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The Relationship of Cognitive, Emotional, and Interpersonal Factors to Screening and
Health-Promoting Behaviors Among Sisters of Breast Cancer Patients

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
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The Relationship of Cognitive, Emotional, and Interpersonal Factors to Screening and
Health-Promoting Behaviors Among Sisters of Breast Cancer Patients

Sheri Jacobs Hartman

ABSTRACT

While sisters of breast cancer patients are at increased risk for developing breast cancer due to their family cancer history and age, little research with first-degree relatives of cancer patients has focused solely on sisters. To address this issue, the current study examined sisters screening and health behaviors and the predictors of these behaviors. In accordance with the Parallel Processing Theory, the current study assessed the relationship of cognitive and emotional factors to screening and health-promoting behaviors among sisters of breast cancer patients. In addition, this study expanded upon the Parallel Processing Theory by also examining the relationship of interpersonal factors to screening and health-promoting behaviors. One-hundred-twenty sisters of breast cancer patients from 89 different families completed questionnaires assessing perceived risk of breast cancer, perceived response efficacy of mammography, diet, and exercise, breast cancer worry, trait anxiety, involvement in sister's cancer care, satisfaction with the sister relationship, mammography screenings, physical activity, and amount of fruits and vegetables consumed. Findings indicated that cognitive, emotional, and relational factors were significantly related to mammography screenings, but not to diet or exercise. Specifically, response efficacy for mammography screening was positively related to mammography screening; while trait anxiety and involvement in sister's care were

negatively related to mammography screening. Additional analyses indicated that breast cancer worry had a curvilinear relationship with mammography screenings, such that no relationship was seen for women with lower breast cancer worry; for women with higher levels of worry, the greater their worry, the less likely they were to obtain mammography screenings. Breast cancer worry was also found to interact with involvement in care, such that among women less involved in their sister's care, greater breast cancer worry was associated with having fewer mammography screenings. However, for women more involved in their sister's care, greater breast cancer worry was associated with having more mammography screenings. Future research should further assess whether a teachable moment exists related to the family member's cancer diagnosis and treatment during which to encourage the FDR to engage in screening health-promoting behaviors.

Introduction

In 2007, it is estimated that 178,480 women will be diagnosed with breast cancer in the U.S. (American Cancer Society (ACS), 2007). Among women, breast cancer is the second leading cause of cancer deaths (National Cancer Institute (NCI), 2005). Women with a family history of breast cancer have a two to four times increased risk for developing breast cancer (ACS, 2005). Although first-degree relatives (FDRs), such as mothers, sisters, and daughters, are at an increased risk, there are steps they can take to decrease their risk of developing breast cancer and to increase the likelihood of early detection. Sisters of breast cancer patients may perceive themselves to be at a greater risk for breast cancer than a daughter might, since breast cancer risk increases with age and sisters would be closer in age to the patient than a daughter. The purpose of this study is to identify whether cognitive factors (e.g. perceived risk and response efficacy), emotional factors (e.g. cancer worry and trait anxiety), and interpersonal factors (e.g. involvement in care and relationship) are related to engagement in screening and health-promoting behaviors among sisters of breast cancer patients.

The following section will first review risk factors for breast cancer. The next three sections will review the relationship of cognitive, emotional, and interpersonal factors to screening and health-promoting behaviors. Lastly, the application of these relationships within a theoretical perspective will be discussed.

Objective Risk Factors for Breast Cancer

Many factors increase a woman's risk of developing breast cancer. One such factor is having an FDR diagnosed with breast cancer (NCI, 2005). The greater the number of relatives who have been diagnosed with breast cancer, the greater the increase in risk for other relatives. Age is also an important risk factor, with the risk of breast cancer increasing with age and most breast cancers being diagnosed after age 50 (NCI, 2005).

Much of the effort to reduce the morbidity and mortality of breast cancer has focused on early detection. Mammography screenings have been shown to be an effective method of reducing breast cancer mortality for women over 50 years of age (ACS, 2005). The United States Preventive Services Task Force (USPSTF, 2002) recommends that women undergo mammography screenings every other year beginning at age 40. It is particularly important for sisters of breast cancer patients to follow these guidelines due to their increased familial risk as well as increased risk due to age.

While family history and age are risk factors that cannot be changed, there are other risk factors that are modifiable. There is growing evidence that engaging in physical activity can decrease risk of breast cancer (ACS, 2005). Friedenreich, Thune, Brinton, and Albanes (1998) reviewed the relationship between physical activity and breast cancer in 21 articles published from 1985 to 1997. In 15 studies, women who were physically active had a decreased risk of breast cancer compared with inactive women. Four studies found no relationship between physical activity and breast cancer. Two studies found an increased risk of breast cancer with increased physical activity. There is also evidence that diet is related to breast cancer risk (Gandini, Merzenich, Robertson, &

Boyle, 2000). Research has been mixed, but findings from a meta-analysis of 17 studies assessing vegetable consumption and 12 studies assessing fruit consumption suggest that greater vegetable and fruit intake is related to decreased breast cancer risk (Gandini et al., 2000). Therefore, for sisters of breast cancer patients, being physically active and eating a diet high in fruits and vegetables may be important ways to decrease their risk of breast cancer.

Relationship of Cognitive Factors to Screening and Health-Promoting Behaviors

Engaging in screening behaviors is important to the early detection of breast cancer. Many studies have examined the relationship between perceived risk of developing breast cancer and adherence to mammography screening. McCaul, Branstetter, Glasgow, & Schroeder (1996) conducted a meta-analysis of 19 studies published from 1980 to 1994. In 18 of the 19 studies, greater perceived risk was positively related to greater mammography screening with effect sizes for all studies ranging from $r = .00$ to $.43$. Although this relationship was significant, there was only a small average weighted effect size ($r = .16$). A more recent meta-analysis (Katapodi Lee, Facione, and Dodd, 2004) included 13 studies published from 1993 to 2002, in addition to the 19 studies examined by McCaul et al. (1996). The results supported the findings of McCaul et al. (1996); again, greater perceived risk had a small but significant effect on mammography screening ($g = .20$).

One example that illustrates the findings from these meta-analyses is a cross-sectional study of a community sample of healthy women (Aiken, West, Woodward, & Reno, 1994). The 615 participants were 35 years old or older with an average age of 55, the majority were Caucasian, married, and had at least some college education. Self-

report questionnaires were used to assess perceived risk of breast cancer and to classify women as being compliant or noncompliant with the ACS guidelines for mammography screening. Perceived risk was significantly correlated with compliance with the ACS guidelines ($r = .20$). These findings demonstrate the small but significant relationship between perceived risk and mammography screening.

In contrast to screening behaviors, much less research has examined the relationship between perceived risk of breast cancer and health-promoting behaviors such as exercising and consuming a diet high in fruits and vegetables. One such study by Audrain, Schwartz, Herrera, and Goldman (2001) examined variables associated with physical activity in 228 FDRs of breast cancer patients. Higher perceived risk was negatively associated with household/occupational activity, but positively associated with greater leisure activity.

In another study, Lemon et al. (2004) interviewed 600 FDRs of breast cancer patients shortly after their relative's diagnosis and again six months later. In the six months following their relative's diagnosis, 25% of FDRs reported increasing physical activity and 22% reported increasing fruit and vegetable intake. However, perceived risk was not associated with any behavior change. Of these participants, 75% reported that they believed regular exercise decreased the risk of breast cancer by either a lot or a little, and 70% reported that they believed a diet high in fiber or fruits and vegetables decreased the risk of breast cancer. Only the belief that a behavior decreased risk was associated with reported changes in that behavior.

The findings presented by Lemon et al. (2004) suggest the importance of assessing another cognitive variable, response efficacy. Response efficacy refers to

individuals' beliefs that the recommended behavior will effectively reduce a health threat. Extensive research has examined the relationship of response efficacy to behavior change in health and non-health related topics. A meta-analysis of 36 studies (Floyd, Prentice-Dunn, & Rogers, 2000) examined the relationship of response efficacy to intention to perform and/or prior performance of health-related behaviors (e.g., cancer prevention, exercise/diet/healthy lifestyle, AIDS prevention). There was a large mean effect size ($d = .54$) suggesting that there is a strong relationship between response efficacy beliefs about a behavior and engaging in that behavior. Further evidence of this relationship is provided by another meta-analysis (Milne, Sheeran, & Orbell, 2000) of studies assessing health-related detection (e.g., breast self-examination, mammography) or prevention (e.g., exercise, sunscreen use) behaviors. Effect sizes were calculated independently for associations with behavioral intentions, concurrent behaviors, and subsequent behaviors. A significant mean effect size ($p < .001$) was found for 12 studies that assessed the association with behavioral intentions and 6 studies that assessed the association with concurrent behavior. The relationship between response efficacy and subsequent behavior in 4 studies was non-significant ($p > .05$). These findings suggest the important role of the relationship between response efficacy of a behavior and engagement in that behavior.

This review of the literature suggests that perceived risk and response efficacy are factors that may relate to engaging in screening and health promoting behaviors at a cognitive level. The previously reviewed literature consists of samples that vary in terms of family history of cancer, or if the samples were of FDRs, they consisted of mixed groups of FDRs (i.e., mothers, sisters, and daughters). No study has assessed only sisters

of breast cancer patients, a population who may feel particularly vulnerable to breast cancer due to their being more similar in age to the cancer patients than other relatives, such as a daughter or mother.

Relationship of Emotional Factors to Screening and Health-Promoting Behaviors

A review of the literature reveals numerous studies that have examined the relationship of emotional factors to mammography screenings. A meta-analysis of articles published between 1980 and 1994 found six studies that assessed the relationship between worry and screening behaviors (McCaul et al., 1996). The effect sizes in these studies ranged from $r = -.22$ to $.45$, with a significant average weighted effect size of $r = .14$. Due to the considerable heterogeneity of these studies and the small total sample size, further analyses were not conducted. These findings suggest that there is a small but significant relationship between worry and mammography screening.

More recently, Hay, Buckley, & Ostroff (2005) reviewed studies that examined the relationship between cancer worry and mammography screenings in FDRs. Two prospective studies were identified. One study found that greater cancer worry predicted greater adherence to mammography screening in the subsequent year (Diefenbach, Miller, & Daly, 1999). In the other study, the relationship between cancer worry and mammography screenings was positive and approached significance (Lerman et al., 2000). In addition to these prospective studies, eight cross-sectional studies of the relationship of worry to mammography screening were identified. Out of these eight cross-sectional studies, three studies found that cancer worry was positively related to mammography screenings (Bowen, Helems, Powers, & Andersen, 2003; Burnett, Steakley, & Slack, 1999; Stefanek & Wilcox, 1991). One study found a curvilinear

relationship between cancer worry and mammography screenings over the past year with high and low worry associated with less mammography screenings (Anderson, Smith, Meischke, Bowmen, & Urban, 2003). Another study found a positive relationship between worry and mammography screening for women referred by a breast cancer patient or a physician, but a negative relationship for women recruited from a clinic sample (Lerman, Kash, & Stefanek, 1994). The remaining three studies found a negative relationship between cancer worry and mammography screenings (Isaacs et al., 2002; Lerman et al., 1993; Meiser et al., 2000). This more recent review supports the mixed findings of the relationship between cancer worry and mammography screenings previously reported by McCaul et al. (1996).

In contrast to mammography screenings, little attention has been focused on the relationship between emotional factors and diet and exercise. Bowen, Alfano, McGregor, & Anderson (2004) assessed cancer worry, general anxiety, and general depression in 1366 women in the general population. None of these factors were found to predict physical activity. Low-fat diet and servings of fruits and vegetables eaten daily were each evaluated with single item assessments. Cancer worry did not significantly predict diet, but greater general anxiety and depression were significant positive predictors of eating a low-fat diet. None of the three variables was associated with the number of daily fruit and vegetable servings.

Audrain et al. (2001) examined the relationship between emotional factors and physical activity in 228 FDRs of breast cancer patients. Results indicated that higher positive affect and lower negative affect were related to greater overall activity. In addition, women who engaged in a greater amount of leisure physical activity had higher

positive affect than women who engaged in a lower amount of leisure physical activity. Cancer-specific distress was not related to physical activity. These studies suggest a link between general emotions and health-promoting behaviors, but not between emotions specifically related to cancer concerns and health-promoting behaviors.

This review of the literature suggests the importance of assessing general emotions in addition to cancer specific worry. As with the previously discussed research assessing cognitive factors, the participants in these studies varied in terms of familial relationship to the breast cancer patient. No study assessed only sisters of breast cancer patients, a group that has been found to experience greater distress related to their sisters' breast cancer than other FDRs such as mothers and daughters (van Dooren et al., 2005).

Relationship of Interpersonal Factors to Screening and Health-Promoting Behaviors

While there is considerable research that has examined the relationship between cognitive and emotional factors and screening behaviors, no studies could be identified that assessed how interpersonal factors relate to screening and health-promoting behaviors. One study was found that examined the relationship between emotional factors and involvement in sisters' care. Van Dooren et al. (2005) examined cancer-related distress in 347 women who had a mother, sister, grandmother, aunt, or niece with breast cancer. Having a sister with breast cancer was significantly related to higher levels of cancer specific distress. Having other relatives with cancer (e.g. mother) was not significantly related to cancer specific distress. Other data suggests that the underlying mechanism for this finding is that the vast majority of sisters were greatly involved in their sister's care. Specifically, the findings suggest that the greater cancer specific distress experienced by sisters was due to their generally high levels of involvement in

the patients' care. If many sisters are closely involved with their sister's care, it is important to know what impact this involvement has on the sister's engagement in screening and health-promoting behaviors. In the absence of existing literature, one must speculate about the potential mechanisms that implicate interpersonal factors. One such possibility is that having a sister with breast cancer increases the sense of personal vulnerability. This sense of vulnerability combined with the sister's use of a mammogram to detect her breast cancer and/or knowledge about the benefits of mammography screenings, exercise, and a healthy diet, could conceivably encourage women to engage in these screening and health-promoting behaviors. If interpersonal factors influence screening and health-promoting behaviors, then breast cancer patients may play an influential role in encouraging their sisters to obtain mammography screenings and to engage in healthy diet and exercise habits.

Theoretical Perspective

Cognitive factors such as perceived risk and response efficacy are central to several theories of health-protective behaviors such as the Health Belief Model (HBM; Rosenstock, 1960) and Protection Motivation Theory (PMT; Rippetoe & Rogers, 1987). While perceived risk and response efficacy are recognized as important motivating factors, most models of health-protective behavior ignore emotions as a motivating factor (McCaul & Mullens, 2003). One of the few theories to explicitly address the role of emotions as a predictor of health-protective behavior is Leventhal's Parallel Processing Model (Leventhal, Nerenz, & Steele, 1984). This model proposes that a health threat motivates coping with the emotional arousal caused by the threat as well as coping directly with the threat itself to the extent that one has available and effective behavioral

options. That is, people are likely to engage in behaviors that will both decrease the threat and relieve the negative emotion associated with the threat (See Figure 1; Leventhal et al., 1984). Research conducted by McCaul and colleagues over the years suggests that perceived risk and worry contribute independently to engaging in health behaviors, specifically mammography screenings (McCaul et al., 2003). For example, McCaul, Reid, Rathge, and Martinson (1996) conducted a cross-sectional survey of a community sample of 838 women, aged 40 to 75. Results indicated that worry was an independent predictor of mammography screening after controlling for perceived risk and that perceived risk was an independent predictor of mammography screening after controlling for worry. This finding aligns with Leventhal's theory that cognitions and emotions predict behavior along parallel paths.

