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Rumination, psychological distress and post-traumatic growth in women diagnosed with breast cancer

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Abstract

***Objective*: Rumination, the repetitive and recursive rehearsal of cognitive content, has been linked to depression and anxiety in physically well populations, and to post-traumatic growth (PTG) in physical illness populations. Women diagnosed with breast cancer may experience both psychological distress and PTG. As rumination may influence outcomes through distinct pathways, this study investigated the association of intrusion, brooding and instrumental subcomponents of rumination with psychological distress and PTG in the breast cancer context.**

***Methods*: Women diagnosed with primary breast cancer ($n = 185$), mean age 55.98 years ($SD = 9.26$), completed an online survey including the Multi-dimensional Rumination in Illness Scale, Depression Anxiety and Stress Scales, Post-traumatic Growth Inventory, Medical Outcomes Social Support Survey, demographic and health-related questions.**

***Results*: As predicted, regression analyses indicated that brooding was positively related to depression, anxiety and stress, but was also negatively related to the PTG dimensions of new possibilities and spiritual growth. Partially supporting the study hypotheses, intrusion was positively associated with stress and the PTG of relating to others and new possibilities. As hypothesised, instrumental rumination was positively associated with all five dimensions of PTG.**

***Conclusions*: Rumination is a key consideration in both positive and negative psychological responses of women diagnosed with breast cancer. Associations of specific components of rumination with varying psychological outcomes suggest differential paths by which the specific subcomponents of rumination exert this influence.**

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The most prevalent cancer diagnosis for women worldwide is breast cancer, accounting for approximately 23% of total female cancer cases and 14% of cancer deaths [1]. In Australia, one in eight women will face a breast cancer diagnosis during their lifetime [2]. Mortality rates have decreased in the developed world, primarily because of more effective treatments and early detection programmes [3]. A breast cancer diagnosis nonetheless represents a unique set of physical and psychological threats, whose impact may extend far beyond the immediate period of diagnosis and treatment to many years post-diagnosis, an issue currently receiving more attention in light of increasing survivorship [4]. Such threats include physical symptoms and treatment effects, as well as psychosocial impacts such as changes to bodily appearance, sexual dysfunction and disruption to family, employment, finances and social life [4]. Rates of psychological distress, particularly depression and anxiety, in breast cancer patients are reported to be twice that found in the general female population [5]. The extent of distress can fluctuate according to individual characteristics including age, with younger women at greater risk, and the availability of support, particularly the presence of a partner as a protective factor [5–7]. Although findings have been equivocal, there is some evidence that distress is influenced by disease severity, treatment modality and time since diagnosis, with the greatest distress evident in women with more advanced disease, those requiring extensive treatment, including chemotherapy, and during the months closest to the time of diagnosis and at disease recurrence [7,8]. There is also evidence that rates of psychological distress in this population may be under-reported, as medical personnel are frequently found to overlook distress symptoms in their patients [9].

While psychological distress is highly prevalent, positive psychological changes have also been demonstrated [10–12]. Post-traumatic growth (PTG), a positive psychological change experienced as a result of the struggle with highly challenging life circumstances, has been reported among women diagnosed with breast cancer [10–12]. PTG is characterised by increased compassion, a heightened focus on relationships and a greater appreciation of life [10–12]. Compared with healthy controls, breast cancer survivors have reported higher levels of PTG [11,13], although longitudinal research suggests that these differences may not be maintained in the longer term [14]. PTG appears to reflect overall psychological well-being in breast cancer survivors, with women experiencing greater

PTG also reporting lower psychological distress and less somatisation [13].

Although psychological distress and PTG exist at opposite ends of the spectrum of potential psychological outcomes, they are not mutually exclusive phenomena and have been found to co-occur [12,14]. There is contradictory evidence among breast cancer survivors with some studies indicating that these emotional responses are not related [11,12,15], while other studies report that PTG is related to active cognitive processing [16,17] and may offset distress [17]. The presence of distress or PTG has quite different implications. In the context of breast cancer, depression and anxiety have been linked to increased symptom burden [18], decreased quality of life [18] and poorer clinical outcomes, including increased mortality [19]. Conversely, PTG has been linked to increased resilience, positive well-being and health behaviours [15,16,20]. As distress and PTG have such pervasive effects on women diagnosed with breast cancer, factors associated with these outcomes must be understood. This is a critical step in designing interventions to identify individuals at particular risk of negative psychological outcomes and addressing the enhancement of more positive outcomes.

