Coping Strategies and Anxiety in Young Breast Cancer Survivors

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Coping Strategies and Anxiety in Young Breast Cancer Survivors

by

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I have reviewed this thesis. It represents work done by the author under my supervision and guidance.

Faculty Supervisor's Signature

Abstract

OBJECTIVES: To understand the types of coping strategies reported by young women with breast cancer in the first 2 years following diagnosis and to evaluate the relationship between coping strategies and anxiety in early survivorship.

BACKGROUND: Young women with breast cancer are thought to be vulnerable to age-specific stressors, and this group's use of coping strategies has not been clearly defined in the literature. A better understanding of coping strategies used by this group and the relationship between specific coping strategies and anxiety could help to inform the development of effective interventions to promote healthy coping, with the goal of improving quality of life in this population.

METHODS: Helping Ourselves, Helping Others: The Young Women's Breast Cancer Study (YWS) is a multi-center, prospective cohort that enrolled 1297 women with newly diagnosed breast cancer at age $\leq$ 40 years between 2006 and 2016. YWS participants complete serial surveys that include information on demographics (baseline), coping strategies (6 months and 18 months), and anxiety and depression (baseline, 2 years). We performed descriptive statistics, tabulated hospital anxiety and depression (HADS) scores at baseline and 2 years, tabulated coping strategies used at 6 and 18 months. We used univariable and multivariable logistic regression models to examine the relationship between specific coping strategies used at 18 months and anxiety at 24 months. We also performed an exploratory analysis of utilization of coping strategies among those participants with anxiety at 24 months.

RESULTS: After excluding women who had not completed the 6 month and/or 18 month surveys and those with metastatic disease at diagnosis, 833 women remained in the analytic sample. The median age at diagnosis was 37 (range: 17-40) years. The cohort was 87% white non-Hispanic, 86% college-educated, 80% married or living as married, and 81% able to pay bills without cutting back. 86% were diagnosed with stage 0, I, or II disease, and over 70% received a bilateral (46%) or unilateral (25%) mastectomy. Social supports were the most commonly reported coping strategies at

both 6 and 18 months, with greater than 80% reporting at least moderate use of support from partner, parents, family, and friends. Greater than 40% of women reported partner support as the most helpful coping strategy. The reported use of alcohol/drugs, exercise, and diet changes to cope increased from 6 to 18 months. In multivariable logistic regression, those with moderate or greater reliance on family support and moderate or greater use of exercise for coping at 18 months were less likely to have anxiety at 24 months, while those with moderate or greater reliance on alcohol/drug use as well as reporting taking care of others to cope were more likely to have anxiety.

CONCLUSION: Young breast cancer survivors rely heavily on social supports from family and friends, and they employ more health-related coping strategies during survivorship compared to early after diagnosis. There is a relationship between specific coping strategies (less social support, less exercise, more alcohol/drug use, more taking care of others) and moderate or greater anxiety in early survivorship. Our findings may help inform the development of psychosocial interventions for young breast cancer survivors and their caregivers.

Table of Contents

Glossary

- ACBCYW = Advisory Committee on Breast Cancer in Young Women
- ASCO = American Society of Clinical Oncology
- AYA = adolescent and young adult
- BCS = breast cancer survivors
- CBSM = cognitive behavioral stress management
- CDC = Centers for Disease Control and Prevention
- CI = confidence interval
- ER = estrogen receptor
- FOR = fear of recurrence
- GLOBOCAN = Global Cancer Incidence, Mortality and Prevalence.
- HADS = Hospital Anxiety and Depression Scale
- HDI = human development index
- HER-2 = human epidermal growth factor receptor 2
- mHealth = mobile health
- OR = odds ratio
- PR = progesterone receptor
- QoL = quality of life
- SIO = Society for Integrative Oncology
- YWS = Helping Ourselves, Helping Others: The Young Women's Breast Cancer Study

Introduction

Breast Cancer Incidence and Mortality Worldwide and in the United States

Breast cancer is the second most commonly diagnosed cancer worldwide, accounting for an estimated 2.1 million new cases in 2018 [1]. Among women, breast cancer is the most commonly diagnosed cancer, accounting for almost 25% of cancer cases, and it is the leading cause of cancer deaths in women worldwide [1]. Due to population growth and aging, breast cancer burden is increasing globally [2].

Breast cancer incidence and mortality rates vary widely across and within countries. Incidence is highest in higher Human Development Index (HDI) regions of the world including Australia/New Zealand (94.2 per 100,000), Western Europe (92.5 per 100,000), Northern Europe (90.1 per 100,000), and North America (84.8 per 100,000). Lowest incidence is seen in lower HDI regions of Eastern Africa (29.9 per 100,000), Middle Africa (27.9 per 100,000), and South Central Asia (25.9 per 100,000) [1]. This variation in incidence is thought to be due to higher prevalence of known risk factors in high HDI countries, including increased lifetime menstrual cycles, decreased childbearing, exogenous hormone exposure, alcohol use, and obesity. Mortality is highest in Melanesia (25.5 per 100,000), Micronesia/Polynesia (19.1 per 100,000), and Northern Africa (18.4 per 100,000) [1].

Breast cancer incidence and mortality rates in the United States are also of concern. The National Cancer Institute estimates that in 2018, over 266,000 women in the United States were diagnosed with breast cancer, over twice the estimate for lung cancer diagnoses in the same population. Additionally, over 40,000 deaths were attributable to breast cancer in 2018, second in cancer deaths only to lung cancer [3]. Further, cancer incidence has increased over the past half-century. A woman living in the United States in the 1970s had a 1-in-11 chance of being diagnosed with breast cancer in her lifetime, while the current lifetime risk of breast cancer is approximately 1-in-8 [4].

AYA Cancers and AYA Breast Cancer Incidence and Mortality

Historically, the adolescent and young adult (AYA) cancer population (ages 20 to 39) has garnered less attention from researchers and policymakers, often being referred to as the 'lost tribe' due to this neglect [5]. Nonetheless, appropriate diagnosis, treatment, and survivorship care of the AYA cancer population is essential both for the well-being of individual patients and also for the economic and social health of the population. AYA cancer patients have a large portion of their expected lifespan remaining, and a cancer diagnosis in this age group impacts a larger number of life-years than in other age groups [5]. This age group plays vital societal roles, including contributing significantly to the economic workforce and providing necessary care for ill and aging family members when necessary. Additionally, the AYA cancer is quite large, with nearly one million AYAs are diagnosed with cancer annually worldwide [6]. Given the significant impact of cancer diagnosis on life-years and the non-trivial incidence, the AYA cancer burden rivals that of all other age groups [5] and requires further study and intervention.

Breast cancer is responsible for a significant portion of this burden. Women in the AYA population are at disproportionally greater risk of cancer than men [6]. Among AYA women worldwide, breast cancer is the most commonly diagnosed malignancy (17.0 cases per 100,000 people per year), followed by cervical cancer, thyroid cancer leukemia, and colorectal cancer [6,7]. Additionally, breast cancer is the most common cause of mortality in this group (4.4 per 100,000 people per year), followed by liver cancer, leukemia, and cervical cancers. Similar to breast cancer incidence overall, incidence in young adults varies by region and HDI [6]. In countries with lower HDI such as in regions of Africa and the Middle East, where populations are skewed much younger and there is not routine population screening, a higher proportion of breast cancer patients are diagnosed under age 40 [7]. An additional contributor to this variation is thought to be genetics. The AYA breast cancer population has a higher likelihood of hereditary breast cancer compared to post-menopausal women [8], and the higher incidence of BRCA1/2 mutations in people of European ancestry could partially

account for the elevated incidence in North America, Europe, and Australia/New Zealand [6].

In the United States, breast cancer is the most common cancer among the AYA population, responsible for both 15% of all invasive cancers and also 30% of female cancers in AYAs [9]. 5.6% of all invasive breast cancers diagnosed between 2000 and 2014 were in the female AYA population [9]. According to the American Cancer Society, 10,980 AYA women were diagnosed with invasive breast cancer, and 1,020 AYA women died secondary to breast cancer in 2013 in the US [10]. The incidence of breast cancer in the AYA population increases dramatically as age 40 approaches [9].

Breast cancer incidence in the AYA population has been increasing slightly since the mid-1990s [4,9]. While incidence of localized and regional disease has remained relatively steady since 1975, the incidence of metastatic disease at diagnosis has been increasing at an increasing rate [9]. AYAs are also more likely to present with higher stage disease, with two thirds of 25- to 29-year-old patients with a new breast cancer diagnosis having non-localized, regional, or distant disease [11], requiring more intensive therapy.

Pathology and Psychosocial Issues Unique to AYA Breast Cancer

A 2014 review showed that several large studies found age at diagnosis of breast cancer to be independent risk factor for breast cancer relapse and mortality, even after adjusting for treatment received [12]. Cancer arising in young women is considered a unique biologic entity, characterized by more aggressive pathologic characteristics including poorly differentiated tumors with higher rates of lymphovascular invasion and lymphocytic infiltration [11-13]. Breast cancers in this population also tend to have lower hormone sensitivity, higher HER-2 and EGFR expression [14-16], and a higher frequency of the more aggressive HER-2-enriched and basal-like subtypes of breast cancer [17]. Additionally, this population has higher frequency of pathologically and clinically aggressive triple negative tumors [17, 18].

While the exact cause of these unique breast cancer characteristics in the AYA population is unknown, it has been posited that mechanism is related to the level of biologic maturity of the substrate. The AYA population has undergone puberty but has not yet experienced common effects of aging including hormonal decline, immune response deterioration, or sequelae of chronic disease [19]. Additionally, breast cancer in the AYA population is more common among women with a family history of early-onset breast cancer, which may contribute to the unique biologics of AYA breast cancer. While 10% of all breast cancer patients are found to have a germline mutation in major known cancer-predisposing genes, about 50% of AYA women diagnosed with breast cancer before age 30 have germline mutations in BRCA1, BRCA2, or TP53 [20].

A breast cancer diagnosis can have a major impact on the physical and emotional well-being of young women. Physically, young patients are often healthy before diagnosis, and a breast cancer diagnosis typically results in some combination of surgery, chemotherapy, radiation, and biologic therapy that can cause negatively viewed body changes, unpleasant side effects, and possible long-term sequelae. As AYAs with breast cancer are often diagnosed with more aggressive disease, this population usually receives more therapy compared to women diagnosed at older ages [21] Younger women are more likely to undergo mastectomy vs. breast-sparing surgery [4]. These treatments are physically and emotionally taxing, particularly given the lower survival rates for young women.