In accordance with the Parallel Processing Theory, the current study seeks to assess the relationship of cognitive and emotional factors to screening and health-promoting behaviors. This study attempts to expand upon McCaul's research by examining health-behaviors other than mammography screening; specifically, the current study examines diet and exercise. In addition, the current study seeks to expand the Parallel Processing Theory to examine the relationship of interpersonal factors with screening and health-promoting behaviors.

Aims

The goal of the current study was to examine how cognitive, emotional, and interpersonal factors relate to screening and health-promoting behaviors. A secondary aim was to explore whether cognitive and emotional factors each act as a mediator between interpersonal factors and screening and health-promoting behaviors and if this

mediation is moderated by the interpersonal factors (see Figure 2), or if interpersonal factors moderate the relationship between cognitive and emotional factors and screening and health-promoting behaviors (see Figure 3).

Hypotheses

The first set of hypotheses examined the relationship between cognitive factors and screening and health-promoting behaviors.

1. There would be a positive relationship of perceived risk with completion of mammography.
 - It was predicted that greater perceived risk of breast cancer would be positively correlated with adherence to mammography screening guidelines.
2. There would be a positive relationship of response efficacy with completion of mammography.
 - It was predicted that higher scores on the mammography response efficacy scale would be positively correlated with adherence to mammography screening guidelines.
3. There would be a positive relationship of perceived risk with exercise.
 - It was predicted that greater perceived risk of breast cancer would be positively correlated with the total score on the Godin Leisure-Time Exercise Questionnaire (LSI).
4. There would be a positive relationship of response efficacy with exercise.
 - It was predicted that higher scores on the exercise response efficacy scale would be positively correlated with the total score on the LSI.

5. There would be a positive relationship of perceived risk with consumption of fruits and vegetables.
 - It was predicted that greater perceived risk of breast cancer would be positively correlated with the total score on By Meal Screener (BMS).
6. There would be a positive relationship of response efficacy with consumption of fruits and vegetables.
 - It was predicted that higher scores on the diet response efficacy scale would be positively correlated with the total score on BMS.

The second set of hypotheses examined the relationship between emotional factors and screening and health-promoting behaviors.

7. There would be a positive relationship of cancer worry with completion of mammography.
 - It was predicted that higher total scores on the Cancer Worry Scale (CWS) would be positively correlated with adherence to mammography screening guidelines.
8. There would be a positive relationship of trait anxiety with completion of mammography.
 - It was predicted that higher total scores on the Trait form of the State-Trait Anxiety Inventory (STAI-T) would be positively correlated with adherence to mammography screening guidelines.
9. There would be a positive relationship of cancer worry with exercise.
 - It was predicted that higher total scores on the CWS would be positively correlated with the LSI total score.

10. There would be a positive relationship of trait anxiety with exercise.
 - It was predicted that higher total scores on the STAI-T would be positively correlated with the LSI total score.
11. There would be a positive relationship of cancer worry with consumption of fruits and vegetables.
 - It was predicted that higher total scores on the CWS would be positively correlated with the total score on the BMS.
12. There would be a positive relationship of trait anxiety with consumption of fruits and vegetables.
 - It was predicted that higher total scores on the STAI-T would be positively correlated with the total score on the BMS.

The third set of hypotheses examined the relationship between interpersonal factors and screening and health-promoting behaviors.

13. There would be a positive relationship of involvement in sister's care with completion of mammography.
 - It was predicted that higher scores on the involvement in the sister's care scale would be positively correlated with adherence to mammography screening guidelines.
14. There would be a positive relationship of satisfaction with the sister relationship with completion of mammography.
 - It was predicted that higher scores on the Lifespan Sibling Relationship Scale (LSRS) would be positively correlated with adherence to mammography screening guidelines.

15. There would be a positive relationship of involvement in sister's care with exercise.
 - It was predicted that higher scores on the involvement in the sister's care scale would be positively correlated with the LSI total score.
16. There would be a positive relationship of satisfaction with the sister relationship with exercise.
 - It was predicted that higher scores on the LSRS would be positively correlated with the LSI total score.
17. There would be a positive relationship of involvement in sister's care with consumption of fruits and vegetables.
 - It was predicted that higher scores on the involvement in the sister's care scale would be positively correlated with the total score on the BMS.
18. There would be a positive relationship of satisfaction with the sister relationship with consumption of fruits and vegetables.
 - It was predicted that higher scores on the LSRS would be positively correlated with the total score on the BMS.

Based on the results of hypothesis testing, exploratory analyses were conducted to test the two expanded models of Leventhal's Parallel Processing model.

Methods

Participants

Breast cancer patients currently enrolled in the “Cognitive-Behavioral Aspects of Cancer-Related Fatigue” study and patients in Moffitt Cancer Center’s Breast Cancer Registry were contacted by mail; the mailed packet included an introductory letter about the study and the informed consent and HIPAA research authorization forms. Potential participants were provided with a toll-free number to call if they did not wish to be contacted. If a call was not received within two weeks, they were contacted by telephone to determine if they have a sister who was eligible to participate in the current study. If the patient was willing to have her sister(s) contacted and was willing and able to provide their names and addresses, then the patient was asked to sign and mail back the informed consent and HIPAA research authorization forms.

Sisters were subsequently sent a letter describing the study. They were provided with a toll-free number to call if they did not wish to be contacted. If a call was not received within two weeks, they were contacted by telephone. Sisters were asked the eligibility questions and, if they were eligible, they were invited to participate. Sisters who were interested in participating were given the option to complete the survey through the mail or online. If they were interested in completing the survey through the mail, they were mailed the informed consent, HIPAA research authorization, questionnaire packet, and a postage paid envelope to return the signed forms and completed questionnaire. If they were interested in completing the study online, they

were mailed the informed consent, HIPAA research authorization, instructions to complete the survey online, and a postage paid envelope to return the signed forms. Participants who completed the questionnaire online were provided with the questionnaire website address, a unique identification number, and a password to log into the website. All participants were given the option to receive the NCI booklet “What You Need To Know About Breast Cancer” at the completion of the survey. After completing the study, participants requesting additional information on breast cancer were mailed this booklet with a thank you letter. Participants not requesting additional information were mailed only a thank you letter.

Patient eligibility criteria were: a) at least 2 months post treatment; b) no history of additional cancer other than basal cell; c) diagnosed with Stage 0, I, or II breast cancer; d) surgically treated with lumpectomy or mastectomy; e) received chemotherapy, radiation, or both; f) able to provide informed consent; g) speak and read English.

Sister eligibility criteria were: a) 45 to 70 years old; b) able to provide informed consent; c) speak and read English; d) no history of breast cancer; e) no breast biopsies within the past five years; f) only one FDR diagnosed with breast cancer; g) have not been tested for the BRAC1/2 genes. Age eligibility was based on the USPSTF recommendation that women between the ages of 40 and 70 should undergo mammography screening every two years (USPSTF, 2002). Because women’s mammography screenings for the past five years was assessed, eligibility was limited to women between the ages of 45 and 70.

Measures

Demographic and Clinical Information. The sister's demographic information was obtained through a standardized self-report measure. Variables assessed included date of birth, race, marital status, income, education, and blood relation to Moffitt patient. Clinical information obtained included menopausal status, height, weight, and objective risk of breast cancer. Objective risk was assessed using the Gail model which provides a five year and a lifetime percentage risk of developing breast cancer (Gail et al., 1989). The Gail model has demonstrated moderate accuracy with ratios of expected to observed numbers of breast cancer ranging from .43 to .75 (Amir et al., 2005). The breast cancer patient's demographic and clinical information was obtained through review of information collected in the "Cognitive-Behavioral Aspects of Cancer-Related Fatigue" study for patients who participated in that study, and through the Moffitt Breast Cancer registry for all of the other women. Variables assessed included date of birth, date of diagnosis, stage of breast cancer, and type of treatments received.

Perceived Risk. Participants' perceived risk of developing breast cancer was assessed with four questions modeled from previous research (Brain, Norman, Gray, & Mansel, 1999; Rowe, Montgomery, Duberstein, & Bovbjerg, 2005). The first question, "How likely do you think that you are to have breast cancer during your lifetime?" is rated on a 6-point Likert scale ranging from 1 = extremely unlikely to 6 = extremely likely. The second question, "What do you think your chances are of having breast cancer in your lifetime compared to other women your age?" and the fourth question "Compared to other women your age with a similar family history of breast cancer, how likely do you think it is that you will develop breast cancer in your lifetime?" are rated on

a 5-point Likert scale ranging from 1 = much higher to 5 = much lower. The third question “How certain are you that you will remain free of breast cancer for the rest of your life?” is rated on a 6-point Likert scale from 1 = extremely uncertain to 6 = extremely certain. These four items were converted to a common metric and summed. Internal consistency for the current study was $\alpha = .85$.

Response Efficacy. Fourteen items were used to assess response efficacy. These items were modified from Jackson and Aiken’s (2000) and Azzarello, Dessureault, and Jacobsen’s (2006) measures assessing response efficacy of sun protective behaviors and Vadaparampil et al.’s (2004) measure assessing response efficacy of prostate cancer screening. Participants report the extent to which they agree or disagree with each statement on a 6-point Likert scale (1 = strongly disagree to 6 = strongly agree). Four items assess mammography response efficacy, five items assess exercise response efficacy, and five items assess diet response efficacy. Internal consistency of similar items has been high, $\alpha = .85$, in previous research (Azzarello, 2006). Internal consistency for the current study was $\alpha = .68$ for mammography response efficacy, $\alpha = .73$ for exercise response efficacy, and $\alpha = .79$ for diet response efficacy.

Cancer Worry. The Cancer Worry Scale (CWS; Lerman et al., 1991) is a 4-item measure of the extent that breast cancer specific worry interferes with daily functioning. Participants respond on a four-point Likert scale (1=not at all or rarely to 4=a lot) the extent to which they endorse each item. This measure has been used in several studies measuring women’s worries and concerns about breast cancer and has demonstrated good internal consistency reliability and test-retest reliability (Bowen, et al., 2003; Rees, Fry, Cull, & Sutton, 2004). Internal consistency for the current study was $\alpha = .79$.

Anxiety. The Trait form of the State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, & Jacobs, 1983) is a 20-item inventory that measures the level of general anxiety. Participants respond on a four-point Likert scale (1=Not at all to 4=Very much so) the extent to which they endorse each item. The internal consistency of the instrument ranges from .86 to .95 across male and female samples (Spielberger et al., 1983). The STAI-T has validity correlations of .80 with other established anxiety measures (Spielberger et al., 1983). Internal consistency for the current study was $\alpha = .94$.

Relationship with Sister. The Lifespan Sibling Relationship Scale (LSRS; Riggio, 2000) is a 48-item scale used to measure attitudes toward the adult sibling relationship. The measure consists of a total score of the satisfaction with the sibling relationship and six subscales. The subscales assess emotion towards the sibling and the relationship as a child (Child Affect) and as an adult (Adult Affect), beliefs about the sibling and the relationship as a child (Child Cognitions) and as an adult (Adult Cognitions), and behavioral interactions with the sibling as a child (Child Behavior) and as an adult (Adult Behavior). Participants respond on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) the extent to which they agree or disagree with each item. The LSRS scale has demonstrated high internal consistency ranging from .84 to .96 and good convergent and discriminant validity (Riggio, 2000). For the purpose of this study, only the Adult subscales were used. Internal consistency for the current study was $\alpha = .96$ for the total score, $\alpha = .93$ for the affect subscale, $\alpha = .95$ for the cognitions subscale, and $\alpha = .87$ for the behavior subscale.

Involvement in Sister's Care. The extent to which the participant was involved in her sister's care was assessed by six questions. The first question is "To what extent were you personally involved in your sister's cancer treatment and care?" which was modeled from previous research (van Dooren et al., 2005). Participants respond on a 5-point Likert scale from 1 = not at all involved to 5 = completely involved. The other five questions were specifically devised for the current study and ask about the frequency of communication with the sister, attending appointments, and the providing assistance. Participants respond on a 5-point Likert scale from 1 = rarely to 5 = frequently. These items were summed to create a total score. Internal consistency for the current study was $\alpha = .88$.

Mammography Screening. Participants were asked if they had a mammography screening in the past two years. Based on this information, participants were classified as being either adherent or nonadherent to the USPSTF guidelines for mammography screenings (USPSTF, 2002) based on whether or not they have had a mammography screening every 1-2 years. In addition, they were asked the date of their last mammography screening and if they have had a mammography screening since their sister's diagnosis. They were asked to indicate the number of mammography screenings obtained in the past five years, perceived change in mammography screening since their sister's breast cancer diagnosis, and future intentions of having a mammography screening.

Exercise. The Godin Leisure-Time Exercise Questionnaire (LSI; Godin, Jobin, & Bouillon, 1986) consists of three questions that assess the average frequency of mild, moderate, and strenuous exercise in a typical week. The LSI was modified to include

assessment of average duration and perceived change in exercise since their sister's diagnosis. A total score was created by multiplying the frequency of mild, moderate, and strenuous exercise by 3, 5, and 9, respectively, and summing (Godin et al., 1986). The reliability and validity of the LSI has been found to compare favorably with other self-report measures of exercise in terms of test-retest scores and correlations with objective activity monitors and objective fitness indices (Jacobs, Ainsworth, Hartman, & Leon, 1993).

Diet. The By Meal Screener (BMS; NCI, 2000) is a brief fruit and vegetable screener used in the National Institutes of Health's, Eating at America's Table Study (NCI, 2000). The BMS assesses the amount of fruits and vegetables consumed in the previous month. Participants are asked to indicate the frequency and quantity of fruits and vegetables they consumed in the morning, afternoon, and evening in the past month. The remaining questions assess frequency and quantity of eight more specific categories of fruits and vegetables consumed at any time of the day in the past month. Frequency is assessed on a 10-point Likert scale ranging from never to five or more times per day. Quantity is assessed on a 4-point Likert scale dependent on the fruit or vegetable being assessed. A total score is calculated by converting quantity to a standard scale for each type of fruit and vegetable, multiplying by the frequency, and summing. The BMS has demonstrated a strong correlation with 24-hour recall of food intake (males $r = .67$, females $r = .53$; Thompson et al., 2002). One additional question was added to the BMS to assess perceived change in overall fruit and vegetable intake since the sister's diagnosis.

Statistical Analyses

Descriptive statistics (e.g., mean and standard deviations) were used to characterize the demographic characteristics of the sample. Prior to conducting the main analyses, exploratory analyses were conducted to examine the relationship of demographic variables and objective risk of breast cancer to cognitive, emotional, and interpersonal factors and screening and health-promoting behaviors. When significant relationships were found, consideration was given to controlling for the relevant variables in subsequent analyses. In addition, the relationship between cognitive factors and involvement in sister's care was assessed.

To test the first set of hypotheses, correlational analyses were performed to examine the relationship of perceived risk and response efficacy to performance of mammography screening in accordance with guidelines, the total score on the LSI, and the total score on the BMS. To test the second set of hypotheses, correlational analyses were performed to examine the relationship of the total score on the CWS and the total score on the STAI-T to performance of mammography screening in accordance with guidelines, the total score on the LSI, and the total score on the BMS. In addition, to test for a curvilinear relationship between the total score on the CWS and mammography screenings in the past five years, a hierarchical regression was performed where the CWS was entered first into the model followed by the CWS squared. To test the third set of hypotheses, correlational analyses were performed to examine the relationship of the involvement in sister's care scale and the total score on the LSRS to mammography screening in accordance with guidelines, the total score on the LSI, and the total score on the BMS.

