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The role of cognitive bias in relation to persistent distress among women diagnosed with breast cancer

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Abstract

Objective: To examine if bias in attention to and interpretation of cancer-related stimuli differentiates women with persistent psychological distress from those with low/transient distress following breast cancer.

Methods: One-hundred forty women classified in a prior longitudinal study as having low (n = 73) or persistent high (n = 67) distress completed 2 modified dot-probe tasks assessing attention bias and an ambiguous cues task assessing interpretation bias toward cancer-related vs neutral information. Psychological distress was assessed using the Hospital Anxiety Depression Scale. Four-way repeated analysis of variance was adopted.

Results: Participants with persistent high distress from the original study who continued to report high Hospital Anxiety Depression Scale scores (≥8) on recruitment into the present study comprised the persistent distress group (ie, 31 reporting high anxiety and 30 reporting high depression scores). Persistent distress and low distress groups did not differ in attentional bias toward negative-stimuli or cancer-related information, but a significant time-course effect in attentional bias toward negative-stimuli or cancer-related information was observed, with women in the persistent distress group showing a significant bias away from negative-stimuli or cancer-related information under supraliminal conditions. There was a borderline difference in interpretation bias scores between low anxiety and chronic anxiety groups (P = .065), with correlation suggesting a significant positive association (r = 0.20, P = .019).

Conclusion: Women with persistent distress may adopt avoidance strategies to cope with breast cancer. Moreover, women reporting persistent anxiety may have a tendency to negatively interpret ambiguous information, leading to illness preoccupation. These findings offer critical insight for clinicians to develop tailored interventions to help women with persistent psychological distress.

KEYWORDS

attention bias, breast cancer, chronic distress, cogntivie bias, interpretation bias

1 | INTRODUCTION

Breast cancer is the most common female cancer worldwide.[1] Its diagnosis and treatment are often psychologically and physically distressing. Recent studies revealed that, while most women diagnosed with and treated for breast cancer experience little longer-term psychological distress (hereafter "distress"), a subset of affected women report prolonged persistent distress sufficient to substantially impair quality of life.[2-8] Understanding distress variability following breast cancer diagnosis is essential to identify those at risk for persistent distress who might benefit most from therapeutic interventions.

Cognitive theories suggest that bias in attention allocation and stimulus interpretation during information processing (information-processing bias) crucially differentiates emotionally vulnerable and nonvulnerable individuals in terms of their initial responses to negative events, as well as subsequent adaptation.[9,10] Substantial evidence implicates attention bias toward negatively valenced stimuli in anxiety and depression among both clinical and subclinical samples.[11-13] The role of attentional bias in adjustment following cancer diagnosis has not been widely investigated. Using experimental paradigms for assessing information-processing bias is necessary as self-report measures show response bias and cannot reliably capture attentional shifts

and are reliant on individual awareness of their cognitive processes, but many key cognitive processes are preconscious.[14] To date, 4 studies have adopted experimental paradigms to study attentional bias in cancer adjustment with mixed results. Two studies[15,16] tested if attentional bias was associated with poor psychological adjustment to breast cancer. Using a dot-probe task, negative attentional bias toward sad faces was associated with greater symptoms of post-traumatic stress disorder in Chinese women with breast cancer.[15] Another dot probe–based study assessed attentional bias toward cancer-related words and reported that women with breast cancer showed attentional bias toward cancer-related words, but not social threat–related words.[16] Two other studies, using dot probe[17] and Stroop[18] paradigms, examined attentional bias toward cancer-related stimuli and fear of cancer recurrence among cancer survivors. Neither study found significant differences between patients with high and those with low fear of cancer recurrence in attention bias toward cancer-related words. Current evidence is limited by the use of cross-sectional study designs only, which cannot reliably differentiate cancer patients with persistent distress from those with transient distress. The role of attention bias toward negatively valenced stimuli in adjustment to cancer diagnosis requires clarification.