Breast cancer treatments carry significant risk of morbidity. Lymphedema of the arm affects approximately 21% of breast cancer survivors [23], with three times higher incidence in women who have undergone axillary dissection vs. sentinel lymph node biopsy alone [24]. Following surgery and/or radiation, women can experience numbness, tingling, or chest discomfort. Women are also more susceptible to developing chronic pain after breast cancer treatment. In addition, chemotherapy and hormonal therapies can induce premature menopause in women, which can cause side

effects like hot flashes, night sweats, atrophic vaginitis, and dyspareunia. Women can also experience weight gain, which can be distressing [22, 25].

Additionally, breast cancer treatments put patients at risk of long-term sequelae. Women are at increased risk of bone loss and osteoporosis due to estrogen-blocking treatments. Patients are also at risk of cardiotoxicity secondary to anthracyclines, radiotherapy, and trastuzumab. There may also be an increased risk of new primary malignancies including tamoxifen-associated endometrial cancer, radiotherapy-associated lung cancer, and chemotherapy-induced hematologic malignancies [24,26]. Importantly, therapies used treat breast cancer in women of childbearing age can eliminate or delay fertility in this cohort [11,27], which can derail patients' plans to have children in the future.

Socially, young women with breast cancer face specific issues related to their age and life stage, including loss of autonomy, interruptions in education/career trajectory, financial issues, disruptions in peer and romantic relationships, desire for pregnancy and being young parents [9,28]. Further, young women are prone to feeling isolated from providers and other breast cancer patients due to their relative young age, which can exacerbate their psychosocial difficulties [29].

AYA Breast Cancer and Anxiety

A breast cancer diagnosis can put young patients at increased risk of emotional and psychological sequelae both during and after treatment [9]. Breast cancer distort one's self-image, generating low self-esteem and suppressed sexuality [30]. Worse body image has been associated with increased psychological stress in breast cancer patients and is associated with worse quality of life [31]. In particular, young women often place high importance on body image and attractiveness, which can be detrimentally impacted by breast cancer treatments [28].

Young women diagnosed with breast cancer who are of childbearing age often have to navigate fertility issues related to their illness and treatment. Fertility concerns can affect patients' relationships, life planning, and general well-being [32]. ASCO clinical practice guidelines recommend that healthcare providers address the possibility of infertility due to treatment as early as possible in the therapeutic course and are ready to speak with their patients about options for fertility preservation and/or refer them to reproductive endocrinology specialists as needed [33]. However, fertility preservation referral rates remain low [34] and the practice of fertility preservation varies widely among reproductive endocrinologists, resulting in an unestablished standard of care and leaving patients susceptible to suboptimal care [35]. These factors contribute to higher levels of psychosocial distress in the AYA population than in older women at both diagnosis and follow-up [26].

In addition to psychological difficulties around fertility issues, many cancer survivors experience psychiatric sequelae after diagnosis including fear of recurrence of their cancer (FOR), posttraumatic stress symptoms, and anxiety and depression. Anxiety is the most prevalent psychiatric sequelae in the AYA breast cancer population. [36]. A 2013 meta-analysis including 43 studies found that the prevalence of anxiety in cancer survivors as 17.9% compared to 13.9% in healthy controls (p = 0.0039), while depression was at 11.6% for survivors and 10.2% for controls (p=0.17) [37]. Throughout survivorship, 55-90% of breast cancer survivors report FOR, which is associated with poorer quality of life and well-being, psychiatric comorbidity, and disruptive symptoms including poor sleep, fatigue, and decreased concentration [32].

Females and AYAs are more susceptible to these sequelae than other cancer populations. AYA survivors are increasingly recognized as a group with unique emotional needs compared to childhood and older cancer survivors [38]. AYA survivors, and breast cancer survivors in particular, have been found to have increased anxiety compared to corresponding older cancer patient cohorts [39,40]. Anxiety is important to address in this population, as it can not only disrupt quality of life and resuming one's normal activities, but it can also be a barrier to engagement in survivorship care [41].

Studies have shown that depression and anxiety levels tend to be highest right after diagnosis and decrease over time. A study of 222 women with early breast cancer found that nearly 50% of women with early breast cancer had depression and/or anxiety during the year after diagnosis, and this percentage decreased to 25% during the next 3 years [42]. Typically, most psychosocial issues remit within the first 24 months after diagnosis in cancer patients [43].

As an indication of the importance of the above issues, the CDC created the Advisory Committee on Breast Cancer in Young Women (ACBCYW), a federal advisory committee established to by the CDC develop initiatives around knowledge acquisition around breast health and breast cancer among women under the age of 40 in an effort to address these issues [44].

Breast Cancer and Coping Strategies

Coping has been described as emotional, behavioral, and cognitive reactions to manage event-related distress. Conceptualization of coping strategies began in the 1960s, and since then a plethora of studies have analyzed coping behaviors. These studies have posited over 100 coping schema with over 400 individual coping strategies [45]. Greer et al.'s 1979 Lancet article was the among the first to examine the 'psychological response' to breast cancer, using patients' statements and mood during interviews 3 months after surgery to assess coping (levels of 'denial', 'fighting spirit', 'stoic acceptance', and 'feelings of helplessness and hopelessness') and subsequently examining associations between coping and 5-year, 10-year, and 15-year outcomes. The analysis showed that patients who were identified as having a 'fighting spirit' and/or 'denial' were more likely to survive and remain disease-free [46, 47]. Out of this work was born the Mental Adjustment to Cancer (MAC) Scale in 1988 [52], the COPE inventory in 1989, the Coping Strategy Indicator in 1990, and Coping Response's Inventory in 1993, among others [49].

The plethora of coping scales is highlighted in the literature [50], along with criticism highlighting the difficulty of both capturing and also interpreting this coping data. Folkman and Moskowitz discuss 3 primary challenges for coping researchers: measurement, nomenclature, and effectiveness [49]. Other recent studies have suggested alternative ways to understand coping, including counting the number of coping strategies an individual used, instead of the type of coping strategies, as a more meaningful measure of coping ability highlighting individuals' aptitude for flexibility [50].

Several studies have examined coping strategies used by women with breast cancer. A 2007 study used a modified Ways of Coping scale to examine coping strategies for 201 women 50 years or younger, and it determined that the most frequently used coping strategies were positive cognitive restructuring, wishful thinking, and making changes. They also found that coping strategies not measured in many coping scales, including physical activity, were also deemed valuable by patients [52]. Another study examined coping strategies reported by 51 women aged 34 to 77 post-radiation and/or chemotherapy for treatment of primary breast or gynecologic cancers, and participants reported acceptance, religion, and distraction as primary coping strategies [53].

Several other small studies have examined coping strategies used by women with a breast cancer diagnosis, although they focus on very specific patient populations, such as Northeastern Thai women, Palestinian women, Chinese women, and Iranian women [44, 45, 46, 47]. These studies used mostly qualitative data, have small sample sizes (18 to 266 subjects), and employed various coping scales for the analysis, making it difficult to compare across studies.

A 2014 meta-analysis of 78 studies examined the associations between coping and psychological well-being and physical health among breast cancer survivors [54]. Because many distinct coping scales were used in the different studies, the authors formed groups of subscales in order to fit the majority of coping questions into a single schema. They found that acceptance and positive reappraisal were associated with improved well-being and health, while disengagement and avoidance coping

mechanisms were associated with decreased well-being and health. The mean age of patients in the analysis was 53, with mean ages ranging from 43 to 62 years, not allowing for meaningful extrapolation of the AYA population. Additionally, most of the included studies were cross-sectional and did not report time since cancer diagnosis, making it difficult to determine where in the diagnosis-survivorship spectrum this data applies [54].

Few studies exist that examine coping strategies used in the AYA breast cancer population specifically. A 2015 study from Borstelmann et al. examined the association between perceptions of partner support and anxiety in the Young Women's Breast Cancer Study (YWS). The study showed that married cancer survivors identified partner support as essential. Partner support appeared to be protective against the stress and anxiety for women who perceived support, while women who felt unsupported by their partners had more difficulty with adaptive coping and reported higher rates of anxiety [55].

Given the dearth of relevant studies in the literature, there is a clear need for further evaluation of coping strategies used by the AYA breast cancer population.

Breast Cancer Survivorship

More than 3.5 million US women with a history of breast cancer were alive on January 1, 2016 [56], accounting for almost one fourth of the 14 million cancer survivors in the US [57]. Some of these women were cancer free, while others had evidence of active disease and may have been receiving therapy [56]. The population of breast cancer survivors in the US is expected to grow to over 4.5 million by 2026 [55]. Due to improvements in cancer detection and treatment, two-thirds of those diagnosed with invasive cancer live more than five years, with a resulting rising population of long-term survivors [55].

As more patients enter survivorship with longer life expectancies, healthcare professional face the new challenge of helping their patients live after a cancer diagnosis. Major concerns for AYA breast cancer survivors include disease-related follow-up including surveillance and appropriate screening, addressing any lingering treatment-related physical symptoms such as lymphedema, discussing fertility and the potential desire for pregnancy in the future, and talking about issues related to body image, sexuality, and sexual function with patients and their partners. In particular, patients' psychosocial health must be monitored and addressed as needed, particularly in coping with feelings of uncertainty and FOR. Disease-specific psychosocial concerns such as FOR, issues regarding body image and sexuality, and financial burdens can persist long into survivorship [59].

Study Aims

Given the gap in the literature around general coping strategies used by young breast cancer survivors in early survivorship, we sought to understand the types of coping strategies reported by young women diagnosed with breast cancer at age 40 and younger in the first two years following diagnosis and to evaluate the relationship between coping strategies and anxiety during this period.

