidance-oriented, hybrid, acceptance-focused, low overall); (b) that some women maintain primarily approach-oriented coping profiles regardless of oncologic treatment timing, and other women alter their coping profile following oncologic treatment; and (c) that women consistently high in or increasing their use of multiple approach-oriented strategies across time would have more favorable depressive and physical symptom outcomes. As a step toward identifying predictors of coping profile transition patterns, we conducted an exploratory examination of demographics, cancer-related treatment variables, and dispositional emotion-related tendencies; women with greater dispositional acceptance of and lower nonacceptance of emotions were expected to maintain higher levels of or increase emotional approach coping in their profiles across time.

## **Methods**

### **Participants**

Following Institutional Review Board approval, women recently diagnosed with invasive breast cancer were recruited from three oncology clinics in California and Arizona to

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<sup>1</sup>As often conceptualized for evaluating quality of life in cancer survivors (e.g., Burkett & Cleeland, 2007; Dow et al., 1996)

participate in the My Year After (MYA) cancer study. Women were eligible if they had a new or initially recurrent invasive breast cancer diagnosis, enrolled within 4 months after diagnosis, received any standard oncologic treatment, and were comfortable reading/writing in English. Exclusion criteria included insufficient English literacy, younger than 21 years, and diagnosis of current or past bipolar disorder, schizophrenia, and schizoaffective or neurocognitive disorder. As described previously (Bauer et al., 2016, 2017; Harris et al., 2017; Marroquín et al., 2016; Stanton et al., 2015, 2018; Stinesen Kollberg et al., 2018; Weihs et al., 2018), data were self-reported<sup>2</sup>; cancer stage was confirmed via medical chart review.

## Primary Measures

**Cancer-related coping.**—Cancer-related coping processes on the modified 36-item version of the COPE (Carver et al., 1989), with embedded Emotional Approach Coping subscales (Stanton et al., 2000), were the indicators for latent coping profiles at study entry, 3, 6, and 9 months. Participants responded with how they had coped with the breast cancer experience in the past four weeks using a 4-point scale (1 [*I do not do this at all*] to 4 [*I do this a lot*]). Approach-oriented coping subscales comprising Problem-focused (e.g., “I think hard about what steps to take”), Positive reinterpretation (e.g., “I look for something good in what is happening”), Acceptance (e.g., “I accept the reality of the fact that it happened”), Social support (e.g., “I try to get advice from someone about what to do”), Emotional expression (e.g., “I take time to express my emotions”), and Emotional processing (e.g., “I try to understand my feelings”) had adequate reliability across time ( $\alpha$ s = .72-.92). Avoidance-oriented coping subscales assessing Behavioral disengagement (e.g., “I admit to myself that I can’t deal with it, and quit trying”), Mental disengagement (e.g., “I turn to work or other substitute activities to take my mind off things”), and Denial (e.g., “I pretend that it hasn’t really happened”) had lower internal consistency reliability ( $\alpha$ s = .47-.76); therefore, the 12-item avoidance composite was used ( $\alpha$ s = .71-.74). Subscale scores were averaged, with higher scores indicating greater use.

**Depressive symptoms.**—Depressive symptoms were assessed at study entry, 3, 6, 9, and 12 months with the 20-item Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977). Frequency of depressive symptoms in the past week were assessed on a 4-point scale ranging from 0 (*rarely or none of the time*) to 3 (*most or all of the time*), with higher scores indicating greater symptoms ( $\alpha$  = .91-.92). To examine all outcomes at the same assessment points, we used the study entry, 6-month, and 12-month measurements.

**Physical symptoms (pain, fatigue, insomnia).**—A pain-fatigue-insomnia physical symptom composite was created from the 6-item Pain Interference subscale of the Patient-Reported Outcomes Measurement Information System measures (PROMIS; Cella et al., 2010), the 2-item fatigue subscale of the Breast Cancer Prevention Trial Symptom Scales (Stanton et al., 2005), and the 5-item Women’s Health Initiative Insomnia Rating Scale (Levine et al., 2003). For all measures, participants rated items on a 5-point scale to indicate

<sup>2</sup>Demographic (e.g., age, SES, employment status), medical (e.g., weeks since diagnosis), and chronic life stress variables (from the UCLA Life Stress Interview (LSI); Hammen, 1991).

their experience during the past 4 weeks. Internal consistency was high ( $\alpha > .81$ ), and subscales were significantly correlated ( $r = .35-.60$   $ps < .001$ ). To assess whether a symptom composite was statistically indicated, we examined the internal consistency, mean inter-item correlations, and item-total correlations for the 13 items at each assessment. Internal consistency for the composite was high ( $\alpha > .89$ ). All mean inter-item correlations were in the suggested range (i.e.,  $rs = .40-.50$ ) for assessing whether items measure a narrowly-related set of characteristics (Clark & Watson, 1995) and were similar to the range of mean inter-item correlations of extensively validated measures (e.g., Beck et al., 1996). Corrected item-total correlations were above .40 ( $rs = .46$  to  $.78$ ), which is a suggested cut-off for scale construction (Juniper et al., 1997). The three subscales were standardized and summed, a common approach (e.g., Raposa et al., 2014).

**Acceptance/Nonacceptance of emotions.**—Dispositional acceptance/nonacceptance of emotions were assessed at study entry with the 5-item acceptance of emotions subscale from the Control of Feelings Scale (e.g., “*I understand and like my feelings as they are*”; Politi et al, 2007) and the 6-item nonacceptance of emotions subscale of the Difficulties with Emotion Regulation Scale (e.g., “*When I am upset, I feel like I am weak*”; Gratz & Roemer, 2004). Internal consistency reliabilities were  $\alpha = .91$  and  $.85$ , respectively.

