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Emotional, Cognitive, and Physical Well-Being during the Wait for Breast Biopsy Results

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Abstract

The experience of waiting for breast biopsy results can cause clinically significant levels of psychological distress. **Objective:** This study is a replication and extension of previous work examining the well-being of patients at a breast biopsy appointment (Sweeny, Christianson, and McNeill, 2019). Expanding on the previous study, we aim to identify predictors of well-being following the appointment (i.e., waiting for results). **Design:** In this longitudinal study, female patients (N = 197) were surveyed at their breast biopsy appointments and then completed daily surveys assessing distress and coping during the week-long wait for results. **Main Outcome Measures:** Surveys asked about patient characteristics, subjective health, cancer history, support availability, outcome expectations, and distress. **Results/Conclusions:** Consistent with the previous study, health history and demographic factors were largely unassociated with distress, this time while waiting for biopsy results. New to this study, Latina ethnicity and being in a committed relationship emerged as predictors of coping, pointing to opportunities for clinical intervention for patients who do not have these characteristics. Finally, anxiety was highest at the beginning and end of the wait for biopsy results, suggesting that interventions may be most effective following a breast biopsy and the days prior to learning one's result.

Abstract word count: 199

Keywords: breast cancer, biopsy, uncertainty, waiting, worry

Emotional, Cognitive, and Physical Well-Being during the Wait for Breast Biopsy Results

An estimated one in eight women in the United States will be diagnosed with breast cancer over the course of their lifetime (Cancer Society of America, 2017). Prior to a cancer diagnosis, approximately 1.6 million women undergo a breast biopsy each year in the United States (Silverstein et al., 2009)—and although 70-80% of these diagnostic tests are benign (Elmore et al., 2015), the experience of waiting for breast biopsy results can cause clinically significant levels of psychological distress (Lebel et al., 2003; Pinneault, 2007). The current study expands on previous findings regarding the psychological experience of women undergoing a breast biopsy (most notably Sweeny, Christianson, & McNeill, 2019) by examining temporal dynamics of distress and coping during the wait for results.

Waiting for Results

The wait for life-altering news is often characterized by levels of uncertainty that lead to debilitating anxiety and worry. Uncertain waiting periods, such as those that typically follow medical tests, are unique in their ability to create distress due to a lack of both certainty and control over the awaited outcome (Sweeny, 2018). Investigations into the experience of patients awaiting the results of diagnostic testing for breast cancer, the focus of the current investigation, confirm the anxiety-provoking nature of this experience (Harding, 2014; Montgomery & McCrone, 2010; Northouse et al., 1995). In fact, many women and their partners report that waiting for uncertain news during the diagnostic process is more distressing than the diagnosis itself (Lebel et al., 2003; Nosarti et al., 2002; Poole, 1997). Importantly, distress experienced prior to diagnosis may be detrimental for cognition (Scott, 1983; Thorne et al., 1999) and immune function (Witek-Janusek et al., 2007; Lang et al., 2009).

Waiting experiences are not static across periods of acute uncertainty. Women in one

study undergoing in vitro fertilization (IVF) reported higher levels of anxiety while awaiting pregnancy test results compared to their treatment phase and the period after receiving a negative pregnancy test (Boivin & Lancastle, 2010). Within the waiting phase, anxiety was highest in the moments immediately prior to receiving pregnancy test results. Sweeny and Cavanaugh (2012) present a theoretical approach, the uncertainty navigation model, to understand the dynamic experience of coping with the wait for news. Studies guided by the uncertainty navigation model have identified a U-shaped pattern of distress in academic and professional waiting periods, such that anxiety is highest at the start and end of a stressful waiting period (Sweeny et al., 2016). The current study investigates time trends in distress and coping using an adapted form of the uncertainty navigation model that applies specifically to the experience of waiting for breast biopsy results (see Figure 1).

Coping with Uncertainty

During waiting periods, people often cope by managing their expectations through bracing for the worst or maintaining hope or optimism; reappraising the situation by trying to see it in a more bearable light or by accepting their lack of control; or attempting to directly manage worry and other forms of distress with strategies like distraction, relaxation, emotion expression, or support seeking (see Figure 1; Sweeny & Cavanaugh, 2012).

Coping with uncertainty while awaiting news is often unsuccessful in reducing distress (Sweeny et al., 2016). In the aforementioned study of women awaiting pregnancy test results following IVF, women used various coping strategies in conjunction with one another during the wait when anxiety was particularly intense (Boivin & Lancastle, 2010), suggesting that the coping strategies were not entirely effective for distress reduction. Similarly, a study of patients' experiences at a breast biopsy appointment found that anxiety remained elevated even when

patients used coping strategies that are typically considered effective (Harding, 2014). In fact, the most relevant previous study found positive associations between distress and use of some coping strategies (Sweeny et al., 2019). Despite these discouraging findings, the present investigation further probes the link between coping and distress during the wait for biopsy results (Sweeny et al., 2019).

Predictors of Distress and Coping

As Figure 1 depicts, a primary aim of the current investigation was to identify predictors of distress and coping during the wait for biopsy results, with the ultimate goal of identifying targets for interventions to mitigate distress. Following the theoretical approach of the most relevant previous study (Sweeny et al., 2019), we examined predictors of four types: patient characteristics, health and health history, outcome expectations, and social support.

Regarding patient characteristics, aspects of personality may influence waiting experiences; however, we focused here on demographic factors (i.e., ethnicity, age, educational attainment, employment status, relationship status, health literacy, and religiosity). Some of these factors could plausibly elevate or reduce distress over health-related uncertainty. For example, religious faith provides comfort to many people in uncertain times (e.g., Vishkin et al., 2014; cf. Sweeny et al., 2021), and Latina patients with breast cancer seem to benefit from cultural and social resources (Ashing-Giwa et al., 2006). However, Sweeny et al. (2019) found no associations between these patient characteristics and distress, and only few and inconsistent associations with patients' use of particular coping strategies. Thus, this aspect of our investigation was somewhat exploratory.