This study examined if attention bias differentiated women diagnosed with breast cancer and reporting persistent high distress from those reporting stable low distress. Using cognitive theories of bias in attention allocation, we hypothesized that compared with breast cancer patients with low or transient distress, those with persistent distress would show greater attentional bias toward negatively valenced stimuli (Hypothesis 1a). Attentional bias may be content specific,[19] and studies on the relationship between attentional bias and distress in cancer populations have ignored priming effects. Here, we tested the content-specific nature of distress by incorporating a subliminal prime of the breast cancer word into the dot-probe task. Specifically, we tested for differences in the way women with persistent vs low distress patterns attended to negatively valenced stimuli when primed with the phrase "breast cancer" (target prime) versus a neutral phrase (neutral prime) (Hypothesis 1b). We also examined attention bias styles because 2 patterns of attention bias in relation to time course have been identified in the anxiety and depression literature, namely, "vigilant-avoidant" and "vigilant-inability to disengage."[9,11-13] Vigilant-avoidant style shows initial attention to negatively valenced stimuli and then a shift away from the stimuli on prolonged exposure, whereas vigilant-inability to disengage reflects heightened attention to negatively valenced stimuli in both initial and prolonged exposure.[9,11-13] Both vigilant-avoidant and vigilant-inability to disengage patterns have been observed in highly anxious individuals, whereas vigilant-inability to disengage has also been observed in depressed individuals.[12] Few studies have explored individual differences in attention bias patterns among cancer patients. Here, we tested if breast cancer patients with persistent distress vs low/transient distress evidenced vigilant-avoidant or vigilant-inability to disengage styles of attentional bias (Hypothesis 1c). Secondly, it is unknown if cancer patients with persistent distress attend generally to negatively valenced stimuli, or to specifically somatic and cancer-related information. We hypothesized that patients with persistent distress vs those with low/transient distress evidence attentional bias for somatic and cancer-related stimuli (Hypothesis 2a). We also tested if vigilant-avoidant or vigilant-inability to disengage styles of attentional bias specifically for cancer-related stimuli is observed in those with persistent distress (Hypothesis 2b).

Interpretation bias is also common in emotionally vulnerable individuals. Self-report measures as well as an experimental paradigm suggested that depressed and anxious patients tend toward negative interpretations of ambiguous threat.[9,20,21] Similarly, studies indicate individuals with chronic pain or chronic fatigue syndrome, compared with healthy control groups, make more somatic-related interpretations when presented with ambiguous stimuli.[22-25] It is unknown if biased interpretation differentiates cancer patients with persistent distress from those with low/transient distress. The present study also addressed this literature gap. We hypothesized that breast cancer patients with persistent vs low/transient distress would make more negative, illness-related interpretations when presented with ambiguous stimuli (Hypothesis 3).

2 | METHODS

2.1 | Participants and design

Ethical approval was obtained from participating institutions (ref: UW14-136).

An experimental paradigm was adopted to test the hypotheses. To compare women with breast cancer experiencing persistent distress and those with low/transient distress, we used as the sample from an ongoing longitudinal study of psychological distress trajectories following breast cancer diagnosis (unpublished). That study followed 637 Cantonese- or Mandarin-speaking Hong Kong Chinese women newly diagnosed with nonmetastatic breast cancer who had completed a baseline questionnaire while awaiting diagnosis confirmation, and follow-up questionnaires at 1-week postdiagnostic consultation, and again at 1-, 4-, and 10-month postsurgery. At each assessment, participants were assessed for psychological distress during cancer using the Hospital Anxiety and Depression Scale (HADS),[26,27] comprising 14 items measuring anxiety and depression. Using latent growth mixture modeling, 3 distinct trajectories of anxiety and depression emerged from that longitudinal sample: low-stable distress (HADS scores <8 throughout the study) (70% and 82%, respectively), high-declining transient distress (initial HADS scores ≥8, which gradually declined to normal level) (17% and 9%), and persistent high distress (HADS scores ≥8 throughout the study) (13% and 10%).

For the present study, we identified from the original study 2 groups of patients having either persistent distress (persistent high levels of anxiety or depression) or low-stable/transient distress. A total of 83 subjects who had persistent distress were recontacted and invited to participate in the current study, of whom 67 of 83 (81%) agreed to participate. Also from that study, a similar number of patients with low-stable/transient distress were randomly selected to join the present study, with 73 of 83 (88%) patients agreeing to participate. Women invited but refusing to participate did not differ by demographic or clinical characteristics. The main reason for refusal was lack of time. A total of 140 patients gave informed consent and participated in the present study. About 3 years had elapsed between

the original and current studies, with 1.9 years (SD 1.17) on average having elapsed since the last assessment of the original study.

