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FULL LENGTH MANUSCRIPT

Distress Disorder Histories Relate to Greater Physical Symptoms Among Breast Cancer Patients and Survivors: Findings Across the Cancer Trajectory

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Abstract

Background Psychological disorders can substantially worsen physical symptoms associated with breast cancer diagnosis and treatment, reducing survivors' quality of life and increasing recurrence risk. Distress disorders may be particularly detrimental given their physical correlates. Across two studies, we examined the relationship between a distress disorder history and physical symptoms pre- and post-adjuvant treatment — two important periods of the cancer trajectory.

Methods Breast cancer patients awaiting adjuvant treatment ($n = 147$; mean age = 52.54) in study 1 and survivors 1–10 years post-treatment ($n = 183$; mean age = 56.11) in study 2 completed a diagnostic interview assessing lifetime presence of psychological disorders. They also rated their pain, fatigue, physical functioning, and self-rated health. Covariates included body mass index, age, cancer stage, menopause status, and physical comorbidities.

Results Results from both studies indicated that a distress disorder history was associated with higher pain, fatigue, and sleep difficulties as well as lower self-rated health compared to those without such a history.

Conclusions These findings suggest that breast cancer survivors with a distress disorder may be particularly at risk for more physical symptoms, poorer sleep, and worse self-rated health both prior to and following adjuvant treatment.

Keywords Breast cancer · Depression · Anxiety · Pain · Fatigue

Introduction

A shift in diagnostic classification of psychological disorders has resulted in conceptualizing distress as a transdiagnostic phenomenon that cuts across both mood and anxiety disorders [1]. This broad experience of distress influences people both with and without chronic health conditions. The experience of chronic and enduring distress over time can result in psychological disorders including depression and anxiety. Distress disorders are a group of psychological disorders characterized by negative emotionality that includes major depressive disorder (MDD), persistent depressive disorder (PDD), generalized anxiety disorder (GAD), and post-traumatic stress disorder (PTSD) [1]. Distress disorders demonstrate a chronic and persistent course and are not likely to remit spontaneously without intervention [2]. They also complicate the presentation and treatment of medical conditions throughout the lifespan, contributing to both an increased risk of cardiovascular disease and metabolic syndrome [3, 4]. Distress disorders therefore encompass conditions such as depression and anxiety that disproportionately affect cancer survivors [5]. Although taking a transdiagnostic approach to understanding distress is common among physically healthy patients, research is sparser regarding a transdiagnostic approach to diagnose psychological disorders in cancer populations.

As many as one in every two cancer patients experience high rates of psychological distress [6], and rates of depression and anxiety are higher among people with cancer compared to the general population [5]. Several factors influence distress among breast cancer patients and survivors,

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including more advanced disease at diagnosis, receiving chemotherapy, being younger, unmarried, or of a lower socioeconomic status [7]. Persistent and prolonged psychological distress among breast cancer patients and survivors can ultimately result in a distress disorder diagnosis. A recent meta-analysis found higher rates of anxiety and depression among breast cancer survivors compared to women with no cancer history [8]. The estimated global prevalence of clinically significant depression is as high as 32.2% among breast cancer survivors [9] while anxiety disorders may impact nearly 20% of survivors [10]. These rates are strikingly higher than the general population, as estimates of major depression are approximately 8.2% and anxiety disorders are 19.1% [11]. A past history of a psychological disorder also predicts cancer-related distress [12] which can remain high up to 2 years following surgery and adjunctive treatment [13].

Epidemiological data suggest that cancer survivors have twice the likelihood of poor health and disability as individuals without a cancer history [14]. Nearly 30% of breast cancer survivors suffer from chronic pain 5 years after treatment [15], and advanced cancer patients often endure pain, fatigue, and sleep difficulties simultaneously [16, 17]. Fatigue may also persist for years after cancer treatment [18] and can worsen other symptoms such as pain and sleep quality above and beyond oncological treatment [19]. Depression and/or anxiety can exacerbate these unpleasant physical symptoms [20, 21] and can further reduce participation in everyday pleasant activities and negatively impact quality of life [22].