Methods

Participants

Helping Ourselves, Helping Others: The Young Women's Breast Cancer Study (YWS) is a longitudinal cohort study of women 40 years old or younger when diagnosed with breast cancer (ClinicalTrials.gov Identifier: NCT01468246). It was established to examine biological, medical, and QOL issues specific to young women with breast cancer. Beginning in November 2006, women within 6 months of a breast cancer diagnosis were systematically identified at several community and academic hospital sites in Massachusetts as well as academic sites in Colorado, Minnesota, and Toronto, Canada. Eligibility requirements included diagnosis of breast cancer at age 40 years or

younger within 6 months of enrollment. After women were enrolled and consented to the study, they fill out surveys and provide blood samples, and tumor tissue is collected. Women are surveyed every 6 months for the first 3 years after diagnosis, then yearly thereafter after diagnosis [31, 60, 61]. The baseline survey was completed by participants an average of 4.6 months after their breast cancer diagnosis. The study closed to enrollment in 2016. In total, 1,302 women were enrolled in the cohort.

This analysis included 833 women (Figure 1). Exclusion criteria included participants who were deemed ineligible post-enrollment (n=5) and participants who had completed abbreviated versions of the surveys that did not include coping and anxiety questions known as "short form" and "modified short form" surveys (n=91). Additionally, we excluded participants who did not fill out the 6-month survey, 18-month survey, or both the 6 and 18-month surveys (n=328). We also excluded women with Stage IV breast cancer (n=45), as these women were thought to be predisposed to different psychosocial challenges secondary to a metastatic cancer diagnosis and have been found to have decreased QoL compared to non-metastatic breast cancer patients, thus warranting a separate analysis [62]. This study was approved by Institutional Review Boards at the Dana-Farber/Harvard Cancer Center and the other study sites.

Data and instruments

Demographic, disease, and treatment data

Race, ethnicity, college education, marital status, financial stress, and employment status, were self-reported by participants on the baseline survey. Medical record review was used to assess stage and reconcile missing race and ethnicity data. Treatment was ascertained by medical record review in combination with self-report on the baseline and 6 months surveys.

Dichotomous variables were created for race/ethnicity (white non-Hispanic vs. other), education (completed college education vs. other), marital status (married or living as

married vs. other), employment (fulltime employment vs. other), primary breast surgery (mastectomy vs. lumpectomy), chemotherapy (yes vs. no) and radiation therapy (yes vs. no). Financial situation was divided into 3 groups: 1) having enough money for special things you want after paying the bills, 2) having enough money to pay the bills but little spare money to buy extra or special things, and having money to pay the bills but only because of cutting back on things or having difficulty paying bills no matter what you do [63]. Stage was divided into four groups: 0, I, II, III.

Assessment of anxiety

Depressive and anxious symptoms were assessed using the Hospital Anxiety and Depression Scale (HADS). The HADS scores range from 0 to 21 on the anxiety and depression subscales, with higher scores indicating more symptoms. Scores are typically groups into low (0-7), mild (8-10), and moderate to high (11-21), and a moderate to high score ($\geq$11) on either subscale is designated as representative of anxiety or depression, respectively, and suggestive of the need for intervention [25]. HADS is a reliable and validated psychological screening scale, and it has been used in other studies of young women with breast cancer [30, 64, 65, 66]. HADS data is collected on yearly surveys for the YWS cohort. HADS data from the baseline survey and 24-month survey (early survivorship) were used in this analysis.

Assessment of coping strategies

Data related to coping strategies was collected on the 6 and 18-month surveys for the YWS cohort (see Appendix 1 for survey questions). This series of questions was investigator developed in the nascence of the YWS. For each of 18 specific coping strategies, participants were asked, 'to what extent have the following factors helped you cope with your breast cancer diagnosis and treatment?' Participants responded by choosing the number corresponding to the level of coping for which they relied upon each strategy: 0 = 'not at all', 1 = 'to a small extent', 2 = 'to a moderate amount', 3 = 'to a large extent', and 4 = 'it is the most important think that keeps me going'. Participants

also had the ability to choose 'does not apply' as an answer for each question instead of choosing a representative number.

Participants were also given the opportunity to write in additional coping strategies that they relied upon and specify its level of importance using the same scale as in the other questions. Additionally, the final question in the section allowed for participants to specify which coping strategy the relied upon the most, and asked, 'now, please look over the list of factors above once more, and circle the one that has been most helpful in coping with your breast cancer diagnosis and treatment.'

We chose to dichotomize the coping strategy variables into 'moderate or greater' vs. 'small extent or less' for the purposes of the analysis, as this was thought to be a clinically relevant cutoff. Further, we chose to split the data into only two groups in order to maintain relatively large numbers within each group to improve power.

We chose to include the 'does not apply' responses in the 'to a small extent or less' group. When a participant responds that a coping strategy does not apply to her, it logically follows that this participant was not relying at all on the coping strategy and thus could fall into the same analysis category as the 'does not apply' responses. For example, if a woman who is unpartnered responds 'does not apply' to the question about partner support, this woman necessarily has not been receiving any support from a partner.

We combined alcohol and drug variables due to their relatively small number of events, as we felt the single variable would be representative of substance use for the group.

Given that there are many coping scales in the literature that all provide different frameworks for understanding coping strategies, we chose to adapt a framework presented in a meta-analysis on coping in women with breast cancer [58]. The framework was based on a hierarchy of higher-order coping strategies (engagement coping, disengagement coping, miscellaneous coping) with lower-order coping

strategies falling under these higher-order strategies. We fit the coping questions asked in the 6 and 18-month surveys into this framework (Figure 2).

In creating the multivariable logistic regression model, we chose to include 6 coping strategies as predictors: support from family, support from healthcare providers, taking care of others, alcohol/drug use, exercise, and vitamins. These coping strategies fall within an array of the categories in Figure 2 providing a representative sample of various coping mechanisms. Additionally, these coping strategies have known and/or hypothesized associations with QoL, particularly anxiety and depression [39, 67, 68, 69]. Finally, we felt these particular coping strategies could potentially be intervened upon, so they would be useful in measuring their relationship to anxiety.

Statistical analysis

Frequencies and medians were reported for categorical and continuous, respectively, for demographic, disease, and treatment variables. Means, medians, and ranges for HADS anxiety and depression subscales scores were reported using baseline and 24-month survey data.

Frequencies of moderate or greater reliance on coping strategies were tabulated at 6 and 18 months. McNemar p-values were calculated to assess differences in the frequencies of coping strategies at the two time points.

Univariable logistic regression models were fit to examine the relationship between specific coping strategies and anxiety as captured by a binary HADS anxiety subscale variable. A multivariable regression model was fit to examine the relationship between the 6 coping strategies and anxiety. We chose, a priori, to include age, race, and stage as covariates in the model. Other covariates included in the multivariable model were those that were significant at the $p \leq 0.20$ level univariable model was. In the multivariable analyses, the HADS anxiety subscale variable was divided into two groups in accordance with validated cutoffs: those with moderate or greater anxiety (score ≥ 11

on HADS anxiety subscale) and those with mild or less anxiety (score <11 on HADS anxiety subscale).

An exploratory analysis examining coping strategies among those with clinically meaningful levels of anxiety at 24 months was performed. As discussed previously, anxiety levels are expected to decline as patients move further away from the time of diagnosis. We divided the population into 4 groups based on their HADS anxiety subscale scores at baseline and 24 months: those anxious at both time points, those not anxious at both time points, those anxious at baseline but not anxious at 24 months, and those not anxious at baseline but anxious at 24 months (Table 6). For those individuals who remained or became anxious (as evidenced by HADS anxiety subscale $\geq$11) in early survivorship, we performed descriptive statistics on demographic, disease, and treatment data as was done for the entire cohort, and we tabulated the coping strategies used at 18 months among the subgroup with anxiety. We calculated χ^2 statistics to examine whether there were differences in the coping strategies used to a moderate or greater amount by those who were anxious vs. those not anxious.

All analyses were conducted in SAS Studio Version 3.71 (SAS Institute Inc., Cary, NC, USA).

Results

Study population characteristics

Table 1 includes demographic, disease, and treatment characteristics for the study population collected on the baseline survey. Median age at diagnosis was 36 (range: 17-40) years old. 86.6% of patients in the study population self-identified as White non-Hispanic, and 85.6% of patients completed a college education. 77.9% of the study population reported being married or living as married. 63.4% of women report being full-time employed in the 6 months prior to diagnosis. 52.7% of patients report having

enough money to buy special things they want, 28.5% say they have little spare money to buy any extra or special things, 9.9% report having money to pay bills because they have cut back on other spending, and 9% report difficulty paying bills no matter what.

35.0% of women were diagnosed with stage I disease, 42.3% of women were diagnosed with stage II disease, and 14.1% of women were diagnosed with stage III disease at the time of initial diagnosis. 71.5% of women had cancers that were ER positive, 65.0% had cancers that were PR positive, and 29.4% had cancers that were HER-2 positive. 46.2% of the study population had a bilateral mastectomy, 24.9% had a unilateral mastectomy, and 28.9% had a lumpectomy. 75.4% of women received chemotherapy, and 61.7% of women underwent a course of radiation.

Anxiety in study population

Tables 2 and 3 include analysis of HADS data from the baseline and 24 month surveys, respectively. At baseline, the study population's mean anxiety subscale score was 7.51 (SD of 4.22), median score was 7, and score range was 0 to 21. The study population's mean depression subscale score was 4.74 (SD of 3.57), median score was 4, and score range was 0 to 18. 23.1% of patients' anxiety subscale scores fell into the clinically significant moderate to high range of 11-21, while only 6.7% of patients' depression subscale scores were in the moderate to high range.

At 24 months, the study population's anxiety and depression subscales showed lower rates of anxiety and depression. The mean anxiety subscale score was 6.87 (SD of 4.36), median score was 6, and score range was 0 to 21. The study population's mean depression subscale score was 3.30 (SD of 3.34), median score was 2, and the range was 0 to 19. 20.1% of patients' anxiety subscale scores were in the moderate to high range, while only 4.5% of patients' depression subscale scores were in this range.

Coping strategies in study population

Figures 3, 4, and 5 show the percentages of the study population who reported moderates or greater reliance on social support, disengagement, and other coping

strategies, respectively, at 6 and 18 months. All forms of social support had high percentages of moderate or greater reliance at both 6 and 18 months, with over 60% for all social support coping variables and over 80% of all family-related social support variables at both time points. Friend support and family support had the highest percentages of all coping variables at both 6 and 18 months: moderate or greater reliance on friend support for coping was reported by 91.7% and 92.8% of the population at 6 and 18 months, respectively, and moderate or greater reliance on family support was reported by 83.7% and 85.2% of the population at 6 and 18 months, respectively.