The cognitive processing of an illness diagnosis plays a key role in adjustment [21], with a focus on the role of cognitive *content* in determining psychological outcomes. Evidence from both cancer and chronic illness populations indicates that maladaptive cognitive responses (e.g. negatively based thoughts about causality—'Why did I get this illness?'; the experience of disease—'I'll never feel well again') increase vulnerability to depression and anxiety [4,22], whereas a focus on positive content, such as seeking beneficial aspects, has been associated with PTG [16].

Increasingly, attention is being given to the role of cognitive processing style on adjustment following a stressful event, particularly rumination, the 'cognitive process of actively thinking about a stressor, the thoughts and feeling it evokes and the implications for one's life and future' [23]. Ruminative processes can be initiated in gaining understanding and resolution to changed circumstances, operating as a self-regulatory function to reduce dissonance between an ideal self as 'healthy' and real self as affected by disease [21,24]. However, when such attention is *passively* focused inwards on the potential causes, meaning and consequences of a stressful event such as illness [25], rumination may lead to depression and anxiety [26]. Limited evidence in the breast cancer context suggests that rumination may be linked both to the development of psychological distress and to PTG [15,16], but studies have generally focused on rumination and PTG as unidimensional constructs.

The evidence that rumination is linked to both psychological distress and PTG, and that both states can co-exist, suggests that rumination may influence psychological outcomes through distinct pathways [15,27]. Rumination manifests in different forms, can incorporate both positive and negative contents and may be either intrusive or self-focused [24]. Specifically, reflective and experiential subtypes of rumination have been distinguished from brooding and evaluative subtypes, with the latter more critical in the development of adverse psychological outcomes [23]. Reflection or instrumental rumination, related to a purposeful self-focus, is considered a more deliberate form of rumination involving an active engagement with problem solving that can reduce levels of depression [28,29]. Meanwhile, brooding, a perseverative, passive focus on negative events or emotions, elusive goals and barriers to progress [28,29], is more of an intrusive process associated with depression [29,30], particularly when that process is related to preventability of an illness, with the potential to lead to self-blame [31]. However, intrusive thought may also trigger purposeful reflection, thus serving as a precursor to PTG [28]. Unfortunately, no investigations to date within the breast cancer context have assessed the influence of specific subcomponents of rumination both on psychological distress and to dimensions of post-traumatic growth.

Given that the key role ruminative processes may have in determining adjustment, understanding how these specific components relate may be critical in developing the most effective psychosocial interventions for this population. As rumination research in the context of illness is limited, any exploration of the role of rumination in psychological outcomes in cancer should account for other factors that have been demonstrated to be influential either directly or indirectly on rumination generally. Socio-demographic characteristics, such as age [32] and social support, have been shown to influence the experience of psychological distress [33] and PTG [14], and clinical characteristics, such as severity of disease and treatment status, have also been shown to influence psychological distress [5,34].

The primary aim of this study was to extend evidence concerning rumination in the context of illness by documenting rumination among women diagnosed with breast cancer and examine the association of specific components of rumination to positive and negative psychological outcomes. It was predicted that the negatively orientated ruminative element of brooding would be associated with depression, anxiety and stress, and the positively oriented ruminative element of instrumentality would be associated with PTG. It was also hypothesised that the ruminative component of intrusion would be related to both negative psychological outcomes and the five dimensions of PTG, reflecting a dual role both as an automatic, invasive, uncontrollable response to trauma [28] and as a trigger to purposeful reflection [35].

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Method

Participants and procedure

Participants included 185 females (mean age 55.98 years, SD = 9.26, range 33–77), diagnosed with primary breast cancer and able to complete an online English-language questionnaire. They were recruited through an emailed invitation sent to members of the Breast Cancer Network of Australia and a dedicated study website. All participants completed the anonymous, online survey following informed consent. Ethics approval was obtained from the Macquarie University Human Ethics Review Committee.

Measures

Demographic and clinical characteristics

Participants provided information about age, marital status, level of education, and comorbid physical and psychological diagnoses. Concerning breast cancer diagnosis, participants indicated time since diagnosis, stage at diagnosis, current treatment status and time since completion of treatment, if appropriate.