Most of the currently available research fails to assess how a distress disorder history may exacerbate the physical distress associated with breast cancer diagnosis and treatment. The scarring hypothesis suggests that histories of depression can result in cognitive, emotional, and behavioral changes via traces of depressive symptoms that persist after remission and recovery. This theory assumes that biological changes occur during a depressive episode, inducing long-lasting changes that increase the likelihood of future symptomology [23]. These "scars" result in someone being more vulnerable to depressive symptoms, particularly at times of high stress such as cancer diagnosis and treatment [24]. For example, people with a history of depression experience more major and minor stressors than those without a similar history, and past depression can boost emotional reactivity [25, 26]. MDD histories also corresponded to decreases in physical functioning as well as reduced social and occupational functioning after treatment among breast cancer survivors compared to survivors without such a history [27, 28]. Therefore, even past histories of a distress disorder can plausibly heighten psychological and physical distress throughout cancer treatment and survivorship, reducing quality of life and enhancing risk for morbidity and mortality. Previous findings on the scarring hypothesis in breast cancer patients and survivors are relatively sparse, and past research has not assessed whether histories of a distress disorder broadly yield similar effects.

The present studies examine the relationship between the distress disorder category and breast cancer patient and survivors' physical health. To assess the relationship between distress disorder histories and physical health, we used data from two studies of breast cancer patients before adjuvant treatment (study 1) and survivors at least 2 years post-treatment (study 2). Across both studies, we hypothesized that women who had a distress disorder history would have greater pain, fatigue, and sleep difficulties, as well as poorer self-rated health and physical functioning, compared to women without such a history. As an exploratory aim of these studies, we also explored whether a history of multiple distress disorders worsened physical symptoms and self-rated health among patients and survivors. We hypothesized that women who had a history of more than one distress disorder diagnosis would experience worse physical symptoms compared to those without comorbid distress diagnoses.

Study 1: Methods

Participants

Women ($N = 148$) were recruited as part of a larger parent study examining cardiovascular function among breast cancer patients. Breast cancer patients were stages I–IIIA, 18–80 years old, and were 52.07 days post-surgery (SD = 24.83) but pre-adjuvant treatment. Exclusion criteria included a prior history of any malignancy except for basal or squamous cell skin cancers, recent strokes, diabetes mellitus, current heart disease or uncontrolled hypertension, peripheral vascular disease, liver disease, autoimmune and/or inflammatory diseases including rheumatoid arthritis and ulcerative colitis, alcohol or drug abuse, or other medical conditions that would limit participation in the study (e.g., implantable defibrillator, pacemaker, or life-threatening heart conditions such as congestive heart failure, pulmonary disease, orthopedic problems, major psychiatric illness, cognitive dysfunction, or an acute medical problem).

Diagnostic Interview

The Structured Clinical Interview for DSM-5 (SCID-5) assessed lifetime history of psychological disorders [29]. Trained post-doctoral fellows, clinical psychology graduate students, and staff administered diagnostic interviews. All interviewers were trained in diagnostic and SCID-specific procedures by a PhD-level psychologist, and a licensed clinical psychologist oversaw all diagnostic interviews.

The diagnostic team recorded and reviewed each SCID-5 interview in consensus meetings to obtain diagnoses. If a discrepancy between the interviewer and rest of the diagnosticians was still present following a consensus meeting, the licensed clinical psychologist provided a consensus recommendation based on the recorded SCID-5 interview. Past diagnoses of MDD, PDD, GAD, and PTSD were collapsed to index whether or not the participant had any lifetime history of distress disorders.

Questionnaires

The Short Form Health Survey-36 [30] provides a non-disease-specific measure of functioning and well-being. It indexes eight health concepts, four of which directly relate to physical well-being and were therefore particularly relevant to this study: physical functioning, bodily pain, energy/fatigue, and general health perceptions. The reliability for the SF-36 subscales ranged from adequate to excellent (McDonald's $\sigma = 0.74–0.92$). The revised Breast Cancer Prevention Trial symptom checklist (BCPT) [31] provided information about symptoms related to the breast cancer diagnosis and treatment. This study used the BCPT mean score, which showed excellent reliability (McDonald's $\sigma = 0.91$).