## Analyses

Latent Profile Analyses (LPA) were conducted for coping assessments at study entry, 3 months, 6 months, and 9 months. To select the best plausible solution(s) for each assessment point, we prioritized profile interpretability, examined the Vuong-Lo-Mendell-Rubin likelihood ratio test (VLMR LRT) significance, and considered sufficient representation in each profile (i.e., 20 women). Then, to account for violations of local independence, large residual correlations as assessed by Mplus 8.0 TECH 12 were added to the best interpretable profile solution(s), until there were no mixed residual covariances greater than .05, similar to a method for latent class analysis (Asparouhov & Muthén, 2015). Bayesian Information Criterion (BIC) determined whether we would use the model with residual correlations vs. the same number of profiles without residual correlations. Sufficient proportional representation and Bootstrapped Likelihood Ratio Test (BLRT) (Nylund et al., 2007; Tein et al., 2013) also guided the final profile selection between models with residual correlations. Models were run with 100 and 500 random starts to confirm that solutions were not based on local maxima. Next, Latent Transition Analysis (LTA) was performed using the three-step method (Asparouhov & Muthén, 2014; Nylund-Gibson et al., 2014), incorporating the previously-finalized number of profiles and residual correlations. Results from the Step 3 LTA directed the mover-stayer LTA model specification. The most likely latent class transition patterns from the LTA provided hypothesized transition probabilities that were specified in the mover-stayer LTA to estimate latent classes of coping profile transitions in addition to overall transition probabilities (Kaplan, 2008; “LTA with movers-stayers,” 2011).

The resulting coping profile transition latent classification was used in two separate multilevel models to assess change in the CES-D and physical symptom composite over 12 months. The 5 (coping transition groups) X 3 (Time: study entry, 6 months, 12 months) multilevel models were analyzed in Stata using restricted maximum likelihood (REML)



estimation. Time was analyzed as a level 1 predictor and coping transition group as a level 2 predictor. Contrast codes assessed change in symptoms from study entry to one year (Aiken & West, 1991).

## Results

### Sample Characteristics

Of the 460 women, most participants were non-Hispanic white (68%) and recruited from California clinics (65%). On average, women had been diagnosed two months prior to study entry; most had received a primary diagnosis of non-metastatic cancer (84%) and had Stage 0–II disease (83%). The most common oncologic treatments were surgery (91%), aromatase inhibitors/endocrine antagonists (64%), and chemotherapy (53%). The mean time of completion of primary oncologic treatments (i.e., surgery, radiation, chemotherapy) was 3.89 months from study entry ( $SD = 2.94$  months). Additional sample characteristics are presented in Table 1.

### Latent Profiles of Cancer-related Coping

Three coping profiles emerged at study entry, then two profiles at subsequent assessment points (Appendix A). Avoidance-oriented coping was low in all profiles. Coping profiles were labeled by their overall level of approach-oriented coping endorsement relative to the other coping profile(s) within each assessment point (Figure 1). At study entry: Highest Approach, Moderate Approach, Lowest Approach; and at three, six, and nine months: High-Moderate Approach, Lower Approach. The High-Moderate Approach and Lower Approach Coping profiles at three and six months were very similar in shape. At all assessments, coping profiles with high-moderate levels of approach-oriented coping were most prevalent. Acceptance of having cancer was the most highly endorsed approach-oriented coping strategy for all profiles across time, except for the Lower Approach profile at nine months (Figure 1).

### Coping Profile Transitions and Study Entry Characteristics

Appendix B shows the latent transition probabilities of moving from one to another coping profile between each assessment point. Particularly those participants in the Highest Approach coping profile at study entry had a high probability of staying in the High-Moderate Approach coping profile, with the highest comparative level of overall approach-oriented coping across time. Women in the Lowest Approach coping profile at study entry also had a high probability of staying in a similarly shaped profile, except at nine months when they were likely to increase all approach-oriented coping strategies. Highest-Approach copers at study entry had a low probability of transitioning to the Lower-Approach profile at three months, and vice versa. Women in the Moderate-Approach coping profile at study entry had a slightly greater probability to shift into the Moderate-High Approach coping profile at three months than into the Lower-Approach profile. Overall, the most probable points of transition into less similar coping profiles at the next assessment point occurred from study entry to three months as well as from six months to nine months (Figure 2, Appendix B). The most probable period of coping profile stability occurred from three to six months.



Latent modeling yielded five coping profile transition groups (Figure 2, see Appendix C for all latent class transition patterns). Study entry attributes (i.e., demographics, cancer-related variables, dispositional acceptance/nonacceptance of emotion) that differed significantly among the coping profile transition groups are also outlined below (Table 1 contains *p*-values).

**“Consistently Higher Maintainers” (48%).**—This pattern was the most frequent and indicates relatively stable coping across time in that acceptance remained at the same highest level of use. Positive reinterpretation remained the next most frequently used strategy. All other approach-oriented strategies were maintained at a moderate-high level over time until nine months, after the completion of primary oncologic treatments, when moderate use was evident.

At study entry, this group was the youngest of all transition groups ( $p < .001$ ), likely to be employed and the lowest proportion retired, lowest on chronic interpersonal stress, highest on having started chemotherapy, and highest on acceptance of emotions.

**“Early Increase Maintainers” (19%).**—This group began with moderate levels of approach-oriented strategies, transitioning to moderate-high use before the average endpoint of primary oncologic treatments ( $M = 3.89$  months). Similar to the Consistently High Maintainers, the most frequently used strategies were acceptance and positive reinterpretation.

At study entry, this group was the highest on medical comorbidities, nonacceptance of emotions, and depressive symptoms (above the clinical cutoff of 16). Although not significantly different in age compared to the Consistently Higher Maintainers, they had significantly more chronic interpersonal stress, lower acceptance of emotions, and higher nonacceptance of emotions. They also had the earliest average endpoint of primary oncologic treatment.

**“Primarily Accepting Copers” (10%).**—This group primarily used cancer-related acceptance. Very little approach-oriented coping was evident at study entry, except for moderate-high acceptance and low-moderate seeking social support. Positive reinterpretation and emotional approach increased slightly to a low-moderate level up to 6 months. At 9 months, approach-oriented coping increased to a moderate-high level, and acceptance remained high.

At study entry, this group was the oldest, had the highest proportion of retirees, was most likely to have had surgery, and was lowest in acceptance of emotions. Compared to the Consistently Higher Maintainers, this group had significantly more chronic interpersonal stress and medical comorbidities, lower likelihood of chemotherapy, and lower acceptance of emotions.