Depending on the pattern of significant correlations observed, hierarchical regression analyses were planned to test Leventhal's Parallel Processing Theory (see Figure 1). Hierarchical regression analyses were also planned to test an expanded moderated mediation model (see Figure 2; Muller, Judd, & Yzerbyt, 2005). A moderated mediation relationship would be demonstrated if the relationship between interpersonal factors and screening and health-promoting behaviors is non-significant or substantially reduced after controlling for either cognitive or emotional factors when interpersonal factors are high, but not when interpersonal factors are low. In addition, hierarchical analyses were planned to test an expanded moderation model (see Figure 3). Specifically, hierarchical regression analyses were planned to examine whether there were interactive effects between interpersonal factors and either cognitive or emotional factors that influenced screening or health-promoting behaviors.

In order to determine the necessary sample size for correlational analyses, a power analysis was conducted. Based on prior research (McCaul et al., 1996) suggesting the presence of a small to medium effect sizes between psychological predictors and screening behaviors, the current study was powered to detect a small to medium size effect for testing the three sets of hypotheses. With 120 participants ($p < .05$, two-tailed), there was power of .80 to detect a correlation coefficient of .25 (small to medium effect size; Cohen, 1988).

Results

Participants

Breast cancer participants were recruited from patients currently enrolled in the “Cognitive-Behavioral Aspects of Cancer-Related Fatigue” study and from the breast cancer registry list (see Figures 4 and 5). One-hundred-eighty-five women from the fatigue study were mailed letters about the current study. Seventeen women were unable to be contacted and 25 declined further information about the study. Of the 143 patients contacted and interested in additional information, 59 women did not have sisters and 41 women did not have an eligible sister. Of the 43 women with eligible sisters who verbally agreed to participate, 3 were non-compliant and 40 returned the informed consents providing a total of 73 sisters’ contact information. Seventy-three sisters were mailed letters about the current study. Four were unable to be contacted and 2 declined further information about the study. Of the 67 sisters contacted and interested in additional information, 16 were ineligible and 51 verbally agreed to participate. Of the 51 eligible sisters who verbally agreed to participate, 2 were later determined to be ineligible, 1 subsequently declined, 10 were non-compliant, and 38 completed the study (see Figure 4).

Five-hundred-thirty-eight women from the breast cancer registry were mailed letters about the current study. One-hundred-and-ten women were unable to be contacted and 76 declined further information about the study. Of the 354 patients contacted and interested in additional information, 176 women did not have sisters and 75 women did

not have an eligible sister. Of the 107 women with eligible sisters who verbally agreed to participate, 15 were non-compliant and 92 women returned consents providing a total of 120 sisters' contact information. One-hundred-twenty sisters were mailed letters about the current study. Eleven were unable to be contacted and 2 declined further information about the study. Of the 107 sisters contacted and interested in additional information, 17 were ineligible and 90 verbally agreed to participate. Of the 90 eligible sisters who verbally agreed to participate, 1 subsequently declined, 7 were non-compliant, and 82 completed the study (see Figure 5). In summary, across recruitment methods, 132 of 150 of eligible patients (88%) and 120 of 141 eligible sisters (85%) completed their respective study requirements.

Patient Demographic and Clinical Information

The 89 breast cancer patients who provided names and contact information for their sisters ranged in age from 43 to 71 years ($M = 57.72$; $SD = 7.18$). These patients had been diagnosed with breast cancer between 1.5 and 6.6 years ago ($M = 3.69$; $SD = 1.51$). Eight patients (9%) had been diagnosed in stage 0, 41 (46%) had been diagnosed in stage I, and 40 (45%) had been diagnosed in stage II. Thirty-one patients (35%) had received radiotherapy only, 23 patients (26%) had received chemotherapy only, and 35 patients (39%) had received chemotherapy with radiotherapy. Forty-seven women (46%) also received hormone therapy. See Table 1 for complete clinical information.

Sister Demographic and Information

A total of 120 sisters of breast cancer patients, from 89 different families, completed the study. Sixty-seven were the only sisters from their family participating in the study and 53 had at least one sibling participating in the study. These participants

ranged in age from 45 to 69 years ($M = 56.19$; $SD = 6.00$). The majority had partial college education or greater (82%), were non-Hispanic (94%), White (95%) and married (72%). Approximately 79% reported an annual household income of at least \$40,000. Their five-year breast cancer risk estimate averaged 2.5% (range 1.0% to 5.1%) and their lifetime breast cancer risk estimate averaged 15.3% (range 7.8% to 27.6%). The majority of participants never had a breast biopsy (80%). See Table 2 for complete demographic and clinical information.

Descriptive Statistics of the Cognitive, Emotional, and Interpersonal Factors and Screening and Health-Promoting Behaviors

The means, standard deviations, and ranges for the cognitive, emotional, interpersonal, screening, and health-promoting behaviors variables are presented in Table 3. Over the past five years, 1 sister (1%) had 10 mammography screenings, 3 (3%) had seven mammography screenings, 3 (3%) had six mammography screenings, 74 (62%) had 5 mammography screenings, 13 (11%) had 4 mammography screenings, 14 (12%) had 3 mammography screenings, 5 (4%) had 2 mammography screenings, 4 (3%) had one mammography screening, and 3 (3%) had zero mammography screenings. Women who had more than five mammography screenings in the past five years were classified as having only five for analysis purposes. Only 8 out of the 120 women (7%) had not had a mammography within the past two years (i.e., were not compliant with USPSTF guidelines). Given the low rate of non-adherence to the USPSTF guidelines, further analyses were not done using this variable. All subsequent analyses with mammography screening used the number of mammography screenings obtained in the past 5 years.

The LSI ranged from 0 to 77, with 19% of women reporting no exercise. The BMS total score ranged from 0.36 to 13.04 cups of fruits and vegetables per day, with an average of .67 cups of fruits per day and .94 cups of vegetables per day reportedly being consumed.

Relationships Among the Cognitive Factors

Exploratory correlational analyses were conducted to examine the relationship among the cognitive variables. Perceived risk of breast cancer was not significantly associated with perceived efficacy of mammography, exercise, or diet (r range = $-.05$ to $.09$, $p > .05$). Perceived efficacy of mammography was significantly positively associated with perceived efficacy of physical activity ($r = .18$, $p < .05$), but not significantly associated with perceived efficacy of diet ($r = .12$, $p > .05$). Perceived efficacy of physical activity was significantly positively associated with perceived efficacy of diet ($r = .67$, $p < .0001$).

Relationship Among the Emotional Factors

Exploratory correlational analyses were conducted to examine the relationship among the emotional variables. Breast cancer worry was significantly positively related to trait anxiety ($r = .32$, $p < .001$).

Relationship Among the Interpersonal Factors

Exploratory correlational analyses were conducted to examine the relationship among the interpersonal variables. Involvement in sister's care was significantly positively related to the LSRS total score ($r = .37$, $p < .0001$), affect subscale ($r = .20$, $p < .05$), behavior subscale ($r = .50$, $p < .0001$), and cognition subscale ($r = .28$, $p < .01$). The

LSRS subscales were all significantly positively associated with each other (r range = .62 to .82, $p < .0001$)

Relationship Between the Cognitive and Emotional Factors

Exploratory correlational analyses were conducted to examine the relationship between the cognitive and emotional factors. Perceived risk of breast cancer was significantly positively related to breast cancer worry ($r = .46$, $p < .0001$) and trait anxiety ($r = .20$, $p < .05$). Perceived response efficacy of mammography use, diet, and exercise were not significantly related to breast cancer worry or trait anxiety (r range = $-.14$ to $.05$, $p > .05$).

Relationship of Cognitive and Emotional Factors with Interpersonal Factors

Exploratory correlational analyses were conducted to examine the relationship of perceived risk, response efficacy, breast cancer worry, and trait anxiety with involvement in sister's care and the satisfaction with the sister relationship (see Table 4). Trait anxiety was significantly negatively associated with the total score and all three subscales on the LSRS, indicating that women with less trait anxiety had greater satisfaction with their relationship with their sister who had breast cancer. Trait anxiety was not significantly associated with involvement in sister's care. Exercise response efficacy was significantly negatively associated with the Behavior subscale of the LSRS, indicating that women who had more negative beliefs about the efficacy of exercise were more satisfied with their behavioral interactions with their sister who had breast cancer. No other relationships of cognitive and emotional factors with interpersonal factors were significant (see Table 4).

Relationship of Sisters' Demographic and Clinical Variables with Cognitive, Emotional, and Interpersonal Factors

Exploratory analyses were conducted to determine the relationship of demographic and clinical variables with cognitive, emotional, and interpersonal factors (see Table 5). Age was significantly negatively associated with the Affect subscale of the LSRS, indicating that younger women expressed more positive emotions about their sister with breast cancer than older women. Ethnicity was significantly associated with involvement in sister's care, indicating that Hispanic or Latino women reported greater involvement in their sister's care than non-Hispanic or non-Latino women. Race was significantly associated with involvement in sister's care, the Behavior and Cognition subscales on the LSRS, and the total score on the LSRS, indicating that Whites reported less involvement in their sister's care and less satisfaction with their relationships with their sister than non-Whites. Blood relation to the breast cancer patient was significantly associated with perceived risk of breast cancer, indicating that half-sisters perceived themselves at lower risk for breast cancer than full-sisters. Having another sister participating in the study was significantly associated with perceived risk of breast cancer, indicating that women who had another sister in the study perceived themselves at lower risk of breast cancer than women who did not have another sister participating in the study. Marital status was significantly associated with perceived risk of breast cancer and breast cancer worry, indicating that married women perceived themselves at lower risk of breast cancer and were less worried about breast cancer than unmarried women. Income was significantly associated with breast cancer worry and trait anxiety, indicating that women with higher income reported less cancer worry and trait anxiety. Time since

the breast cancer patients' diagnosis was not related to any of the cognitive, emotional, or interpersonal factors.

Exploratory analyses were conducted to examine the influence of birth order between the breast cancer patient and the sister. Birth order was significantly associated with satisfaction with the sister relationship and involvement in sisters care. Specifically, older sisters reported closer relationships and were more involved in their sister's breast cancer care than younger sisters.

Relationship of Sisters' Demographic and Clinical Variables with Screening and Health-Promoting Behaviors

Exploratory analyses were conducted to determine the relationship of demographic and clinical variables with screening and health-promoting behaviors (see Table 5). Blood relation to the breast cancer patient was significantly associated with the number of mammography screenings received in the past 5 years, indicating that half-sisters had fewer mammography screenings over the past 5 years than full-sisters. Having another sister participating in the study was significantly associated with exercise, indicating that women who had another sister in the study exercised more than women who did not have another sister participating in the study. Income was significantly associated with exercise, indicating that women with higher income exercised more. Lifetime breast cancer risk was significantly associated with the Vegetable subscale on the BMS ($p > .01$), indicating that women with a higher lifetime risk reported eating more vegetables.

Relationship of Cognitive Factors with Screening and Health-Promoting Behaviors

The first set of hypotheses examined the relationship of the cognitive variables of perceived risk and response efficacy to mammography screening, exercise, and diet (see Table 6). Hypothesis one examined the relationship between perceived risk and mammography screening. Contrary to the hypothesis, perceived risk was not significantly associated with the number of mammography screenings obtained in the past five years. Hypothesis two examined the relationship between response efficacy and mammography screening. Consistent with the hypothesis, perceived response efficacy of mammography screening was significantly positively associated with the number of mammography screenings obtained in the past five years, indicating that women with more positive beliefs about the efficacy of mammography screening obtained more mammography screenings.

Hypotheses three and four examined the relationship of the cognitive variables to exercise. Contrary to hypothesis three, perceived risk of breast cancer was not significantly associated with exercise. Contrary to hypothesis four, perceived response efficacy of exercise was not significantly associated with exercise.

Hypotheses five and six examined the relationship of the cognitive variables to diet. Contrary to hypothesis five, perceived risk of breast cancer was not significantly associated with diet. Consistent with hypothesis six, perceived response efficacy of diet was significantly positively associated with diet, indicating that women with more positive beliefs about the efficacy of diet in reducing breast cancer risk ate more fruits and vegetables. Additional analyses indicated that perceived efficacy regarding diet was

significantly associated with the fruit subscale of the BMS, but not the vegetable subscale.

Relationship of Emotional Factors with Screening and Health-Promoting Behaviors

The second set of hypotheses examined the relationship of the emotional variables of breast cancer worry and trait anxiety to mammography screening, exercise, and diet (see Table 6). Hypotheses seven and eight examined the relationship of the emotional factors to mammography screening. Contrary to hypothesis seven, breast cancer worry was not significantly associated with number of mammography screenings in the past five years. Hypothesis eight was not supported. Contrary to the hypothesis, trait anxiety was significantly negatively, rather than positively, associated with number of mammography screenings in the past five years, indicating that women with more trait anxiety obtained fewer mammography screenings.

Hypotheses nine and ten examined the relationship of the emotional factors to exercise. Contrary to hypothesis nine, cancer worry was not significantly associated with exercise. Contrary to hypothesis ten, trait anxiety was not significantly associated with exercise.

Hypotheses eleven and twelve examined the relationship of the emotional factors to diet. Contrary to hypothesis eleven, cancer worry was not significantly associated with diet. Contrary to hypothesis twelve, trait anxiety was not significantly associated with diet.

Relationship of Interpersonal Factors with Screening and Health-Promoting Behaviors

The third set of hypotheses examined the relationship of involvement in sister's breast cancer care and sister relationship to mammography screening, exercise, and diet

(see Table 6). Hypotheses thirteen and fourteen examined the relationship of the interpersonal factors to mammography screening. Hypothesis thirteen was not supported. Contrary to the hypothesis, involvement in sister's care was significantly negatively, rather than positively, associated with number of mammography screenings obtained in the past five years, indicating that women with greater involvement in their sister's care obtained fewer mammography screenings. Contrary to hypothesis fourteen, satisfaction with the sister relationship was not significantly associated with number of mammography screenings obtained in the past five years.

Hypotheses fifteen and sixteen examined the relationship of the interpersonal factors to exercise. Contrary to hypothesis fifteen, involvement in their sister's care was not significantly associated with exercise. Contrary to hypothesis sixteen, satisfaction with the sister relationship was not significantly associated with exercise.

Hypotheses seventeen and eighteen examined the relationship of the interpersonal factors to diet. Contrary to hypothesis seventeen, involvement in their sister's care was not significantly associated with diet. Contrary to hypothesis eighteen, satisfaction with the sister relationship was not significantly associated with diet.

Controlling for Blood Relationship in Significant Associations of Cognitive, Emotional, and Interpersonal Factors with Mammography Screening

Since blood relation to the breast cancer patient was significantly associated with mammography screening, correlational analyses were conducted controlling for blood relationship where there were significant associations between cognitive, emotional or interpersonal factors and mammography screening. After controlling for blood relation, perceived efficacy of mammography screening remained significantly associated with

number of mammography screenings in the past five years (original $r = .27$, $p < .01$; controlled for $r = .25$, $p < .01$) as did trait anxiety (original $r = -.20$, $p < .05$; controlled for $r = -.19$, $p < .05$) and involvement in sister's care (original $r = -.20$, $p < .05$; controlled for $r = -.20$, $p < .05$). All other non-significant relationships remained non-significant. Controlling for blood relation in subsequent analyses did not change the pattern of significant results; therefore, remaining results do not control for blood relation.

