REGULAR ARTICLE

The Psychological Experience of Awaiting Breast Diagnosis

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Abstract

Background Each year, over 1 million women in the USA undergo diagnostic breast biopsies, many of which culminate in a benign outcome. However, for many patients, the experience of awaiting biopsy results is far from benign, instead provoking high levels of distress.

Purpose To take a multifaceted approach to understanding the psychological experience of patients undergoing a breast biopsy.

Method Female patients (N = 214) were interviewed at an appointment for a breast biopsy, just prior to undergoing the biopsy procedure. Pertinent to the current investigation, the interview assessed various patient characteristics, subjective health and cancer history, support availability, outcome expectations, distress, and coping strategies.

Results The findings revealed a complex set of interrelationships among patient characteristics, markers of distress, and use of coping strategies. Patients who were more distressed engaged in more avoidant coping strategies. Regarding the correlates of distress and coping, subjective health was more strongly associated with distress and coping than was cancer history; perceptions of support availability were also reliably associated with distress.

Conclusion Taken together, the results suggest that patients focus on their immediate experience (e.g., subjective health, feelings of risk, perceptions of support) in the face of the acute moment of uncertainty prompted by a biopsy procedure, relative to more distal considerations such as cancer history and demographic characteristics. These findings can guide clinicians' interactions with patients at the biopsy appointment and can serve as a foundation for interventions designed to reduce distress in this context.

Keywords Breast cancer • Biopsy • Uncertainty • Waiting • Worry

Introduction

In 2017, over 250,000 new cases of invasive breast cancer were expected to be diagnosed in American women, and over 3 million women in the USA are currently under treatment or have completed treatment for breast cancer [1]. Women endure an undoubtedly distressing experience in the face of a breast cancer diagnosis [2], yet these numbers paint only part of the picture of distress surrounding the threat of breast cancer. Each year, over 1 million women in the USA undergo diagnostic breast biopsies, ~70–80% of which culminate in a benign or noninvasive outcome [3]. However, as Poole eloquently put it, "a benign biopsy is not a benign experience" [4] (p. 279; see also [5]). The present study examines the psychological experience of women undergoing breast biopsy, with a focus on correlates of distress and strategies used to cope with feelings of uncertainty during this common diagnostic procedure.

Distress Prior to Diagnosis

Studies have documented levels of anxiety and depression during the wait for biopsy results that exceed thresholds for clinical diagnosis in otherwise mentally healthy women [6–9]. In addition to emotional distress, a study of women at their biopsy appointment found deficits in critical thinking ability relative to their ability several weeks after a benign diagnosis [10], and women reflecting on their experience following an abnormal mammogram recalled an inability to concentrate or plan during the diagnostic period [11].

High levels of distress while awaiting breast diagnosis may even have direct consequences for women's health.

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A systematic review concluded that existing evidence, though limited, points to decreased immune functioning during the wait for biopsy results [12], and a study comparing biochemical stress levels (i.e., cortisol fluctuations) in women with an uncertain diagnosis, a benign diagnosis, and a malignant diagnosis of breast cancer found substantial biochemical distress in the uncertain group, equivalent to that of women with a malignant diagnosis [13]. Importantly, many women and their partners report that the uncertainty and fear inherent to the diagnostic process is more distressing than the diagnosis itself [4, 7, 14], emphasizing the importance of addressing patients' well-being even prior to cancer diagnosis.

Other evidence confirms that uncertainty-related distress is distinct from other types of stressors (e.g., getting bad news [15, 16]). Uncertainty may be particularly distressing because it precludes a clear plan of action. In the context of breast cancer, a diagnosis points to a course of action (i.e., treatment), whereas uncertainty prior to diagnosis provides little opportunity to take action to mitigate the consequences of the threat. Thus, the present study provides an overview of patients' experiences during this period of uncertainty, with the ultimate goal of informing interventions aimed at reducing distress and its consequences for health and well-being.

An Uncertainty Navigation Approach

The magnitude of women's distress as they await breast diagnosis makes clear the need for targeted, in-depth studies of the waiting experience. However, studies of the diagnostic process have been hampered by the absence of a theoretical framework that addresses the particular experience of stressful uncertainty. In fact, general theories of stress and coping [17] are limited in their applicability to waiting periods because they address appraisal and coping responses to identified threats, and affective processes that target a known stressor differ in notable ways from the processes that target an uncertain outcome [12, 15, 16].

In contrast, the *uncertainty navigation model* [18] was developed as a theoretical approach to understanding the experience of awaiting uncertain news. The model delineates key markers of distress, coping strategies people employ in an effort to manage this distress, and correlates of distress during uncertain waiting periods (adapted in Fig. 1 for relevance to breast cancer diagnosis).