**“End Higher Copers” (19%).**—This group’s transition patterns suggest that women started with a high or moderate level of approach-oriented coping that decreased to a low level—except for acceptance which remained high—prior to or shortly after primary

oncologic treatments. At nine months when most women had completed primary oncologic treatment, approach-oriented coping processes again increased to a high-moderate level.

At study entry, this group was least likely to have had chemotherapy and lowest on depressive symptoms. Compared to the Consistently Higher Maintainers, the group was older, had more chronic interpersonal stress, more surgery, and lower acceptance of emotions.

**“End Low Copers” (4%).**—This coping transition type was the least frequent and was unique in their decline in coping through acceptance at nine months (compared to all other groups who maintained or increased in acceptance), along with a decrease in all other approach-oriented coping strategies to a low level. The coping profiles at study entry and 3 months reflected predominantly moderate-high use of approach-oriented coping, while the coping profile at 9 months involved low use of approach-oriented coping processes (see Appendix C).

Compared to the Consistently Higher Maintainers, no study entry characteristic differed significantly; the group had lower emotional nonacceptance than Early Increase Maintainers.

### Coping Profile Transition Types and Symptoms

Multilevel modeling revealed differences in symptom change across the five coping transition groups (see Table 2 and Figure 3), with the Consistently Higher Maintainers as the reference group based on being the largest group and hypotheses that consistently high use of multiple approach-oriented coping would relate to favorable symptom outcomes, in addition to being the only group not including women who increased their use of multiple approach-oriented coping.

**Depressive Symptoms.**—At study entry, Early Increase Maintainers had significantly higher depressive symptoms than Consistently Higher Maintainers ( $b = 3.09 [0.52, 5.66]$ ), but had a significantly steeper negative slope than Consistently Higher Maintainers ( $b = -4.26 [-7.24, -1.28]$ ). Depressive symptoms declined significantly in all coping transition groups, such that the groups did not differ significantly at 12 months.

**Physical Symptoms (Pain-Fatigue-Insomnia Composite).**—At study entry, Primarily Accepting Copers were significantly lower on physical symptoms compared to Consistently Higher Maintainers ( $b = 1.12 [0.28, 1.96]$ ). Coping transition groups had relatively stable physical symptoms over 12 months, with the exception of the Primarily Accepting Copers, who evidenced a significant increase in physical symptoms ( $b = 1.16 [0.24, 2.09]$ ). The groups did not differ significantly at 12 months.

## Discussion

This study of 460 women recently diagnosed with breast cancer and followed for one year is the first to: (a) use person-centered latent modeling across more than two assessments to uncover profiles of multifaceted coping, (b) describe whether and how women with breast cancer alter their cancer-related coping processes, and (c) examine the relations of coping

profile transition patterns with depressive and physical symptoms over time. As hypothesized, at least two distinct profiles of cancer-related coping were evident at each assessment point. Overall, coping profiles demonstrated that women face cancer using a constellation of approach-oriented coping processes, similar to prior findings (e.g., Dunkel-Schetter et al., 1992). No coping profile was predominantly avoidance-oriented. Nearly all coping profiles were highest on acceptance, similar to prior research (Heim et al., 1993). The exception was one profile indicating low use of all coping processes, which characterized only 20 women at nine months, when most had completed primary oncologic treatments. Consistent with Lazarus and Folkman's (1984) contention that coping declines once the stressor is resolved, the completion of primary oncologic treatment might signal a period of resolution.

The latent transition probabilities showed that most women's coping profiles involved maintaining a high-moderate use of approach-oriented coping or increasing the use of approach-oriented coping, particularly at nine months after study entry—the re-entry phase (Mullan, 1984) for a majority of women. Women with lower approach-oriented coping profiles were likely to increase all approach-oriented coping to a high-moderate level. This pattern might reflect an adaptive response to the oft-reduced interpersonal support that is structurally present during primary oncologic treatment (Stanton et al., 2005), and it may also suggest that more coping strategies are incorporated into repertoires over time (Carver et al., 1989; Holahan et al., 1996; Kling et al., 1997).

Across the coping profile transition groups, approximately half the participants maintained high to high-moderate levels of all approach-oriented strategies, including positive reinterpretation, acceptance, emotional expression, and emotional processing. These “Consistently Higher Maintainers” most closely resembled a trait-like pattern of coping. In contrast, other coping profile transition groups evidenced more state-like coping, engaging in lower levels of coping at specific assessment points corresponding to changing psychosocial contexts across clinically important periods (e.g., during primary oncologic treatment, maintenance/re-entry phase (Mullan, 1984)).

We also examined what distinguishes women with more trait-like vs. more state-like coping profile transitions. The transition groups did not differ significantly on most study entry characteristics including demographic variables (e.g., race/ethnicity, SES), medical variables (e.g., time since diagnosis, cancer stage), and chronic non-interpersonal stress. Instead, specific predisposing factors appear to influence initial coping, as well as how coping changes. For the most trait-like Consistently Higher Maintainers, who began with and largely maintained a high level of multifaceted coping, pre-existing tendencies to approach emotions as well as being younger and employed may have prompted use of approach-oriented coping strategies shortly after diagnosis. The most prevalent daily hassles for younger populations are related to finances and work (Folkman et al., 1987), and with the added stress of cancer, maintaining high-moderate levels of approach-oriented coping could be important for responding to life's demands. The “Early Increase Maintainers” were also relatively young and employed, but were lower on pre-existing tendencies to approach emotions and had greater chronic interpersonal stress, as well as more comorbid medical problems. These women began with a somewhat lower (moderate) level of multifaceted

coping, but increased coping processes to mirror the Consistently Higher Maintainers' pattern at three months. Perhaps emotion regulatory predispositions prompt an initial starting point for coping, but other developmental contextual factors catalyze change in coping.

Another example of how predisposing factors and context influences coping over time is the observation that the "Primarily Accepting Copers" differed from the Early Increase Maintainers in their older age, retired status, and lower nonacceptance of negative emotions. The distinct developmental context might have set the stage for coping variation despite other similar psychosocial characteristics. Cancer becomes more normative with age and might render acceptance-oriented coping more likely, especially when one's emotion regulatory disposition is to be less reactive to emotions resulting from stressful situations.