Exploratory Quadratic Analysis

As noted previously, no linear relationship was found in the current study between breast cancer worry and mammography screening. However, some previous research suggests that the relationship between breast cancer worry and mammography screening may be curvilinear rather than linear (Anderson et al., 2003). Exploratory analysis of data from the current study yielded evidence of a curvilinear relationship. Specifically, a regression analysis was conducted to determine if a quadratic term accounted for significant variability in the number of mammography screenings obtained in the past five years. Breast cancer worry was forced into the model first and accounted for 0.8% of the variance. The square of breast cancer worry entered the model on the next step and accounted for 10.8% of the remaining variance ($p = .0002$; see Table 7). The significant quadratic term suggests that the relationship between breast cancer worry and number of mammography screenings is not the same across all levels of worry. In order to explore this relationship, the data were then divided based on a median split of breast cancer worry. Two correlational analyses were run, one with the lower half of the breast cancer worry distribution (scores of 4 to 6; $n = 60$) and one with the upper half of breast cancer worry distribution (scores of 6 to 15; $n = 60$). For the lower half of the

breast cancer worry distribution, breast cancer worry was not significantly related to mammography screenings ($r = .04, p > .05$). For the upper half, breast cancer worry was significantly negatively related to mammography screening ($r = -.39, p < .01$). Using the Fisher's r to z statistic (Steiger, 1980), it was determined that these two correlations were statistically different from one another ($z = 2.41, p = .016$). These findings indicate that among women with lower levels of breast cancer worry, their breast cancer worry was not related to obtaining mammography screenings; for women with higher levels of breast cancer worry, the greater their worry, the less likely they were to obtain mammography screenings

Regression Analyses Evaluating Leventhal's Parallel Processing Theory

Based on the results of hypothesis testing, conditions were met to test Leventhal's parallel processing model with regard to the contribution of cognitive and emotional factors to mammography screening. Specifically, a regression analysis was conducted to determine if mammography response efficacy and trait anxiety each accounted for significant variability in the number of mammography screenings obtained in the past five years. Mammography response efficacy entered the model on the first step and accounted for 7.4% of the variance ($p = .003$). Trait anxiety accounted for a non-significant (2.8%, $p = .06$) amount of the remaining variance (see Table 8). A second regression analysis was conducted forcing trait anxiety into the model before mammography response efficacy. Trait anxiety entered the model on the first step and accounted for 4.2% of the variance ($p = .023$). Mammography response efficacy entered the model on the second step and accounted for 6.1% of the remaining variance ($p = .006$; see Table 9). Leventhal's parallel processing model could not be tested in relation to

health-promoting behaviors because a cognitive variable and an emotional variable were not both significantly related to either exercise or diet.

Moderated Mediation Model Expansion upon Leventhal's Parallel Processing Theory

In order for the proposed moderated mediation analyses to be tested, first a mediation analyses must be conducted. Although involvement in sister's care was significantly associated with number of mammography screenings, it was not significantly associated with any of the emotional or cognitive factors; therefore mediation could not be tested. No other interpersonal factors were significantly associated with any of the screening or health-promoting behaviors. Due to the lack of significant relationships between the necessary variables, the moderated mediation model could not be tested (Figure 2).

Moderated Model Expansion upon Leventhal's Parallel Processing Theory

Although the moderated mediation analyses could not be tested, the proposed moderation analyses could be tested (Figure 3). Due to the large number of possible moderations that could be tested, it was decided to test four sets of interactions. The first set of analyses examined whether involvement in sister's care moderated the relationship between response efficacy of a screening or health-promoting behavior and that screening or health-promoting behavior. The second set of analyses examined whether satisfaction with sister relationship moderated the relationship between response efficacy of a screening or health-promoting behavior and that screening or health-promoting behavior. The third set of analyses examined whether involvement in sister's care moderated the relationship between breast cancer worry and screening or health-promoting behaviors. The fourth set of analyses examined whether satisfaction with the sister relationship

moderated the relationship between breast cancer worry and screening or health-promoting behaviors.

Using hierarchical regression analyses to conduct each of these moderation analyses, one of the tested moderations was found to be significant. The interaction between involvement in sister's care and breast cancer worry was significantly related to the number of mammography screenings. Using a hierarchical regression, involvement in sisters' care and breast cancer worry were first forced into the analysis and together accounted for 4.9% of the variance in mammography screening. The interaction term between breast cancer worry and involvement in sister's care entered the model next and accounted for an additional 3.7% of the variance ($p < .05$; see Table 10). Using Aiken and West's procedures (Aiken & West, 1991), the interaction was graphed (see Figure 6). These results indicate that, among women less involved in their sister's care, greater breast cancer worry was associated with having fewer mammography screenings. However, for women more involved in their sister's care, greater breast cancer worry was associated with having more mammography screenings.

Additional Moderation Analyses

In addition to the proposed moderation analyses, three additional sets of moderation analyses were tested. The first set of analyses examined whether perceived risk of breast cancer moderated the relationship between response efficacy of a screening or health-promoting behavior and that screening or health-promoting behavior. The second set of analyses examined whether breast cancer worry moderated the relationship between response efficacy of a screening or health-promoting behavior and that screening or health-promoting behavior. The third set of analyses examined whether involvement

in sister's care moderated the relationship between time since diagnosis and screening or health-promoting behaviors.

Using hierarchical regression analyses to conduct each of these moderation analyses, one of the tested moderations was found to be significant. The interaction between perceived risk of breast cancer and response efficacy for mammography screening was significantly related to the number of mammography screenings. Using a hierarchical regression, perceived risk of breast cancer and response efficacy for mammography screening were first forced into the analysis and together accounted for 8.3% of the variance in mammography screening. The interaction term between perceived risk of breast cancer and response efficacy for mammography screening entered the model next and accounted for an additional 6.3% of the variance ($p < .01$; see Table 11). Using Aiken and West's procedures (Aiken & West, 1991), the interaction was graphed (see Figure 7). These results indicate that, among women with greater perceived response efficacy for mammography screenings, lower perceived risk of breast cancer was associated with having greater mammography screenings. However, for women with low perceived response efficacy for mammography screenings, lower perceived risk of breast cancer was associated with having fewer mammography screenings.

Discussion

The primary aim of the current study was to examine how cognitive, emotional, and interpersonal factors relate to screening and health-promoting behaviors in sisters of women with breast cancer. This discussion will review the findings and integrate them with previous research. In addition, limitations of this study, clinical implications, and future directions for research will be discussed.

Relationship of Cognitive Factors with Screening and Health-Promoting Behaviors

The hypothesis that greater perceived risk of breast cancer would be associated with greater mammography screenings was not supported. This result is somewhat inconsistent with the meta-analyses by McCaul et al. (1996) and Katapodi Lee et al. (2004) that found greater perceived risk was positively related to greater mammography screening. Although the relationships were significant in the meta-analyses, the effect sizes were small ($r = .16$ and $g = .20$). These small effect sizes are consistent with this study's finding of $r = .12$; however, the current study did not have sufficient power to detect a significant small effect size.

The hypothesis that greater perceived risk of breast cancer would be associated with greater exercise was not supported. This result is inconsistent with the study by Audrain et al. (2001) that found that greater perceived risk of breast cancer was positively associated with greater leisure physical activity. However, this result is somewhat consistent with the study by Lemon et al. (2004) that found greater perceived risk was not related to increasing exercise after a FDR's diagnosis of breast cancer.

The hypothesis that greater perceived risk of breast cancer would be associated with a diet higher in fruits and vegetables was not supported. This result is somewhat consistent with the study by Lemon et al. (2004) that found greater perceived risk was not related to increasing fruit and vegetable intake after a FDR's diagnosis of breast cancer.

In general, there was mixed support for the proposed hypotheses regarding the relationship of response efficacy with screening and health-promoting behaviors. The hypothesis that greater response efficacy for mammography screening would be associated with greater mammography screenings and the hypothesis that greater response efficacy of diets high in fruits and vegetables would be associated with diets higher in fruits and vegetables were supported. The hypothesis that greater response efficacy for exercise would be associated with greater exercise was not supported. The significant findings for mammography screening and diet are consistent with the meta-analyses of response efficacy for health and non-health related topics that found strong relationships between response efficacy for a specific behavior and engaging in that behavior (Floyd et al., 2000; Milne et al., 2000). However, the lack of significant findings for exercise is inconsistent with the meta-analyses.

In summary, although there was mixed support for the hypothesized relationships of cognitive factors with screening and health-promoting behaviors, these findings are generally consistent with the literature.

Relationship of Emotional Factors with Screening and Health-Promoting Behaviors

The hypothesis that breast cancer worry would be positively associated with mammography screenings was not supported. The lack of significant relationship for breast cancer worry is consistent with the meta-analysis by McCaul et al. (1996) that did

not find a significant effect size for the relationship between worry and screening behaviors. Although a linear relationship between breast cancer worry and mammography screenings was not supported, a quadratic relationship was supported. The finding that among women with greater breast cancer worry, greater worry was related to obtaining less mammography screenings, but among women with lower levels of breast cancer worry, breast cancer worry was not related to obtaining mammography screenings is partially consistent with previous research. Specifically, the fewer mammography screenings at high levels of worry is consistent with the study by Anderson et al. (2003); however, the lack of relationship between worry and mammography screening at low levels of worry is not consistent with Anderson et al. (2003) who found less screening associated with less worry.

The hypothesis that greater trait anxiety would be associated with greater mammography screenings was not support. In fact, the opposite was found, that greater trait anxiety was related to less mammography screenings. Although no research has specifically examined trait anxiety, this negative relationship for trait anxiety is not consistent with a meta-analysis (McCaul et al., 1996) that found a small but significant relationship between worry and screening behaviors. However, this finding is consistent with research that found a negative relationship between cancer worry and mammography screening (Isaacs et al., 2002; Lerman et al., 1993; Meiser et al., 2000).

The hypotheses that breast cancer worry and trait anxiety would be associated with exercise were not supported. This result is consistent with the research by Audrain et al. (2001) that found that cancer specific distress was not related to exercise in FDRs of

women diagnosed with breast cancer, and with the research by Bowen et al. (2004), that found cancer worry and anxiety were not related to exercise in the general population.

The hypotheses that breast cancer worry and trait anxiety would be associated with diet were not supported. This result is consistent with the research by Bowen et al. (2004) that found that cancer worry and anxiety were not related to fruit and vegetable intake in the general population.

In summary, there was no support for the hypothesized relationships of emotional factors with screening and health-promoting behaviors. Although the lack of linear relationship between breast cancer worry and mammography screening is contrary to much of the literature, the significant quadratic relationship is consistent with some research. The significant negative relationship between trait anxiety and mammography screening was contrary to expectation and the worry literature. In addition, the lack of relationship between emotional variables and health-promoting behaviors is consistent with the literature.

Relationship of Interpersonal Factors with Screening and Health-Promoting Behaviors

Involvement in the sister's breast cancer care and satisfaction with the sister relationship were not related to obtaining mammography screening, exercising, or having a diet high in fruits and vegetable, with one exception. Involvement in sister's care was related to mammography screenings, but in the opposite direction than was hypothesized; greater involvement in the sister's care was associated with fewer mammography screenings. No prior studies have examined the relationship between interpersonal factors and screening and health-promoting behaviors. However, a study by Van Dooren et al. (2005) found that greater involvement in sister's care was related to increased

cancer specific distress. In the absence of existing literature, the current study speculated that the increased cancer specific distress related to increased involvement in care may promote engaging in screening and health-promoting behaviors among the sisters. However, there was no significant relationship between involvement in sisters care and cancer worry, and for trait anxiety, greater satisfaction with the sister relationship was associated with less anxiety, rather than greater anxiety.

Regression Analyses Evaluating Leventhal's Parallel Processing Theory

Analyses were planned to assess the independent contribution of cognitive and emotional factors to screening and health-promoting behaviors based on Leventhal's parallel processing theory. Based on the significant findings, a regression analysis was conducted to determine if response efficacy of mammography screenings and trait anxiety each accounted for significant variability in the number of mammography screenings obtained in the past five years. Inconsistent with Leventhal's parallel processing theory (Leventhal et al., 1984) and McCaul and colleagues' research (2003, 1996), trait anxiety did not account for a significant amount of additional variance after response efficacy entered the model. However, when trait anxiety was forced into the model first, both trait anxiety and response efficacy accounted for a significant amount of the variability, providing some support for Leventhal's parallel processing theory.

Moderated Mediation Model Expansion upon Leventhal's Parallel Processing Theory

Although a moderated mediation model was proposed, it was unable to be tested due to the lack of significant relationships between necessary variables in order to first test for a significant mediation analysis. As no mediation analysis could be tested, the moderated mediation model could not be tested.

Moderated Model Expansion upon Leventhal's Parallel Processing Theory

Although no hypotheses were offered, twelve moderating relationships were tested. Only one moderation was supported; the interaction between involvement in sister's care and breast cancer worry was significantly related to the number of mammography screenings obtained in the past five years. Among women less involved in their sister's care, greater breast cancer worry was associated with having fewer mammography screenings. However, for women more involved in their sister's care, greater breast cancer worry was associated with having more mammography screenings.

The interaction between involvement in sister's care and response efficacy of a behavior was not related to that behavior. The interaction between satisfaction with sister relationship and response efficacy of a behavior was not related to that behavior. The interaction between involvement in sister's care and breast cancer worry was not related to exercise or diet. The interaction between satisfaction with the sister relationship and breast cancer worry was not related to screening or health-promoting behaviors.

Lack of Support for Hypotheses

In general, most of the proposed hypotheses were not supported. There are multiple possible reasons for the lack of significant findings. First, many of the non-significant findings were consistent with previous research suggesting that no significant relationship may exist between some of these variables. Also, there is a lack of previous research on interpersonal factors; therefore, the general lack of significant findings for interpersonal factors with screening and health-promoting behaviors may also be the state of nature. Another possible explanation for the findings with regards to the interpersonal factors may be measurement error. No validated measure could be found to assess

involvement in sister's care. In addition, the LSRS measures satisfaction with the sibling relationship. This satisfaction may not accurately reflect closeness of the relationship, which may have a greater relationship to screening and health-promoting behaviors. Another measurement issue may be the length of time since the breast cancer diagnosis. The breast cancer survivors were an average of more than three and a half years post diagnosis. As these women had early stage breast cancer, it is likely that they are doing well this far after diagnosis and that any impact that the breast cancer diagnosis and treatments may have had on the patient's sister may not have been sustained.

Limitations

Several limitations of the current study should be noted. First, the sample was predominantly Caucasian, married, well-educated, and economically stable potentially limiting the generalizability of the results to a more socioeconomically diverse group. Second, almost all of the women were compliant with obtaining mammography screenings once every two years; therefore, comparisons could not be made between women who were compliant and were not compliant with the USPTF mammography guidelines. In addition, these results may not generalize to women who are not obtaining regular mammography screenings. Third, all data were obtained through cross-sectional self-report and the accuracy of information regarding screening and health-promoting behaviors is unknown. Fourth, the cross-sectional design did not allow for repeated measurements; therefore, how emotional, cognitive, and interpersonal factors relate to changes in screening and health-promoting behaviors could not be assessed. Fifth, validated measures were not used for all measures. For example, the items used to assess involvement in sister's care were developed for this study and not previously validated.