Covariates

All analyses controlled for age, cancer stage, menopause status, body mass index (BMI), and medical comorbidities. Covariates were chosen a priori based on their theoretical and biological connections to physical symptoms associated with breast cancer diagnosis and treatment [31–33]. The Charlson comorbidity index, originally developed with breast cancer patients, assessed physical comorbidities [34]. The Charlson assigns weights to 19 medical conditions with greater scores equal to a greater comorbidity burden. BMI was calculated based on objective metrics obtained during the patients' study visit (see details below). Menopause status was obtained via patient self-report of their last menstrual cycle.

Procedures

The Biomedical Institutional Review Board where this study was completed approved this study. Every participant provided written informed consent. Participants completed questionnaires and the diagnostic interview as part of a full-day study visit at the Ohio State Clinical Research Center where they completed several other tasks relevant to the parent study (ate a standardized meal, had their blood drawn to assess meal responses, and underwent metabolic measurements).

Data Analysis Plan

A post hoc power analysis using G*Power (Faul et al., 2007) revealed that using an alpha of 0.05, a sample size of at least 89 participants was required to detect at least a medium effect ($f^2 \geq 0.15$) for hierarchical linear regressions (described below).

All analyses were conducted using SPSS Version 27. A diagnostic history of major depressive disorder, persistent depressive disorder, generalized anxiety disorder, and post-traumatic stress disorder were collapsed to create a single, dichotomous "distress disorder" variable, which served as the predictor variable in all models. Body mass index, physical comorbidities, cancer stage (I, II, or III), menopause status (pre-menopausal, peri-menopausal, or post-menopausal), and age were included as covariates in all models. Preliminary analyses examined associations between a distress disorder diagnosis and each covariate. Independent samples *t*-tests determined whether women with a distress disorder history had a higher BMI, age, or more physical comorbidities compared to women without such a history. Further, chi-squared tests determined whether women with a distress disorder history differed from those without in terms of race, marital status, or cancer stage. Hierarchical multiple linear regressions addressed the hypotheses that having a distress disorder history would predict greater physical symptoms, poorer self-rated health, and physical functioning. All models were tested using a two-step approach; covariates were entered into the first step, and the distress disorder variable was entered into the second step to quantify additional variance explained. Independent samples *t*-tests addressed the exploratory aim of identifying if patients with a history of more than one distress disorder had higher physical symptoms compared to patients with a history of a single distress disorder.

Study 1: Results

Participant Demographics and Covariates

Overall, 53 breast cancer patients (35.3%) met criteria for a lifetime history of at least one distress disorder. Regarding diagnoses, 46 met criteria for histories of MDD, 5 for PDD, 3 for GAD, and 8 for PTSD. Only four participants endorsed a current distress disorder (2 MDD, 1 PDD, and 1 PTSD) and were excluded from analysis. Table 1 presents the demographic information for the breast cancer patients. There were no significant differences on these covariates between women with and without a distress disorder history ($ps > 0.16$).

Table 1 Baseline characteristics of breast cancer patients (study 1) and survivors (study 2)

	Study 1 ($n=148$)		Study 2 ($n=183$)	
	Mean (SD)	*N* (%)	Mean (SD)	*N* (%)
Age	52.54 (10.1)	-	56.11 (8.3)	-
BMI	28.54 (5.7)	-	27.72 (6.0)	-
Physical comorbidities	.21 (.5)	-	.23 (.59)	-
Race				
White	-	127 (85.8%)	-	168 (91.8%)
Black	-	13 (8.8%)	-	10 (5.5%)
Asian	-	3 (2.0%)	-	1 (0.5%)
Native American	-	1 (0.7%)	-	0 (0.0%)
Mixed	-	4 (2.7%)	-	4 (2.2%)
Marital status				
Married	-	104 (70.3%)	-	130 (71.0%)
Domestic partner	-	4 (2.7%)	-	6 (3.3%)
Divorced	-	25 (16.9%)	-	19 (9.3%)
Widowed	-	5 (3.4%)	-	16 (8.7%)
Single	-	10 (6.8%)	-	14 (7.7%)
Cancer stage				
I	-	73 (49.3%)	-	72 (43.6%)
II	-	70 (47.3%)	-	85 (51.5%)
III	-	5 (3.4%)	-	8 (4.8%)
No longer menstruating	-	81 (54.7%)	-	183 (100%)