Regarding patterns of coping profile transitions predicting depressive and physical symptoms, all coping profile transition groups showed improvement in depressive symptoms at 1 year after study entry. Hypotheses were partially supported, in that the Consistently Higher Maintainers had favorable depressive and physical symptom outcomes, but so did other women as long as they were moderate to high in their use of multiple approach-oriented coping at study entry or 3 months (Figure 2 and Appendix C). Although causality cannot be inferred, results support prior findings in this sample that higher or increased approach-oriented coping is generally beneficial for depressive symptoms (Stanton et al., 2018). The data from this study add to prior results examining averaged isolated effects of coping strategies across the sample, by demonstrating how the constellations of coping strategies varied for women engaging in higher or increased approach-oriented coping to benefit depressive symptoms. Participants who remained high-moderate across all approach-oriented strategies over time, those who increased all approach-oriented coping strategies, those who only used a high-moderate level of cancer-related acceptance over time, those who shifted between collectively high-moderate levels and lower levels of approach-oriented coping, had the commonality of incorporating higher levels of or increased approach-oriented coping. Furthermore, by examining this variation among women in the sample, this study potentially suggests an optimal timepoint to facilitate approach-oriented coping. Specifically, intervening with women soon after diagnosis, prior to the end of primary oncologic treatment, might be especially beneficial in that the largest reduction in depressive symptoms was observed for women with an early increase in all approach-oriented strategies that then was maintained at a high-moderate level.

The benefits of early or increased approach-oriented coping did not extend to physical symptoms, however. All transition groups, except the group maintaining primarily acceptance-focused coping, were unchanged in physical symptoms at one year. It was unexpected that women with primarily acceptance-focused coping (i.e., sustaining lower levels of other approach-oriented coping strategies including emotional processing until nine months after study entry) had an increase in physical symptoms at 12 months, despite starting with the lowest level of physical symptoms at study entry. Interestingly, these Primarily Accepting Copers experienced an increase in physical symptoms despite a reduction in depressive symptoms. These findings held in a post-hoc analysis without the somatic component of the CES-D; CES-D subdomain analysis suggested that women's

decrease in depressive symptoms were primarily driven by depressed mood. Emotional processing is negatively associated with inflammatory biomarkers in cancer survivors (Hoyt et al., 2013) and lower levels of emotional approach coping following diagnosis may contribute to inflammatory signaling related to specific physical symptoms (Bower et al., 2011) rather than depressed mood. Alternatively, Primarily Accepting Copers aligned their coping over time with their initial characteristics (i.e., lower cancer-related emotional approach coping and lowest acceptance of emotions), and perhaps persistently lower emotional approach coping from diagnosis through primary treatments suggests a continued low acceptance of emotions, which is associated with persisting physical symptoms, even when proinflammatory cytokines are low (Reed et al., 2017). In sum, earlier approach-oriented coping, including emotional approach, appears important for physical symptom management. Moreover, a mismatched but increased use of approach-oriented strategies, including emotional approach, appears important for physical symptoms in women low on dispositional emotion-related tendencies. In fact, Early-Increase Maintainers, who were low on dispositional emotion-related tendencies (with low acceptance of emotions similar to Primarily Accepting Copers) yet increased approach-oriented coping early, evidenced the largest reduction in depressive symptoms and no worsening in physical symptoms. Less multifaceted approach-oriented coping may be iatrogenic for physical symptoms. This finding is consistent with stoic acceptance coping being associated with poorer breast cancer outcomes (S. Greer et al., 1979). Research is needed to understand why a primary focus on accepting the cancer experience is unfavorable.

Regarding study limitations, findings are specific to the experience of breast cancer, and research is required to generalize to individuals with other cancers or chronic illnesses. Studies of men may find a different combination of profiles, with more avoidance-elevated profiles (e.g., Herres, 2015). Although the sample included 19% Latinas, it is possible that coping profiles, transitions and symptom implications would vary in more diverse samples, particularly when including culturally-relevant coping strategies in coping profiles (e.g., “church family support”, “being strong for others”; Hamilton et al., 2011). Furthermore, statistical power for profile analyses is variable and relies on factors unknown a priori, such as separation of indicators. This study’s findings can be viewed as only one possible solution; a greater number of profiles and transition types might be uncovered during the first year after breast cancer diagnosis with a larger sample size and more profile indicators. Finally, women’s appraisals of the cancer as a stressor over time were not assessed in of this study. Future research would benefit from such measurements to evaluate coping profile transitions in relation to variations in appraisals of the cancer experience over time.

## Conclusions

This study demonstrates the multifaceted nature of coping over time during the experience of a profound stressor, breast cancer. Findings suggest the importance of considering dispositional emotion-related tendencies and psychosocial contexts at breast cancer diagnosis, in that they may differentiate initial and continued patterns of coping through the completion of primary oncologic treatments. Clinically, the early period following diagnosis is critical for interventions to address depressive and physical symptoms. Lower levels of approach-oriented coping during this early period appears to be detrimental for physical

symptoms, as does a narrow emphasis on cancer-related acceptance. Rather, an early increase and maintenance of multifaceted approach-oriented coping (e.g., emotional processing) appears beneficial in the long-term, especially for women with clinical levels of depressive symptoms following diagnosis and high dispositional nonacceptance of emotions. Early interventions that increase levels of emotional acceptance or emotional approach strategies, such as ACT (Hayes et al., 2011) or Barlow's Unified Protocol (Farchione et al., 2012; Sauer-Zavala et al., 2012) are promising in the context of cancer (e.g., Fashler et al., 2018; Mosher et al., 2018; Weihs et al., 2019).