At the heart of the uncertainty navigation model is a set of coping strategies that are particularly relevant to stressful periods of acute uncertainty, which fall into three broad categories: consequence mitigation, reappraisal, and direct emotion management. Regarding consequence mitigation, waiting periods are in part distressing due to a loss of control, and people may attempt to regain a sense of control by taking action to mitigate consequences that would occur in the case of bad news (preventive action) or by spending time psychologically preparing to cope with bad news (proactive coping). In fact, some women report using the waiting period following breast biopsy for such preparation [9, 19], and some evidence suggests that longer waiting periods might benefit women who ultimately face a malignant diagnosis because it allows for sufficient preparation [12, 20]. Although efforts toward preventive action and proactive coping may not reduce distress during the wait for biopsy results, both strategies are likely to be effective for buffering well-being following a diagnosis of breast cancer [21].

Reappraisal comes in several forms during uncertain waiting periods, including managing expectations (either by bracing for the worst or by embracing hope and optimism [22, 23]) and preemptively finding the silver lining in the feared bad outcome (preemptive benefit finding [24, 25]). In each case, reappraisal strategies involve thinking differently about some aspect of the upcoming news: Expectation management alters one's perspective
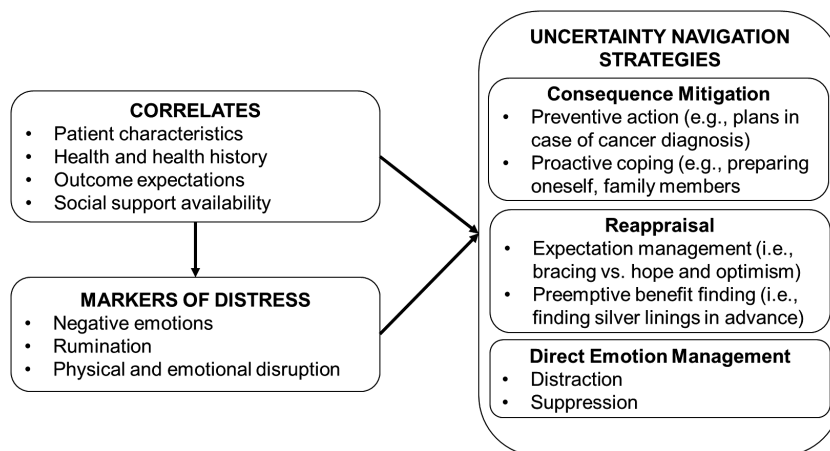

Fig. 1. Uncertainty navigation model, adapted for relevance to awaiting breast diagnosis.

on the probability of good and bad news, and benefit finding alters one's perspective on the potential impact of good and bad news. Preemptive benefit finding may be effective for both mitigating distress during the wait for biopsy results and in the wake of a breast cancer diagnosis. Expectation management, on the other hand, may be most effective when timed properly (i.e., trajectory rather than level). Bracing can be an effective and relatively painless strategy at the moment of truth, just prior to diagnosis [26], but this pessimistic mindset can be quite distressing if deployed too early in a waiting period [21, 27, 28].

Finally, direct emotion management refers to attempts to mitigate distress in ways that are irrelevant to the outcome itself, namely distraction or efforts to suppress one's worry over the uncertain future. Studies of coping styles in women awaiting breast diagnosis find that many women engage in distraction, suppression, and denial strategies in response to the distress of uncertainty [7, 19, 29, 30], although the effectiveness of these strategies varies [29].

In contrast to approaches to understanding stress and coping in the face of a known stressor, the uncertainty navigation model captures processes that are unique to or heightened during periods of uncertainty. Most notably, the model highlights the future-focused nature of uncertain waiting periods with the inclusion of future-focused coping strategies such as preventive action, proactive coping, expectation management, and preemptive benefit finding. This theoretical model guided the present inquiry.

Overview and Hypotheses

The current study took a theoretically-driven approach to understanding the experience of women undergoing a breast biopsy, with a focus on the feelings of uncertainty that accompany the diagnostic process. Although a number of studies have examined this experience, the present study is a direct response to a call to action by Montgomery in a review of the literature on uncertainty during breast diagnosis: "A need exists to better understand the relationships among anxiety, selection of coping methods, and demographic characteristics as they relate to uncertainty" [19] (p. 81). Seven years have passed since this exhortation, but few, if any, studies have met Montgomery's challenge. A number of hypotheses emerged based on previous research in this area and related work guided by the uncertainty navigation model:

Hypothesis 1: Patients who report greater distress will also report greater use of coping strategies [20].

Hypothesis 2: Patients with a personal or family history of breast cancer, or who have undergone at least one previous biopsy, will report greater distress and greater use of coping strategies (see [31–33]).

Hypothesis 3: Patients who are more pessimistic about their biopsy result (i.e., predict a greater likelihood of needing treatment) will report greater distress and greater use of coping strategies [20].

Hypothesis 4: Patients who perceive greater availability of social support will report less distress and less use of coping strategies (see [5]).

Due to limited or conflicting existing evidence, analyses of health literacy, religiosity, and demographic characteristics were exploratory and included in the interest of thoroughness.