Turning to health and health history, a systematic review of psychological distress during the diagnostic process of breast cancer concluded that personal and family history of breast

cancer were significant predictors of distress (Montgomery & McCrone, 2010). However, Sweeny et al. (2019) found almost no associations between these factors and distress or coping at the biopsy appointment, a moment of acute uncertainty that may overshadow those relatively distal risk factors. Instead, current feelings of health (i.e., subjective health) were far more consistent predictors of distress, albeit less so of coping.

Finally, we examined the roles of outcome expectations (i.e., perceived likelihood of an eventual cancer diagnosis) and social support. Sweeny et al. (2019) found that both factors were associated with distress at the biopsy appointment (greater optimism and support predicting less distress), consistent with research on patients already diagnosed with cancer (e.g., Kroenke et al., 2006; Trunzo & Pinto, 2003; Friedman et al., 2006; also see Northouse et al., 1997 for similar findings prior to breast biopsy). That study also documented unique patterns of coping depending on outcome expectations, such that pessimistic patients also embraced relatively pessimistic and defensive coping strategies. Social support was not associated with coping; however, the current study includes seeking support as a potential coping strategy, which is likely associated with patients' perceptions of support availability.

The Current Study

The present investigation is a direct follow-up to Sweeny and colleagues' (2019) report, which was limited to a one-time interview at the biopsy appointment. The current study goes beyond the previous one most notably through the inclusion of daily measures of distress and coping throughout the approximately week-long wait for biopsy results. Although decades of research have addressed the psychological experience of breast cancer patients and survivors, very little work has examined women's experience prior to diagnosis in any depth. As recently as 2010, a review of the literature on uncertainty during breast diagnosis identified a clear lack of

evidence regarding associations among distress, coping, and patient characteristics during the wait for diagnosis (Montgomery & McCrone, 2010).

Hypotheses

Hypotheses emerged based on the findings of Sweeny and colleagues (2019) and previous investigations into temporal trends of distress and coping during uncertain waiting periods.

Hypothesis 1: Demographic characteristics will not consistently predict distress or coping during the wait for biopsy results.

Hypothesis 2: Current perceptions of health will be a better predictor of distress and coping during the wait for biopsy results than will personal or family breast cancer history.

Hypothesis 3: More optimistic expectations regarding one's biopsy result will predict less distress.

Hypothesis 4: Greater social support availability or provision will predict less distress

Hypothesis 5: Use of coping strategies will be unassociated with distress during the wait for biopsy results, or perhaps positively associated such that greater distress is associated with more use of coping strategies.

Hypothesis 6: Distress and coping efforts will increase throughout the waiting period, culminating at the end of the wait.

Method[1]

Participants

Female patients (N = 197; see Table 1 for sample characteristics) participated in a two-part study. We aimed for 200 participants to provide sufficient power for our broad set of

[1]Aside from study-specific changes, the participants and the interview portion of the procedure sections are excerpted from [redacted for review].

analyses. As outlined below, our primary analyses are multiple regression and multilevel models. Our sample size is nearly double the number needed to detect a medium effect size in our most complex multiple regression analysis (n = 103, α = .05, power = .80). No definitive guidance is available to determine power in multilevel models. We collected as much data as possible before the study was halted in March 2020 due to COVID-19 restrictions that prohibited our research team from entering the hospital, and we made every effort to retain our participants throughout the protocol (see below for attrition rate).

In the first part of the study, patients were interviewed immediately prior to undergoing a breast biopsy in the radiology department of a large county hospital in Southern California between April 2017 and March 2020. Participants were alerted to the study opportunity by hospital staff; all participants who indicated an interest in the study completed the interview at their biopsy appointment. Patients were eligible to participate if they were over 18 years of age, fluent in either English or Spanish (no patient was excluded due to language constraints), and not currently incarcerated. Patients were referred to the radiology department for a biopsy following one or more abnormal mammogram results. Patients typically wait one week for their biopsy results following the procedure at the research site.

In the second part of the study, patients were asked to complete daily surveys at home in the days that followed until they had received their breast biopsy results. Due to attrition, 118 participants completed the daily surveys. The most common cause of attrition was an inability to reach the participant to schedule a time to meet in person to collect the daily surveys; others dropped out because their biopsy procedure was not conducted as planned. Because this type of longitudinal study was a first at the facility, we had no way of anticipating the attrition rate in our study planning.

Participants varied in the number of surveys they completed. Some participants simply forgot to fill out one or more surveys, and others completed fewer than seven surveys because they received their biopsy results in less than a week. Of the 118 participants who completed some daily surveys, 91 (76%) completed all seven surveys; 93% completed at least five of the seven surveys. As another indicator of the degree of attrition, 96 participants completed the seventh and final daily survey.

Procedure

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 in a private, quiet room in the radiology department. Patients could either read the consent form or go over it with the researcher. Following consent, the researcher conducted a structured interview with the patient. We opted to conduct structured interviews rather than self-directed surveys due to literacy concerns in this population. Relevant data collected from the interviews were quantitative in nature. Although all interview questions were directed to the patient, in 29% of cases the patient had a family member or friend with her during the interview, by the patient's request.

In the second part of the study, participants were given a packet that included short daily surveys. Participants were to complete these surveys each evening at home, at participants' leisure, until they received their biopsy results. In many cases, participants received results via phone, so they were met at various locations to return the packets and receive payment. This study was approved by the Institutional Review Boards at both [redacted] and the county hospital

where data collection procedures took place. The interview included a number of questions not pertinent to the current investigation; full study materials and deidentified data are available on the Open Science Framework. The current paper addresses the primary goals of the larger study. The authors report no conflict of interest.

Measures

Biopsy Appointment

See Tables 2 and 3 for descriptive statistics and scale information for all measures.

Patient Characteristics. In the initial interview, we collected demographics and other patient characteristics. Regarding demographics, we asked about the following key variables: ethnicity, age, employment status, education, and marital status. We also asked about health literacy and religiosity.