Sixth, the breast cancer patients all had early stage breast cancer and had no other FDR with breast cancer. These results may not generalize to FDRs of patients with more advanced cancers, other cancers, or with greater family history of cancer. Finally, the lack of a comparison group without a family history of breast cancer limits the ability to determine differences between women with a sister with breast cancer and women with no family history of breast cancer.

Clinical Implications

The present study found that women were generally compliant with obtaining mammography screenings, suggesting that sisters of breast cancer patients may not require intervention to promote mammography screenings. On the other hand, women with the highest levels of breast cancer worry were obtaining less mammography screenings, suggesting interventions to decrease breast cancer worry may be important for a subset of women. Also, greater involvement in the sister's cancer care was related to fewer mammography screening. Since sisters of breast cancer patients are at increased risk for breast cancer it may be important to intervene with these women to ensure that additional time taking care of their sister does not ultimately decrease their care for themselves. The present study also found that women were generally sedentary and had diets low in fruits and vegetables. The general lack of significant results with exercise and diet suggest that the experience of having a sister with breast cancer does not motivate women to engage in these health-promoting behaviors. Although the experience of having a sister with breast cancer itself may not be related to engaging in health-promoting behaviors, there may still be a teachable moment surrounding the breast cancer experience that could be capitalized on to provide women with information on the

benefits of exercise and healthy diets and to encourage health-promoting behaviors. On the other hand, the lack of significant findings may also indicate that the experience of having a sister with breast cancer may not motivate women to obtain mammography screenings, exercise, or eat diets high in fruits and vegetables.

Future Directions

Future research should compare women with and without a family history of breast cancer to examine what if any impact a family history has on women's screening and health-promoting behaviors. While mammography screening adherence and response efficacy for mammography screening was good in the current study, future research should consider providing educational interventions to increase family members' response efficacy of behaviors such as exercise and diet. In addition, this line of research could help assess whether a teachable moment exists related to the family member's cancer diagnosis and treatment during which to encourage the FDR to engage in health-promoting behaviors. Future research should also include more diverse samples of patients in regards to stage of cancer and types of cancer, as well as include more diverse samples in regards to race, ethnicity, and SES.

In summary, the present study examined the relationship of cognitive, emotional, and interpersonal factors with screening and health-promoting behaviors. Findings indicated that greater response efficacy for mammography screening and for diet are related to engaging in those behaviors. In addition, breast cancer worry influenced mammography screenings only in women with higher levels of worry, and among these women the greater their worry, the less likely they were to obtain mammography screenings. Breast cancer worry was also found to interact with involvement in care such

that among women less involved in their sister's care, greater breast cancer worry was associated with having fewer mammography screenings. However, for women more involved in their sister's care, greater breast cancer worry was associated with having more mammography screenings. Participants had lower perceived response efficacy for exercise and diet than they had for mammography screenings, and in general, cognitive, emotional, and interpersonal factors were not related to exercise and diet.

Table 1

Patient Clinical Characteristics (n = 89)

Variables		
Mean age (SD) years	57.7	(7.18)
Mean time since diagnosis (SD) years	3.69	(1.51)
Stage		
0	8	(9.0%)
I	41	(46.1%)
II	40	(44.9%)
Treatment		
Radiotherapy only	31	(34.8%)
Chemotherapy only	23	(25.8%)
Chemotherapy and radiotherapy	35	(39.3%)
Received hormone therapy	47	(52.8%)

Table 2

Sister Demographic and Clinical Characteristics (N = 120)

Variables		
Mean age (SD)	56.19	(6.00)
Ethnicity		
Hispanic	7	(5.9%)
Non-Hispanic	112	(94.1%)
Race		
White/Caucasian	114	(95.0%)
Black/African American	3	(2.5%)
More than one race	3	(2.5%)
Blood relation to sister with breast cancer		
Full blood relation	110	(91.7%)
Half blood relation	10	(8.3%)
Sisters involved in study		
Only sister participating in study	67	(55.8%)
Have other sister participating in study	53	(44.2%)
Education		
Junior high school (7 th to 9 th grade)	2	(1.7%)
Partial high school (10 th or 11 th grade)	5	(4.2%)
High school graduate	15	(12.5%)
Partial college or specialized training	45	(37.5%)
College or university graduate	35	(29.7%)
Graduate professional training	18	(15.0%)
Marital Status		
Single, never married	3	(2.5%)
Married	86	(71.7%)
Divorced	24	(20.0%)
Widowed	6	(5.0%)
Separated	1	(0.8%)
Total household income*		
Less than \$ 10,000	3	(2.7%)
\$10,000 - \$19,999	3	(2.7%)
\$20,000 - \$ 39,999	18	(15.9%)
\$40,000 - \$59,999	24	(21.2%)
\$60,000 - \$100,000	32	(28.3%)
Greater than \$100,000	33	(29.2%)
Breast cancer risk		
Mean 5 year risk (SD)	2.49%	(0.75)
Mean lifetime risk (SD)	15.30%	(3.27)
Previous breast biopsy	24	(20.0%)

*n = 113, Preferred not to answer = 7

Table 3

Descriptive Statistics of Cognitive, Emotional, and Interpersonal Factors and Screening and Health-Promoting Behaviors

	Mean	SD	Range
Cognitive variables			
Perceived risk	73.59	16.93	22-110
Response efficacy			
Mammography	5.21	0.80	2-6
Exercise	3.74	0.90	1-6
Diet	3.71	1.00	1-6
Emotional variables			
Cancer worry	6.54	1.81	4-15
Trait anxiety (STAI-T)	34.58	10.07	20-80
Interpersonal variables			
Involvement in sister's care	13.94	6.10	6-30
Sister relationship total (LSRS)			
Affect	34.69	5.67	9-40
Behavior	25.33	6.92	9-40
Cognition	31.73	7.57	10-40
Mammography screening ¹	0.93	0.25	0-1
Mammography past 5 years	4.39	1.45	0-10
Exercise (LSI)	22.59	17.48	0-77
Diet total (BMS)			
Fruit	0.67	0.60	0-3
Vegetable	0.94	0.75	0-4.5

Table 4

Correlational Analyses of Cognitive and Emotional Factors with Interpersonal Factors

	Involvement In Sister's Care	Total	Sister Relationship (LSRS)		
			Affect	Behavior	Cognitions
Cognitive variables					
Perceived risk	-.01	.04	.05	.08	-.02
Response efficacy					
Mammography	-.10	.14	.18	.11	.11
Exercise	-.04	-.05	.03	-.18*	.02
Diet	.08	.04	.05	-.05	.10
Emotional variables					
Cancer worry	-.03	.02	.05	.04	-.03
Trait anxiety (STAI-T)	-.11	-.26**	-.19*	-.20*	-.30***

* $p < .05$ ** $p < .01$ *** $p < .001$

Table 5

Correlational Analyses of Sisters' Demographic and Clinical Variables with Cognitive, Emotional, and Interpersonal Factors and Screening and Health-Promoting Behaviors

	Age	Education	Ethnicity ¹	Race ²	Blood Relation	Other Sister Participating	Marital Status ³	Income ⁴	5 year BC risk	Lifetime BC risk	Previous Biopsy
Perceived risk	-.06	.11	.09	-.10	-.19*	-.20*	.18*	-.13	.03	.15	-.01
RE mammography	-.02	-.13	.00	-.13	-.15	-.11	-.05	-.03	.02	.06	-.03
RE physical activity	-.04	.05	.08	-.02	-.13	-.09	.00	.03	-.07	.01	-.12
RE diet	-.05	.08	.01	-.05	-.11	-.09	-.10	.09	-.08	.01	-.02
Breast cancer worry	-.10	-.14	.00	.04	-.07	-.17	.20*	-.29**	-.14	.04	-.13
Trait anxiety (STAI-T)	-.08	-.14	.07	-.17	.08	-.11	.15	-.25**	-.10	.03	-.09
Involvement in sister's care	.00	-.03	-.24**	.30***	.02	.07	-.02	-.01	-.08	-.14	-.06
Sister relationship (LSRS)											
Total	-.12	-.04	-.14	.21*	.03	.12	.02	.05	-.12	.00	-.02
Affect	-.18*	-.01	-.12	.12	.08	.05	-.03	.05	-.10	.13	.05
Behavior	-.06	-.01	-.10	.25**	.00	.15	.07	.03	-.12	-.12	-.13
Cognition	-.11	-.08	-.16	.20*	.01	.12	.00	.06	-.10	.01	.03
Mammography screenings ⁵	.06	.05	-.03	-.11	-.23*	.02	-.01	.18	.12	.08	.07
Exercise (LSI)	-.15	.12	.09	-.01	-.10	.23*	-.04	.24**	-.03	.16	.05
Diet total (BMS)	.00	.01	.03	-.01	.12	.00	.04	-.09	.08	.09	.07
Fruit	.02	.03	.04	-.10	.04	.00	-.08	.04	.06	.07	-.04
Vegetable	-.13	.08	.06	-.14	-.06	-.02	.02	-.01	.07	.26**	.14

¹Ethnicity = Hispanic compared to Non-Hispanic; ²Race = White compared to others; ³Marital Status = Married compared to others; ⁴n = 113; ⁵ = number of mammography screenings past five years; BC = Breast Cancer; RE = response efficacy

* p < .05, **p < .01, ***p < .001

Table 6

Correlational Analyses of Cognitive, Emotional, and Interpersonal Factors with Screening and Health-Promoting Behaviors

	Mammography Past 5 Years	Exercise (LSI)	Diet (BMS)		
			Fruit & Veg	Fruit	Vegetable
Cognitive variables					
Perceived risk	.12	-.11	-.08	-.12	.01
Response efficacy					
Mammography	.27**	-.07	.00	.10	-.03
Exercise	.07	.15	.08	.19*	.07
Diet	.07	.07	.20*	.30***	.17
Emotional variables					
Cancer worry	-.09	-.04	-.10	-.14	-.03
Trait anxiety (STAI-T)	-.20*	-.07	.09	.13	.04
Interpersonal variables					
Involvement in sister's care	-.20*	-.03	.11	-.04	.00
Sister relationship (LSRS)					
Total	.06	.06	.07	.07	.01
Affect	.02	.01	.11	.09	.09
Behavior	.01	.06	.08	.03	-.05
Cognition	.12	.09	.03	.07	.01

* p < .05

**p < .01

Table 7

Curvilinear Regression Analyses of Breast Cancer Worry and Mammography Screening

	β	R ² change	Cumulative R ²	p value
*Breast Cancer Worry	1.404	.008	.008	.319
Quadratic Term ¹	-1.531	.108	.117	.0002

*forced into model first

¹Breast Cancer Worry x Breast Cancer Worry

Table 8

Regression Analysis of Mammography Screenings in Past 5 Years – Testing Leventhal’s Parallel Processing Theory

	β	R ² change	Cumulative R ²	p value
Cognitive Variable				
Mammography Response Efficacy	.249	.074	.074	.003
Emotional Variable				
Trait Anxiety (STAI-T)	-.168	.028	.102	.060

Table 9

Regression Analysis of Mammography Screenings in Past 5 Years forcing Trait Anxiety in First – Testing Leventhal’s Parallel Processing Theory

	β	R ² change	Cumulative R ²	p value
Emotional Variable				
Trait Anxiety (STAI-T)	-.168	.042	.042	.026
Cognitive Variable				
Mammography Response Efficacy	.249	.061	.102	.006

Table 10

Moderation Analysis of Involvement in Sister's Care, Breast Cancer Worry and Mammography Screenings

	β	R ² change	Cumulative R ²	p value
*Involvement in Sister's Care	-1.120			.027
*Breast Cancer Worry	-.618	.049	.049	.276
Interaction term ¹	1.057	.037	.087	.031

* forced into model first

¹Involvement in Sister's Care x Breast Cancer Worry

Table 11

Moderation Analysis of Perceived Risk of Breast Cancer, Response Efficacy of Mammography Screening, and Mammography Screenings

	β	R ² change	Cumulative R ²	p value
* Perceived Risk of Breast Cancer	.001			.285
* RE of Mammography Screening	.406	.083	.083	.004
Interaction term ¹	-.021	.064	.148	.004

* forced into model first

¹ Perceived Risk of Breast Cancer x Response Efficacy of Mammography Screening

RE = Response Efficacy

Figure 1: Leventhal's Parallel Processing Model

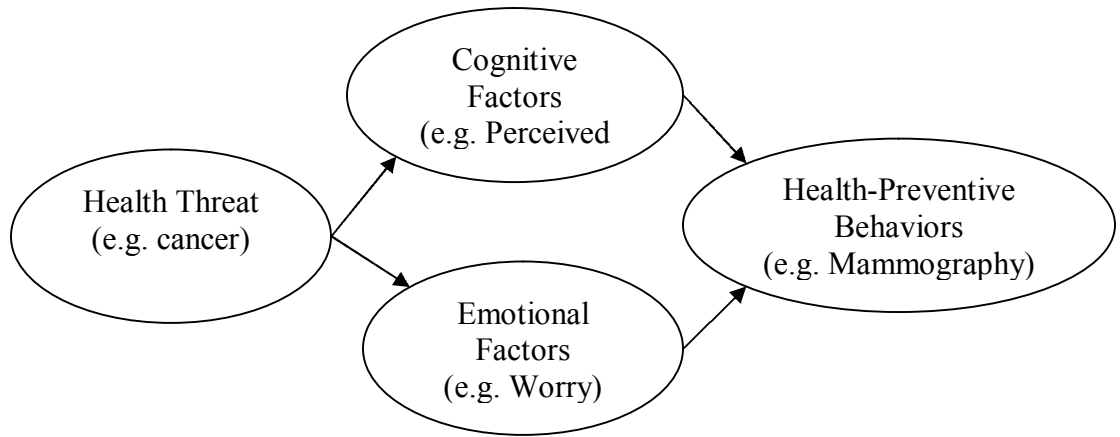


Figure 2: Expansion of Leventhal's Parallel Processing Model – Moderated Mediation Model