Method

Participants and Procedures

Female patients (N = 214; see Table 1 for sample characteristics) were interviewed immediately prior to undergoing a breast biopsy in the radiology department of a large county hospital in Southern California between April 2015 and March 2017. Patients were eligible to participate if they were over 18 years of age, fluent in either English or Spanish (only one patient was excluded due to language constraints), and not currently incarcerated. In the current study, 44% of interviews were conducted in English, 56% in Spanish. Patients were referred to the radiology department for a biopsy following one or more abnormal mammogram results. Patients typically wait 1–2 weeks for their biopsy results following the procedure at the research site.

Department staff provided a brief description of the study when they called patients to remind them about their biopsy appointment. If patients were interested in learning more about the study, they arrived 30 min prior to their biopsy appointment and were met by a trained member of the research team (undergraduate and post-graduate students), who conducted consent procedures and the interview. The researcher escorted the patient to a private, quiet room in the radiology department to complete the interview. Patients could either read the consent form or go over it with the researcher; only three patients opted out of the study following consent procedures. Following consent, the researcher conducted a structured interview with the patient (see below for study measures). Although all interview questions were directed to the patient, in 23% of cases the patient had a family member or friend with her during the interview, by the patient's request.

This study was approved by the Institutional Review Boards at both the University of California, Riverside and the county hospital where data collection procedures

Table 1 Sample characteristics

Patient characteristics	(N = 214)
% Female	100%
Mean age	47.8
Education	
Did not complete high school	47%
Completed high school only	37%
Completed college (2- or 4-year degree)	16%
Insured (any)	88%
Employed	34%
Ethnicity: Hispanic/Latina	73%
Race	
White/Caucasian	71%
Black/African-American	10%
Asian	4%
Native Hawaiian/Pacific Islander	<1%
American Indian/Alaska Native	1%
Other/multiple	14%
Completed interview in Spanish	56%
Religious affiliation (any)	82%
Health history	
Personal history of breast cancer	15%
Family history of breast cancer	30%
Marital status: married	52%
Parental status: at least 1 child	92%

took place. The interview included a number of questions not pertinent to the current investigation; full study materials are at https://osf.io/7rdf4/. However, the current study addresses the primary goals of the larger study.

Measures

Patient characteristics

For the purpose of our investigation, we include demographic information, health literacy, and religiosity in the broader category of patient characteristics, simply to distinguish those characteristics from other key constructs of interest (e.g., cancer history, social support availability).

The following demographic information was collected from patients during the interview: ethnicity ("Are you Hispanic or Latino?" *yes/no*), race ("What is your race?" *open-ended*), age ("How old are you?" *open-ended*), employment status ("Are you employed?" *yes/no*), education ("What is the highest grade in school you completed?" *open-ended*), marital status ("Are you married?" *yes/no*), and number of children ("Do you have children?" *yes/no*; if yes, "How many children do you have?" *open-ended*).

Participants indicated their health literacy with a single-item measure that has been validated against widely used health literacy assessment instruments ([34]; "How

confident are you filling out medical forms by yourself?"; 1 = *not at all*, 10 = *completely confident*).

Participants responded to a single-item measure of religiosity ([35, 36]; "I am a religious person"; 1 = *strongly disagree*, 7 = *strongly agree*). Participants also reported their religious affiliation (53% Catholic, 30% Christian-other, 8% none, 7% other, <1% Protestant, <1% Muslim).

Cancer history

Participants indicated whether they had ever been diagnosed with breast cancer (15% had a personal history), whether anyone in their family had ever been diagnosed with breast cancer (30% had a family history), and whether they had ever undergone a breast biopsy prior to that day (20% had a previous biopsy). Participants also reported their current health with a single item, adapted from the SF-36 ([37]; "In general, would you say your health is…"; 1 = *poor*, 5 = *excellent*).

Outcome expectations

Participants' expectations regarding their biopsy result were assessed with a single item, worded with the intention of sensitivity to participants' distress (i.e., avoiding a direct inquiry about the likelihood of cancer; "From 0% to 100%, and taking your best guess based on how you feel right now, how likely do you think it is that your biopsy will turn out completely fine?").

Social support availability

Participants completed a validated short-form version of the Medical Outcomes Study, Social Support Survey [38]. The measure consists of four items, each addressing a different type of support availability (tangible support, "How often do you have someone to help you with your daily chores if you were sick?"; informational support, "How often do you have someone to turn to for suggestions about how to deal with a personal problem?"; positive social interaction, "How often do you have someone to do something enjoyable with?"; affectionate support, "How often do you have someone to love and make you feel wanted?"; for all, 1 = *none of the time*, 4 = *all of the time*). These items were averaged and combined into a composite.

Markers of distress

Distress was assessed in three ways. First, participants completed the physical and emotional subscales of the Psychological Consequences Questionnaire [39], which include nine items designed specifically to address impairment in women undergoing breast screening (e.g., had trouble sleeping, been unhappy or depressed, felt worried about the future, had difficulty meeting work or other commitments; 1 = *none of the time*, 4 = *all of the time*).

Second, participants responded to five items assessing current negative emotions, adapted from the Positive and Negative Affect Schedule, Expanded ([40]; "I am tense/upset/worried/ashamed/angry"; 1 = *strongly disagree*, 7 = *strongly agree*).