2.2 | Measures

2.2.1 | Attention bias paradigm

Negatively valenced stimuli

A modified dot-probe task involving visually presented verbal stimuli was used (Figure 1). Dot-probe tasks use pairs of stimuli, one negative/positive valence and one neutral, presented briefly on each trial, followed by a probe stimulus (dot) in the location of one of the paired stimuli immediately on termination of each stimulus pair.[11,28] Here, participants were asked to respond to the probe as quickly as possible. We used verbal (word) rather than image-based stimuli, as they have comparable effect potency and ambiguity is easily controlled.[11] Negative 2-character Chinese compound words were used as negative valence stimuli; positive 2-character Chinese compound words are used as positive valence stimuli; neutral 2-character Chinese compound words are used as control stimuli (Table S1). Sixty-four neutral, 32 negative, and 32 positive 2-character Chinese compound words were used in the dot-probe test.[29] The chosen sets of words have been repeatedly validated and used locally to study the role of attention bias in relation to anxiety and depression.[29-31] To test if attention bias occurs globally or only in cancer-related contexts, a priming condition was incorporated in the dot-probe task. The priming involved subliminal presentation (approximately 20 ms duration) of the Chinese text "breast cancer" for half of the trials (target prime) and a subliminal presentation of a neutral Chinese text ("sky") for the other half of the trials (neutral prime).[19] To test selective attention style, we manipulated exposure duration to the stimulus words.[11,32] Hence, each trial began with the display of a white fixation cross in the middle of a black screen for 500 milliseconds. Then the prime condition was presented for 20 ms, followed by a pattern mask for 500 milliseconds, and then a pair of words was presented (eg, a negative word paired with a neutral word). Word pairs were presented for either 500 milliseconds (ie, to assess initial orienting) or 1250 milliseconds (ie, to assess maintenance of attention).[32] The 500-ms exposure has been shown to be effective for capturing the initial attention shift. Immediately after termination of each word pair stimulus presentation, the probe (a small black dot) appears at the location of one of the words, requiring a rapid keypress response from the participant.[32] Attention to negative valence stimuli is indicated by faster response times to probes replacing negative valence words than to those replacing neutral words.[11,32]

Response latency scores (recorded reaction times) for dot detection were used to calculate attention bias scores, using the following formula:

Bias index = [(TRPL − TLRL) = (TLPR − TRPR)]/2, where T = target stimulus, P = probe location, R = right side, and L = left side. Positive bias index indicates an attentional tendency toward the target stimulus, whereas a negative bias index indicates an attentional tendency away from the target stimulus. Reaction time data with errors and outliers of <200 milliseconds or >3000 milliseconds or those more than 3 standard deviation above each participant's mean reaction time were excluded from trials.[33,34]

Attentional bias for cancer-related information

A similar modified dot-probe task was used (Figure 2). Cancer-related words replaced negative words as cancer-related threat stimuli (Table S2). Cancer-related words including "arm lymphedema," "cancer treatment," and "treatment side-effects" were used as threat stimuli; neutral or positive words matched in length were used as control stimuli. Following pilot testing on breast cancer patients and healthy women, 64 neutral, 32 negative cancer-related, and 32 positive 2-character Chinese compound words were used in the dot-probe test. Since cancer-related information was used as threat stimuli, a priming condition was unnecessary in this second dot-probe task, but in all other respects, the procedure was identical to that described above.