SD standard deviation, *BMI* body mass index

Distress Disorders and Physical Symptoms

Table 2 presents the results from all regression analyses. Consistent with study hypotheses, when a distress disorder history was entered into step 2 of the model, it predicted increased fatigue, pain, and breast cancer symptoms along with decreased sleep quality and self-rated health. A distress disorder history explained an additional 4% of variance in fatigue ($R^2=0.10$, $F[5, 136]=2.45$, $p=0.03$), 4% of the variance in self-rated health ($R^2=0.14$, $F[5, 136]=3.62$, $p<0.01$), 4% of variance in sleep quality ($R^2=0.16$, $F[5, 136]=5.65$, $p=0.02$), and 5% of variance in breast cancer symptoms ($R^2=0.15$, $F[5, 136]=3.95$, $p<0.01$). The proportion of variance explained by including the distress disorder variable did not significantly differ for physical functioning ($R^2=0.03$, $F[5, 136]=0.73$, $p=0.63$) or pain ($R^2=0.08$, $F[5, 136]=1.84$, $p=0.10$). A sensitivity analysis revealed that this pattern of results did not differ when only patients with an MDD history were included in the regression models.

Diagnostic Comorbidity and Physical Symptoms

Overall, 53 women endorsed having a lifetime diagnosis of at least one distress disorder. Of these 53 women, 13 endorsed having a history of more than one distress disorder diagnosis. No significant differences in physical symptoms emerged between women who had multiple versus a single distress disorder history (all $ps>0.06$).

Study 2: Methods

Participants

Breast cancer survivors ($N=183$) were recruited via breast cancer support groups, oncologists' referrals, and community announcements for a parent study which addressed inflammatory responses to a typhoid vaccine. Participants were post-menopausal, between 40 and 80 years old, and had completed primary cancer treatment an average of 4 years earlier for stages I–IIIA breast cancer. The exclusionary criteria for the parent study included a prior history of other cancers as well as other chronic diseases known to alter metabolism and inflammation (i.e., diabetes, anemia, autoimmune disease, or other inflammatory disease), alcohol or drug abuse, statin usage, and current smoking.

Diagnostic Interview and Self-report Measures

Similar to study 1, the SCID-5 assessed lifetime prevalence of distress disorders [29]. The Short Form Health Survey-36

Table 2 Study 1 regression effects

	B	*SE*	*β*	R^2	ΔR^2
Pain					
Block 1				.05	.05
Age	.64	.29	.27*		
Menopause	−4.75	3.32	−.18		
BMI	.11	.36	.03		
Stage	−2.74	3.55	−.07		
Comorbidities	−4.10	3.58	−.10		
Block 2				.08	.03
Distress disorder	−8.88	4.34	−.18*		
Fatigue					
Block 1				.06	.06
Age	.31	.24	.16		
Menopause	−.82	2.72	−.04		
BMI	−.66	.30	−.19*		
Stage	−1.66	2.91	−.05		
Comorbidities	−1.41	2.93	−.04		
Block 2				.10	.04*
Distress disorder	−8.63	3.53	−.21*		
Physical function					
Block 1				.02	.02
Age	−.16	.19	−.13		
Menopause	1.77	2.18	.10		
BMI	−.24	.24	−.09		
Stage	−2.96	2.33	−.11		
Comorbidities	.83	2.35	.03		
Block 2				.03	.01
Distress disorder	−2.86	2.88	−.09		
Self-rated health					
Block 1				.10	.10*
Age	−.05	.18	−.03		
Menopause	.68	2.01	.04		
BMI	−.60	.22	−.23*		
Stage	−1.58	2.15	−.06		
Comorbidities	−5.61	2.17	−.21*		
Block 2				.14	.04*
Distress disorder	−6.49	2.61	−.21*		
Sleep quality					
Block 1				.12	.12**
Age	−.11	.04	−.38**		
Menopause	.76	.40	.23		
BMI	−.03	.04	−.06		
Stage	−.52	.42	−.10		
Comorbidities	.89	.42	.17*		
Block 2				.16	.04*
Distress disorder	1.23	.52	.19*		
Breast cancer symptoms					
Block 1				.10	.10*
Age	−.01	.01	−.27*		
Menopause	.16	.06	.33*		
BMI	.01	.01	.10		
Stage	−.06	.06	−.07		
Comorbidities	.10	.06	.12		
Block 2				.15	.05**
Distress disorder	.22	.08	.24**		