Third, participants completed a three-item measure assessing repetitive thoughts, adapted from the Rumination about an Interpersonal Offense scale [41]. Items captured the extent of repetitive and persistent thoughts about breast cancer ("I couldn't stop thinking about breast cancer," "Thoughts about breast cancer limited my enjoyment of life," "Breast cancer was never far from my mind"; 1 = *strongly disagree*, 7 = *strongly agree*). Because the three measures of distress were highly intercorrelated, *r*s > .60, each measure was standardized and the three measures were averaged to create a distress composite.

Uncertainty navigation strategies

Use of theoretically proposed coping strategies (based on the uncertainty navigation model; see [18] and Fig. 1) was assessed with items adapted from previous work on waiting periods [20, 27]. To assess consequence mitigation, preventive action was assessed with one dichotomous item ("Have you done anything to prepare for issues that might come up if you find out you need to get treatment?"; 28% responded yes, *n* = 54), as was proactive coping ("Have you thought about how you would cope if you find out you need to get treatment?"; 40% responded yes, *n* = 77).

To assess reappraisal efforts, expectation management was assessed with three items, kept separate for analyses ("I am bracing for the worst"; "I am hoping for the best"; "I am trying to be optimistic"; 1 = *strongly disagree*, 7 = *strongly agree*). Initial review of the distribution of these measures revealed that both hope and optimism were substantially negatively skewed (skewness of –8.09 and –4.34, respectively). Thus, we squared each of those variables before conducting our analyses to correct for the negative skewness. Preemptive benefit finding was assessed with a single dichotomous item ("Can you think of any good that might come out of it, any silver lining, if you find out you need to get treatment?"; 86% responded yes, *n* = 164).

To assess direct emotion management, distraction efforts were assessed with one item ("I have been trying to distract myself from thinking about breast cancer"; 1 = *strongly disagree*, 7 = *strongly agree*). Suppression efforts were assessed with two items to capture both emotion and expressive suppression ("I have been trying to stop myself from thinking about breast cancer," "I have been trying to hide my feelings from other people"; 1 = *strongly disagree*, 7 = *strongly agree*). These items were strongly intercorrelated, *r* = .70, so they were averaged into a direct emotion management composite.

Results

Descriptive statistics and internal reliability (where relevant) for all measures are presented in Table 2.

Correlates of Distress

Patient characteristics

To examine patient characteristics as correlates of distress, a simultaneous multiple regression was conducted predicting distress from ethnicity, age, educational attainment, employment status, marital status, number of children, health literacy, and religiosity (Table 3). No patient characteristic was significantly associated with distress.

Health-relevant correlates

To examine health-relevant correlates of distress, a simultaneous multiple regression was conducted predicting distress from personal history of breast cancer, family history of breast cancer, history of breast biopsy, and subjective health (Table 3). Contrary to *Hypothesis 2*, none of the cancer history variables were associated with distress. However, subjective health was significantly associated with distress, $\beta = -.23$, $p = .001$, such that participants who perceived their health to be worse also reported greater distress.

Outcome expectations

Contrary to *Hypothesis 3*, participants' outcome expectations were only marginally significantly correlated with distress, $r(199) = -.14$, $p = .06$ (Table 4), such that participants who were more pessimistic about their biopsy result (i.e., indicated

Table 2 Descriptive statistics and internal reliability for all measures

	M	*SD*	Cronbach's α
Patient characteristics			
Health literacy	5.70	1.82	N/A
Religiosity	5.61	1.82	N/A
Subjective health	2.71	1.02	N/A
Outcome expectations	76.25	30.77	N/A
Social support availability	3.13	0.71	.74
Distress composite	N/A	N/A	.84
Psychological consequences questionnaire	1.90	0.66	.89
Negative emotions	3.55	1.35	.75
Rumination	4.05	1.95	.80
Uncertainty navigation strategies			
Bracing	3.91	2.46	N/A
Hope	6.90	0.53	N/A
Optimism	6.75	0.75	N/A
Direct emotion management	4.73	1.95	.75

a lower perceived likelihood that their biopsy would turn out "completely fine") reported only somewhat greater distress.

Support availability

Consistent with *Hypothesis 4*, participants' perceptions of support availability were significantly correlated with distress, $r(210) = -.24$, $p = .0004$ (Table 4), such that participants who felt they had more social support available to them reported less distress.