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## Appendix

### Appendix A

Fit Parameters for Latent Profile Analysis of Cancer-specific Coping Strategies

Assessment Period	K	Param.	Log-Likelihood	BIC	VLMR LRT	BLRT	Smallest Profile	
							%	n
Study entry	2	22	-2674.544	5483.590	<.001	<.001	33	151
	3	30	-2560.309	5304.028	<.01	<.001	18	80
	4	38	-2527.293	5286.906	>.05	<.001	10	46
	<b>3<sup>RC</sup></b>	32	-2517.890	<b>5231.419</b>	>.05	<b>&lt;.001</b>	14	<b>63</b>
3 months	2	22	-2302.324	4735.734	<.001	<.001	30	118
	3	30	-2186.276	4551.304	<.01	<.001	17	65
	4	38	-2150.649	4527.718	>.05	<.001	1	5
	<b>2<sup>RC</sup></b>	31	-2129.200	<b>4443.111</b>	<.01	<b>&lt;.001</b>	26	<b>99</b>
	3 <sup>RC</sup>	35	-2121.789	4458.046	<.01	<.001	16	63
6 months	2	22	-2322.464	4775.841	<.001	<.001	38	146
	3	30	-2225.087	4628.694	>.05	<.001	19	72
	4	38	-2163.210	4552.545	>.05	<.001	3	12
	<b>2<sup>RC</sup></b>	31	-2149.178	<b>4482.827</b>	<.001	<b>&lt;.001</b>	35	<b>134</b>
	3 <sup>RC</sup>	39	-2155.621	4405.594	>.05	<.001	3	12
9 months	2	22	-2412.348	4955.667	<.001	<.001	42	161
	3	30	-2300.470	4779.536	<.01	<.001	18	71
	4	38	-2237.819	4701.862	>.05	<.001	3	13
	<b>2<sup>RC</sup></b>	36	-2150.939	<b>4516.194</b>	.08	<b>&lt;.001</b>	6	<b>24</b>
	3 <sup>RC</sup>	32	-2263.570	4711.551	<.01	<.001	17	60

*Note.* Final selected profile solutions are bolded. The 4 profile solution at study entry was not clearly interpretable in contrast to the 3 profile solution, therefore was not considered in further steps. K = number of profiles modeled. Param. =

number of parameters.  $RC$  including highest residual correlations. BIC = Bayesian Information criterion. VLMR LRT = Vuong-Lo-Mendell-Rubin likelihood ratio test. BLRT = bootstrapped likelihood ratio test.

**Appendix B**

Latent Transition Probabilities for Coping Profiles Across Timepoints

to 3 months		
From study entry	High-Moderate Approach (HM)	Lower Approach (L)
Highest Approach (H)	<b>.940</b>	.060
Moderate Approach (M)	.551	.449
Lowest Approach (L)	.082	<b>.918</b>
to 6 months		
From 3 months	High-Moderate Approach (HM)	Lower Approach (L)
High-Moderate Approach (HM)	<b>.897</b>	.103
Lower Approach (L)	.036	<b>.964</b>
to 9 months		
From 6 months	High-Moderate Approach (HM)	Lower Approach (L)
High-Moderate Approach (HM)	<b>.970</b>	.030
Lower Approach (L)	.896	<b>.104</b>

*Note.* Probabilities of staying in a coping profile with a similar within-time comparative level of overall approach-oriented coping at the next assessment point are bolded (i.e., Highest (H)/ High-Moderate (HM) and Lowest (L)/ Lower (L)). Probabilities of transitioning to a less similar coping profile at the next assessment point are un-bolded.

**Appendix C**

Counts and Proportions for the Coping Profile Transition Latent Class Patterns

Coping Transition Latent Class	Class <i>n</i>	Class proportion	Coping Profile Transition Pattern				Pattern <i>n</i>	Pattern Proportion
			Study entry	3 months	6 months	9 months		
1: Consistently Higher Maintainers	219	.48	3 (H)	2 (HM)	2 (HM)	2 (HM)	219	.4792
2: Early Increase Maintainers	86	.19	2 (M)	2 (HM)	2 (HM)	2 (HM)	86	.1882
3: Primarily Accepting Copers	46	.11	1 (L)	1 (L)	1 (L)	2 (HM)	46	.1006
4: End Higher Copers	86	.19	3 (H)	2 (HM)	1 (L)	2 (HM)	36	.0788
			2 (M)	1 (L)	1 (L)	2 (HM)	34	.0744
			3 (H)	1 (L)	1 (L)	2 (HM)	14	.0306
			2 (M)	2 (HM)	1 (L)	2 (HM)	2	.0044
5: End Low Copers	20	.04	2 (M)	1 (L)	1 (L)	1 (L)	7	.0154
			3 (H)	2 (HM)	2 (HM)	1 (L)	4	.0087
			3 (H)	2 (HM)	1 (L)	1 (L)	2	.0044
			1 (L)	2 (HM)	1 (L)	1 (L)	2	.0044
			1 (L)	2 (HM)	2 (HM)	1 (L)	2	.0044
			3 (H)	1 (L)	2 (HM)	1 (L)	1	.0022
			2 (M)	2 (HM)	1 (L)	1 (L)	1	.0022
			2 (M)	1 (L)	2 (HM)	1 (L)	1	.0022



*Note.* At study entry: 1 = Lowest Approach coping profile, 2 = Moderate Approach coping profile, 3 = Highest Approach coping profile.

At 3, 6, 9 months: 1 = Lower Approach coping profile, 2 = High-Moderate Approach coping profile.

Entropy for this mover-stayer LTA was 0.88. Corresponding shorthand for within-time comparative level of overall approach-oriented coping also shown (H = Highest, HM = High-Moderate, M = Moderate, L = Lowest/Lower).