ΔR^2 change in R^2, *B* standardized beta, *SE* standard error, *β* unstandardized beta

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

provided information on pain, fatigue, physical functioning, and self-rated health among survivors [30]. Reliability estimates for the SF-36 subscale ranged from adequate to good (McDonald's $\sigma = 0.76–0.89$).

Procedure

The biomedical institutional review board approved this study and all survivors provided written informed consent. Survivors reported their self-rated health and completed the SCID-5 diagnostic interview as part of an initial screening visit for the larger parent study which also included a blood draw and exercise test. Covariate data was collected based on chart review and participant self-report.

Data Analysis Plan

Consistent with study 1, a post hoc power analysis revealed that a sample of at least 89 participants was required to detect at least a medium effect ($f^2 \geq 0.15$) for hierarchical linear regressions (described below).

All analyses were conducted using SPSS Version 27. The analytic approach was identical to what was used in study 1. The distress disorder variable served as the predictor variable in all models. Hierarchical multiple linear regressions assessed hypotheses regarding whether having a distress disorder history predicted increased physical symptoms and worsened self-rated health and physical functioning. Covariates included body mass index, physical comorbidities, cancer treatment, cancer stage, menopause status, and age. Covariates were entered into the first step and distress disorder status was entered into the second step to quantify change in variance explained (*R* squared). Independent samples *t*-tests addressed if survivors with a history of more than one distress disorder had higher physical symptoms compared to survivors with a history of a single distress disorder.

Study 2: Results

Participant Demographics

Overall, 71 breast cancer patients (36.0%) met criteria for a lifetime history of at least one distress disorder. A total of 59 women were diagnosed with a lifetime history of MDD, 9 with PDD, 10 with GAD, and 12 with PTSD. Fourteen participants endorsed a current distress disorder (5 MDD, 1 PDD, 6 GAD, and 2 PTSD) and were thus removed from the final analyses. Table 1 presents the demographic information for the breast cancer survivors in this study. No significant differences emerged in age, BMI, marital status, race, or physical comorbidities among survivors who had a distress disorder history compared to those without ($ps > 0.06$). There was a significant difference in cancer stage among women with versus without a distress disorder history ($X^2 = 7.58$, $df = 2$, $p = 0.02$), indicating that women without a distress disorder history were more likely to have stage I cancer whereas those with a distress disorder history were more likely to have stage II.

Distress Disorders and Physical Symptoms

Table 3 presents the results from all regression analyses. The final models with distress disorder history in step 2 showed women with a distress disorder history had greater pain, fatigue, and BCS, as well as poorer sleep quality and self-rated health, than those without such a history. Contrary to hypotheses, a distress disorder history was not associated with physical functioning for the breast cancer survivors in this study. The final models with a distress disorder diagnosis explained an additional 7% of variance in fatigue ($R^2 = 0.19$, $F[5, 147] = 5.79$, $p < 0.001$), 5% of variance in self-rated health ($R^2 = 0.21$, $F[5, 147] = 6.42$, $p < 0.001$), 4% of variance in sleep quality ($R^2 = 0.12$, $F[5, 147] = 3.44$, $p < 0.01$), and 4% of variance in pain ($R^2 = 0.13$, $F[5, 147] = 3.71$, $p < 0.01$). Consistent with findings from study 1, these results did not differ when only patients with an MDD history were included in the regression models.

Distress Disorder Comorbidities and Physical Symptoms

Overall, 71 women endorsed a lifetime history of a distress disorder and 13 of those women reported a lifetime history of more than one distress disorder. There were no significant differences in pain, fatigue, sleep quality, self-rated health, or physical function between women with a single diagnosis versus multiple distress diagnoses ($ps > 0.21$).