Health and Health History. We assessed personal and family history of breast cancer, history of diagnostic testing, and subjective health.

Outcome Expectations. Participants' expectations regarding their biopsy result were assessed with a single item.

Social Support Availability. Participants indicated the extent to which they had social support available to them (four-item version of the Medical Outcomes Study, Social Support Survey). This survey measured tangible support, informational support, positive social interaction, and affectionate support. These items were averaged and combined into a social support availability composite.

Markers of Distress. In this study, we separately assessed three indicators of distress: emotions, somatic symptoms, and repetitive thought about cancer. Given that the distress measures were not strongly correlated (*r*s > .45), we opted to analyze each indicator of distress

separately. Participants indicated their emotional state on three items (happy, sad, anxious). Somatic symptoms over the past week were assessed with 12 items from the Physical Symptom Inventory. Repetitive thoughts about cancer was assessed with three items from the Impact of Events Scale, Revised.

Daily Surveys

Emotions. In the daily surveys, participants reported their anxious emotions, positive emotions, and negative emotions with an adapted version of the GRID (anxious emotions: 3 items, anxiety, stress, fear; positive emotion: 9 items, e.g., happiness, contentment, pride; negative emotion: 12 items; e.g., shame, sadness, irritation).

Somatic symptoms. Participants reported somatic symptoms they experienced that day using the same measure as in the biopsy appointment interview.

Repetitive thought. Participants reported repetitive thoughts about breast cancer throughout the day using the same measure as in the biopsy appointment interview.

Received social support. Participants reported how much social support they received that day using a single item.

Coping strategies. Participants reported whether they had engaged in a variety of coping strategies each day using items adapted from the Daily Coping Assessment () and targeting expectation management given the relevance of this coping strategy to stressful waiting periods (e.g., Sweeny et al., 2016; for all, 0 = *no,* 1 = *yes,* averaged across seven days): bracing for the worst, hoping for the best, trying to be optimistic, distraction, reappraisal, active coping, emotion expression, acceptance, support seeking, and doing things to try to relax.

Analytical Plan

First, we examined concerns about differential attrition by testing differences between

participants who did and did not complete the daily measures. We used independent-samples t-tests to compare these two groups on continuous measures at the biopsy appointment (e.g., emotions, health literacy) and chi-square tests to compare groups on categorical measures (e.g., health history, language).

Second, we sought to replicate findings from Sweeny et al. (2019) by examining predictors of distress at the biopsy appointment (*Hypotheses 1-4*). We conducted multiple regression models predicting distress at the biopsy appointment from demographics (all demographics as simultaneous predictors) and health variables (all health variables as simultaneous predictors), and we conducted bivariate correlations to examine associations between distress and expectations/social support (separately).

Third, we expanded beyond the previous study (Sweeny et al., 2019) to utilize the longitudinal data in the daily surveys. We first examined associations between measures at the biopsy appointment and average levels of distress/coping in multilevel models (*Hypotheses 1-4*). These models predict daily measures from each relevant variable at the biopsy appointment (grand-mean centered) and, where available, a relevant covariate from the biopsy appointment (e.g., controlling for sadness at the biopsy appointment in models predicting negative emotion during the week[2]). We include these outcome-specific covariates to minimize the effect of third variables. For example, we would anticipate an association between social support availability and positive emotions in daily life, not specific to the wait for biopsy results; by controlling for positive emotion (namely happiness) at the biopsy appointment, we remove the generalized effect of social support availability on emotions and narrow the association to the waiting period

[2]Covariates used in these analyses were as follows: sadness at the appointment for negative emotion, happiness at the appointment for positive emotion, anxiety at the appointment for anxiety, somatic symptoms at the biopsy appointment for somatic symptoms, and repetitive thought at the appointment for repetitive thought.

specifically.

We ran four sets of multilevel models, matching our approach to testing associations within measures at the biopsy appointment: one set with all demographic predictors included, one set with all health variables included, one set with outcome expectations as the sole predictor, and one set with social support availability as the sole predictor. In all cases, we present tests of fixed effects of our focal predictors.

Fourth, we examined associations between measures in the daily surveys, testing *Hypothesis 5*. In the interest of thoroughness, we ran multilevel models for all pairs of daily variables (e.g., positive emotion with received support, anxiety with repetitive thoughts about breast cancer) using multilevel models that included person- and grand-mean centered predictors and controlling for appointment variables where available (see Footnote 2). When models failed to converge, we removed the person mean-centered variable from the random line (all models converged via this strategy). We again present tests of fixed effects of our focal predictors.

Finally, we conducted longitudinal growth curve analyses to detect any linear or quadratic trends in the daily measures over the seven days of surveys, testing *Hypothesis 6*. These models predicted each daily measure first from the intercept only (allowed to vary randomly), then intercept and the linear trend (both allowed to vary randomly), then intercept and linear and quadratic trends (all allowed to vary randomly). We compared fit indices between unconditional-means models (no change over time), models including only a linear change term, and models including linear and quadratic change terms. We also examined fixed effects of linear and quadratic time. Where significant or near-significant fixed effects of time emerged, we inspected AIC indices (comparing the indices of the simpler and more complex models) to confirm that the more complex model was a significantly better fit to the data compared to the

simpler model.

Results

We first examined differences between patients who completed daily surveys and those who dropped out of the study after the initial interview. Among all of the measures included in the biopsy appointment interview that are pertinent to this investigation (i.e., demographics, patient characteristics, markers of distress), only three differences emerged. Those who participated in the daily surveys were higher in health literacy, $t(195) = 2.06$, $p = .04$, more likely to be cohabitating with a romantic partner if not married, $\chi^2(1, 100) = 5.05$, $p = .02$, and (despite effort to remain in contact with those not English fluent) more likely to have completed the initial interview in English, $\chi^2(1, 197) = 5.45$, $p = .02$.

Given the large number of analyses, we adopted a significance level of $p < .01$ for all analyses.