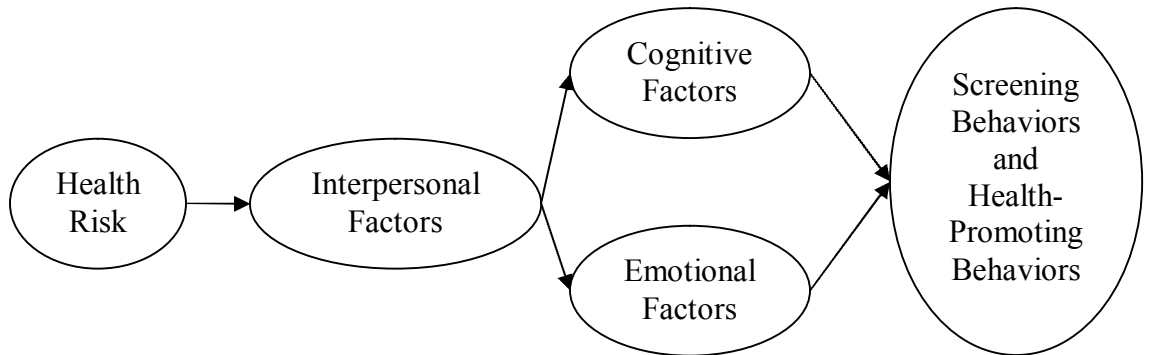


Figure 3: Expansion of Leventhal's Parallel Processing Model – Moderation Model

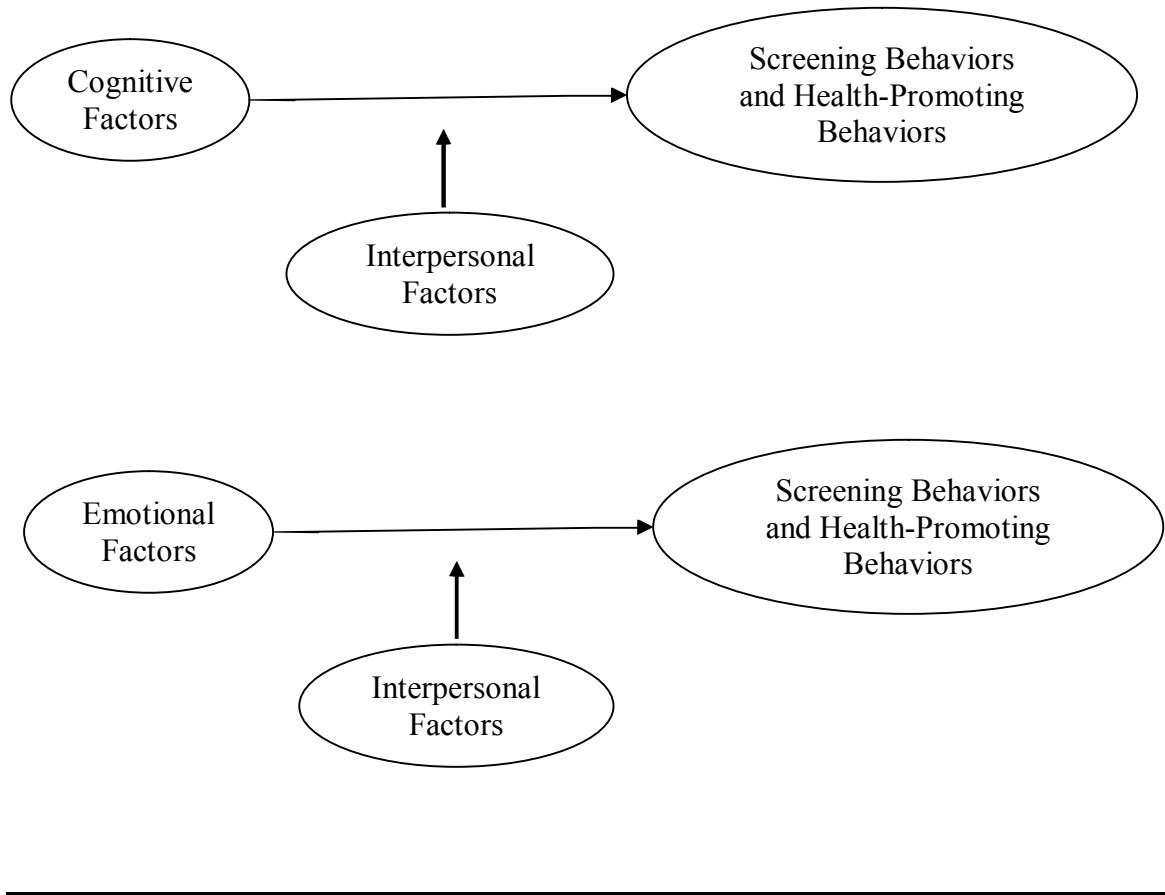


Figure 4: Fatigue Study Patient Accrual

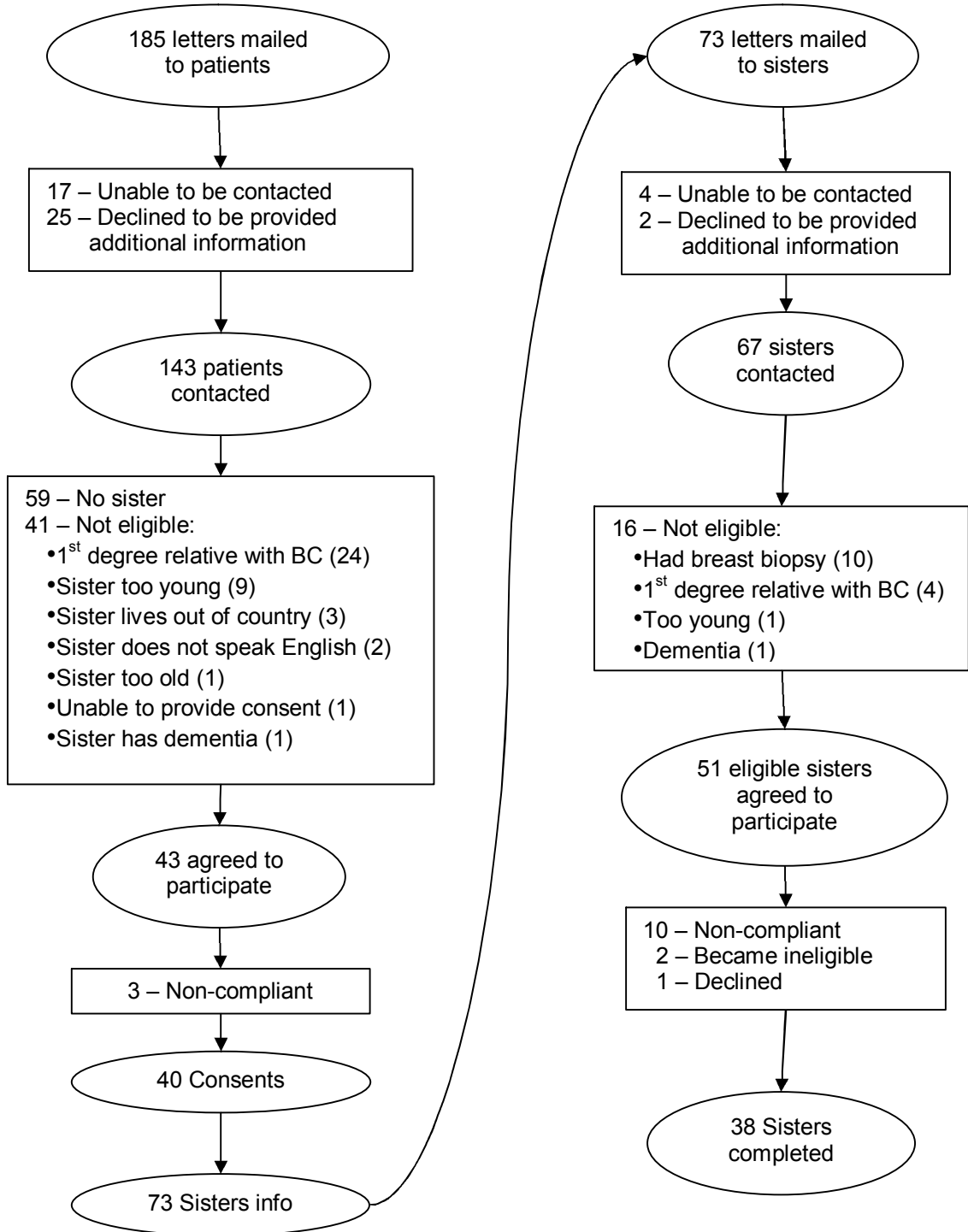


Figure 5: Cancer Registry Accrual

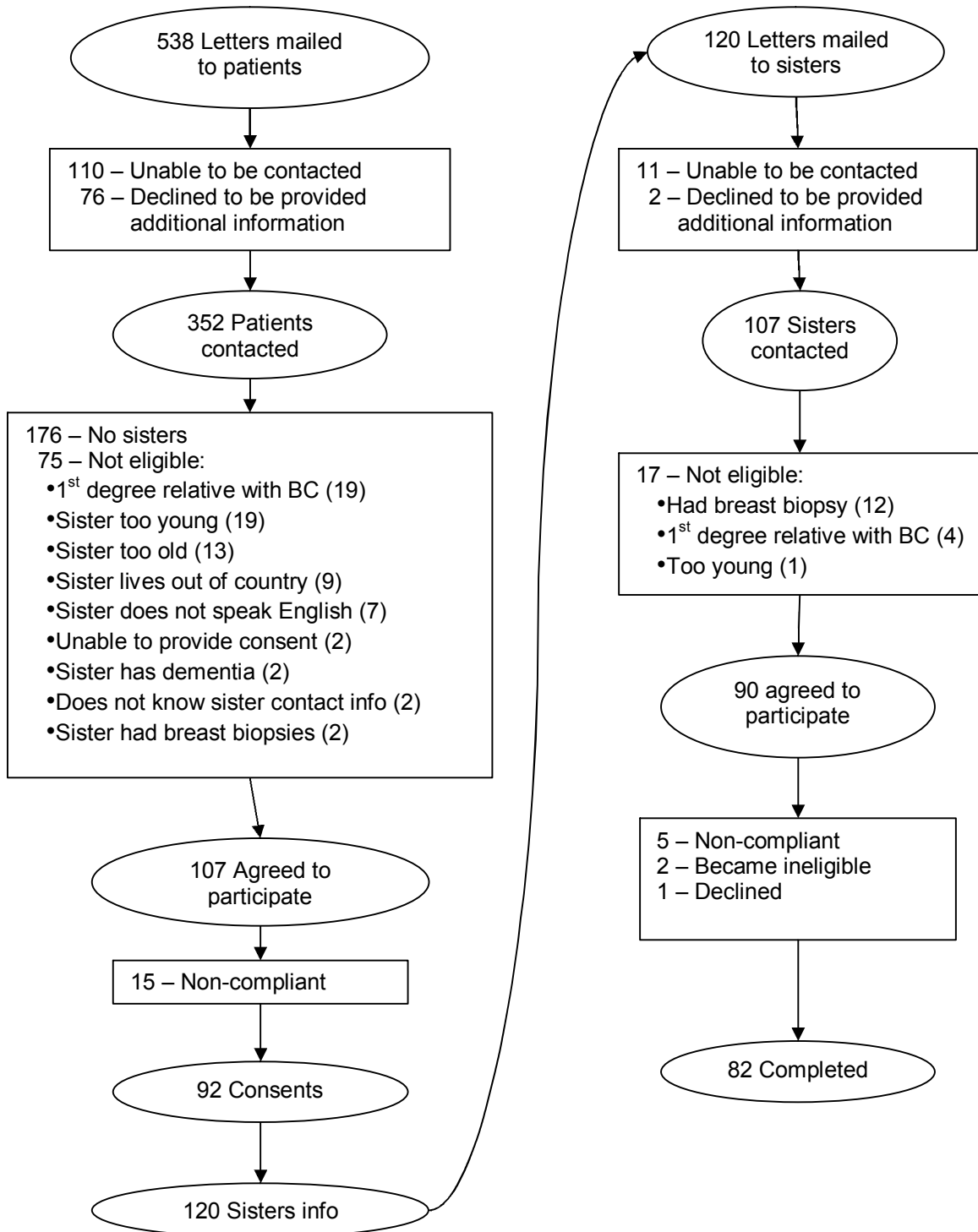


Figure 6: Interaction Between Breast Cancer Worry and Involvement in Sister's Care on Number of Mammography Screening in the Past Five Years

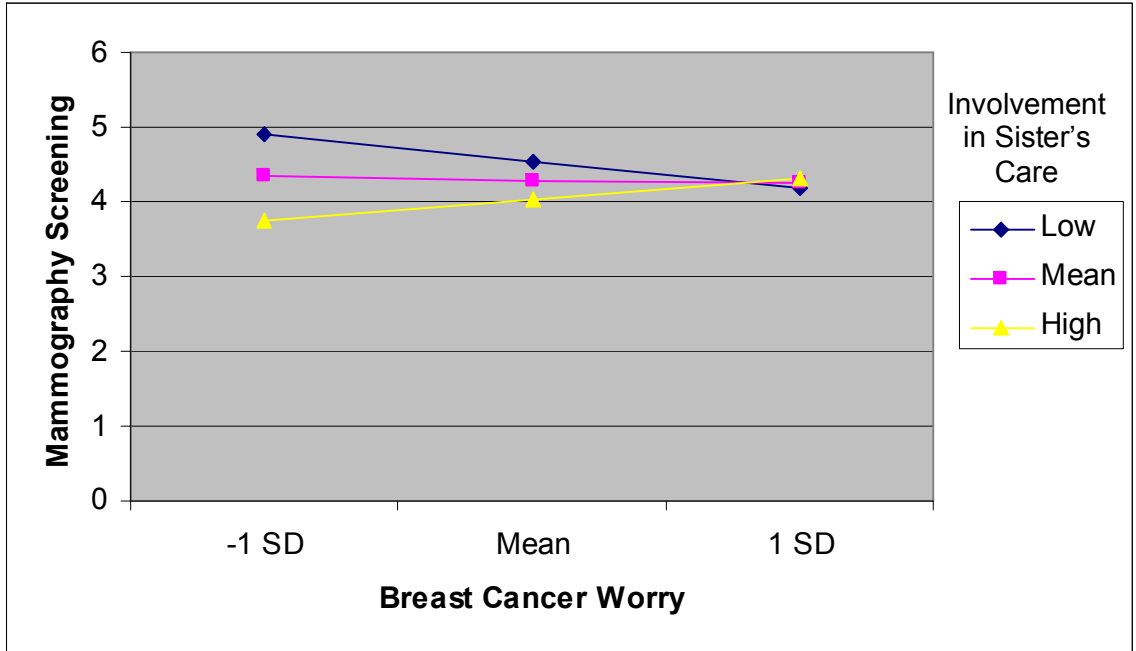
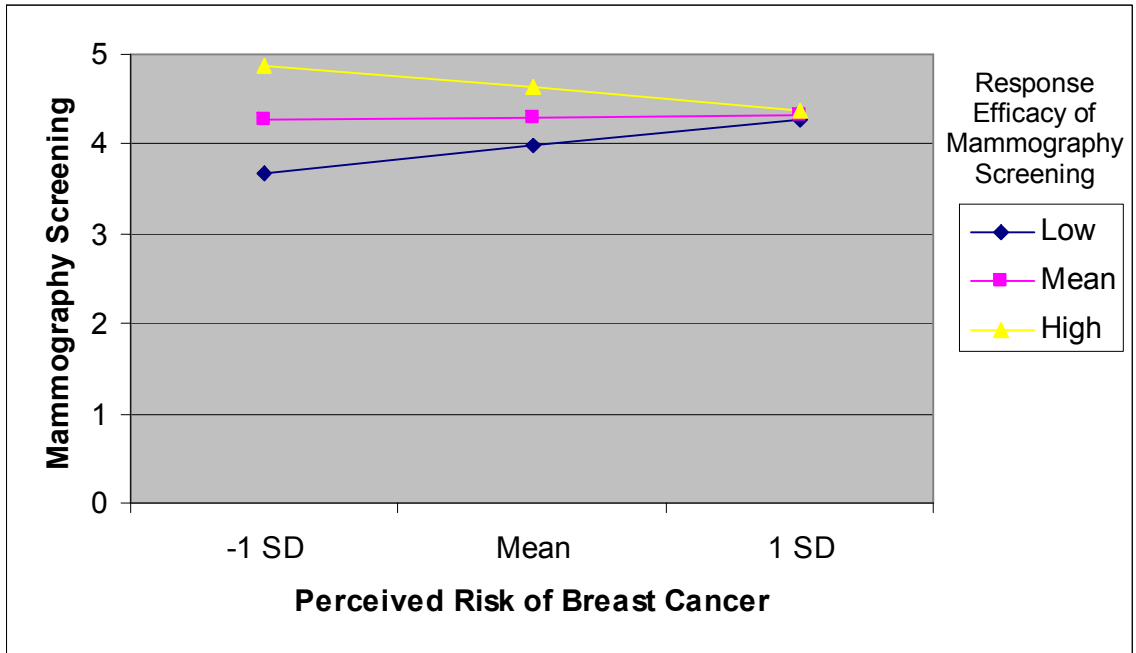