2.2.2 | Ambiguous cues task for assessing interpretation bias

On the basis of the previous studies using ambiguous cues paradigms to test interpretation bias,[22,25] a 30-word list was created to assess

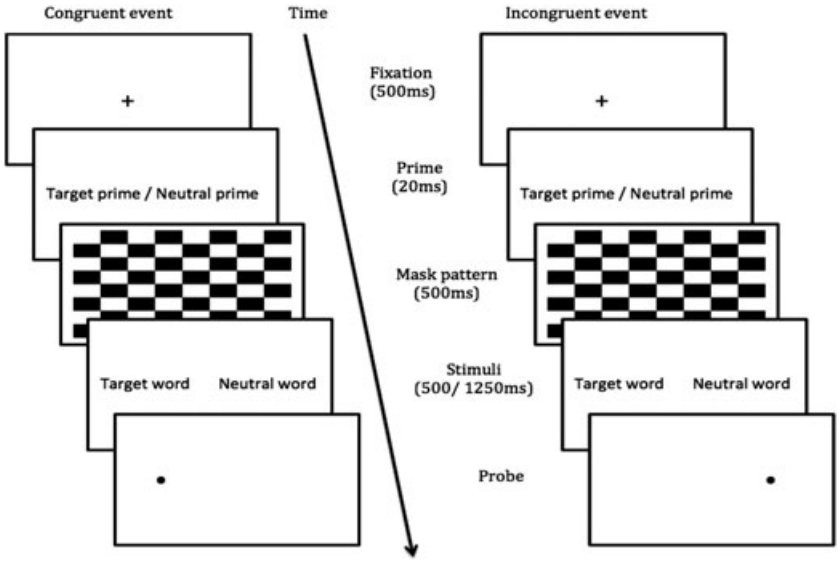

FIGURE 1 Dot-probe task using negatively valenced stimuli

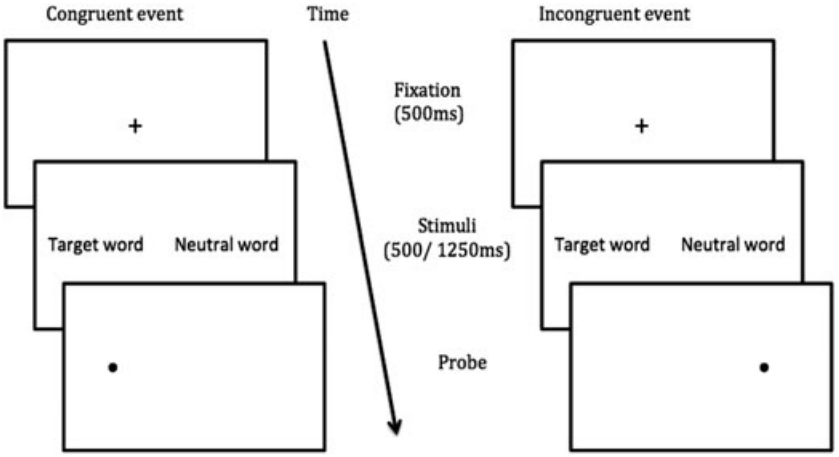

FIGURE 2 Dot-probe task using cancer-related information

interpretation bias for somatic or illness-related information (Table S3). In this task, we used 15 ambiguous Chinese words that have both neutral and illness-related interpretations (eg, 岩 [phonetically similar to "cancer" in Chinese], 讀 [phonetically similar to "toxic"], and 雨 [phonetically similar to "breast"]) and 15 unambiguous words (eg, 天 [sky] and 杯 [cup]). These 30 words were randomly presented. Participants were told that this was a word-association exercise and wrote down the first word entering their mind after each cue word was read aloud. Responses were then independently coded by the second and third authors blinded to both participants' distress status and cue word sequence. Participants received 1 "point" for every somatic or illness-related interpretation,[20] with higher summed point scores suggesting greater interpretation bias for cancer-related information.

2.2.3 | Psychological distress

In addition to the experimental tasks, participants completed the HADS to measure psychological distress.[27]

2.3 | Procedure

Eligible participants were contacted via phone by the research assistant who explained the study purpose and nature of participation, emphasizing confidentiality and anonymity. Those agreeing to participate attended an individual 90-minute assessment session. Both the dot-probe task and ambiguous cues task were programmed using E-Prime, using a 2.20-GHz notebook computer with a 15-in color display. Each participant sat 50 cm in front of the computer display and instructed on the 2 dot-probe tasks, the ambiguous cues task, and questionnaire. Each dot-probe task had 8 practice trials and 64 test trials, totaling 72 trials. Participants then completed the ambiguous cue task, followed by a self-report questionnaire.