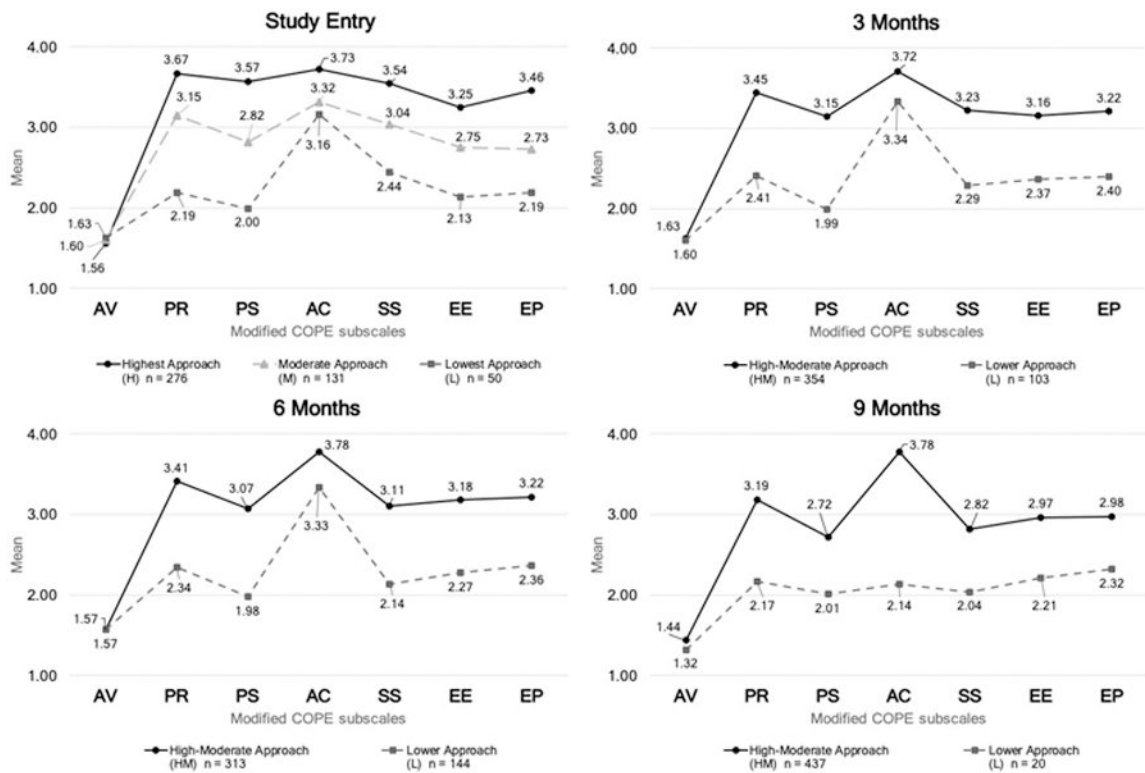
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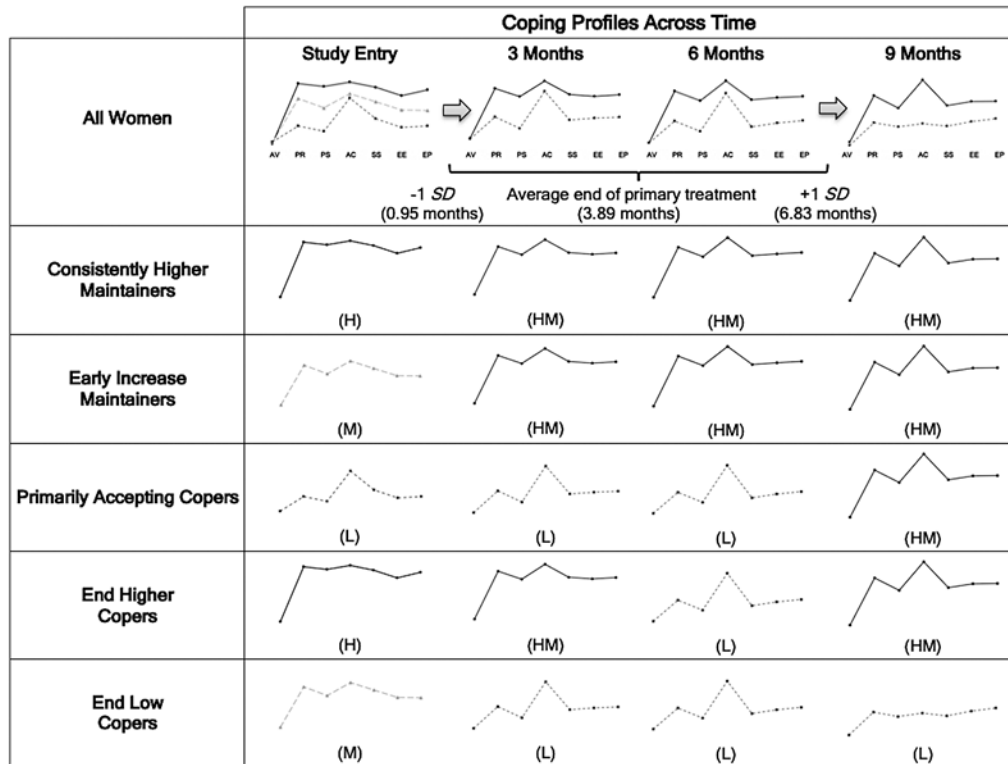
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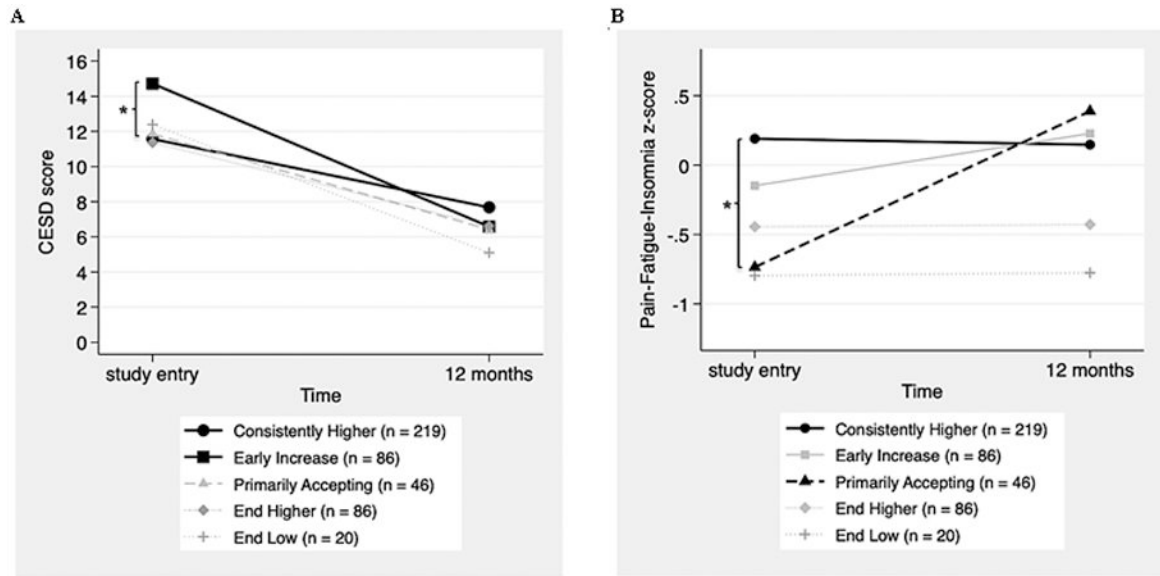