Figure 7: Interaction Between Perceived Risk of Breast Cancer and Response Efficacy of Mammography Screening on Number of Mammography Screening in the Past Five Years



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Appendices

Appendix A: Demographic and Clinical Information

1. Today's Date: / /

2. Birth Date: / /

3. Height: (ft) (in)

4. Weight: (pounds)

5. Blood relation to sister with breast cancer (check one box):

Full blood relation (have the same biological parents)

Half blood relation (share one biological parent)

6. Please identify your ethnic group (check one box)

Hispanic or Latino

Not Hispanic or Latino

7. Please identify your race (check one box)

American Indian or Alaska Native

Native Hawaiian or other Pacific Islander

Asian

White

Black or African American

More than one race

8. Marital status (check one box):

Never married

Divorced

Currently married

Widowed

Separated

Appendix A: Demographic and Clinical Information (continued)

9. Current living arrangement (check one box):

- | | |
|---|--|
| <input type="checkbox"/> Live alone | spouse/partner |
| <input type="checkbox"/> Live with spouse/partner | <input type="checkbox"/> Live with roommate who is not partner |
| <input type="checkbox"/> Live with spouse/partner and children | <input type="checkbox"/> Live with parents |
| <input type="checkbox"/> Live with children (no spouse/partner) | <input type="checkbox"/> Other |

10. How long in current living arrangement (check one box):

- | | |
|--|--|
| <input type="checkbox"/> Less than 1 month | <input type="checkbox"/> Two to 5 years |
| <input type="checkbox"/> One to 6 months | <input type="checkbox"/> More than 5 years |
| <input type="checkbox"/> Seven months to 2 years | |

11. Level of school completed (check one box):

- | | |
|---|--|
| <input type="checkbox"/> Less than 7 th grade | <input type="checkbox"/> High school graduate |
| <input type="checkbox"/> Junior high school (7 th to 9 th grade) | <input type="checkbox"/> Partial college or specialized training |
| <input type="checkbox"/> Partial high school (10 th or 11 th grade) | <input type="checkbox"/> College or university graduate |
| | <input type="checkbox"/> Graduate professional training |

12. Approximate annual gross income for your household: (check one box)

- | | |
|--|---|
| <input type="checkbox"/> Less than \$ 10,000 | <input type="checkbox"/> Greater than \$100,000 |
| <input type="checkbox"/> 10,000 - \$19,999 | <input type="checkbox"/> Prefer not to answer |
| <input type="checkbox"/> 20,000 - \$ 39,999 | |
| <input type="checkbox"/> 40,000 - \$59,999 | |
| <input type="checkbox"/> 60,000 - \$100,000 | |

Appendix A: Demographic and Clinical Information (continued)

13. During your lifetime, have you smoked at least 100 cigarettes (5 packs)? YES

NO

If YES:

a) How many cigarettes do/did you typically smoke each day? (# cigarettes)

b) Have you smoked in the past month?

Yes, approximately cigarettes per day

No, I quit years and months ago

c) How many years in total have you smoked, or if you have quit, how many years did

you smoke? (# years)

14. Have you consumed any alcoholic beverages in the past month? YES NO

If YES:

a) Which of the following best describes the number of alcoholic beverages you consumed in the past month? (check one)

(NOTE: Beer:1 can=1 drink; Wine:1 glass=1 drink; Hard liquor:1 shot=1 drink)

1-3 drinks a month

1 drink a day

1-3 drinks a week

2 drinks a day

4-6 drinks a week

3 or more drinks a day

Appendix B: Menopausal Status Questionnaire

1. Have you ever had a hysterectomy (i.e., removal of the womb)?
 - No
 - Yes
 - Don't Know

2. Have you ever had one or both of your ovaries removed?
 - No, neither of my ovaries have been removed
 - Yes, one ovary removed
 - Yes, both ovaries removed
 - Don't Know

3. Have you received any hormone replacement therapy within the past week (i.e., estrogen)?
 - No
 - Yes
 - Don't Know

4. Have you ever received hormone replacement therapy (i.e., estrogen)?
 - No
 - Yes
 - Don't Know

5. Have you had a menstrual period within the past 3 months?
 - No
 - Yes

Appendix B: Menopausal Status Questionnaire (continued)

6. Have you had a menstrual period within the past 12 months?

No

Yes

7. Compared with 12 months ago, are your menstrual periods in the past 3 months, less regular, about the same, or more regular?

Have not had a menstrual period within the past 3 months

Less regular

About the same

More regular

Appendix C: Gail Model

1. How old were you when you had your first menstrual period?
 - 7 to 11
 - 12 to 13
 - Older than 13
2. If you have children, how old were you when you first gave birth?
 - I do not have children
 - Younger than 20
 - 20 to 24
 - 25 to 30
 - Older than 30
3. How many first degree relatives (mother, sisters, daughters) have had breast cancer?
 - 1
 - 2
 - More than 2
4. Have you ever had a breast biopsy?
 - No
 - Yes

Appendix D: Perceived Risk of Breast Cancer

1. How likely do you think you are to have breast cancer during your lifetime?

- Extremely Unlikely Very Unlikely Somewhat Unlikely Somewhat Likely Very Likely Extremely Likely

2. What do you think your chances are of having breast cancer in your lifetime compared to other women your age?

- Much Higher Somewhat Higher About the Same Somewhat Lower Much Lower

3. How certain are you that you will remain free of breast cancer for the rest of your life?

- Extremely Uncertain Very Uncertain Somewhat Uncertain Somewhat Certain Very Certain Extremely Certain

4. Compared to other women your age with a similar family history of breast cancer, how likely do you think it is that you will develop breast cancer in your lifetime?

- Much Higher Somewhat Higher About the Same Somewhat Lower Much Lower

Appendix E: Response Efficacy

Please indicate whether you disagree or agree with each statement by circling the appropriate number on the scale provided.

- | | |
|--|--|
| 1. Breast cancer can be cured if it is found early through routine mammography screening | strongly disagree 1 2 3 4 5 6 strongly agree |
| 2. By the time something is found by routine mammography screening, it is usually too late to do anything about it | strongly disagree 1 2 3 4 5 6 strongly agree |
| 3. Having routine mammography screenings will increase my chances of living longer | strongly disagree 1 2 3 4 5 6 strongly agree |
| 4. I believe that routine mammography screening would benefit me | strongly disagree 1 2 3 4 5 6 strongly agree |
| 5. I believe that engaging in physical activity would benefit me | strongly disagree 1 2 3 4 5 6 strongly agree |
| 6. I believe that engaging in physical activity would reduce my chances of getting breast cancer | strongly disagree 1 2 3 4 5 6 strongly agree |
| 7. If people engaged in more physical activity, they wouldn't be less likely to develop breast cancer | strongly disagree 1 2 3 4 5 6 strongly agree |
| 8. Whether or not a person develops breast cancer is related to how frequently they engage in physical activity | strongly disagree 1 2 3 4 5 6 strongly agree |
| 9. If more people engaged in physical activity, there would be fewer cases of breast cancer | strongly disagree 1 2 3 4 5 6 strongly agree |

Appendix E: Response Efficacy (continued)

- | | | | | | | | | |
|---|-------------------|---|---|---|---|---|---|----------------|
| 10. I believe that eating a diet high in fruits and vegetables would benefit me | strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | strongly agree |
| 11. I believe that eating a diet high in fruits and vegetables would reduce my chances of getting breast cancer | strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | strongly agree |
| 12. If people ate more fruits and vegetables, they wouldn't be less likely to develop breast cancer | strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | strongly agree |
| 13. Whether or not a person develops breast cancer is related to how many fruits and vegetables they eat | strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | strongly agree |
| 14. If more people ate fruits and vegetables, there would be fewer cases of breast cancer | strongly disagree | 1 | 2 | 3 | 4 | 5 | 6 | strongly agree |

Appendix F: Cancer Worry

1. How often have you been concerned about getting breast cancer?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all
or Rarely | Sometimes | Often | A lot |

2. How often have you thought about your own chances of having breast cancer?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all
or Rarely | Sometimes | Often | A lot |

3. How often have thoughts about breast cancer affect your mood?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all
or Rarely | Sometimes | Often | A lot |

4. How often have thoughts about breast cancer affected your ability to perform you daily activities?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Not at all
or Rarely | Sometimes | Often | A lot |

Appendix G: State-Trait Anxiety Inventory – Trait Form

A number of statements which people have used to describe themselves are given below. Read each statement and then select the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost never	Sometimes	Often	Almost Always
1. I feel pleasant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I feel nervous and restless.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I feel satisfied with myself.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I wish I could be as happy as others seem to be	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I feel like a failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I feel rested	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I am "calm, cool, and collected"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I feel that difficulties are piling up so that I cannot overcome them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I worry too much over something that really doesn't matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I am happy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I have disturbing thoughts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I lack self-confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I feel secure.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I make decisions easily.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. I feel inadequate.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I am content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Some unimportant thought runs through my mind and bothers me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I take disappointments so keenly that I can't put them out of my mind	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I am a steady person.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I get in a state of tension or turmoil as I think over my recent concerns and interests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix H: Involvement in Sister's Care

1. To what extent were you personally involved in your sister's cancer treatment and care?

- | | | | | |
|--|--|--|--|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently Involved
(more than once a week) | Regularly Involved
(on average once a week) | Occasionally Involved
(on average less than once a week and more than once a month) | Infrequently Involved
(on average once a month) | Rarely Involved
(less than once a month or not at all) |

2. How often did you talk to your sister face-to-face about her cancer treatment and care throughout her treatment?

- | | | | | |
|---------------------------------------|---------------------------------------|---|---|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently
(more than once a week) | Regularly
(on average once a week) | Occasionally
(on average less than once a week and more than once a month) | Infrequently
(on average once a month) | Rarely
(less than once a month or not at all) |

3. How often did you talk to your sister through other means (e.g. telephone, email) about her cancer treatment and care throughout her treatment?

- | | | | | |
|---------------------------------------|---------------------------------------|---|---|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently
(more than once a week) | Regularly
(on average once a week) | Occasionally
(on average less than once a week and more than once a month) | Infrequently
(on average once a month) | Rarely
(less than once a month or not at all) |

4. How often did you provide assistance (e.g., caregiving, babysitting, driving, housework) for your sister during her treatments?

- | | | | | |
|---------------------------------------|---------------------------------------|---|---|--|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently
(more than once a week) | Regularly
(on average once a week) | Occasionally
(on average less than once a week and more than once a month) | Infrequently
(on average once a month) | Rarely
(less than once a month or not at all) |

Appendix H: Involvement in Sister's Care (continued)

5. How often did you come to your sister's doctor appointments?

- | | | | | |
|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently
(almost every) | Regularly
(most) | Occasionally
(about half) | Infrequently
(a few) | Rarely
(almost none
or none) |

6. How often did you come to your sister's treatment appointments?

- | | | | | |
|------------------------------|--------------------------|------------------------------|--------------------------|------------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Frequently
(almost every) | Regularly
(most) | Occasionally
(about half) | Infrequently
(a few) | Rarely
(almost none
or none) |

Appendix I: Lifetime Sibling Relationship Scale

Please rate the extent to which you agree or disagree with each statement concerning your current relationship with your sister who was diagnosed with breast cancer by choosing the appropriate box.

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.	My sister makes me happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	My sister's feelings are very important to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	I enjoy my relationship with my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	I am proud of my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	My sister and I have a lot of fun together.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.	My sister frequently makes me Angry.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.	I admire my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	I like to spend time with my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.	I presently spend a lot of time with My sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.	I call my sister on the telephone frequently.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.	My sister and I share secrets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	My sister and I do a lot of things together.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	I never talk about my problems with my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14.	My sister and I borrow things from each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.	My sister and I 'hang out' together.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16.	My sister talks to me about personal problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix I: Lifetime Sibling Relationship Scale (continued)

		Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
17.	My sister is my good friend.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18.	My sister is very important in my life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19.	My sister and I are not very close.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20.	My sister is one of my best friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21.	My sister and I have a lot in common.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22.	I believe I am very important to my sister.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23.	I know that I am one of my sister's best friend.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24.	My sister is proud of me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix J: Mammography Screening

1. Have you had a mammography screening in the past 24 months (2 years)?

Yes

No

2. What was the date of your last mammography: (month) (year)

3. Was your last mammography screening before or after your sister's breast cancer diagnosis?

Before her diagnosis

After her diagnosis

I have never had a mammography screener

4. How many mammography screening have you had in the past 60 months?

5. Has your mammography screening behavior changed since your sister's diagnosis?

I have increased the frequency of mammography screening since her diagnosis.

I have decreased the frequency of mammography screening since her diagnosis.

I have not changed the frequency of mammography screenings since her diagnosis.

6. In the next 24 months (2 years), how likely is it that you will obtain a mammography screening?

Extremely
Unlikely

Very
Unlikely

Somewhat
Unlikely

Somewhat
Likely

Very
Likely

Extremely
Likely

Appendix K: Godin Leisure-Time Exercise Questionnaire

Please report the frequency and average duration of any exercise over the past week in the spaces below. As an example: If you exercised four times last week at a moderate intensity you would put “4” in the frequency column following moderate exercise. We would like you to also give an average of the time spent exercising. In our example, if two of those “4” exercise sessions were 30 minutes and the other two were 20 minutes you would put 25 minutes in the average duration column following moderate exercise.

When answering these questions, please remember to:

- Only count exercise that was done in your free time (i.e., not occupational or housework).
- Note that the differences between the three categories is in the intensity of the exercise.
- If you did not engage in a type of exercise, write "0" in the frequency column.

	<u>Frequency</u>	<u>Duration</u>
<p>A. STRENUOUS EXERCISE (HEART BEATS RAPIDLY, SWEATING) Examples: running, jogging, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes</p>	<input style="width: 60px; height: 25px;" type="text"/> times	<input style="width: 60px; height: 25px;" type="text"/> mins.

	<u>Frequency</u>	<u>Duration</u>
<p>B. MODERATE EXERCISE (NOT EXHAUSTING, LIGHT PERSPIRATION) Examples: fast walking, tennis, easy bicycling, easy swimming, popular and folk dancing</p>	<input style="width: 60px; height: 25px;" type="text"/> times	<input style="width: 60px; height: 25px;" type="text"/> mins.

	<u>Frequency</u>	<u>Duration</u>
<p>C. MILD EXERCISE (MINIMAL EFFORT, NO PERSPIRATION) Examples: easy walking, yoga, bowling, shuffleboard, horseshoes, golf</p>	<input style="width: 60px; height: 25px;" type="text"/> times	<input style="width: 60px; height: 25px;" type="text"/> mins.

D. CHANGE IN EXERCISE

Is this a change from your level of activity from before your sister’s breast cancer diagnosis?