2.4 | Data analysis

To test if attentional bias differentiated participants with persistent distress and low distress, a mixed, repeated measures analysis of variance[19] was performed with group (persistent distress vs low distress) as a between-subject variable and priming condition (cancer vs neutral), stimuli (negative vs neutral), and exposure duration (500 vs 1250 ms) as within-subjects variables. Independent sample *t* test analysis was used to assess group differences in interpretation bias scores.

3 | RESULTS

Women who demonstrated persistent distress in the original study were significantly younger ($t = 4.12$, $P < .001$), were more likely to have achieved tertiary education ($\chi^2 = 10.21$, $P = .006$), and be unemployed ($\chi^2 = 20.20$, $P < .001$) (Table 1). Of the 67 women displaying persistent distress in the original study, only 31 (46.3%) and 30 (44.8%), respectively, displayed high anxiety and depression scores on recruitment into the present study. Hence, some of the women in the original study persistent distress group recruited for the current study no longer reported high distress in the present study (approximately 3 y after recruitment into the first study).

To examine the role of information-processing bias in persistent distress, participants experiencing persistent high distress in both the original study and who continued to report high HADS scores (HADS scores ≥8) in the present study (ie, 31 participants reporting high anxiety and 30 reporting high depression scores) comprised the persistent distress group. This group of participants is hereafter referred to as "women with persistent anxiety/depression." Subsequent analyses compared pairs of women: those with persistent anxiety (n = 31) with women reporting low anxiety (n = 109), and women with persistent depression (n = 30) with women reporting low depression (n = 110).

3.1 | Attentional bias for negatively valenced stimuli

Attentional bias scores did not differ significantly by age, education, or occupation status, and hence, these 3 variables were excluded as covariates in subsequent analyses (Table 2). When we examined persistent anxiety status, repeated analysis of variance analysis showed no significant main effect for group, $F_{1,138} = 0.15$, $P = .70$. There was a significant 4-way interaction of group × prime × stimulus word × duration, $F_{1,138} = 4.13$, $P = .044$, $\eta^2 = 0.03$. Post hoc Student *t* test analyses showed women reporting persistent anxiety had a significant bias away (mean = −22.98, SD 49.03, $t = -3.47$, $P = .001$) from negative valence stimuli under the neutral prime in the supraliminal (1250 ms)

TABLE 1 Demographic and clinical characteristics of participants (n = 140)

Characteristics	Overall Sample n, %	Stable Low Distress (n = 73)	Persistent High Distress (n = 67)
Age (y) mean ± SD*	55.81 ± 8.10	58.32	52.9
Time since diagnosis, y	4.75 (1.33)	4.91 (1.11)	4.46 (1.63)
Marital status			
Married	97 (69.3)	51 (69.9%)	46 (68.7%)
Single	18 (12.9)	6 (8.2%)	12 (17.9%)
Divorced/separated	14 (10.0)	10 (13.7%)	4 (6%)
Widowed	11 (7.9)	6 (8.2%)	5 (7.5%)
Education level**			
No/primary formal education	26 (18.6)	20 (27.4%)	6 (9%)
Secondary (completed high school)	92 (65.7)	46 (63%)	46 (68.7%)
Tertiary (college/university)	22 (15.7)	7 (9.6%)	15 (22.4%)
Occupation*			
Unemployed	18 (12.9)	2 (2.7%)	16 (23.9%)
Employed (full-time/part-time)	78 (55.8)	40 (54.8%)	38 (56.7%)
Retired	20 (14.3)	16 (21.9%)	4 (6%)
Housewife	24 (17.1)	15 (20.5%)	9 (13.4%)
Currently receiving hormonal therapy	79 (56.4)	37 (94.9%)	42 (95.5%)
No active treatment	57 (40.7)	34 (46.6%)	23 (34.3%)
Cancer recurrence	6 (4.3)	3 (4.2%)	3 (4.5%)
Persistent anxiety[a]*	31 (22%)	0 (0%)	31 (46.3%)
Persistent depression[b]*	30 (21%)	0 (0%)	30 (44.8%)

Abbreviations: HADS, Hospital Anxiety and Depression Scale; SD, standard deviation.