Correlates of Uncertainty Navigation Strategies

Distress

Consistent with *Hypothesis 1*, participants who reported greater distress also reported significantly greater

Table 3 Multiple regression analyses predicting distress from patient characteristics and health-relevant variables

	β	[95% CI]	p
Patient characteristics ($R^2 = .03$)			
Ethnicity[a]	–.06	[–.23, .11]	.47
Age	–.04	[–.19, .12]	.64
Educational attainment	–.09	[–.25, .08]	.30
Employment status[b]	–.13	[–.28, .01]	.07
Marital status[b]	–.03	[–.18, .12]	.68
Number of children	.05	[–.11, .21]	.52
Health literacy	–.02	[–.17, .12]	.75
Religiosity	.05	[–.09, .20]	.45
Health-relevant correlates ($R^2 = .07$)			
Personal history of breast cancer[b]	.03	[–.12, .18]	.67
Family history of breast cancer[b]	.06	[–.07, .20]	.37
History of breast biopsy[b]	.07	[–.08, .22]	.44
Subjective health	–.23	[–.36, –.09]	.001

Results from separate simultaneous multiple regression analyses, predicting distress from the set of patient characteristics and health-relevant correlates (separately).

[a]Non-Hispanic/Latina = 0, Hispanic/Latina = 1. [b]No = 0, Yes = 1.

bracing, $r(204) = .43$, $p < .0001$, and direct emotion management, $r(206) = .57$, $p < .0001$. Distress was not correlated with preventive action, $r(190) = .09$, $p = .24$, proactive coping, $r(192) = .13$, $p = .13$, maintaining hope, $r(204) = -.03$, $p = .63$, or preemptive benefit finding, $r(168) = -.02$, $p = .81$, and only marginally significantly associated with less optimism, $r(205) = -.13$, $p = .06$.

Patient characteristics

To examine patient characteristics as correlates of strategy use, a series of simultaneous multiple regressions were conducted to predict use of each continuously measured strategy (bracing, hope, optimism, and direct emotion management) from the set of patient characteristics (i.e., ethnicity, age, educational attainment, employment status, marital status, number of children, health literacy, and religiosity; Table 5). Turning first to expectation management strategies, several patient characteristics were significantly associated with participants' efforts to brace for the worst. Participants who had more children, $\beta = .16$, $p = .04$, and who were less educated, $\beta = .16$, $p = .05$, braced more than those with fewer children or who were more educated. No patient characteristic was associated with efforts to remain hopeful; ethnicity, $\beta = .20$, $p = .02$, and education, $\beta = .19$, $p = .03$, were associated with efforts to remain optimistic, such that Latina participants and participants who were more educated made greater efforts to maintain optimism.

Only the number of children participants had was associated with direct emotion management efforts, $\beta = .23$, $p = .004$, such that participants with more children reported engaging in greater effort to distract themselves from and suppress thoughts and feelings about breast cancer.

To test associations between patient characteristics and use of dichotomously-assessed strategy use (proactive coping, preventive action, preemptive benefit finding), multiple logistic regression analyses were conducted predicting strategy use from the set of patient characteristics (Table 5). Only education was associated with

Table 4 Correlations between outcome expectations, support availability, distress, and coping strategies

	Outcome expectations r [95% CI]	Support availability r [95% CI]
Distress	–.14[†] [–.27, .004]	–.24** [–.37, –.11]
Preventive action[a]	–.12 [–.26, .02]	–.03 [–.18, .11]
Proactive coping[a]	–.15* [–.29, –.01]	–.09 [–.23, .05]
Bracing for the worst	.19** [–.33, –.06]	–.10 [–.24, .04]
Efforts to be hopeful	.10 [–.04, .23]	.09 [–.05, .22]
Efforts to be optimistic	–.04 [–.18, .10]	.13[†] [–.01, .26]
Preemptive benefit finding[a]	.07 [–.07, .22]	.02 [–.13, .17]
Direct emotion management	–.22** [–.35, –.09]	–.05 [–.18, .09]

[a]No = 0, Yes = 1.

[†]$p < .10$, *$p < .05$, **$p < .01$.

Table 5 Multiple regression analyses predicting use of coping strategies from patient characteristics

Parameter estimate	Preventive action[b] Odds ratio	Proactive coping[b] Odds ratio	Bracing for the worst Standardized beta	Hope Standardized beta	Optimism Standardized beta	Preemptive benefit finding[b] Odds ratio	Direct emotion management Standardized beta
Patient characteristics	$R^2 = .04$	$R^2 = .07$	$R^2 = .09$	$R^2 = .06$	$R^2 = .04$	$R^2 = .09$	$R^2 = .08$
Ethnicity[a]	1.21 [.81, 1.81]	1.02 [.71, 1.45]	−.06 [−.23, .10]	.11 [−.06, .28]	.20* [.03, .40]	1.60* [1.00, 2.57]	.02 [−.14, .19]
Age	1.01 [.70, 1.45]	1.13 [.81, 1.57]	−.04 [−.19, .11]	−.12 [−.28, .04]	<.001 [−.16, .16]	1.04 [.65, 1.67]	−.05 [−.21, .10]
Educational attainment	1.15 [.79, 1.67]	1.48* [1.04, 2.10]	−.16* [−.32, <.001]	.11 [−.05, .28]	.19* [.02, .35]	1.15 [.68, 1.67]	−.02 [−.18, .14]
Employment status[b]	.77 [.54, 1.09]	.83 [.60, 1.14]	−.09 [−.24, .05]	.10 [−.04, .25]	−.01 [−.15, .14]	1.15 [.73, 1.83]	−.05 [−.19, .10]
Marital status[b]	1.03 [.73, 1.46]	1.01 [.76, 1.36]	−.14† [−.28, .01]	−.02 [−.13, .17]	.01 [−.14, .16]	1.38 [.85, 2.26]	−.12 [−.26, .02]
Number of children	1.00 [.69, 1.46]	1.08 [.76, 1.52]	.16* [.01, .32]	.13 [−.04, .29]	.01 [−.15, .18]	1.18 [.71, 1.96]	.23** [.08, .39]
Health literacy	1.52* [1.02, 2.29]	.88 [.63, 1.22]	−.03 [−.18, .12]	−.07 [−.23, .08]	.07 [−.08, .22]	.89 [.53, 1.49]	.06 [−.09, .21]
Religiosity	1.07 [.77, 1.49]	.85 [.63, 1.15]	.10 [−.03, .24]	−.05 [−.20, .09]	.02 [−.12, .16]	.98 [.64, 1.50]	.13† [−.005, .27]