Associations between Measures at the Biopsy Appointment

Next, we sought to replicate relevant cross-sectional findings from a similar, previous study (Sweeny et al., 2019). The results of those analyses are available in supplemental materials on the study's Open Science Framework page. In brief, those analyses supported our hypotheses that demographic variables would not predict distress (*Hypothesis 1*; no demographic variable predicted any measure of distress at the biopsy appointment); that current perceptions of good health would predict less distress and personal and family health history would not (*Hypothesis 2*; subjective health predicted two measures of distress and no other health variable predicted any distress measure); and that both optimistic expectations (*Hypothesis 3*) and social support availability (*Hypothesis 4*) would negatively predict distress.

Predicting Daily Measures from Biopsy Appointment Measures

Turning to the daily measures, we first examined links between measures at the biopsy appointment and daily measures of distress. Full results from all models are available in supplemental tables posted on the Open Science Framework.

Our first set of models included all demographic variables (ethnicity, age, educational attainment, employment status, relationship status, health literacy, and religiosity), along with the outcome-relevant covariate where available (see Footnote 2), as predictors of each daily measure. Consistent with *Hypothesis 1,* no demographic variable aside from ethnicity predicted any daily measure. Ethnicity predicted use of several coping strategies, such that Latina participants were more likely to report using distraction, $\beta = .21$, $se = .08$, $p = .008$, reappraisal, $\beta = .22$, $se = .09$, $p = .01$, and emotional expression, $\beta = .22$, $se = .09$, $p = .01$, compared to non-Latina participants.

Our second set of models included all health-relevant variables (personal history of breast cancer, family history of breast cancer, mammogram history, and subjective health), along with the outcome-relevant covariate where available (see Footnote 2), as predictors of each daily measure. No health-relevant variable predicted any daily variable, in partial support of *Hypothesis 2*.

Next, we ran models predicting each daily measure from outcome expectations, controlling for the outcome-relevant covariate when available. Supporting *Hypothesis 3*, outcome expectations predicted lower average levels of negative emotion, $\beta = -.29$, $se = .07$, $p < .0001$, anxiety, $\beta = -.29$, $se = .08$, $p = .0005$, repetitive thoughts about breast cancer, $\beta = -.30$, $se = .08$, $p = .0003$, and bracing, $\beta = -.29$, $se = .002$, $p = .002$.

Finally, we ran models predicting each daily measure from social support availability, controlling for the outcome-relevant covariate when available. In partial support of *Hypothesis 4*,

perceived support availability predicted higher average levels of positive emotion, β = .31, *se* = .08, p = .0005, lower average levels of repetitive thoughts about breast cancer, β = -.26, *se* = .08, p = .001, and more received social support, β = .53, *se* = .07, $p < .0001$.

Associations Among Daily Measures

Our next set of analyses examined associations between daily variables. Full results from all models are available in supplemental tables posted on the Open Science Framework. We focus here on person-level associations, which indicate the extent to which daily variables "rise" and "fall" together, relative to each person's mean across the week-long waiting period. We also focus on tests of our hypotheses, namely models predicting measures of distress from received social support from family and friends during the wait for results (a secondary test of *Hypothesis 4*) and models predicting measures of distress from use of coping strategies (*Hypothesis 5*).

In partial support of *Hypothesis 4,* received social support predicted positive emotion, β = .07, *se* = .02, p = .001, such that participants reported relatively high levels of positive emotion on days when they also reported relatively high levels of received support.

Turning to the link between distress and coping, results varied considerably across coping strategies. Bracing predicted repetitive thoughts about breast cancer, β = .79, *se* = .18, $p < .0001$, such that participants reported relatively high levels of repetitive thought on days when they engaged in bracing. Hopefulness predicted positive emotion, β = .59, *se* = .12, $p < .0001$, and negative emotion, β = -.35, *se* = .12, p = .003, such that participants reported relatively high levels of positive emotion and low levels of negative emotion on days when they engaged in hopefulness. Optimism, β = .57, *se* = .13, $p < .0001$, distraction, β = .46, *se* = .14, p = .001, reappraisal, β = .51, *se* = .14, p = .0004, and active coping, β = .78, *se* = .15, $p < .0001$, predicted only positive emotion, such that participants reported relatively high levels of positive emotion

on days when they engaged in these strategies. Emotional expression, acceptance, support seeking, and relaxation did not predict any measure of distress.

Time Trends in Daily Measures

Finally, we conducted longitudinal growth curve analyses to detect any linear or quadratic trends in the daily measures over the ≤7 days of surveys, testing *Hypothesis 6*. Table 4 presents key model parameters for the final model for each variable, and Figure 2 depicts notable time trends.

The time trends varied considerably across measures. Positive emotion showed a negative linear trend and a positive quadratic trend, such that participants reported more positive emotion at the start than at the end of the waiting period, with the most notable decline occurring across the first four days. Anxiety showed a positive quadratic trend and a non-significant negative linear trend, such that anxiety was highest at the beginning and somewhat less so at the end of the wait. Somatic symptoms and use of distraction, reappraisal, and active coping as coping strategies showed negative linear trends, such that reports of somatic symptoms and use of these coping strategies decreased over the waiting period. No other daily variable showed significant change over time; analyses thus provided little support for *Hypothesis 6*.

Discussion

The aim of this investigation was to provide a deep dive into the stressful experience of awaiting breast biopsy results. We sought to replicate the findings from a previous cross-sectional study on the topic (Sweeny et al., 2019) and, importantly, to extend those findings beyond the biopsy appointment into the week-long wait for results.