Disengagement coping strategies were generally used less frequently than social support coping strategies. Taking care of others was the most highly relied upon coping strategy to a moderate degree or greater, with hobbies and work as the next most relied upon coping strategies in this category. Approximately 70% population relied on taking care of others moderately or greater for coping both at 6 and 18 months. Over half (56.7%) and 64.5% of the study population relied on hobbies moderately or greater for coping at 6 and 18 months, respectively, while 56.2 % and 61.5% of the study population relied on work moderately or greater for coping at 6 and 18 months, respectively. Of note, alcohol/drug use was a moderately or greater used coping strategy for 11.8% of the population at 6 months and 15.0% of the study population at 18 months.

Participants' reliance on coping strategies in the 'other' group were variable. Exercise was relied upon the most, with 65.1% and 73.3% of participants reporting a moderate amount or more reliance on exercise for coping at 6 and 18 months, respectively. Diet and religion were the other most relied upon coping strategies in this group, with 45.0% and 54.5% of the having moderate or greater reliance on diet as a coping strategy at 6 and 18 months, respectively, and 37.3% and 43.1% of the cohort relying moderately or greater on religion for coping at 6 and 18 months, respectively. Additionally, vitamins were a moderate or greater source of coping for 25.1% of women at 6 months and 29.4% of women at 18 months.

When we compared the proportion utilizing each strategy at each time point, there were statistically significantly higher proportions of women in the cohort reporting moderate or greater reliance on specific coping strategies at 18 months compared to 6 months, including support from healthcare providers (p = 0.0111), work (p = 0.0191), hobbies (p = 0.0002), religion (p <0.0001), alcohol/drug use (p = 0.0223), exercise (p <0.0001), dietary change (p <0.0001), and vitamins (p=0.0419). Moderate or greater reliance on partner support, parental support, family support, friends' support, co-worker support, shopping, taking care of others, complementary medicine, and meditation for coping were not significantly different between the two time points.

Table 4 includes the coping strategies that participants reported to be the most helpful at 6 and 18 months. These included support from partner (40.2% at 6 months, 39.9% at 18 months), taking care of others (9.8% at 6 months, 12.6% at 18 months), support from friends (7.6% at 6 months, 6.8% at 18 months), support from family (6.4% at 6 months, 6.0% at 18 months), and support from parents (6.1% at 6 months, 4.6% at 18 months).

Other coping strategies volunteered by women included psychotherapy and medications (antidepressants, Ativan, Percocet), online support groups, spending time with pets, and practicing yoga.

Relationship between coping strategies and anxiety in study population

Table 5 shows the univariable and multivariable models, Age, race, financial stress, stage at diagnosis, and chemotherapy were covariates included in the multivariable model. In univariable and multivariable analyses of coping strategies and anxiety, moderate or greater use of support from family for coping (vs. use to a small extent or less) was associated with lower odds of anxiety (HADS $\geq$ 11) (univariable OR, 0.486; 95% CI, 0.312-0.757; p = 0.0014; multivariable OR 0.435; 95% CI, 0.261-0.724; p = 0.0014), and moderate or greater reliance on drug/alcohol use for coping (vs. less or none) was associated with higher odds of anxiety (univariable OR, 1.897; 95% CI, 1.171-3.073; p = 0.0093; multivariable OR, 1.985; 95% CI, 1.207-3.263; p = 0.0069).

In those with moderate or greater reliance on exercise for coping, there was a trend towards lower odds of anxiety in the univariable (OR, 0.698; 95%CI 0.473-1.030; p = 0.0704) and lower odds of anxiety in the multivariable model (OR, 0.623; 95% CI, 0.399-0.975; p = 0.0383). In those with moderate or greater reliance on taking care of others, there was a trend towards higher odds anxiety in the univariable analysis (OR, 1.488; 95% CI, 0.973-2.276; p = 0.0666) and higher odds of anxiety in the multivariable model (OR, 1.991; 95% CI 1.154-3.065; p = 0.0112).

Additionally, in the multivariable model younger age (OR, 0.949; 95% CI 0.902-0.998; p = 0.0435) and increased financial stress were associated with higher odds of anxiety (OR, 2.232; 95% CI, 1.373-3.661; p = 0.0013).

Sub-Analysis of Participants with Anxiety at 24 Months

145 people in the study population had anxiety at 24 months (Table 7). Demographic data for this group was largely similar to that of the larger cohort, although the median age at diagnosis was slightly lower in the subgroup (36.6 years old) and a larger percentage of people in this subgroup had financial security, with 12.6% having to cut back on things to pay the bills and 17.5% of having difficulty paying the bills no matter what.

The 18-month coping questions showed that compared to those without anxiety at 24 months, the subgroup had a significantly lower percentage of moderate or greater support from family (75.18% vs. 87.29%; p = 0.0017). Additionally, this subgroup had numerically lower percentages of moderate or greater support from partner (77.46% vs. 83.80%; p = 0.0599), parents (79.43% vs. 81.97%; p = 0.3245), and friends (90.85% vs. 93.20%; p = 0.2633), but the subgroup had a higher percentage of moderate or greater support from healthcare providers (86.62% vs. 83.01%; p = 0.3126), though these differences were not statistically significant.

In terms of disengagement coping strategies, a significantly larger percentage of those in the subgroup reported moderate or greater reliance on alcohol/drug use (23.57% vs. 13.19%; p = 0.0039) and shopping (41.01% vs. 31.49%; P = 0.0199) for coping compared to those without anxiety at 24 months. The subgroup also had numerically higher percentages of coping by taking care of others compared to those without anxiety at 24 months (77.14% vs. 70.15%; p = 0.0962), though the difference is not statistically significant.

In terms of other coping strategies, the subgroup had decreased rates of moderate or greater reliance on exercise for coping (67.61% vs. 74.52%; p = 0.0718), but higher rates of vitamins (32.39% vs. 28.81; p = 0.2516), complementary therapies (33.80% vs 29.02%; p = 0.3074), and meditation (42.55% vs. 34.88%; p = 0.0772) for coping compared to those without anxiety at 24 months. These differences were not statistically significant.

Discussion, Conclusions, and Suggestions for Future Work

This analysis is among the first to examine various coping strategies used specifically by young women with breast cancer in the early survivorship period. Social supports, particularly family, friend, and partner support, were overwhelmingly the most commonly relied upon coping strategies at both 6 and 18 months, with over 80% of study population relying on these social supports a moderate amount or greater for coping with their breast cancer. These findings are consistent with existing literature on the impact of social support on QoL in survivorship populations [25, 39]. In the 1980s, sociologist Peggy Thoits reconceptualized social support as coping assistance, emphasizing the protective effects that social support can play for people who are trying to cope with difficult circumstances [70]. In the breast cancer population, social support, particularly emotional support, has been associated with improved QoL, including lower levels of anxiety [71]. The quality of social support is thought to be a more important predictor of QoL than quantity [72.] In a prior study from our team, Bertelsmann et al. found that among young women with breast cancer who were partnered, those who felt

unsupported had higher odds of anxiety (OR, 2.08; 95% CI 1.32-3.27; P ≤ 0.01), suggesting the negative effect of perceived lack of partner support in this population [39]. For young women who feel positive social support, it has been suggested that these feelings positively impacted their perception of the difficult situation, making them feel more equipped to cope with it [73].

Young breast cancer survivors may be particularly vulnerable to perceived lack of partner support due to less experience in coping with life stresses as a couple, particularly when the couple may be young in the relationship as well. Further, young couples often have a large number of competing demands on time and emotional energy, including financial issues, career trajectory and work productivity, fertility issues, and raising young children [39]. The relationship between social support and QoL factors such as anxiety are thought to be modified by other factors, including exercise, which should be investigated further [86]. Distress screening and subsequent intervention design in this population should necessarily include exploration of individuals' perceived social support, particularly from their most important relationships [39].

In the multivariable model, individuals relying on alcohol and/or drug consumption for moderate or greater coping were almost twice as likely to have clinically significant anxiety compared to those relying on alcohol and/or drug consumption to a small extent or less (OR, 1.985; 95% CI, 1.207-3.263; P = 0.0069). Alcohol use disorder and anxiety co-occur frequently in the general public, with ORs for comorbidity in several studies ranging from 2.1 to 3.3 [74], which aligns with our findings. Epidemiologic studies have suggested that alcohol may play a causative role in the development of breast cancer [75, 76] and may contribute to increased incidence of cancer recurrence [77]. Given the association between alcohol intake and anxiety and the negative effects alcohol intake can have on the health of the survivorship population, it is certainly an issue that should be addressed by patients' clinical teams. Unfortunately, the question asked about coping via drug use provides no specificity on the types of drugs used by the patients who indicated drug use as a coping mechanism.

The multivariable model also identified moderate or greater reliance on exercise as a protective factor against anxiety (OR, 0.623; 95% CI, 0.399-0.975; P = 0.0383). Exercise is a known protective factor against anxiety in the general population [78]. Studies have found that exercise in breast cancer patients can decrease patients' psychologic difficulties during treatment and improve QoL in survivorship [79, 80]. We also found that a significantly greater percentage of women were using exercise for coping at 18 months compared to 6 months (P < 0.01), suggesting that as women are further through or finished with treatment, they are more able to take up exercising. One study that tested a home-based walking exercise program for patients receiving radiation therapy provided psychological benefit for patients [81], emphasizing the need for determining patients' ever-changing physical capacity and encouraging movement within that capacity during and after treatment.

Additionally, moderate or greater reliance on taking care of others was associated with increased anxiety in the multivariable model (OR, 1.881; 95% CI, 1.154-3.065; P = 0.0112). As discussed previously, AYA women are in the age range where they might have young or adolescent children and they also may be caring for elderly relatives. Caretaker roles can increase feelings of stress and anxiety. AYA breast cancer survivors with young children in particular can feel burdened by the need to figure out whether or how to explain their diagnosis to their children, potentially having to answer uncomfortable and upsetting questions about their mortality [82].