**Figure 1. Estimated Means for Latent Profiles of Coping**  
 Note. AV = Avoidance, PR = Positive reinterpretation, PS = Problem-solving, AC = Acceptance, SS = Social support, EE = Emotional expression, EP = Emotional processing



**Figure 2. Coping Profile Transition Types (Classes) Across Time**

Note. Arrows indicate most probable points of transitioning to less similar coping profiles (see Appendix B). Highest proportion latent coping profile transition pattern in each class shown (see Appendix C). Corresponding coping profile shorthand for within-time comparative level of overall approach-oriented coping also shown (H = Highest, HM = High-Moderate, M = Moderate, L = Lowest/Lower). AV = Avoidance, PR = Positive reinterpretation, PS = Problem-solving, AC = Acceptance, SS = Social support, EE = Emotional expression, EP = Emotional processing.



**Figure 3. Predicted Depressive (A) and Physical (B) Symptom Scores by Coping Profile Transition Type**

Note. \* $p < .05$  for study entry symptom score; significantly different slopes in black.



Study Entry Characteristics

Table 1

Variables	Overall N = 460	Coping Profile Transition Types					p-value
		Consistently Higher Maintainers n = 219	Early Increase Maintainers n = 86	Primarily Accepting Copers n = 46	End Higher Copers n = 86	End Low Copers n = 20	
Age	56.35 (12.59)	<b>54.06</b> (11.64) <sup>ab</sup>	56.67 (12.79) <sup>c</sup>	<b>62.76</b> (13.41) <sup>ac</sup>	58.31 (12.40) <sup>b</sup>	55.93 (14.16)	<.001
Race/Ethnicity							.100
Non-Latina	80.88%	78.24%	79.07%	86.96%	88.24%	70.00%	
Latina	19.12%	21.76%	20.93%	13.04%	11.76%	30.00%	
Married/living as married	67.03%	70.37%	70.93%	60.87%	72.94%	60.00%	.583
Number of children (co-residing)	0.39 (0.49)	0.36 (0.48)	0.42 (0.49)	0.46 (0.50)	0.41 (0.49)	0.30 (0.46)	.549
Income							.648
< \$50,000	28.51%	27.96%	28.75%	36.59%	24.69%	35.00%	
\$50,000–\$74,999	22.30%	20.09%	24.42%	17.39%	24.42%	15.00%	
\$75,000–\$100K	13.10%	12.80%	11.25%	19.51%	12.35%	10.00%	
> \$100K	36.09%	38.39%	33.75%	24.39%	37.04%	40.00%	
Education							.066
< 4yrs college	45.15%	42.59%	51.16%	53.33%	41.18%	40.00%	
Bachelor's	36.12%	33.80%	37.21%	37.78%	38.82%	45.00%	
> 4yrs college	18.72%	23.61%	11.63%	8.89%	20.00%	15.00%	
Subjective SES	6.98 (1.56)	7.20 (1.44)	6.92 (1.52)	6.50 (1.95)	6.73 (1.54)	6.97 (1.55)	.071
Employment Status							.025
Employed	52.10%	<b>58.90%</b> <sup>ab</sup>	43.02% <sup>a</sup>	<b>36.96%</b> <sup>b</sup>	47.67%	50.00%	.016
Retired	29.58%	<b>21.86%</b> <sup>abc</sup>	34.88% <sup>a</sup>	<b>46.67%</b> <sup>b</sup>	35.29% <sup>c</sup>	30.00%	.005
Unemployed	18.32%	18.14%	22.09%	15.56%	16.47%	20.00%	.874
Comorbidity count	1.85 (1.88)	1.62 (1.83) <sup>ab</sup>	<b>2.49</b> (2.08) <sup>acd</sup>	2.46 (1.83) <sup>bd</sup>	1.64 (1.73) <sup>ce</sup>	<b>1.33</b> (1.37) <sup>df</sup>	.001
Weeks since Diagnosis	9.12 (3.47)	9.29 (3.52)	8.83 (3.78)	8.57 (3.46)	9.13 (3.23)	9.40 (2.37)	.649
Stage							.390
1	44.44%	41.10%	50.59%	41.30%	51.16%	35.00%	
2	38.78%	40.64%	31.76%	41.30%	38.37%	45.00%	