Predictors of Distress

Focusing first on replication, our current findings are remarkably similar to those

reported in Sweeny et al. (2019)—remarkable in part because they contradict both findings from related work and, in some cases, intuition. As in the previous study, we found no demographic predictors of distress at the biopsy appointment, nor did any associations emerge when considering distress during the week-long wait for biopsy results (*Hypothesis 1*). Patients in those challenging moments were equally distressed regardless of age, ethnicity, educational attainment, employment status, religiosity, or health literacy.[3]

Also consistent with the previous study, patients' health history did not predict distress at the biopsy appointment, nor did it predict distress during the wait for biopsy results (*Hypothesis 2*). That is, patients with a family or personal history of breast cancer or a history of abnormal mammogram were no more distressed than those without such history. This finding is mostly inconsistent with previous research; however, at least two other studies found that having a family history of cancer is not associated with greater patient distress at a breast biopsy appointment (Harding, 2014; Northouse et al., 1995). Although this finding may be surprising, we suggest that distal risk factors like health history are insufficiently powerful, psychologically speaking, compared to the salient uncertainty provoked by a biopsy and the ensuing wait for results. To that point, Sweeny et al. (2019) found that the more proximal experience of subjective health (i.e., current feelings of sickness or health) predicted distress at the biopsy appointment. We did not replicate that finding during the waiting period, but a number of distress markers at the biopsy appointment were associated with subjective health (i.e., positive emotion, repetitive thoughts about breast cancer).

Similarly, other relatively proximal psychological factors predicted numerous measures of distress at both the biopsy appointment and during the wait for results: greater outcome

[3]It is possible that small demographic effects exist and were not detected by this study due to limited statistical power; however, a lack of demographic effects is consistent with the previous study (Sweeny et al., 2019).

expectations and perceived social support were each associated with lower distress (*Hypotheses 3* and *4*). However, we cannot determine the direction of these associations (e.g., lower distress may increase perception of social support or vice versa).

Predictors of Coping

Our exploration of coping during the wait for biopsy results differed in the current study compared to the previous study in two ways. First, we assessed coping only during the wait rather than at the biopsy appointment. Second, we included a somewhat different and more expansive set of coping strategies in the current study.

As in the previous study, ethnicity emerged as a consistent predictor of coping, albeit in different ways. The previous study found that Latina patients were more likely to use optimism and preemptive benefit finding (i.e., seeking silver linings in possible bad news) to cope with their uncertainty, compared to non-Latina patients (Sweeny et al., 2019). The current study did not replicate the link between ethnicity and optimism, and we did not include a measure that specifically addressed preemptive benefit finding. However, in the current study, Latina women were more likely to use reappraisal (similar to preemptive benefit finding), distraction, and emotional expression to cope with uncertainty during the wait. Although the pattern of results differs a bit from the previous study, in part due to the altered list of coping strategies, both studies point to the possibility that Latina patients are particularly likely to reach for a variety of coping strategies during the wait for biopsy results. This is in line with other investigations of coping among Latina patients during the diagnostic phase for breast cancer (Molina et al., 2014) and cancer treatment (Culver et al., 2002).

This difference in coping by ethnicity did not translate into a difference in distress in either study. It seems that cultural factors may influence how people cope with health-related

uncertainty, but these coping efforts are ineffective. This conclusion is consistent with other research on uncertain waiting periods in professional domains, which found that a variety of coping strategies are quite ineffective against the distress of uncertainty (Sweeny et al., 2016). In short, stressful uncertainty may be a uniquely challenging type of distress that is resistant to many coping efforts that would be effective under different circumstances.

In the current study, no measure of health or health history predicted coping. The previous study found sparse associations (Sweeny et al., 2019), which were not replicated here. Unsurprisingly, outcome expectations were associated with bracing (a type of expectation management), and perceived social support did not predict any coping strategy, consistent with the previous study.

Time Trends

Extending our investigation to assess daily waiting experiences for biopsy results allowed us to expand our inquiry in several ways. One novel contribution of the current study was an examination of time trends in distress and coping over the week-long wait for biopsy results. As a reminder, studies of other waiting periods (e.g., the wait for results from IVF treatment) have revealed increasing distress and coping efforts as the moment of truth draws near, with some evidence also pointing to elevated distress at the start of the wait (i.e., a U-shaped pattern). However, these studies address waiting periods that had a clear beginning. In contrast, a breast biopsy is simply one stop along the uncertainty journey when it comes to a breast cancer diagnosis, a journey that may begin with the discovery of a lump or an abnormal mammogram.

Interestingly, we found a U-shaped pattern only for anxiety, such that anxiety was highest at the start and end of the waiting period. Although we did not anticipate that pattern given that the initiation of uncertainty far preceded the biopsy appointment, anxiety is arguably the most

uncertainty-relevant measure in our surveys. This finding is consistent with previous work, which has found that both anxiety and worry (a close relative of anxiety) are most intense when uncertainty is most salient (e.g., Sweeny et al., 2016). In the case of medical testing, the appointment itself and receiving news of a diagnosis are peak anxiety-provoking moments.

In contrast, positive emotion showed a pattern opposite to the typical U-shape, such that positive emotion was highest shortly after the biopsy appointment and (less so) toward the end of the wait. We suspect that patients were quite relieved that the biopsy procedure itself was over and that relief boosted positive emotions as they moved into the waiting period. Perhaps they experienced some anticipatory relief at the end of the waiting period because they knew their uncertainty would soon be resolved.

No other measure of distress showed significant change across the week-long wait for biopsy results, nor did most coping strategies—perhaps unsurprising given the relative brevity of the waiting period, compared with studies of other types of waiting (e.g., the 4-month wait for bar exam results; Sweeny & Andrews, 2014; Sweeny et al., 2016). A few coping strategies (distraction, reappraisal, and active coping) surprisingly showed a declining pattern over time. However, the daily coping measure was relatively insensitive to small variations, given that it was a yes/no question rather than the continuous measures typically used to study coping during waiting periods. Future research can use more sensitive measures to reliably detect variations in coping across the wait for biopsy results. Nonetheless, we tentatively conclude that the experience of awaiting biopsy results is fairly consistent over the relatively short waiting period, with the exceptions of anxiety and positive emotions.

Dynamics of the Wait

The final novel contribution of the current investigation is insight into the dynamics of

the wait for biopsy results. That is, we used multilevel modeling to identify psychological experiences that "rise" and "fall" together during this stressful waiting period. Given our hypotheses, we focused on models testing 1) received social support as a predictor of distress and coping, and 2) distress as a predictor of coping.