Exploratory analysis showed that about 20% of the population was experiencing moderate to high levels of anxiety at 24 months after diagnosis, a larger percentage than might have been expected and a significant source of poor QoL and morbidity in this population. Compared to the older cancer population, the AYA population is unique and requires its own holistic interventions. This population has been found to experience expectation and reality mismatch particularly moving into later survivorship, which can exacerbate feelings of anxiety [83]. AYA patients have been found to have unmet information and service needs, with over 50% of AYA cancer patients who

needed mental health services not receiving them. The development of interventions to support protective coping strategies and potentiate negative coping strategies is essential to improving QoL in the AYA population. A 2016 systematic review of psychosocial outcomes and interventions among AYA cancer survivors determined that the survivorship experience of the AYA population is nuanced and requires interventions that are both age-appropriate and flexible to encourage autonomy and engagement in follow-up care [84].

Multiple studies have sought to explore the impact of psychosocial interventions such as cognitive behavioral therapy on cancer patients themselves. A 2006 study that randomized non-metastatic post-surgical breast cancer patients to a 10-week group cognitive behavior stress management (CBSM) intervention including relaxation training for anxiety reduction, cognitive restructuring, and coping skills training. They found that the CBSM group had lower rates of thought intrusion, lower interviewer anxiety ratings, and less emotional distress in the year following the intervention compared to the control group [85]. A 2015 randomized control trial by the same research group found that women who received a 10-week group-based cognitive-behavioral stress management (CBSM) intervention post-surgery for early stage breast cancer had significantly lower depressive symptoms and better quality of life than the control group up to 15 years later, suggesting the lasting impact of early cognitive-behavioral intervention [86, 87]. Additionally, peer support and education interventions have been shown to reduce depressive symptoms and increase life purpose, although the positive effect only was experienced by the group that attended at least one group meeting [88].

Inclusion of integrative medicine techniques into the development of interventions may provide efficacy. ASCO-endorsed SIO guidelines include grade A evidence recommending and grade B evidence recommending music therapy group or individual stress management programs, and yoga in order to reduce anxiety [89].

While interventions focused on AYA cancer patients themselves is a key part of mitigating negative effects the diagnosis and treatment can have on patient QoL,

interventions also must target patients' families, particularly their partners and children. Studies have shown that holistic interventions for cancer patients, their children and the rest of their family unit are beneficial for all [93].

There has been growing amount of literature around treatment of the cancer survivor-partner dyad over the last several decades [92]. Successful interventions target multiple pain points for couples with a new cancer diagnosis, often incorporating work around exploring feelings related to diagnosis and treatment, coping with the disease as a team, and adjusting to changing circumstances [90]. A 2014 prostate cancer partner support intervention review found that the most successful interventions were those targeting emotional distress reduction, improved communication, better sexual intimacy, and the development of tools to express individual distress and change behavior [91]. A 2015 systematic review of dyadic coping showed that stress communication, supportive behaviors, and positive dyadic coping were important to the functioning of the dyadic relationship while coping with cancer [92]. As both the patient's and partner's needs tend to change over time and each partner can feel disappointed by their interactions with the other when this happens, interventions that begin early on in the treatment process and provide tools to practice flexibility are most effective. An additional essential part of a successful psychosocial intervention is the caregiver's own personal care [94].

For patients with younger children, anxiety can develop around the impact of their cancer diagnosis on their children and concern about how and what to tell their kids about the diagnosis. Literature shows that children and adolescents want honest, accurate, and complete information particularly with regard to long-term implications and the possibility of genetic inheritance [93]. Parents with a cancer diagnosis need support in determining the best way to explain their diagnosis to their kids from healthcare providers, and healthcare providers and their teams need to strive to provide family-centered care in order to meet the needs of the patient's significant other, children, and other family members [95].

Given the near-constant interaction of the AYA population with digital platforms and the multitude of barriers to face-to-face psychosocial interventions, efforts have been made to explore the potential of Mobile health (mHealth) interventions as a means for improving engagement with psychosocial interventions in this group. Analysis of cancer survivors' use of a publicly available physical activity mobile app elucidated the increased utility of apps designed specifically for cancer survivors [96]. Several studies have looked at breast cancer survivors' and AYA cancer survivors' engagement with Facebook groups, while variable, is promising for physical activity interventions [97, 98]. A team in Oslo, Norway, has developed a stress management app through an iterative process and identified essential characteristics of the app to be usefulness of the app, accessibility, user friendliness, ease of comprehension, and brief content sections [99]. Another group in Denmark has been using a co-creation, user-involved process to produce an app that is made by the AYA cancer population for the AYA cancer population [100]. While these tools are still under development, mHealth may potentially be a promising avenue to reaching this population with effective psychosocial interventions for cancer survivors and their families.

As has also been documented extensively in the literature, younger age and financial insecurity were both independently associated with anxiety in our multivariable model [39]. The exploratory analysis of the 145 participants who had HADS anxiety subscale scores $\geq$ 11 at 24 months also appeared to be younger than the overall cohort and had more financial insecurity as well. Further research is warranted to this high risk group, to ensure adequate and timely identification and intervention of those who are most vulnerable to high levels of psychosocial distress.

There are several limitations to this study worth noting. Participants in YWS were largely white, college-educated, and financially secure, thus limiting generalizability. The coping questions asked on the 6 month and 18 month surveys are not part of a validated scale. The coping data is limited to 6 and 18 months, at which times HADS data was not collected, so comparisons had to be drawn between early survivorship data collected at different time points.

This analysis is also limited by individuals' interpretations of questions posed in the survey. For example, for coping questions where 'does not apply' and 'not at all' are mutually exclusive answers available to choose, respondents could have interpreted their choices different than had been intended. Further, this survey data is subject to response bias (although the response rate in this cohort is generally high). Additionally, the coping questions were all based on respondents' own perceptions of coping strategies they were using themselves, which may be biased.

Future steps include a prospective analysis of coping strategies and anxiety that allows for causal inference. At this point, we are unable to determine the whether these coping strategies are influencing levels of anxiety or vice versa, and while the relationship may be bi-directional, this should be investigated further. Additionally, the knowledge that has been acquired should be used to design dyad-focused psychosocial interventions utilizing the burgeoning mHealth space that allows patients and their families to gain knowledge about the disease, improve communication with family and providers, integrate healthy habits such as physical activity and meditation, work on eliminating negative habits such as alcohol use, and have questions answered by healthcare professionals. We have learned that major determinants of cancer patients' ability to cope with their illness are related to their social environment [69], and developing ways for physicians to feel better equipped to facilitate supportive relationships for patients and their families is essential.

This analysis emphasizes the importance of asking patients questions regarding the coping strategies they have been using. Only when negative coping behaviors associated with poorer QoL are identified can they start to be addressed in order to stop cancer survivors from experiencing needless suffering.

Summary

Young women with breast cancer are a uniquely vulnerable population, having to navigate the diagnosis of a serious illness and cancer treatment while also confronting issues specific to their stage of life, including work, long-term partners, and fertility and children. For both oncology and primary care providers who may be interacting with this population in survivorship, these unique issues are important to be aware of in order to provide the best care to these patients and connect them with resources that will improve their quality of life during treatment and in survivorship.

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Tables Figures, and Appendices