Table 3 Study 2 regression effects

	B	*SE*	*β*	R^2	ΔR^2
Pain					
Block 1				.09	.09*
Age	−.36	.21	−.14		
BMI	−.72	.28	−.21*		
Stage	−6.23	3.12	−.17*		
Comorbidities	−3.71	2.92	−.10		
Treatment	1.63	1.71	.08		
Block 2				.13	.04**
Distress disorder	−9.10	3.45	−.21**		
Fatigue					
Block 1				.12	.12**
Age	.49	.19	.21*		
BMI	−.69	.25	−.22**		
Stage	−3.81	2.78	−.12		
Comorbidities	−3.22	2.61	−.10		
Treatment	1.16	1.53	.06		
Block 2				.19	.07**
Distress disorder	−10.66	3.03	−.27***		
Physical function					
Block 1				.16	.16***
Age	−.03	.17	−.01		
BMI	−1.07	.23	−.36**		
Stage	−3.85	2.55	−.13		
Comorbidities	−1.78	2.39	−.06		
Treatment	−.24	1.40	−.01		
Block 2				.18	.02
Distress disorder	−4.75	2.86	−.13		
Self-rated health					
Block 1				.16	.16***
Age	.45	.16	.21**		
BMI	−.96	.22	−.34***		
Stage	−.96	2.39	−.03		
Comorbidities	.81	2.24	.03		
Treatment	1.38	1.32	.09		
Block 2				.21	.05**
Distress disorder	−8.00	2.63	−.23*		
Sleep quality					
Block 1				.08	.08*
Age	−.01	.03	−.02		
BMI	.13	.05	.23*		
Stage	.15	.50	.03		
Comorbidities	.74	.47	.13		
Treatment	−.09	.27	−.03		
Block 2				.12	.04**
Distress disorder	1.50	.55	.21*		

ΔR^2 change in R^2, *B* standardized beta, *SE* standard error, *β* unstandardized beta

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

Discussion

Consistent with recent conceptualizations of psychological disorders, distress disorders encompass conditions such as depression and anxiety that disproportionately affect cancer survivors [5]. Across two studies, we demonstrated that a distress disorder history was associated with greater pain and fatigue, along with worse physical functioning and self-rated health, before and after cancer treatment. Consistent with the scarring hypothesis [24], distress disorder histories correspond to greater physical symptoms and worse self-rated health even in the absence of a current diagnosis. Overall, these studies supply insight into how a distress disorder history relates to physical health. Although cross-sectional in nature, these findings show the importance of treating distress disorders to help combat physical distress symptoms that may persist throughout cancer diagnosis and treatment.

Findings highlighted that women with a distress disorder history had significantly more pain and fatigue, along with worse sleep quality and self-rated health, compared to women without such a history. These findings are consistent with previous research showing breast cancer survivors with depression and anxiety had worse physical symptoms compared to their counterparts without these psychological symptoms [15, 16, 18, 35]. The results from these two studies advance earlier research by providing a more comprehensive picture of how clinically significant levels of distress correspond to physical health following cancer diagnosis and within the first decade of survivorship. In doing so, this study emphasizes the connection between psychological and physical health is not localized to one stage of the cancer trajectory but, rather, has negative consequences from diagnosis through survivorship.

Contrary to study hypotheses, self-reported physical functioning did not differ between women with and without a distress disorder history across the two studies. Along with symptoms associated with distress disorders, several other variables can reduce physical functioning including treatment type, pre-diagnosis physical functioning, and symptom severity [36]. Depression and anxiety symptoms can also predict future physical functioning [37]. Findings from the current studies and previous research highlight that physical functioning may be a downstream consequence of the increased physical symptoms that breast cancer patients and survivors with distress disorders experience. Additionally, women with a history of more than one distress did not report poorer physical symptoms than those with one distress disorder history; however, we may be underpowered to detect these differences because only approximately 25% of patients and 18% of survivors had multiple distress disorders. Future research will benefit from addressing the physical implications of a history of multiple distress disorders across the cancer trajectory.