Results from simultaneous multiple regression analyses (logistic regressions in the case of dichotomous variables), predicting coping strategies from the set of patient characteristics. Standardized betas with 95% confidence intervals in brackets. Wald confidence intervals around odds ratios used for logistic regressions.

[a]Non-Hispanic/Latina = 0, Hispanic/Latina = 1. [b]No = 0, Yes = 1.

†$p < .10$, *$p < .05$, **$p < .01$.

use of proactive coping, odds ratio (OR) = 1.48, $p = .03$, such that more educated participants were more likely to engage in that strategy. Only health literacy was associated with preventive action, OR = 1.52, $p = .04$, such that more health-literate participants were more likely to engage in that strategy. Finally, only ethnicity was associated with preemptive benefit finding, OR = 1.60, $p = .05$, such that Latina participants were more likely to find silver linings in a potential diagnosis of cancer than were non-Latina participants.

Health-relevant correlates

To examine health-relevant correlates of strategy use, a series of simultaneous multiple regression analyses were conducted to predict use of each continuously measured strategy from the set of health-relevant variables listed above (Table 6). Regarding expectation management, no health-relevant variable was associated with use of positive strategies (maintaining hope and optimism), contrary to *Hypothesis 2*, nor were these variables significantly associated with bracing. However, history of breast biopsy, $\beta = .18$, $p = .02$, was associated with bracing, such that participants who had previously undergone a biopsy engaged in more bracing (consistent with *Hypothesis 2*). Subjective health was associated with direct emotion management, $\beta = −.21$, $p = .003$, such that participants who reported poorer health also reported engaging in greater effort to distract themselves from and suppress thoughts and feelings about breast cancer. No other health-relevant variable was significantly associated with direct emotion management.

To test associations between health-relevant variables and use of dichotomously assessed strategy use, multiple logistic regression analyses were conducted predicting strategy use from the set of health-relevant variables (Table 6). Consistent with *Hypothesis 2*, personal history of breast cancer was associated with proactive coping, OR = 1.50, $p = .01$, such that participants who had been previously diagnosed with breast cancer were more likely to engage in that strategy. No other health-relevant variable was associated with proactive coping, nor were these variables significantly associated with preventive action or preemptive benefit finding.

Outcome expectations

Consistent with *Hypothesis 3*, participants' outcome expectations were significantly correlated with proactive coping, $r(186) = −.15$, $p = .04$, bracing for the worst, $r(196) = −.19$, $p = .006$, and direct emotion management, $r(198) = −.22$, $p = .002$ (see Table 4), such that more pessimistic participants engaged in each of these strategies more. Outcome expectations were not correlated with

efforts to be optimistic or hopeful, nor preemptive benefit finding or preventive action.

Support availability

Contrary to *Hypothesis 4*, no strategy was correlated with participants' perceptions of support availability (Table 4).

Discussion

The goal of this study was to examine the interrelationships among distress, coping, and various patient characteristics that might be associated with these experiences in the context of awaiting breast diagnosis—thus responding to Montgomery's call for exactly such research [19]. These relationships were examined in a relatively large sample of female patients, diverse in socioeconomic status and ethnicity, at a biopsy appointment. The endeavor was guided by several hypotheses, which received mixed support. That said, the guiding theoretical model (Fig. 1) seems to provide a reasonable depiction of the key characteristics and experiences relevant to this acute moment of medical uncertainty.

Links Between Distress and Strategy Use

Based on the uncertainty navigation model [18], it was hypothesized that patients who reported more distress would also report greater efforts to use an array of theoretically derived strategies to cope with their distress. In fact, patients who were more distressed put more effort into bracing for the worst, distracting themselves, and suppressing thoughts and feelings about breast cancer. These findings are consistent with recent work suggesting that distress is a strong predictor of uncertainty-oriented coping strategies, whereas use of these strategies does not seem to appreciably alleviate distress during acute moments of uncertainty [21]. That is, if patients' coping strategies were highly effective, one would expect a negative relationship between use of these strategies and reports of concurrent distress. Instead, most associations point to coping as a reaction to distress rather than the other way around.