Our findings for social support partially supported our hypothesis, such that received support from family and friends predicted greater positive emotion (but not negative markers of distress). We suspect this relationship reflects the positive effects of receiving support on a given day, but it is also possible that patients elicited more support from loved ones on days when they were feeling more upbeat and cheerful.

Finally, most coping strategies were unrelated to distress over the week-long wait for biopsy results. The clear exception arose for positive emotion, which was predicted by use of hopefulness, optimism, distraction, reappraisal, and active coping. We suggest that the most parsimonious explanation for these associations is that using any of these five coping strategies on a given day boosted positive emotions on that day, without mitigating negative psychological experiences (apart from hopefulness, which had a mitigating association with negative emotion). It is noteworthy that the previous relevant study only assessed negative markers of distress (Sweeny et al., 2019), thus the inclusion of a positive emotion measure provides a broader look at potential coping effects. This finding is particularly promising for intervention development, such that interventions could focus on increasing use of these strategies to improve the wait for biopsy results, even against the backdrop of persistent distress.

Limitations and Future Directions

Our investigation had a number of notable strengths, namely the *in situ* assessment of psychological experiences both at a breast biopsy appointment and daily through the wait for

biopsy results. However, it was limited in several key ways. First, like the previous study on which this investigation was based, the data come from a single county hospital, thus limiting the generalizability of the findings to populations with different demographic characteristics or to other types of healthcare facilities. Further work is needed to determine whether our findings apply narrowly to this population and type of facility or relatively broadly.

Second, we did not collect extensive measures of mental health in our study due to limitations on the duration of our interview and daily measures. Although we suspect that even the most mentally healthy person finds the wait for potentially life-changing health news to be stressful, we also suspect that people who suffer from mental health issues (particularly anxiety disorders) find such uncertainty to be especially distressing. Future studies should consider the role of mental health in experiences with acute medical uncertainty.

Third, although this study improved on the previous study with its longitudinal design, the data are correlational and do not permit strong causal inferences. The clear next step in this line of research is to develop interventions based on our findings to determine causal links between, for example, optimistic outcome expectations and distress during the wait for biopsy results, or between specific coping strategies and distress.

Finally, although our sample was relatively large for this type of intensive data collection and difficult-to-recruit population, our power to detect small effects was certainly limited. As a related point, the attrition rate was relatively high (47%) between the interview at the biopsy appointment and completion of the daily surveys during the wait for results, although we found few differences (based on the initial interview) between those who completed and did not complete daily surveys. Such attrition was largely a function of the timing of the initial interview (just prior to the biopsy procedure, which was then canceled in some cases) and the challenges

inherent in recontacting patients who did not have follow-up appointments scheduled.

Conclusions and Clinical Implications

Taking our wide-ranging results together, several key takeaways emerge, several of which have clear clinical implications. First, our results were remarkably consistent with the results presented in Sweeny et al. (2019), which provides reassurance that our conclusions are quite robust (at least in the context of the particular patient population and healthcare setting). Second, as in the previous study, it is striking how little health history and demographic factors seem to affect distress during the stressful wait for biopsy results. Instead, proximal psychological factors are far more relevant. This finding is encouraging in that it suggests that malleable factors like outcome expectations and social support may be key to bolstering well-being during periods of health-related uncertainty—factors on which clinicians could focus in their communication with patients undergoing breast biopsy. We would note that such support would not require significant resources of time or money, as it would ideally transpire in the course of conversation during already-necessary appointments.

Third, two demographic characteristics emerged as consistent predictors of coping: Latina ethnicity and being in a committed relationship. This finding points to yet another opportunity for clinical intervention, such that clinicians could target non-Latina patients and patients who are not in committed relationships for coping interventions. Other findings in our study suggest that this approach might be particularly effective for boosting positive emotions during the wait for biopsy results.

Finally, consistent with previous research on waiting for uncertain news in non-medical contexts, anxiety was highest at the beginning and end of the wait for biopsy results. Although clinicians may not be in contact with patients during this time, this pattern points to opportunities

for effective social support targeted at the days following a breast biopsy and the days prior to learning one's biopsy result. Other results suggest that such support from family and friends would likely bolster positive emotions in those challenging moments. Given the undeniable emotional challenge of awaiting such potentially dire news (Lebel et al., 2003; Pineault, 2007) and the implications of this distress for health and sleep (Howell & Sweeny, 2016; Howell & Sweeny, 2020), any relief clinicians or loved ones can provide during this period is a very worthy goal indeed.

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Table 1

Sample Characteristics

Patient characteristics	Completed interview at biopsy appointment (*N* = 197)	Completed daily surveys (*N* = 118)
% female	100%	100%
Mean age ("How old are you?")	46.0	44.0
Education ("What is the highest grade in school you completed?")		
Did not complete high school	36%	33%
Completed only high school	27%	26%
Completed some college	22%	26%
Completed college (2- or 4-year degree)	14%	16%
Employed ("Are you employed?" *yes/no*)	38% employed	36% employed
Ethnicity ("Are you Hispanic or Latino?" *yes/no*)	74% Hispanic/Latina	72% Hispanic/Latina
Race ("Do you identify as any other race?")		
White/Caucasian	72%	65%
Black/African-American	8%	12%
Asian	3%	3%
Native Hawaiian/Pacific Islander	1%	1%
American Indian/Alaska Native	2%	2%
Other/multiple	15%	16%
Completed interview in Spanish	49%	41%
Religious affiliation ("What is your religious affiliation, if any?")	93% any affiliation	94% any affiliation
Health history		
Personal history of breast cancer ("Have you ever been diagnosed with breast cancer?" *yes/no*)	10%	8%
Family history of breast cancer ("Has anyone in your family ever been diagnosed with breast cancer?" *yes/no*)	36%	36%
History of diagnostic testing ("Prior to the experience that brought you here today, have you ever had an abnormal mammogram result?" *yes/no*)	39%	35%
Marital status ("Are you married?" *yes/no*)	49% married	50% married