These two studies add to a small but significant body of literature examining how psychological "scars" can enhance sensitivity to stress even in the absence of current symptoms [23]. Prior research on the scarring hypothesis in breast cancer shows that women with depression histories experience poorer quality of life and social/emotional functioning during treatment and survivorship compared to those without such a history [27, 28]. The current studies expand this research through using an additive approach of examining distress disorder histories broadly rather than histories of major depression alone. Further, they offer insight into how these psychological "scars" correspond to physical symptoms, which earlier research did not test within the cancer context. The psychological "scars" of a distress disorder history may enhance physical and psychological symptoms during cancer via biological priming [23]. Although this study did not explore the mechanisms linking psychological scars and physical symptoms, it is possible that these scars enhance cancer patients' and survivors' vigilance to bodily cues. Given that current psychological symptoms can heighten inflammation along with physical symptoms such as pain and fatigue among breast cancer patients and survivors [38, 39], it is possible that distress disorder histories enhance inflammation, thus contributing to greater psychological symptoms. Future research should explore these potential mediators.

This study has several notable strengths. The first sample included breast cancer patients who had undergone surgery but not begun adjuvant treatment. The assessment of women at this stage in cancer treatment provides novel insights into their psychological and physical health that can predict functioning both prior to and following adjuvant treatment. However, the cross-sectional nature of these data limits causal claims about the impact of distress disorder history on self-reported physical health. Relatedly, given that the samples used were measured and two distinct periods in the cancer trajectory, the two samples are not directly comparable to one another. The use of diagnostic data via the SCID provides more nuanced information about diagnoses than what is typical of cancer research, which has traditionally relied largely on self-report measurement of psychological symptoms or self-reported diagnostic history. However, diagnostic symptom severity was not assessed. The extensive exclusionary criteria used for the parent studies resulted in these samples likely being healthier than the general population of breast cancer survivors. Further, replication of the findings from these studies in more diverse samples is important to increase generalizability of these results. Individuals diagnosed with distress disorders also are likely to engage in risky behaviors [40], such as smoking tobacco, consuming greater quantities of alcohol, living a more sedentary lifestyle, and eating an unhealthier diet [41]. Future research

may address how these risky behaviors relate to psychological and physical distress across the cancer trajectory.

Breast cancer survivors experience pain, fatigue, and psychological distress resulting from their cancer diagnosis and treatment — all of which influence their quality of life and overall health. Pain and fatigue may also limit breast cancer survivors' physical activity [42]. Evidence-based interventions including cognitive behavioral therapy and mindfulness-based stress reduction are beneficial in offsetting some of the psychological and physical symptom consequences associated with breast cancer survivorship [43, 44]. Yoga has also proven useful in reducing the physical, psychological, and biological consequences of cancer [45]. Despite these clear benefits, several barriers often prohibit cancer survivors from engaging in these lengthy, structured treatments. These barriers include not having access to these interventions, medical appointment burden, physical health complications, or not being able to afford specialized mental health services [46]. Limited screenings for distress, and especially for past distress disorders, and referral resources for psychological treatment also serve as barriers to treating psychological distress among patients and survivors [46]. As a result, there is a clear need for brief, feasible, evidence-based interventions to be widely disseminated to improve physical and psychological health among breast cancer patients and survivors across the cancer trajectory. Further, these results also underscore the need for screening for both current and past depression and anxiety in breast cancer survivors, in line with recommendations from the American Society of Clinical Oncology and accreditation standards for cancer facilities set forth by the American College of Surgeons Commission on Cancer [47, 48].

Taken together, findings from these studies showed that breast cancer patients awaiting adjuvant treatment and post-adjuvant survivors who had histories of a distress disorder diagnosis experienced worse pain, fatigue, sleep quality, and self-rated health compared to those without such a history. This research shows the need to identify resources to help improve patient and survivors' psychological health before and after treatment. Intervening on patients' depression and anxiety early in the cancer trajectory may help reduce physical symptoms throughout survivorship.

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Declarations

Ethics Approval All procedures performed in these studies were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Competing Interests The authors declare no competing interests.

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