Variables	Coping Profile Transition Types					p-value
	Overall N = 460	Consistently Higher Maintainers n = 219	Early Increase Maintainers n = 86	Primarily Accepting Copers n = 46	End Higher Copers n = 86	
3	11.33%	12.79%	14.12%	13.04%	4.65%	10.00%
4	5.45%	5.48%	3.53%	4.35%	5.81%	10.00%
Oncologic Treatments Received						
<b>Chemotherapy</b>	41.69%	<b>49.04%</b> <sup>ab</sup>	40.00%	33.33% <sup>a</sup>	<b>30.86%</b> <sup>b</sup>	35.00%
Radiation	7.05%	5.74%	8.14%	6.67%	11.25%	0.00%
<b>Surgery</b>	59.60%	53.24% <sup>ab</sup>	61.63%	<b>76.09%</b> <sup>ac</sup>	67.06% <sup>b</sup>	<b>50.00%</b> <sup>c</sup>
Tamoxifen	15.45%	14.81%	11.63%	19.57%	15.29%	30.00%
Herceptin	15.89%	16.67%	13.95%	21.74%	15.29%	5.00%
<b>Last Primary Oncologic Tx</b> (months since study entry) <sup>‡</sup>	3.89 (2.94)	4.44 (2.91) <sup>ab</sup>	<b>3.06</b> (2.58) <sup>ac</sup>	3.69 (3.29)	3.26 (2.82) <sup>b</sup>	<b>4.67</b> (2.91) <sup>c</sup>
<b>LSI interpersonal</b>	2.22 (0.49)	<b>2.12</b> (0.48) <sup>abc</sup>	2.30 (0.38) <sup>a</sup>	<b>2.33</b> (0.58) <sup>b</sup>	<b>2.33</b> (0.51) <sup>c</sup>	2.29 (0.50)
LSI non-interpersonal	2.28 (0.42)	2.28 (0.44)	2.29 (0.35)	2.33 (0.44)	2.27 (0.41)	2.17 (0.42)
<b>Acceptance of Emotions</b>	72.36 (21.41)	<b>79.58</b> (17.41) <sup>abc</sup>	65.77 (22.40) <sup>ad</sup>	<b>58.60</b> (25.64) <sup>bcd</sup>	68.21 (20.24) <sup>ce</sup>	75.00 (17.55) <sup>df</sup>
<b>Nonacceptance of Emotions</b>	10.49 (4.84)	10.01 (4.32) <sup>a</sup>	<b>12.16</b> (5.49) <sup>abc</sup>	9.67 (3.92) <sup>b</sup>	10.66 (5.60)	<b>9.50</b> (3.96) <sup>c</sup>
<b>CES-D Depression</b>	12.82 (10.63)	11.64 (9.61) <sup>a</sup>	<b>16.40</b> (12.04) <sup>ab</sup>	14.33 (12.12)	<b>11.44</b> (9.81) <sup>b</sup>	12.00 (10.24)
BCPT Fatigue	1.76 (1.10)	1.87 (1.17)	1.77 (1.06)	1.61 (1.08)	1.65 (0.97)	1.40 (0.97)
PROMIS Pain	0.74 (1.04)	2.18 (1.10)	2.12 (0.98)	1.85 (0.88)	1.88 (0.97)	1.86 (1.00)
WHIRS Insomnia	9.27 (5.37)	9.36 (5.23)	9.56 (5.43)	9.89 (5.08)	8.84 (5.62)	7.40 (5.60)

Note. Means and standard deviations or proportions are presented. *p*-values are from a Wald test, pairwise comparisons were conducted only for predictors with a significant overall effect. Groups differing significantly are denoted by the same alphabetic letter, with the highest and lowest values bolded. LSI = UCLA Life Stress Interview; BCPT = Breast Cancer Prevention Trial Symptom Scale; PROMIS = Patient-Reported Outcomes Measurement Information System Pain scale; WHIRS = Women's Health Initiative Insomnia Rating Scale.

<sup>‡</sup>Seven women who did not undergo any primary oncologic treatments (chemotherapy, radiation, surgery) were excluded.

**Table 2****Multilevel Model Estimates for Depressive Symptoms and Pain-Fatigue-Insomnia Symptom Composite**

	<b>Depressive Symptoms b [95% CI]</b>	<b>Pain-Fatigue- Insomnia b [95% CI]</b>
Intercept	2.53 [-5.99, 11.04]	-2.53 [-4.75, -0.32]
Coping Profile Transition Type <sup>a</sup>		
Early Increase Maintainers	<b>3.09 [0.52, 5.66]</b>	-0.36 [-1.02, 0.30]
Primarily Accepting Copers	0.13 [-3.13, 3.38]	<b>-0.98 [-1.81, -0.15]</b>
End Higher Copers	-0.24 [-2.73, 2.25]	-0.65 [-1.28, -0.01]
End Low Copers	0.73 [-3.55, 5.02]	-1.02 [-2.11, 0.08]
Time <sup>b</sup>		
6 months	-1.07 [-2.63, 0.49]	0.00 [-0.37, 0.38]
1 year	<b>-3.88 [-5.45, -2.31]</b>	-0.04 [-0.43, 0.34]
Estimated Slopes, study entry to 12-months		
Consistently Higher Maintainers	<b>-3.88 [-5.45, -2.31]</b>	-0.04 [-0.43, 0.34]
Early Increase Maintainers	<b>-8.14 [-10.68, -5.61]</b>	0.37 [-0.25, 1.00]
Primarily Accepting Copers	<b>-5.45 [-8.86, -2.03]</b>	<b>1.12 [0.28, 1.96]</b>
End Higher Copers	<b>-4.76 [-7.24, -2.27]</b>	0.01 [-0.60, 0.62]
End Low Copers	<b>-7.28 [-12.37, -2.19]</b>	0.02 [-1.23, 1.28]
Slope contrasts, study entry to 12-months		
Early Increase vs. Consistently Higher	<b>-4.26 [-7.24, -1.28]</b>	0.41 [-0.32, 1.15]
Primarily Accepting vs. Consistently Higher	-1.57 [-5.32, 2.19]	<b>1.16 [0.24, 2.09]</b>
End Higher vs. Consistently Higher	-0.88 [-3.81, 2.06]	0.05 [-0.67, 0.77]
End Low vs. Consistently Higher	-3.40 [-8.72, 1.93]	0.07 [-1.25, 1.38]
df	47	47
AIC	6463.05	4093.51
BIC	6690.25	4321.56
Log-Likelihood	-3184.53	-1999.75
Intercept variance	18.42 [13.26, 25.58]	1.41 [1.06, 1.88]
Residual variance	47.23 [42.11, 52.98]	2.86 [2.55, 3.20]

Note. Results presented are unstandardized coefficients and 95% CI in brackets.

<sup>a</sup>Reference category is Consistently Higher Maintainers.

<sup>b</sup>Reference category is week 0 at study entry. Statistically significant ( $p < .05$ ) coefficients are bolded. Models adjusted for demographic, medical, and other known predictive factors including chronic life stress variables. Included variables were: age (centered), Latina vs. non-Latina, marital status, income, education, employment, subjective socioeconomic status, number of children at home, cancer stage, time since diagnosis, assessment interval at which primary oncologic treatments ended (centered), recruitment site, number of comorbidities, ever received chemotherapy, ever received radiation therapy, ever received surgery, and ever on aromatase inhibitors or endocrine antagonists, chronic life stress, acceptance of emotions, and nonacceptance of emotions.