Figure 1: Consort Diagram


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┌─────────────────────────┐
│  Assessed for eligibility│
│      N = 1,302          │
└─────────────────────────┘
              │                    ┌──────────────────────────────────────┐
              ├────────────────────│                Exclude                 │
              │                    │   Deemed ineligible post-enrollment    │
┌─────────────────────────┐       │                N= 5                    │
│       N = 1,297         │       └──────────────────────────────────────┘
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              ├────────────────────│                Exclude                 │
              │                    │    Short Form / Modified Short Form     │
┌─────────────────────────┐       │                N = 91                  │
│       N =1,206          │       └──────────────────────────────────────┘
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              ├────────────────────│                Exclude                 │
              │                    │ Did not complete 6 month survey, 18 month,│
┌─────────────────────────┐       │      or both 6 and 18 month survey      │
│       N = 878           │       │                N = 328                 │
└─────────────────────────┘       └──────────────────────────────────────┘
              │                    ┌──────────────────────────────────────┐
              ├────────────────────│                Exclude                 │
              │                    │           Metastatic disease            │
┌─────────────────────────┐       │                N = 45                  │
│       N = 833           │       └──────────────────────────────────────┘
└─────────────────────────┘
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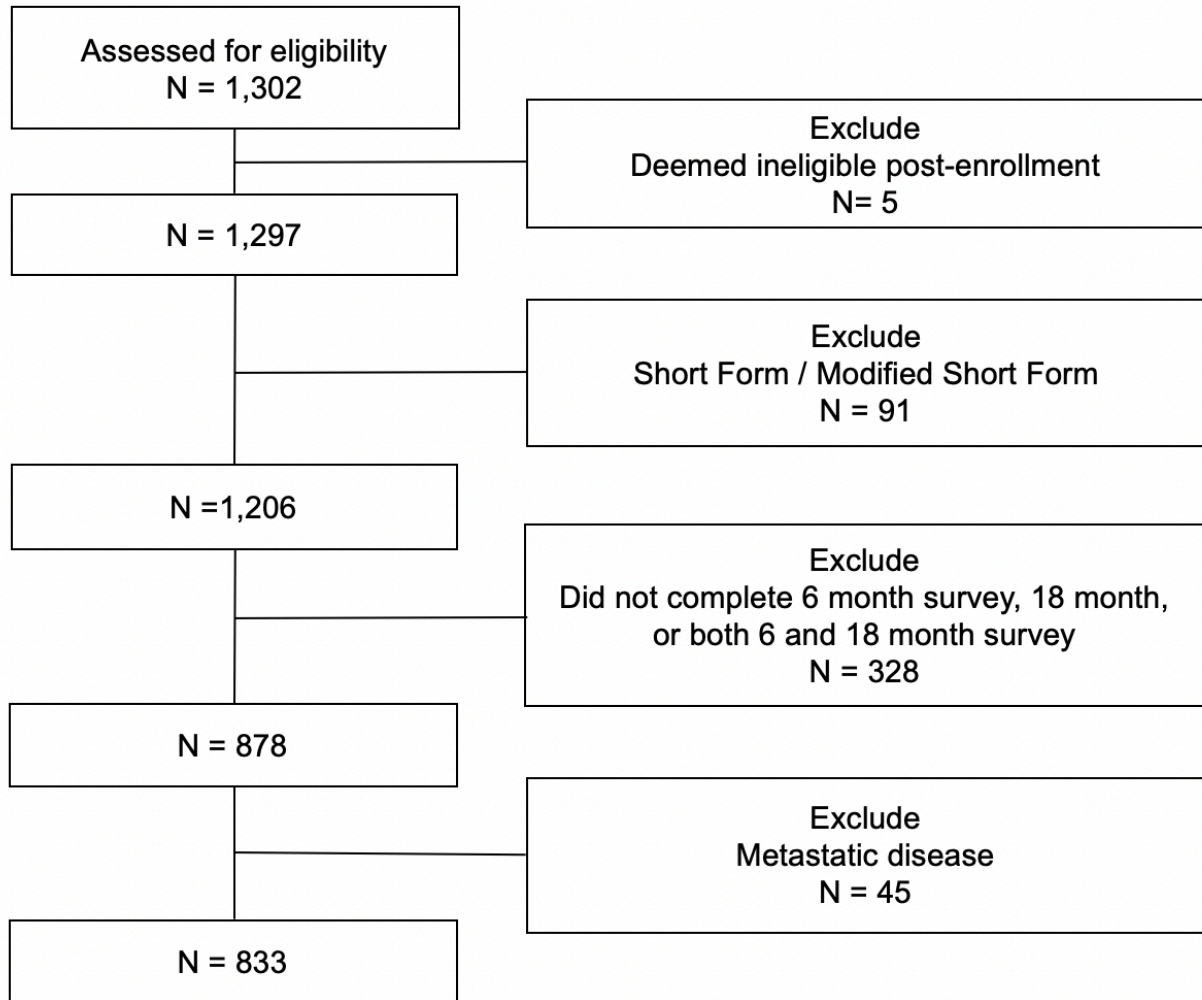
Figure 2: Coping Strategy Categorization Based on Literature
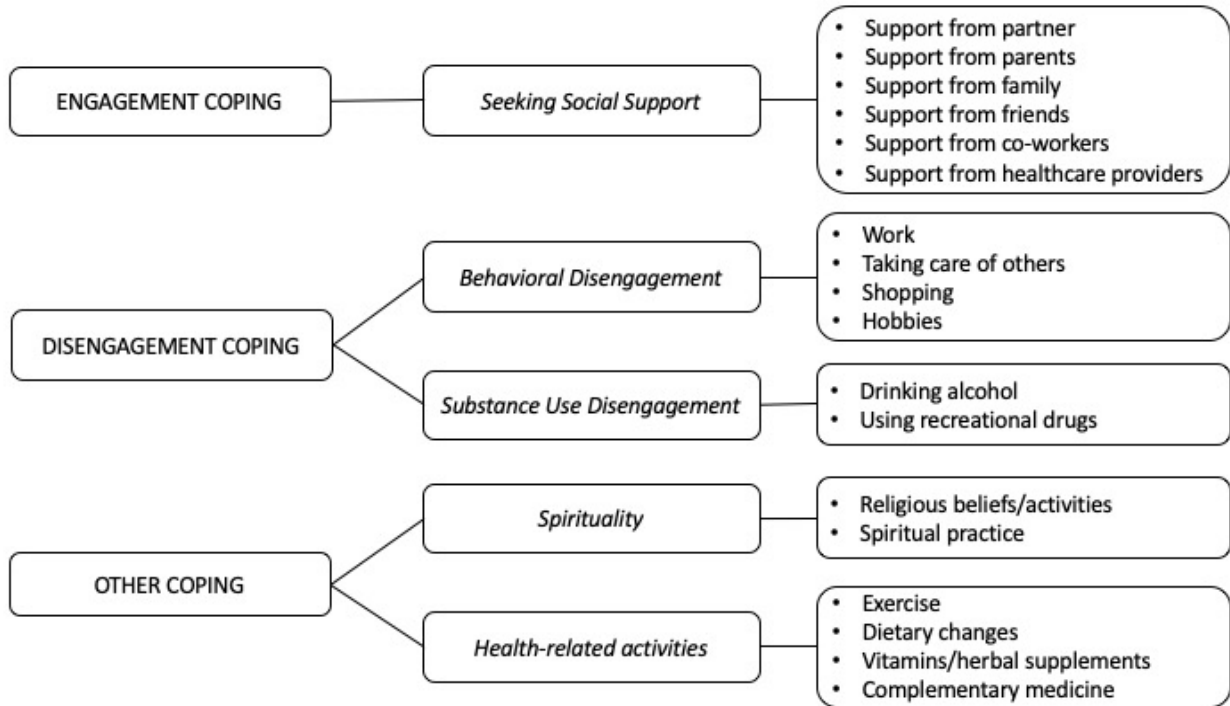
Table 1: Study Population Demographic Characteristics (n=833)

Variable	Median (range)
Age at diagnosis	36.9 (17 to 40)
Variable	**N (%)**
Race	
White Non-Hispanic	721 (86.6)
Other	112 (13.5)
College education	
Yes	694 (85.6)
No	117 (14.4)
Missing/unknown	22
Married/living as married	
Yes	632 (77.9)
No	179 (22.1)
Missing/unknown	22

Fulltime employment	
Yes	512 (63.4)
Other	296 (36.6)
Missing	25
Financial situation	
Have enough money for special things that you want	424 (52.7)
Little spare money to buy extra or special things	229 (28.5)
Have money to pay bills because cut back on things	79 (9.9)
Difficulty paying the bills, no matter what	72 (9.0)
Missing	29
Stage at diagnosis	
0	69 (8.3)
I	295 (35.4)
II	352 (42.3)
III	117 (14.1)
Estrogen receptor (ER) status	
ER +	595 (71.5)
ER -	237 (28.5)
Missing	1
Progesterone receptor (PR) status	
PR +	537 (65.0)
PR -	289 (35.0)
Missing	7
Her-2 Neu status	
HER2 +	234 (29.4)

HER2 -	549 (69.0)
Indeterminate	13 (1.6)
Missing	37
Surgery	
Lumpectomy	241 (28.9)
Unilateral mastectomy	207 (24.9)
Bilateral mastectomy	385 (46.2)
Chemotherapy	
Yes	628 (75.4)
No	205 (24.6)
Radiation	
Yes	514 (61.7)
No	319 (38.3)

Table 2: Participant HADS scores at Baseline

	HADS Anxiety	HADS Depression
Mean (SD)	7.51 (4.22)	4.74 (3.57)
Median score	7	4
Observed range	0 to 21	0 to 18
Grouped results (n, %)		
Low (0-7)	427 (54.0)	629 (78.5)
Mild (8-10)	181 (22.9)	118 (14.7)
Moderate to high (11-21)	183 (23.1)	54 (6.7)
Missing	42	32

Table 3: Participant HADS scores at 24 months

|	HADS Anxiety	HADS Depression
Mean (SD)	6.87 (4.36)	3.30 (3.34)
Median score	6	2
Observed range	0 to 21	0 to 19
Grouped results (n, %)		
Low (0-7)	462 (60.4)	674 (87.1)
Mild (8-10)	149 (19.5)	65 (8.4)
Moderate to high (11-21)	154 (20.1)	35 (4.5)
Missing	68	59

Figure 3: Supportive Coping Strategies Used at 6 and 18 Months
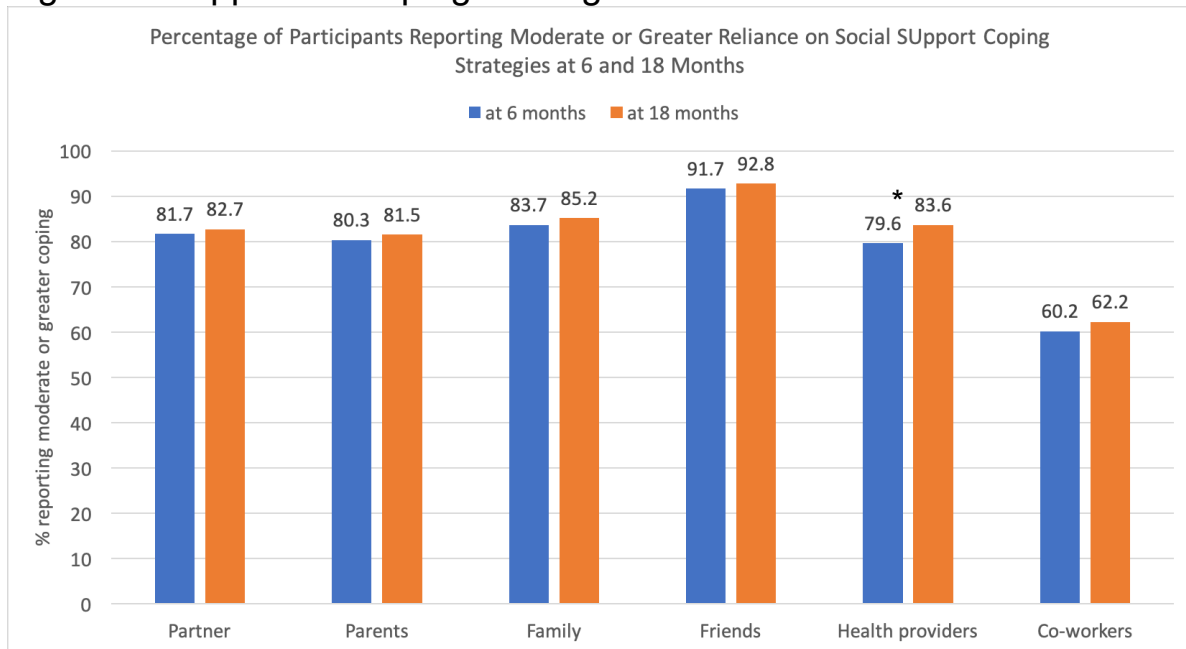
Missing: partner (6 month, n = 14; 18 month, n=18), parents (6 month, n = 5; 18 month, n = 21), family (6 month, n = 6; 18 month, n = 23), friends (6 month, n = 5; 18 month, n =15), healthcare providers (6 month, n = 8; 18 month, n = 20), co-workers (6 month, n = 12; 18 month, n = 23).
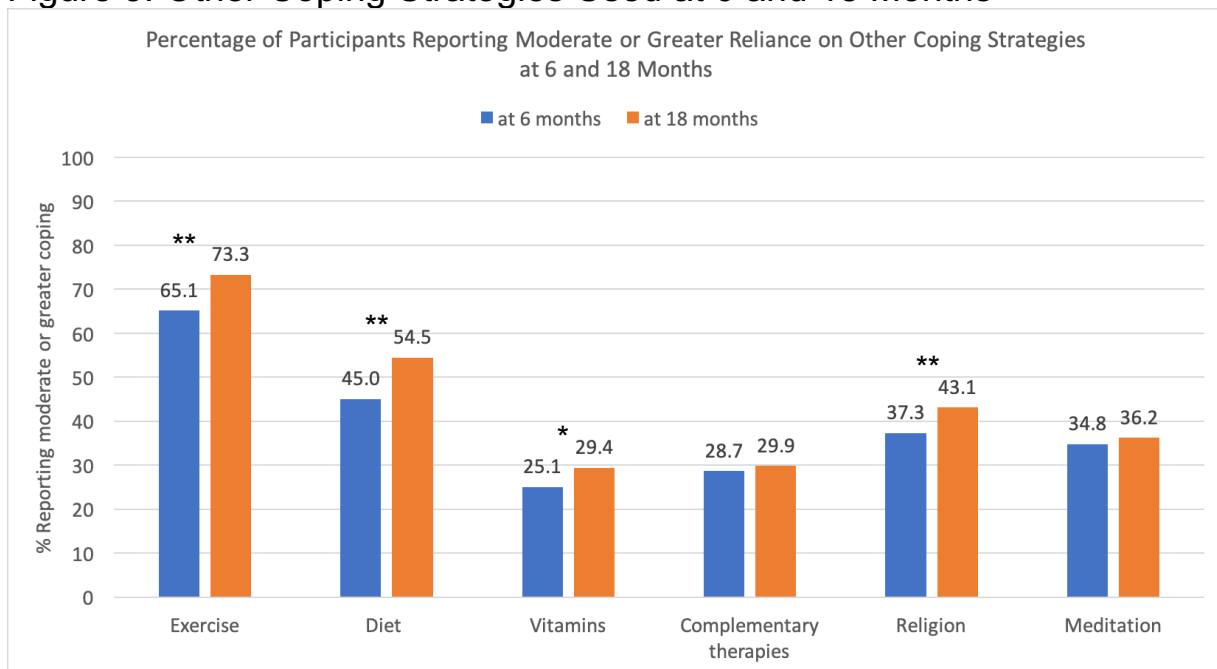*P < 0.05