The Multi-dimensional Rumination in Illness Scale [36]

The 41-item Multi-dimensional Rumination in Illness Scale (MRIS) measures rumination in response to physical illness, consisting of three subscales: intrusion (e.g. 'I can't seem to control thinking about my illness'), brooding (e.g. 'I think that trying new things may be pointless'), instrumentality (e.g 'Thinking about my illness helps me understand its cause'). Participants rated all MRIS items according to frequency in relation to a current illness (5-point Likert-type scale; '0' = 'not at all' to 4 = 'almost always'). Item scores were summed to yield subscale scores with a possible range of 0 to 64 (brooding), 0 to 68 (intrusion), 0 to 32 (instrumentality) and full scale scores from 0 to 164, with higher scores representing a greater tendency towards rumination. Two supplementary items were scored separately from the main scale and indicated the 'amount of time thoughts about illness were accompanied by feelings or emotions' (5-point Likert-type scale; '0' = 'not at all' to 4 = 'almost always') and whether 'these feelings or emotions tend to be more positively or negatively orientated' (5-point Likert-type scale; '0' = 'very negative' to 4 = 'very positive'). Full scales and subscales have demonstrated internal consistency, test–retest reliability and validity [36]. High internal consistency was demonstrated for the full scale (0.94), and the subscales of intrusion (0.90), brooding (0.92) and instrumentality (0.86) in the current study.

Depression, Anxiety and Stress Scales [37]

Depressive, anxious and stress symptomatology was assessed with the Depression, Anxiety and Stress Scales, which has demonstrated adequate reliability and test–retest reliability [38]. For each seven-item subscale, participants rated on a 4-point Likert-type scale (0 = 'did not apply to me at all' to 3 = 'applied to me very much or most of the time') the extent to which they experienced each state over the previous week. All Depression, Anxiety and Stress Scales subscales showed high internal consistency in the current study (depression $\alpha = 0.92$, anxiety $\alpha = 0.79$, stress $\alpha = 0.90$).

The post-traumatic growth inventory [20]

The 21-item post-traumatic growth inventory measured positive changes following adversity across five PTG dimensions: relating to others, new possibilities, personal strength, spiritual change and appreciation of life. Each item was rated along a 6-point Likert-type scale (0 = 'I did not experience this change as a result of my illness' to 5 = 'I experienced this change to a very great degree as a result of my illness'). The scale was scored according to the five subscales, with higher scores demonstrating a greater level of each particular dimension of PTG. The scale is reported to have good reliability and validity [39]. In the current study, high internal consistency was demonstrated for the subscales of relating to others (0.91), new possibilities (0.89), personal strength (0.86), spiritual change (0.74) and appreciation (0.86).

The medical outcomes social support survey [40]

The 19-item medical outcomes social support survey (MOS-SS) measured multiple dimensions of support: emotional/informational, tangible, affectionate and positive social interaction. Each item was rated along a 5-point Likert-type scale (1 = 'none of the time' to 5 = 'all of the time'). The scale was scored according to four subscales, with higher scores demonstrating a greater level of each particular dimension of social support. The scale has established reliability and validity [39]. High internal consistency was demonstrated for the subscales of emotional/informational support (0.96), tangible support (0.91), affectionate support (0.93) and positive social interaction support (0.94) in the current study.

Data analyses

Analyses were performed using SPSS® (SPSS Inc. IBM, Chicago, Illinois, USA), with statistical significance set at $p < 0.05$. Data were screened for univariate outliers, missing data and violations to the assumptions of multivariate analysis. Variables with non-normal distributions were transformed using square-root transformations (depression, anxiety, comorbid psychological conditions). Descriptive statistics were used to describe demographic and clinical characteristics of the sample.

As demographic (e.g. age [32] and level of education [41]), clinical (e.g. time since diagnosis, severity of

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disease, treatment status, comorbid medical and psychological conditions [5,34]) and contextual (e.g. availability of social support [14,42]) variables may influence psychological distress and PTG, these variables were considered as potential covariates and assessed using Pearson's correlations (continuous and ordinal variables). Hierarchical regression analysis tested the study hypotheses and established the relative contribution of each variable to the outcomes of interest. Identified covariates, demographic and social support variables, were entered into the model before clinical variables, for which the relationship to psychological outcomes has been more equivocal [8,15].