- Yes, my level of activity has increased since her diagnosis.
- Yes, my level of activity has decreased since her diagnosis.
- No, my level of activity has not changed since her diagnosis.

Appendix L: By Meal Screener

INSTRUCTIONS

- Think about what you usually ate last month.
- Please think about all the fruits and vegetables that you ate last month. Include those that were:
 - raw and cooked,
 - eaten as snacks and at meals,
 - eaten at home and away from home (restaurants, friends, take-out), and
 - eaten alone and mixed with other foods.
- Report how many times per month, week, or day you ate each food, and if you ate it, how much you usually had.
- If you mark "Never" for a question, follow the "Go to" instruction.
- Choose the best answer for each question. Mark only one response for each question.

1. Over the last month, how many times per month, week, or day did you drink 100% fruit juice such as orange, apple, grape, or grapefruit juice? Do not count fruit drinks like Kool-Aid, lemonade, Hi-C, cranberry juice drink, Tang, and Twister. Include juice you drank at all mealtimes and between meals.

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	1-3	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	times	time	times	times	times	times
Question	last	per	per	per	per	per	per	per	per
2)	month	week	week	week	day	day	day	day	day

1a. Each time you drank 100% juice, how much did you usually drink?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Less than 3/4 cup (less than 6 ounces)	3/4 to 1-1/4 cup (6 to 10 ounces)	1-1/4 to 2 cups (10 to 16 ounces)	More than 2 cups (more than 16 ounces)

2. Over the last month, how often did you eat lettuce salad (with or without other vegetables)?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Never	1-3	1-2	3-4	5-6	1	2	3	4	5 or more
(Go to	times	times	times	times	time	times	times	times	times
Question	last	per	per	per	per	per	per	per	per
3)	month	week	week	week	day	day	day	day	day

Appendix L: By Meal Screener (continued)

2a. Each time you ate lettuce salad, how much did you usually eat?

- About 1/2 cup
 About 1 cup
 About 2 cups
 More than 2 cups

3. Over the last month, how often did you eat French fries or fried potatoes?

- Never
 (Go to Question 4)
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

3a. Each time you ate French fries or fried potatoes, how much did you usually eat?

- Small order of less
 (About 1 cup or less)
- Medium order
 (About 1-1/2 cups)
- Larger order
 (About 2 cups)
- Super Size order of more
 (About 3 cups or more)

4. Over the last month, how often did you eat other white potatoes? Count baked, boiled, and mashed potatoes, potato salad, and white potatoes that were not fried.

- Never
 (Go to Question 5)
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

4a. Each time you ate these potatoes, how much did you usually eat?

- 1 small potato or less
 (1/2 cup or less)
- Medium order
 (About 1-1/2 cups)
- Larger order
 (About 2 cups)
- Super Size order of more
 (About 3 cups or more)

5. Over the last month, how often did you eat cooked dried beans? Count baked beans, bean soup, refried beans, pork and beans and other bean dishes.

- Never
 (Go to Question 6)
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Appendix L: By Meal Screener (continued)

5a. Each time you ate these beans, how much did you usually eat?

- Less than 1/2 cup 1/2 to 1 cup 1 to 1-1/2 cups More than 1-1/2 cups

Now, divide your waking hours into three time periods:

- MORNING
- LUNCHTIME AND AFTERNOON
- SUPPERTIME AND EVENING

Please think about the foods you ate during each of those time periods over the last month.

MORNING

6. Think about all the foods you ate at your morning meal and snacks over the last month. On how many days did you eat fruit for your morning meal or morning snacks? Count any kind of fruit—fresh, canned, and frozen. Do not count juices.

- Never
(Go to Question 7)
- 1-3 days
last month
- 1-2 days
per week
- 3-4 days
per week
- 5-6 days
per week
- Every day

6a. When you ate fruit in the morning, what is the total amount of fruit that you usually ate in a morning ?

- Less than 1 medium fruit
(Less than 1/2 cup)
- 1 medium fruit
(About 1/2 cup)
- 2 medium fruits
(About 1 cup)
- More than 2 medium fruits
(More than 1 cup)

Appendix L: By Meal Screener (continued)

7. Think about all the foods you ate at your morning meal and morning snacks. On how many days did you eat vegetables for your morning meal or morning snacks?

DO NOT COUNT:

- Lettuce Salads
- White potatoes
- Cooked dried beans
- Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
- Rice

COUNT:

- All other vegetables—raw, cooked, canned, and frozen

Never
(Go to Question 8)

1-3 days last month

1-2 days per week

3-4 days per week

5-6 days per week

Every day

7a. When you ate vegetables in the morning, what is the total amount of vegetables that you usually ate in a morning?

Less than 1/2 cup

1/2 to 1 cup

1 to 2 cups

More than 2 cups

LUNCHTIME AND AFTERNOON

8. Think about all the foods you ate at lunchtime and for your afternoon snacks last month. On how many days did you eat fruit at lunchtime or for your afternoon snacks? Count any kind of fruit—fresh, canned, and frozen. Do not count juices.

Never
(Go to Question 9)

1-3 days last month

1-2 days per week

3-4 days per week

5-6 days per week

Every day

Appendix L: By Meal Screener (continued)

8a. When you ate fruit at lunchtime or for your afternoon snacks, what is the total amount of fruit that you usually ate then?

- | | | | |
|---|-----------------------------------|----------------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Less than 1 medium fruit
(Less than 1/2 cup) | 1 medium fruit
(About 1/2 cup) | 2 medium fruits
(About 1 cup) | More than 2 medium
fruits
(More than 1 cup) |

9. Think about all the foods you ate at lunchtime and for your afternoon snacks. On how many days did you eat vegetables at lunchtime or for your afternoon snacks?

DO NOT COUNT:

- Lettuce Salads
- White potatoes
- Cooked dried beans
- Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
- Rice

COUNT:

- All other vegetables—raw, cooked, canned, and frozen

- | | | | | | |
|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Never
(Go to Question 10) | 1-3 days
last month | 1-2 days
per week | 3-4 days
per week | 5-6 days
per week | Every day |

9a. When you ate vegetables at lunchtime or for your afternoon snacks, what is the total amount of vegetables that you usually ate then?

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Less than 1/2 cup | 1/2 to 1 cup | 1 to 2 cups | More than 2 cups |

Appendix L: By Meal Screener (continued)

SUPPERTIME AND EVENING

10. Think about all the foods you ate at supper and for your evening snacks last month. On how many days did you eat fruit at supper or for your evening snacks? Count any kind of fruit—fresh, canned, and frozen. Do not count juices.

- Never
(Go to Question 11)
- 1-3 days
last month
- 1-2 days
per week
- 3-4 days
per week
- 5-6 days
per week
- Every day

10a. When you ate fruit at supper or for your evening snacks, what is the total amount of fruit that you usually ate then?

- Less than 1 medium fruit
(Less than 1/2 cup)
- 1 medium fruit
(About 1/2 cup)
- 2 medium fruits
(About 1 cup)
- More than 2 medium
fruits
(More than 1 cup)

11. Think about all the foods you ate at supper and for your evening snacks. On how many days did you eat vegetables at supper or for your evening snacks?

DO NOT COUNT:

- Lettuce Salads
- White potatoes
- Cooked dried beans
- Vegetables in mixtures, such as in sandwiches, omelets, casseroles, Mexican dishes, stews, stir-fry, soups, etc.
- Rice

COUNT:

- All other vegetables—raw, cooked, canned, and frozen

- Never
(Go to Question 12)
- 1-3 days
last month
- 1-2 days
per week
- 3-4 days
per week
- 5-6 days
per week
- Every day

Appendix L: By Meal Screener (continued)

11a. When you ate vegetables at supper or for your evening snacks, what is the total amount of vegetables that you usually ate then?

- Less than 1/2 cup
 1/2 to 1 cup
 1 to 2 cups
 More than 2 cups

These last few questions ask about how often you ate particular foods at any time of the day.

12. Over the last month, how often did you eat tomato sauce? Include tomato sauce on pasta or macaroni, rice, pizza and other dishes.

- Never
 (Go to Question 13)
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

12a. Each time you ate tomato sauce, how much did you usually eat?

- About 1/4 cup
 About 1/2 cup
 About 1 cup
 More than 1 cup

13. Over the last month, how often did you eat vegetable soups? Include tomato soup, gazpacho, beef with vegetable soup, minestrone soup, and other soups made with vegetables.

- Never
 (Go to Question 14)
- 1-3 times last month
- 1-2 times per week
- 3-4 times per week
- 5-6 times per week
- 1 time per day
- 2 times per day
- 3 times per day
- 4 times per day
- 5 or more times per day

Appendix L: By Meal Screener (continued)

13a. When you ate vegetable soup, how much did you usually eat?

- Less than 1 cup 1 to 2 cups 2 to 3 cups More than 3 cups

14. Over the last month, how often did you eat mixtures that included vegetables?
Count such foods as sandwiches, casseroles, stews, stir-fry, omelets, and tacos.

- Never 1-3 times last month 1-2 times per week 3-4 times per week 5-6 times per week 1 time per day 2 times per day 3 times per day 4 times per day 5 or more times per day

15. Has your overall fruit and vegetable intake changed since your sister's diagnosis?

- Yes, my fruit and vegetable intake has increased since her diagnosis
- Yes, my fruit and vegetable intake has decreased since her diagnosis
- No, my fruit and vegetable has not changed since her diagnosis

Appendix M: NCI Booklet

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Please read the following carefully:

We would like to provide you with the opportunity to receive educational information about breast cancer (free of charge). Please check ONE of the following boxes:

Yes, I would like to be mailed educational information about breast cancer.

No, I do not want to be mailed educational information about breast cancer.

Appendix N: Fatigue Patient Recruitment Letter

Dear _____,

We are conducting a study at H. Lee Moffitt Cancer Center to learn more about attitudes and knowledge of breast cancer screening practices and diet and exercise behaviors among sisters of women diagnosed with breast cancer. We received your name through the “Cognitive-Behavioral Aspects of Cancer Related Fatigue” study, which you are currently involved in, as someone who may have sisters who are potentially eligible for this study. This study will involve your sister answering questions about attitudes and beliefs about breast cancer screening practices and diet and exercise behaviors

If you would prefer not to be contacted about potentially providing contact information for your sister(s), please let us know by leaving a message at the following toll-free telephone number 1-800-456-3434, ext. 1992 within the next two weeks. If we don't hear from you during that time, a member of our research staff will contact you to answer any questions you have about the study and find out if you have eligible sisters and are willing to participate in the study by providing your sisters' contact information.

We hope you decide to participate in this study. Thank you very much for your time.

Sincerely,

Paul B. Jacobsen, Ph.D.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

Sheri R. Jacobs, M.A.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

Appendix O: Registry Patient Recruitment Letter

Dear _____,

We are conducting a study at H. Lee Moffitt Cancer Center to learn more about attitudes and knowledge of breast cancer screening practices and diet and exercise behaviors among sisters of women diagnosed with breast cancer. We received your name through the physician in charge of the Comprehensive Breast Cancer Program as someone who may have sisters who are potentially eligible for this study. This study will involve your sister answering questions about attitudes and beliefs about breast cancer screening practices and diet and exercise behaviors

If you would prefer not to be contacted about potentially providing contact information for your sister(s), please let us know by leaving a message at the following toll-free telephone number 1-800-456-3434, ext. 1992 within the next two weeks. If we don't hear from you during that time, a member of our research staff will contact you to answer any questions you have about the study and find out if you have eligible sisters and are willing to participate in the study by providing your sisters' contact information.

We hope you decide to participate in this study. Thank you very much for your time.

Sincerely,

Paul B. Jacobsen, Ph.D.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

W. Bradford Carter, MD
Comprehensive Breast Cancer Program
H. Lee Moffitt Cancer Center

Sheri R. Jacobs, M.A.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

Appendix P: Sister Recruitment Letter

Dear _____,

We are conducting a study at H. Lee Moffitt Cancer Center to learn more about attitudes and beliefs about breast cancer screening practices and diet and exercise behaviors among women who have a sister who has had breast cancer. The study would involve answering questions about breast cancer and its prevention. We have spoken with your sister, who gave us permission to contact you regarding your participation in our study.

If you would prefer not to be contacted about potentially participating in this study, please let us know by leaving a message at the following toll-free telephone number, 1-800-456-3434, ext. 1992 within the next two weeks. If we don't hear from you during that time, a member of our research staff will contact you to answer any questions you have about the study and find out if you are willing to participate.

We hope you decide to participate in this study. Thank you very much for your time.

Sincerely,

Paul B. Jacobsen, Ph.D.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

Sheri R. Jacobs, M.A.
Psychosocial & Palliative Care Program
H. Lee Moffitt Cancer Center

Appendix Q: Sister agree to participate – hard copy version

Dear _____,

Thank you for taking the time to speak with me on the phone the other day and for agreeing to participate in the study I described.

Please:

1. Read the Informed Consent Form which describes the study and what participation will involve. Read the Research Authorization form which describes our policy towards protecting the privacy of your information.
2. Sign and date both copies of the Informed Consent Form and Research Authorization Form. One copy of each form is to be returned with the questionnaire, and one copy of each form is yours to keep. If you have any questions about the study, please call me at (813) 745-1992 or 1-800-456-3434 ext. 1992.
3. Complete the Questionnaire Packet. This will take approximately 30 minutes to complete.
4. Return one signed and dated copy of the Informed Consent Form/Research Authorization Form and the Questionnaire packet in the enclosed self-addressed, stamped envelope. In order for your responses to be included in the study, your envelope must be put in the mail no later than _____.

Someone from the Moffitt Cancer Center may be calling you to insure that you have received the questionnaire packet. Again, thank you for taking the time to help us in our study.

Sincerely,

Sheri Jacobs, M.A.
Research Assistant

Appendix R: Sister agree to participate – online version

Dear _____,

Thank you for taking the time to speak with me on the phone the other day and for agreeing to participate in the study I described.

Please:

5. Read the Informed Consent Form which describes the study and what participation will involve. Read the Research Authorization form which describes our policy towards protecting the privacy of your information.
6. Sign and date both copies of the Informed Consent Form and Research Authorization Form. One copy is yours to keep. If you have any questions about the study, please call me at (813) 745-1992 or 1-800-456-3434 ext. 1992.
7. Complete the online questionnaire. This will take approximately 30 minutes.

Website: www.moffittresearch.com/moffitt

When you go to the website you must fill in your unique identification number and password to complete the questionnaire.

ID:

Password:

8. Return one signed and dated copy of the Informed Consent Form/Research Authorization Form in the enclosed self-addressed, stamped envelope. In order for your responses to be included in the study, your envelope must be put in the mail no later than _____.

Someone from the Moffitt Cancer Center may be calling you to insure that you have received the questionnaire packet. Again, thank you for taking the time to help us in our study.

Sincerely,

Sheri Jacobs, M.A.
Research Assistant

About the Author

Sheri Jacobs Hartman graduated cum laude with a Bachelor's degree in Psychology from Washington University in St. Louis in 2002. After completing her undergraduate studies she entered the Clinical Psychology Ph.D. program at the University of South Florida where she received her Master of Arts Degree in 2005. She completed her pre-doctoral internship in 2008 from the Warren Alpert Medical School of Brown University. In 2008, she also received her Ph.D. in clinical psychology from the University of South Florida. She is currently a postdoctoral fellow at the Warren Alpert Medical School of Brown University continuing her research pursuits in psycho-oncology.