[a]Persistent anxiety refers to those patients with persistent high HADS anxiety scores at the original study, as well as with HADS anxiety scores 8 or above in the present study.

[b]Persistent depression refers to those patients with persistent high HADS depression scores at the original study, as well as with HADS depression scores 8 or above in the present study.

*$P < .001$.

**$P < .05$.

condition. Similar findings were observed for women reporting persistent depression. There was no significant main effect for group, $F_{1,138} = 0.35$, $P = .55$, but there was, again, a significant 4-way interaction of group × prime × stimulus word × duration, $F_{1,138} = 7.38$, $P = .007$, $\eta^2 = 0.05$. Post hoc *t* test analyses showed women reporting persistent depression showed a significant bias away (mean = −19.26, SD 54.21, $t = -2.72$, $P = .008$) from negatively valenced stimuli under neutral primes in the supraliminal (1250 ms) condition.

3.2 | Attention bias in cancer-related information

For women reporting persistent anxiety, there was a marginal main effect for anxiety group status, $F_{1,138} = 3.07$, $P = .08$, and a significant 3-way interaction of group × word stimulus × duration, $F_{1,138} = 5.59$, $P = .019$, $\eta^2 = 0.04$. Post hoc analysis revealed that these women also showed a significant bias away (mean = −17.84, SD 43.39, $t = -2.90$, $P = .006$) from cancer-related information in the supraliminal condition.

For women reporting persistent depression, the analysis showed a significant main effect for depression group status, $F_{1,138} = 7.75$, $P = .006$, and a significant 3-way interaction of group × word stimulus × duration, $F_{1,138} = 4.58$, $P = .034$, $\eta^2 = 0.03$. Post hoc analysis revealed that women reporting persistent depression showed a significant bias away (mean = −17.16, SD 53.15, $t = -2.74$, $P = .009$) from cancer-related information in the supraliminal condition.

3.3 | Interpretation bias

For anxiety, interpretation bias scores showed a borderline result between groups (mean = 6.01, SD 2.38, for low anxiety vs mean = 7.19, SD 3.20, for persistent anxiety, $t = -1.89$, $P = .065$). Correlation indicated significant positive association between interpretation bias and anxiety ($r = 0.20$, $P = .019$). For depression, there was no significant difference between groups (mean = 6.12, SD 2.53, for low depression vs mean = 6.85, SD 2.89, for persistent depression, $t = -1.27$, n.s.). Correlation showed nonsignificant association between interpretation bias and depression ($r = 0.14$, n.s.).

4 | DISCUSSION

This is the first study we know of that examines if bias in attention and interpretations differentiate women with breast cancer reporting persistent distress from those reporting low/transient distress. The persistent distress and low distress groups did not significantly differ in attentional bias toward negative-stimuli or cancer-related information. These findings are similar to previous studies comparing patients with high and low fear of cancer recurrence[17,18] and comparing cancer patients reporting acute insomnia with those reporting persistent insomnia.[35] Our findings, however, demonstrated that women with persistent distress exhibited a bias away from negative-stimuli or cancer-related information presented at a supraliminal level that allowed for conscious recognition, whereas women with low distress showed a bias toward negative-stimuli or cancer-related information. At a conscious level, controlled attention to threat-relevant information may lead to engagement coping like active problem solving and cognitive reinterpretation of threat, considered adaptive strategies.[16] Conversely, controlled efforts to avoid threat may inhibit affected individuals from using adaptive strategies to manage threat, leading to psychological distress.[16] Previous studies suggest engagement coping, such as acceptance is associated with less psychological distress in cancer patients, whereas disengagement coping such as denial and avoidance increases with distress in cancer patients.[36-38]

Subliminal attention bias toward threat-related information did not differ between groups, agreeing with previous cancer studies reporting no associations between responses in the subliminal condition and emotional distress measures[16] or fear of cancer recurrence.[17] Instead, all current study participants showed (preconscious) attention bias toward cancer-related information presented subliminally. A previous study comparing high-fearful and low-fearful breast cancer survivors similarly reported both groups exhibiting bias toward cancer words.[18]