It seems that distress was particularly intertwined with more avoidant coping strategies, less so with positive and proactive approaches. Contrary to the current study, previous studies [20, 27] have found that people who are less distressed as they await uncertain news typically engage in greater efforts to be hopeful and optimistic. One explanation for the weak or absent relationships here is a ceiling effect: The average ratings for both hope and optimism were near the top of the scale (see Table 2). Given the life-or-death nature of uncertainty in this context, perhaps it is unsurprising that nearly all patients,

Table 6 Multiple regression analyses predicting use of coping strategies from health-relevant variables

Parameter estimate	Preventive action	Proactive coping	Bracing for the worst	Hope	Optimism	Preemptive benefit finding	Direct emotion management
	Odds ratio	Odds ratio	Standardized beta	Standardized beta	Standardized beta	Odds ratio	Standardized beta
Health-relevant correlates	$R^2 = .02$	$R^2 = .07$	$R^2 = .08$	$R^2 = .01$	$R^2 = .01$	$R^2 = .02$	$R^2 = .05$
Personal history of breast cancer	1.03 [.73, 1.46]	1.50* [1.09, 2.07]	.09 [−.05, .24]	−.02 [−.17, .13]	−.09 [−.24, .06]	1.30 [.72, 2.33]	.07 [−.08, .22]
Family history of breast cancer	.96 [.69, 1.32]	.94 [.69, 1.27]	.10 [−.04, .23]	.03 [−.11, .17]	−.01 [−.15, .12]	.96 [.62, 1.47]	−.03 [−.17, .10]
History of breast biopsy	1.15 [.82, 1.62]	1.08 [.78, 1.50]	.18* [.03, .32]	.08 [−.08, .23]	.03 [−.11, .18]	.97 [.59, 1.61]	.03 [−.12, .18]
Subjective health	1.26 [.91, 1.74]	1.19 [.87, 1.61]	−.13† [−.27, .01]	−.04 [−.18, .11]	−.04 [−.18, .10]	.87 [.56, 1.33]	−.21** [−.35, −.07]

Results from simultaneous multiple regression analyses (logistic regressions in the case of dichotomous variables), predicting coping strategies from the set of health-relevant correlates. Standardized betas with 95% confidence intervals in brackets. Wald confidence intervals around odds ratios used for logistic regressions.

†p < .10, *p < .05, **p < .01.

regardless of their level of distress, expressed intense efforts to remain positive.

The Role of Cancer History

Previous studies that examined patients' experiences in the context of a breast biopsy found that objective risk factors, including personal and family history of breast cancer, were associated with greater distress [31–33]. However, the current study found no evidence of a link between cancer history and distress. Notably, the previous studies did not assess distress at the biopsy appointment; the closest measurement points were at the point of an abnormal mammogram [32] and several days post-biopsy [33]. Perhaps the situational "press" of the biopsy appointment negated the influence of more distal factors like cancer history. Further supporting this explanation was the significant relationship between current subjective health and distress, which suggests that patients may have been particularly focused on the immediate situation. Although we asked about subjective health broadly, not in the context of cancer, the fact that subjective health was consistently associated with patients' experiences at the biopsy appointment suggests that patients may have known that their health symptoms could indicate advanced-stage cancer, or they may have simply used a heuristic that feeling sick indicates something dire. In either case, this immediate concern seemed to outweigh any influence of cancer history.

Similarly, subjective health was far more consistently associated with patients' use of coping strategies, relative to cancer history. The two exceptions were relationships between personal history of breast cancer (present in 15% of participants) and proactive coping and bracing for the worst. It is sensible that patients who have been "down that road" before would recognize the importance of preparing for the blow of bad news. Future studies can replicate and extend these findings to better understand when and how current health versus cancer history contribute to distress over medical uncertainty.

Expectations and Social Support

Two additional correlates were hypothesized to play a notable role in distress and coping in the context of a breast biopsy: outcome expectations and perceptions of support availability. Regarding outcome expectations, the findings weakly support the distressing nature of pessimism in this context. Surprisingly, patients were quite optimistic on average, with close to half of the sample indicating a 100% chance of a good outcome (<5% said there was no chance of a good outcome). Among those who were less optimistic, however, distress was a bit higher than among those who were more optimistic. These findings, albeit weak,

are consistent with studies of cancer patients, which find that a natural tendency toward optimism tends to benefit well-being and quality of life [42, 43]. Furthermore, pessimistic patients had a distinct coping profile. They braced for the worst, they attempted to distract themselves and suppress thoughts and feelings about breast cancer, and they put effort into planning how they would cope with bad news (in all cases, consistent with previous work in other uncertainty contexts [20, 27]).

Turning to social support, the findings were consistent with the hypothesis that patients who perceived that they had more support available to them would report less distress. As in a previous study of patients' experiences just prior to biopsy [5], the present study assessed support availability rather than the amount of support patients received, given evidence that perceptions of support matter more than reality when it comes to buffering people from the ill effects of stress [44].