Table 2

Descriptive Statistics and Internal Reliability for Biopsy Appointment Measures

Variable	Source	Min	Max	*M*	*SD*	Cronbach's *α*
Patient characteristics						
Health literacy ("How confident are you filling out medical forms by yourself?")	Chew et al. (2008)	1 (*not at all confident)*	10 (*extremely confident*)	8.62	2.52	-
Religiosity ("How religious are you?")	N/A	1 (*not at all*)	10 (*extremely*)	6.32	2.29	-
Subjective health (In general, would you say your health is excellent, very good, good, fair, or poor?")	Ware & Sherbourne (1992)	1 (*poor*)	5 (*excellent*)	2.83	1.03	-
Outcome expectations ("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?")	Sweeny et al. (2019)	0%	100%	76.68	28.25	-
Social support availability (4 items; e.g., "How often do you have someone to do something enjoyable with?")	Gjesfjeld et al. (2008)	1 (*none of the time*)	4 (*all of the time*)	3.11	0.74	.76
Markers of distress						
Happy ("How much of the time today have you felt happy?")	N/A	1 (*none of the time*)	4 (*all of the time*)	2.58	0.97	-
Sad ("How much of the time today have you felt sad?")	N/A	1 (*none of the time*)	4 (*all of the time*)	1.69	0.86	-
Anxious ("How much of the time today have you felt anxious?")	N/A	1 (*none of the time*)	4 (*all of the time*)	2.35	0.99	-
Somatic symptoms (12 items; "Thinking about the past week, have you had any of the following symptoms?"; e.g., upset stomach, dizziness)	Spector & Jex (1998)	0 (*no*)	1 (*yes*)	0.30	0.23	.76
Repetitive thoughts (3 items; e.g., "I couldn't stop thinking about breast cancer.")	Weiss & Marmar (1996)	1 (*strongly disagree*)	7 *strongly agree*)	4.70	1.91	.78

Note. M and *SD* represent mean and standard deviation, respectively.

Table 3

Descriptive Statistics and Internal Reliability for Daily Diary Measures

Variable	Source	Min	Max	*M*	*SD*	Cronbach's α
Received social support ("How supported did you feel in your interactions with friends and family today?")	N/A	1 (*not at all*)	5 (*completely*)	3.85	1.03	-
Markers of distress						
Emotions ("How much of the time today did you feel each of the emotions?")	Fontaine et al. (2007)	1 (*none of the time*)	4 (*all of the time*)			
Anxious emotions		1	4	1.73	0.65	.83 - .88
Positive emotions		1	4	2.01	0.56	.80 - .84
Negative emotions		1	4	1.35	0.42	.84 - .89
Somatic symptoms (see Table 2)		0	1	0.21	0.20	.73 - .81
Repetitive thoughts (see Table 2)		1	5	2.63	1.12	.83 - .89
Coping	Porter & Stone (1996)	0 (*no*)	1 (*yes*)			
Bracing for worst		0	1	0.35	0.40	-
Hoping for best		0	1	0.82	0.28	-
Staying optimistic		0	1	0.83	0.27	-
Distraction ("distracting yourself from the situation by thinking about other things or engaging in distracting activities")		0	1	0.76	0.32	-
Reappraisal ("trying to see the situation in a different light that made it seem more bearable")		0	1	0.58	0.40	-
Active coping ("thinking about solutions to the situation, gathering information about it, or actually doing something to try to solve it")		0	1	0.49	0.41	-
Emotion expression ("expressing emotions in response to the situation to reduce tension, anxiety, or frustration")		0	1	0.54	0.40	-
Acceptance ("trying to accept that the situation is occurring and that nothing can be done about it")		0	1	0.53	0.39	-
Support seeking ("seeking emotional support from loved ones, friends, or professionals")		0	1	0.59	0.39	-
Relaxing		0	1	0.81	0.29	-

Note. *M* and *SD* are used to represent mean and standard deviation, respectively.

Table 4

Time Trends in Daily Variables

	Intercept *b (se)* *[95% CI]*	Linear time *b (se)* *[95% CI]*	Quadratic time *b (se)* *[95% CI]*	$\Delta\chi^2$
Negative emotion	1.35** (.04) [1.28, 1.43]	--	--	N/A
Positive emotion	1.98** (.05) [1.87, 2.08]	-.04** (.009) [-.06, -.03]	.01** (.003) [.008, .02]	30.0**
Anxiety	1.70** (.06) [1.58, 1.83]	-.02 (.01) [-.04, .003]	.01* (.005) [.001, .02]	16.9**
Somatic symptoms	.21** (.02) [.18, .25]	-.007** (.002) [-.01, -.002]	--	49.0**
Repetitive thought	2.62 (.10) [2.42, 2.82]	--	--	N/A
Received support	3.85** (.09) [3.67, 4.04]	--	--	N/A
Bracing	.35** (.04) [.37, .42]	--	--	N/A
Hopefulness	.82** (.03) [.77, .87]	--	--	N/A
Optimism	.83** (.02) [.78, .88]	--	--	N/A
Distraction	.77** (.03) [.71, .83]	-.01* (.007)	--	31.3**
Reappraisal	.59** (.04) [.51, .66]	-.01* (.007) [-.03, -.002]	--	9.0**
Active coping	.50** (.04) [.43, .58]	-.03** (.007) [-.04, -.01]	--	36.0**
Emotional expression	.55** (.04) [.48, .62]	--	--	N/A
Acceptance	.54** (.04) [.47, .61]	--	--	N/A
Support seeking	.60** (.04) [.53, .67]			N/A
Relaxation	.81** (.03) [.76, .86]			N/A

Note: $^{**}p < .01$; $^{*}p < .05$. Model parameters are from the final model for each variable, based on fixed effects and fit statistics.