TABLE 2 Mean attention bias scores of the dot-probe task

Attentional Bias in Negatively Valenced Stimuli	Persistent Anxiety (n = 31) M (SD)	Low Anxiety (n = 109) M (SD)	Persistent Depression (n = 30) M (SD)	Low Depression (n = 110) M (SD)
Stimulus/prime/duration + or −/BC or neutral/500 or 1250 ms				
+/BC/500 ms	15.39 (66.11)	4.62 (65.82)	20.85 (72.99)	3.22 (63.54)
+/Neutral/500 ms	−3.18 (59.48)	−2.31 (53.89)	−4.56 (60.58)	−1.94 (53.61)
+/BC/1250 ms	−0.35 (57.47)	8.70 (45.19)	−10.38 (53.86)	11.35 (45.57)
+/Neutral/1250 ms	7.19 (47.39)	−1.28 (55.64)	7.97 (53.15)	−1.41 (54.13)
−/BC/500 ms	14.39 (94.85)	−3.40 (71.03)	15.64 (93.53)	−3.58 (71.67)
−/Neutral/500 ms	25.47 (150.66)	6.53 961.90)	31.56 (151.94)	5.04 (61.87)
−/BC/1250 ms	7.15 (69.38)	2.96 (52.72)	7.62 (70.78)	2.87 (52.39)
−/Neutral/1250 ms	−22.98 (49.02)	13.37 (59.48)	−19.26 (54.21)	12.02 (58.86)
Attention bias in cancer-related information				
Stimulus/duration ca-related words or non-ca words/500 or 1250 ms				
Ca-related words/500 ms	19.20 (65.67)	7.91 (45.51)	13.32 (66.85)	9.62 (45.55)
Non-ca words/500 ms	−10.13 (87.67)	4.28 (44.68)	−15.73 (87.29)	5.68 (44.86)
Ca-related words/1250 ms	−17.84 (52.81)	12.23 (43.39)	−17.16 (53.14)	11.77 (43.60)
Non-ca words/1250 ms	7.34 (56.68)	2.71 (31.66)	4.89 (55.09)	3.42 (32.73)

Abbreviation: BC, breast cancer.

One explanation is that the stimulus words used were insufficiently specific, failing to generate differences.[18] This warrants further research.

Our findings also suggest that women with persistent anxiety may evidence interpretative bias for cancer-related information, consistent with previous studies on chronic pain[23-25] and on chronic fatigue.[22] Anxious patients may overinterpret ambiguous information negatively, reinforcing or reactivating threat elements of illness representation/schema to maintain anxiety. However, interpretative bias did not differentiate women with persistent depressive symptoms from those without. While negative interpretation bias may contribute to persistent depressive symptoms,[39] this was not examined here and should be tested in future studies.

4.1 | Study limitations

This study has several limitations of note. First, despite using an ongoing longitudinal study to identify eligible women for inclusion in the current study, we were only able to test the cross-sectional associations between information-processing bias and distress pattern. Second, some of the patients with persistent distress in the original study had recovered, and the sample size for the chronic distress group in the present study was small, potentially limiting statistical power to detect any smaller differences between groups. However, post hoc power analyses showed overall statistical power ranged from 0.71 to 0.95, suggesting adequate statistical power. Third, HADS is an acceptable screening tool but not for case finding. Hence, it may be suboptimal for distress classification. Fourth, the study lacked a healthy control group for comparison purposes. We therefore cannot determine if these study findings are specific to women with breast cancer. Most current evidence is based on studies focusing on women with breast cancer. Future research should examine these associations among other cancer populations.

4.2 | Clinical implications

In summary, the present study showed women treated for breast cancer who report persistent distress show responses potentially consistent with avoidance strategies to cope with threat stimuli, possibly including symptoms. Avoidant or disengagement coping can impair adaptation. Future studies should test whether tailored interventions like attention bias modification promoting active goal-focused attention search[40] can shift disengagement coping to engagement coping and if this benefits women at risk of persistent distress. Moreover, women with persistent anxiety may have a tendency to negatively interpret ambiguous information, perhaps leading to illness preoccupation. Cognitive behavior therapy strategies focusing on identifying and challenging these women's negative interpretations of cancer-related information may help to manage anxiety symptoms.[22]

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CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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