Figure 4: Disengagement Coping Strategies Used at 6 and 18 Months

Percentage of Participants Reporting Moderate or Greater Reliance on Disengagement Coping Strategies at 6 and 18 Months
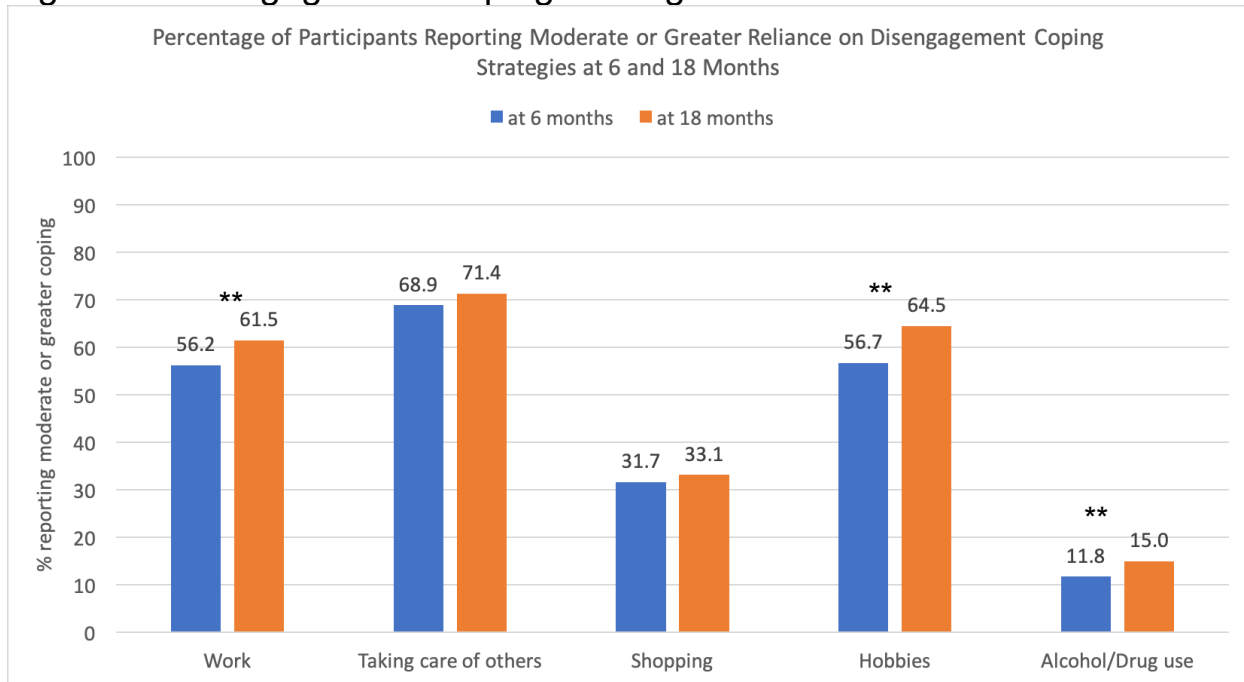
Missing: work (6 month, n = 15; 18 month, n = 21), taking care of others (6 month, n = 11; 18 month, n = 23), shopping (6 month, n = 9; 18 month, n = 24), hobbies (6 month, n = 10; 18 month, n = 21), alcohol/drug use (6 month, n = 17; 18 month, n = 26).
**P < 0.01

Figure 5: Other Coping Strategies Used at 6 and 18 Months

Percentage of Participants Reporting Moderate or Greater Reliance on Other Coping Strategies at 6 and 18 Months

Missing: exercise (6 month, n = 4; 18 month, n = 16), diet (6 month, n = 13; 18 month, n = 20), vitamins (6 month, n = 7; 18 month, n = 21), complementary therapy (6 month, n = 6; 18 month, n = 19), religion (6 month, n = 8; 18 month, n = 19), meditation (6 month, n = 10; 18 month, n = 24).
*P < 0.05
*P < 0.01

Table 4: Most Helpful Coping Strategy Reported at 6 and 18 Months

	6 months (n, (%))	18 months (n, (%))
Partner	323 (40.2)	320 (39.9)
Taking care of others	82 (9.8)	105 (12.6)
Friends	63 (7.6)	57 (6.8)
Family	53 (6.4)	50 (6.0)
Parents	51 (6.1)	38 (4.6)
Exercise	33 (4.0)	33 (4.0)
Religion	33 (4.0)	32 (3.8)
Healthcare providers	14 (1.7)	13 (1.6)
No response	111 (13.3)	101 (12.1)

Table 5: Univariable and Multivariable Logistic Regression of Coping Strategies at 18 Months and Anxiety at 24 Months

|	Univariable models			Multivariable model		
	OR	95% CI	P value	OR	95% CI	P value
Age at diagnosis (years)	0.958	0.917, 1.002	0.0585	0.949	0.902, 0.998	0.0435
White non-Hispanic (ref=non-WNH)	1.320	0.759, 2.295	0.3253	1.577	0.824, 3.018	0.1690
College education (ref=no college education	0.813	0.491, 1.345	0.4204			
Fulltime employment (ref=non-fulltime employment)	0.913	0.629, 1.326	0.6336			
Financial comfort (ref=enough money for special things)						
Enough money to pay bills but little spare money for extras	1.056	0.676, 1.652	0.0898	1.059	0.654, 1.712	0.8166
Money to pay bills but only after cutting back/difficulty paying bills	2.322	1.483, 3.636	0.0002	2.242	1.373, 3.661	0.0013
Stage (ref=1)						

0	0.511	0.231, 1.132	0.0979	0.468	0.182, 1.199	0.1135
2	1.108	0.750, 1.637	0.6078	0.998	0.626, 1.591	0.9927
3	0.666	0.357, 1.240	0.1995	0.556	0.268, 1.156	0.1160
Mastectomy (ref=lumpectomy)	1.261	0.843, 1.885	0.2590			
Any chemotherapy (ref=none)	1.407	0.913, 2.171	0.1220	0.943	0.526, 1.692	0.8443
support from family‡	*0486*	*0.312, 0.757*	*0.0014*	*0.435*	*0.261, 0.724*	*0.0014*
Support from healthcare providers‡	*1.451*	*0.858, 2.455*	*0.1651*	*1.516*	*0.839, 2.741*	*0.1681*
Taking care of others‡	*1.488*	*0.973, 2.276*	*0.0666*	*1.881*	*1.154, 3.065*	*0.0112*
Alcohol and/or drug use‡	*1.897*	*1.171, 3.073*	*0.0093*	*1.985*	*1.207, 3.263*	*0.0069*
Exercise‡	*0.698*	*0.473, 1.030*	*0.0704*	*0.623*	*0.399, 0.975*	*0.0383*
Vitamins‡	*1.352*	*0.922, 1.981*	*0.1224*	*1.342*	*0.866, 2.080*	*0.1886*

‡Moderate or greater use of this variable as a coping mechanism (ref = less than moderate use of this variable as a coping mechanism)

Table 6: Participants' Anxiety State (HADS score of $\geq$11) at Baseline and at 24 Months (n = 833)

| Anxiety at Baseline	Anxiety at 24 Months	N (%)
Yes	Yes	85 (11.6)
No	Yes	60 (8.2)
Yes	No	81 (11.1)
No	No	505 (69.1)
Missing		102