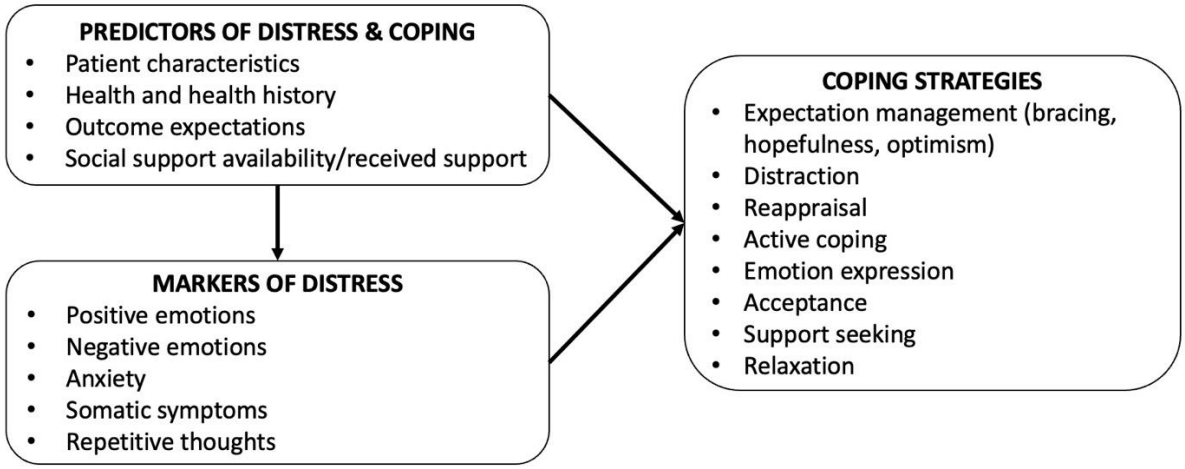


Figure 1. The uncertainty navigation model, adapted for relevance to awaiting breast diagnosis.

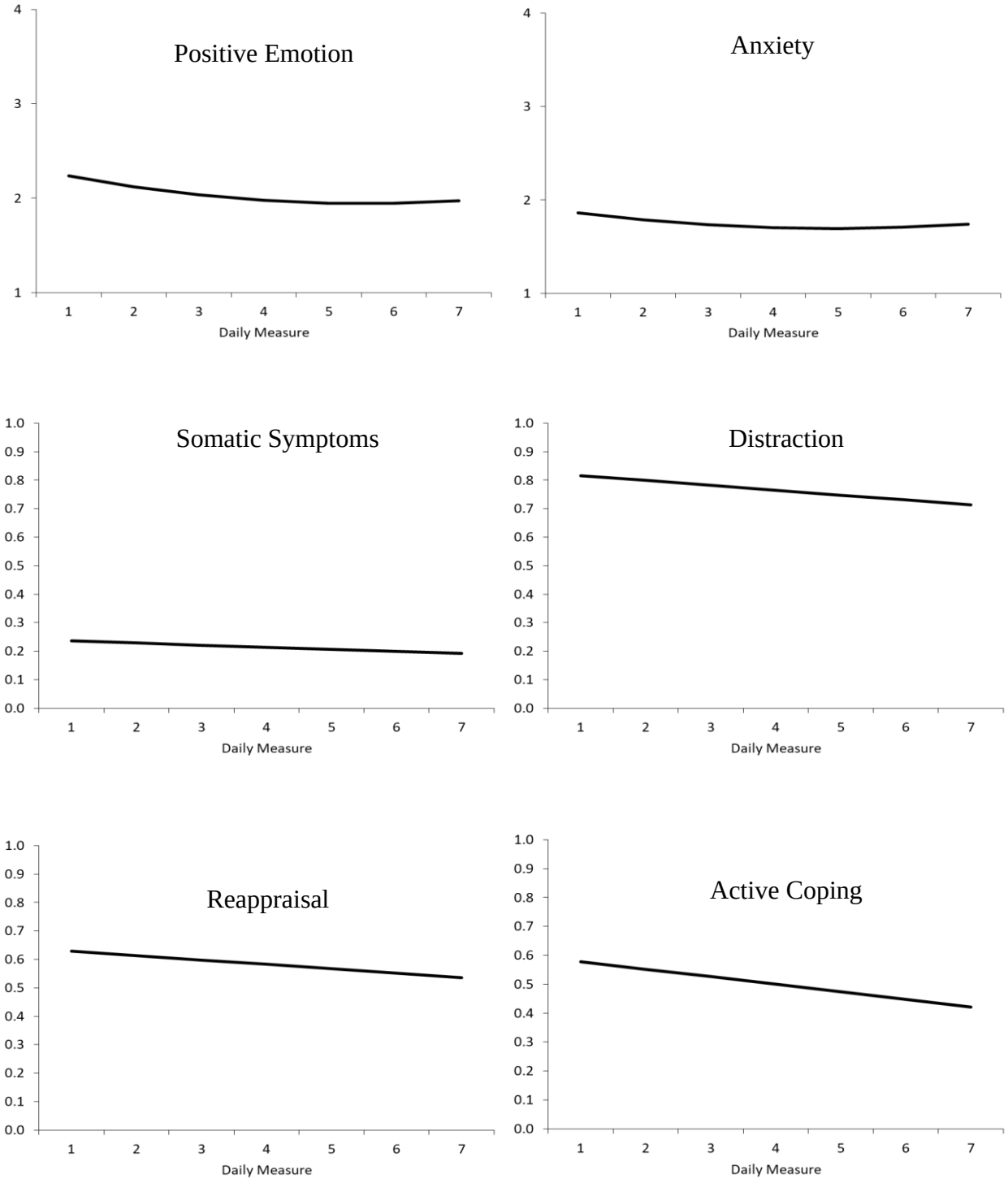


Figure 2. Time trends in daily measures. Positive emotion and anxiety: 1 = *none of the time* and 4 = *all of the time.* Somatic symptoms, distraction, reappraisal, and active coping: 0 = *no*, 1 = *yes*.