Despite this strong relationship between support availability and distress, support was largely unassociated with coping efforts. The strategies assessed in the present study were "internal" rather than interpersonal, so perhaps social support simply augments one's psychological coping strategies rather than guiding or altering them.

The Inconsistent Role of Demographics

An exploratory aim of the current study was to examine demographic correlates of distress and coping. Few consistent patterns emerged. As noted above, Latina patients put more effort toward being optimistic, and they were also more likely to engage in preemptive benefit finding (i.e., finding silver linings in a cancer diagnosis, even before a diagnosis is delivered). Overall, these findings point to a more positive coping style among Latina patients, consistent with a study of Latina breast cancer survivors who expressed greater optimism about and acceptance of their cancer experience [45].

Education was also associated with several coping strategies, such that more educated patients braced less, made greater efforts to be optimistic, and engaged in more proactive coping. These findings emerged even after controlling for all other demographic correlates, including health literacy. Given the exploratory nature of these analyses, it is difficult to ascertain why education would shift the coping profile of patients in these ways. Similarly, it is unclear why health literacy was associated with preventive action, such that patients higher in health literacy were more likely to engage in efforts to proactively mitigate consequences of a breast cancer diagnosis. Perhaps more educated and more health-literate patients had a clearer sense of what to expect at the next steps of the diagnostic process, and thus were better able to plan and, in the case of education, had less need

to psychologically brace themselves for the worst. Clearly, more work is needed to replicate these findings and delve into the mechanisms by which education and health literacy might guide coping efforts in an acute moment of uncertainty.

Finally, patients with more children braced more and engaged in more distraction and suppression—the more avoidant coping strategies among the set of strategies assessed here. Note that nearly all patients had at least one child, and most had at least three children (results held even when truncating the range at five children to address the possible influence of outliers). One could imagine that facing a potentially life-threatening diagnosis would be particularly terrifying for someone responsible for a large family; however, patients with more children reported no more distress than those with smaller families. Nonetheless, it seems that family responsibilities may have shifted patients' coping efforts toward worst-case scenario thinking and direct efforts to manage whatever distress they did experience.

Clinical Implications

Patients' suffering has many sources in the context of healthcare, but uncertainty is one culprit that has been largely ignored in efforts to improve patient satisfaction and quality of care. Anecdotally, many clinicians are aware that their patients experience levels of worry and anxiety that impair functioning and disrupt their health and sleep [46]. However, nurses and physicians may feel unable to act to alleviate uncertainty during the course of diagnostic testing. When it comes to breast biopsies, often the person conducting the procedure is prohibited from providing initial feedback to patients about the likely diagnosis, even if the diagnosis is quite clear.

In light of this informational limitation, the findings from the current study provide clinicians with several alternative approaches to providing comfort to their patients as they await their biopsy result. For example, clinicians can inquire about patients' sources of social support and provide support resources when available (e.g., support groups, patient navigators). They can also talk to patients about their current health concerns and provide clear, accurate feedback on whether their symptoms should be a source of concern. Further research is needed to test these potential interventions, but the current study provides necessary insights into the interplay between personal and situational factors that are associated with distress and coping during the wait for breast diagnosis.

Limitations

Although the present study had a number of strengths, it was also limited in notable ways. First, the generalizability of the findings is unclear, given that the data were collected at a single hospital in a county health system in a particular region of the USA. The study also targeted just one phase of a broader diagnostic process that might span weeks or even months. Second, the sample may have been affected by a degree of self-selection, given that some potential participants opted out when the study was introduced by staff or after the initial study description. Only three patients opted out following consent procedures, as noted earlier, but records were not kept regarding drop-out at earlier stages. Third, the study was entirely correlational and descriptive, and thus interpretations of causal relationships should be made with caution. Finally, because the study was guided by a particular theoretical approach, the assessment of coping strategies, patient characteristics, and markers of distress were limited to theoretically specified variables. Future work is needed to extend the current endeavor to additional samples and sites, to introduce interventions or longitudinal methods to better disentangle causal relationships, and to expand the consideration of key experiences and strategies in this context.

Conclusion

To return to Poole's eloquent description of uncertainty in the context of breast diagnosis, "a benign biopsy is not a benign experience" [4] (p. 279). The current study provides a multifaceted approach to understanding who is likely to have a particularly "malignant" experience and how people cope with uncertainty-related distress. Clinicians may benefit from the insights revealed here, including the key role of patients' expectations, support networks, and current health perceptions in predicting distress in this context. Furthermore, these findings can inform the development of interventions to reduce distress. Perhaps the best route to improving patients' biopsy experience is to encourage them to focus on their support system and expect the best, along with a dose of preparation.

Compliance with Ethical Standards

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

Authors' Contributions All authors contributed substantially to the study and/or the manuscript.

Ethical Approval This study was reviewed and approved by the Institutional Review Boards at the University of California, Riverside and the Riverside University Health System-Medical Center.

Informed Consent All participants provided written consent before the interview commenced and were provided a copy of the consent form.

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