Figure 6: Supportive Coping Strategies Used at 18 Months By Those Anxious vs. Non-Anxious at 24 Months
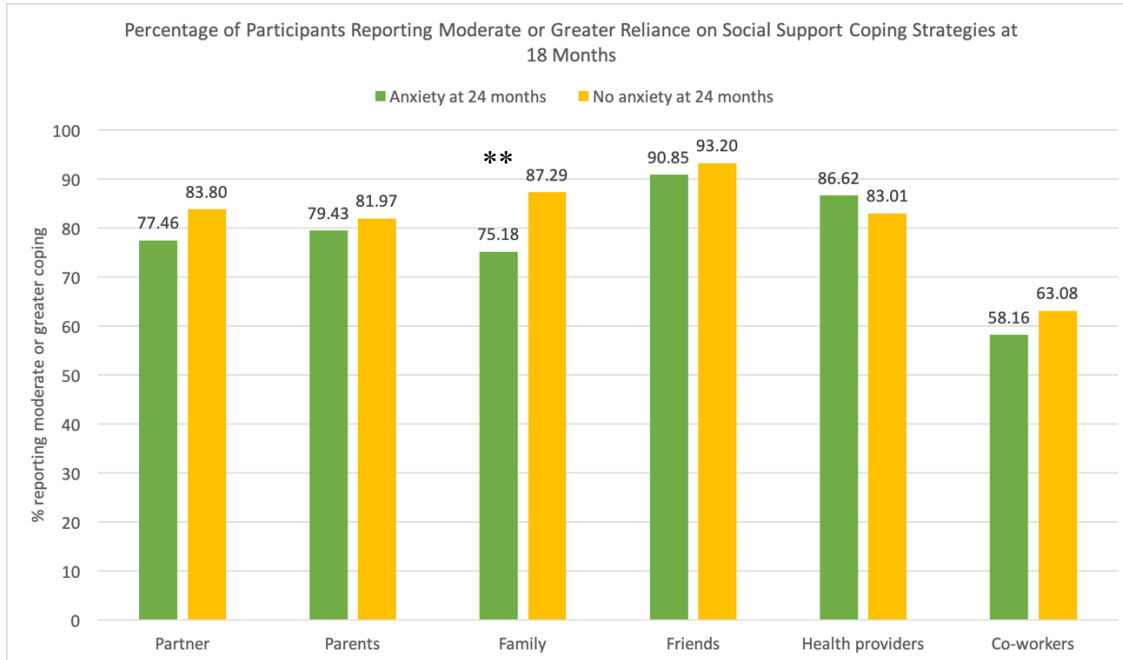
Missing: partner (anxious, n = 3; non-anxious, n = 15), parents (anxious, n = 4; non-anxious, n = 17), family (anxious, n = 4; non-anxious, n = 19), friends (anxious, n = 3; non-anxious, n = 12), healthcare providers (anxious, n = 3; non-anxious, n = 17), co-workers (anxious, n = 4; non-anxious, n = 19).
**P < 0.01

Figure 7: Disengagement Coping Strategies Used at 18 Months By Those Anxious vs. Non-Anxious at 24 Months
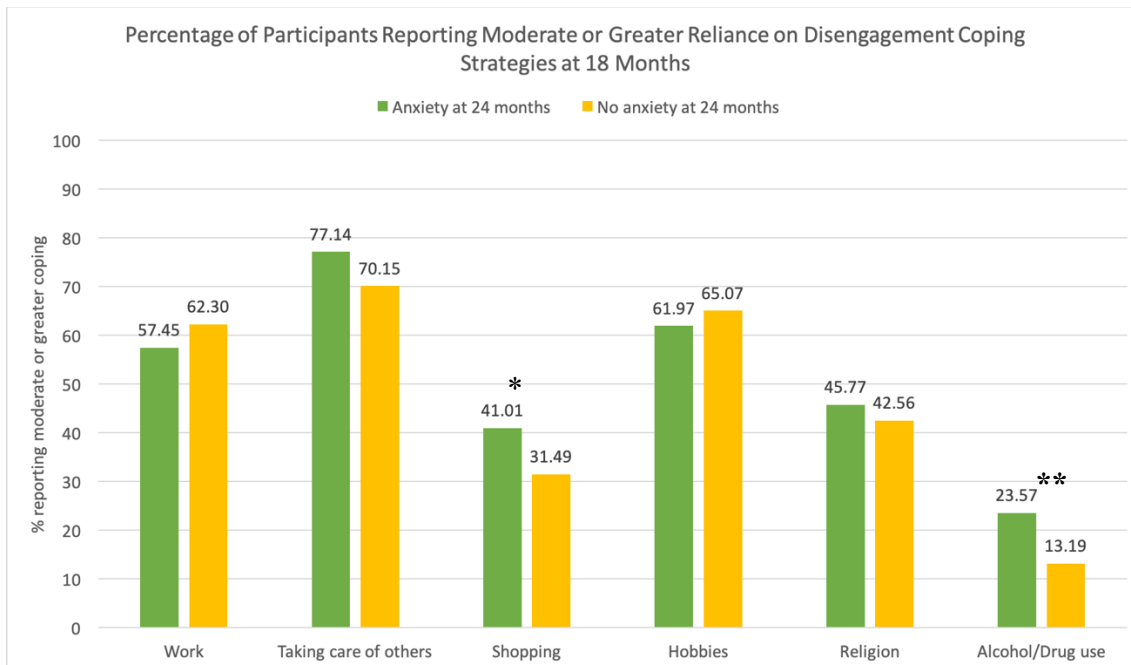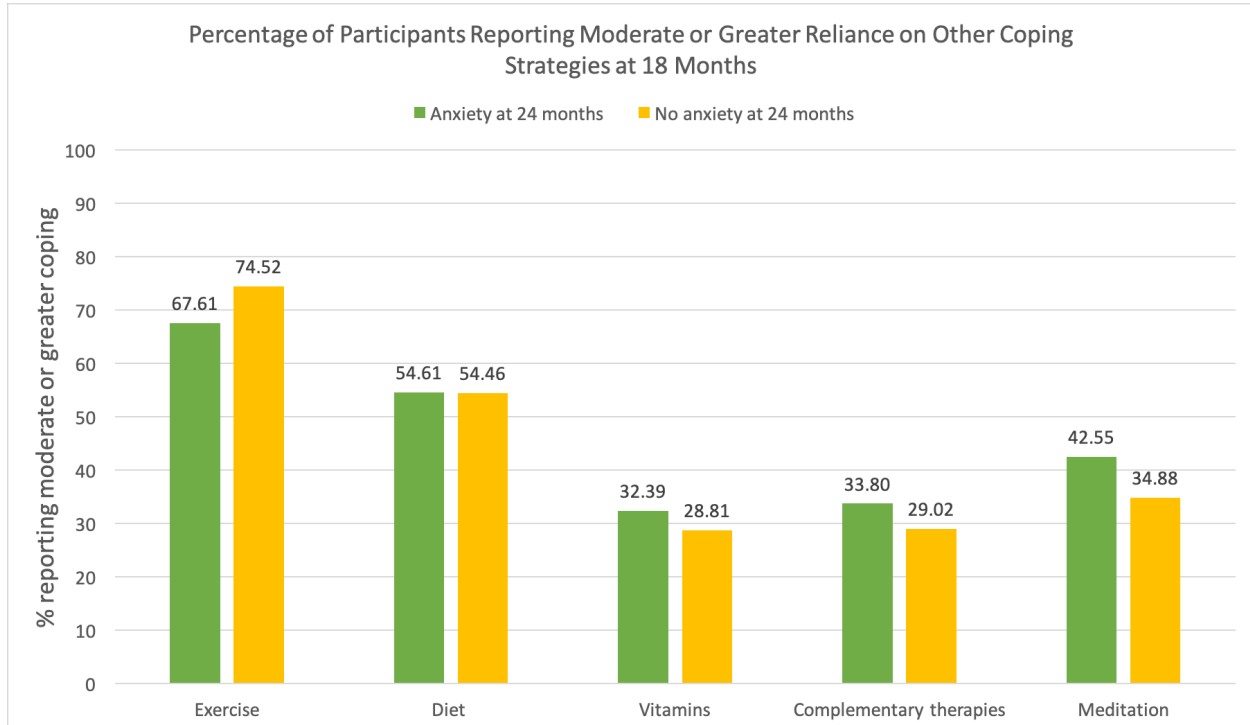
Missing: work (anxious, n = 4; non-anxious, n = 17), taking care of others (anxious, n = 5; non-anxious, n = 18), shopping (anxious, n = 6; non-anxious, n = 18), hobbies (anxious, n = 3; non-anxious, n = 18), religion (anxious, n =3; non-anxious, n = 16), alcohol/drug use (anxious, n = 5; non-anxious, n = 21).
*P < 0.05
**P < 0.01

Figure 8: Other Coping Strategies Used at 18 Months By Those Anxious vs. Non-Anxious at 24 Months

Missing: exercise (anxious, n = 3; non-anxious, n =13), diet (anxious, n = 4; non-anxious, n = 16), vitamins (anxious, n = 3; non-anxious, n = 18), complementary therapies (anxious, n = 3; non-anxious, n = 16), meditation (anxious, n = 4; non-anxious, n = 20).

Section 7.

The following questions refer to coping with your breast cancer diagnosis and treatment.

40) To what extent have the following factors helped you to cope with your breast cancer diagnosis and treatment?	Does not apply	Not at all	To a small extent	To a moderate amount	To a large extent	It is the most important thing that keeps me going
a) emotional support from partner/ spouse/significant other		0	1	2	3	4
b) emotional support from parent(s)		0	1	2	3	4
c) emotional support from other family members (e.g., children, siblings)		0	1	2	3	4
d) friends		0	1	2	3	4
e) co-workers		0	1	2	3	4
f) health care providers		0	1	2	3	4
g) work		0	1	2	3	4
h) taking care of children, family, friends		0	1	2	3	4
i) shopping		0	1	2	3	4
j) hobbies (e.g., reading, photography)		0	1	2	3	4
k) religious beliefs or activities		0	1	2	3	4
l) spiritual practices (e.g., meditation)		0	1	2	3	4
m) exercise		0	1	2	3	4
n) dietary changes		0	1	2	3	4
o) vitamin or herbal supplements (e.g., ginkgo, vitamin C, St. John's wort)		0	1	2	3	4
p) complementary therapies (e.g., acupuncture, massage)		0	1	2	3	4
q) drinking alcohol		0	1	2	3	4
r) using recreational drugs (e.g., marijuana, cocaine)		0	1	2	3	4
s) other (please specify): _____ _____		0	1	2	3	4
t) Now, please look over the list of factors above once more, and circle the **ONE** that has been most helpful in coping with your breast cancer diagnosis and treatment.						