Results

Demographic and clinical characteristics are presented in Tables 1 and 2. The mean score for the supplementary item, 'amount of time thoughts about illness were accompanied by emotions', was 1.91 ($SD = 0.94$, range 0–4). The mean score for the supplementary item, 'positivity versus negativity of those emotions', was 2.57 ($SD = 1.28$, range 0–4). Mean depression, anxiety and stress scores for the overall sample were within the normal range.

Table 1. Frequencies for demographic and clinical characteristics

Variable		*n*	%
Marital status	Single	19	10.3
	Married/de facto	128	69.2
	Separated/divorced	30	16.2
	Widow/widower	8	4.3
Education	High school	55	29.7
	Technical college	36	19.5
	Undergraduate	41	22.2
	Postgraduate	53	28.6
Time since diagnosis	1–6 months	6	3.3
	7 months–1 year	11	5.9
	1–4 years	68	36.8
	5–10 years	71	38.3
	10 years plus	29	15.7
Stage at diagnosis	Unknown	32	17.3
	1	59	31.9
	2	62	33.5
	3	23	12.4
	4	9	4.9
Breast cancer treatment	In treatment	84	45.4
	Surgery	3	1.6
	Chemotherapy	10	5.4
	Radiation	5	2.7
	Hormonal	78	42.2
Time since completion of treatment	<1 year	30	16.2
	1–2 years	20	10.8
	2–3 years	10	5.4
	3–4 years	18	9.7
	>5 years	40	21.6

Table 2. Mean and standard deviations of demographic and clinical characteristics

Variable	*n*	*M*/% (*SD*)	Range
Age, in years	185	55.98 (9.26)	33–77
Comorbid health conditions	185	1.14 (1.37)	0–8
Comorbid psychological conditions	185	0.24 (0.54)	0–2
Rumination			
Total	185	45.25 (21.76)	6–119
Intrusion	185	14.17 (9.77)	0–54
Brooding	185	17.62 (10.24)	0–48
Instrumentality	185	13.46 (6.40)	0–31
Distress			
Depression	185	4.91 (7.23)	0–36
Anxiety	185	4.46 (5.83)	0–32
Stress	185	9.35 (8.00)	0–40
Post-traumatic growth			
Total	183	48.55 (20.58)	1–84
Relating to others	183	17.14 (7.61)	0–28
New possibilities	183	10.13 (5.91)	0–20
Personal strength	183	9.89 (4.64)	0–16
Spiritual change	183	2.45 (2.61)	0–8
Appreciation of life	183	8.93 (3.24)	0–12
Social support			
Total	183	3.85 (1.00)	1.11–5
Emotional/informational	183	3.85 (1.01)	1.13–5
Tangible	183	3.84 (1.11)	1–5
Affectionate	183	4.15 (1.05)	1–5
Positive social interaction	183	4.04 (0.96)	1.11–5

Correlation coefficients among key study variables are presented in Appendix 1. There were several significant correlations between demographic, emotional/informational social support, clinical predictor variables and the dependent variables of depression, anxiety, stress and the five PTG dimensions. Accordingly, these variables were treated as covariates in subsequent regression analyses as indicated.

Table 3 displays the results of the hierarchical regression analyses to identify the specific components of rumination most strongly associated with each psychological outcome. Both brooding and instrumentality subscales were significantly associated with depression. Only brooding was associated with anxiety. Brooding, intrusion and instrumentality were significant predictors of stress. For PTG, brooding, intrusion and instrumentality were significant predictors of new possibilities, intrusion and instrumentality for relating to others and instrumentality for personal strength and appreciation of life. Brooding and instrumentality predicted spiritual change.

Discussion

This study examined rumination and affective outcomes among women diagnosed with breast cancer. Consistent with earlier research [5], findings confirmed the presence

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Table 3. Hierarchical regression analysis of rumination on depression, anxiety, stress and post-traumatic growth ($n = 185$)

Variable	*B*	Std. beta	*t*	R^2	Adj. R^2	R^2 Δ
Depression						
Final model $F(10, 172) = 15.38$, $p < 0.01$						
Step 1: social support				0.10	0.08	0.10
MOS-AFFECT	0.07	0.05	0.53			
MOS-EMOT	0.07	0.05	0.42			
MOS-INTERACT	−0.24	−0.15	−1.12			
MOS-TANG	−0.01	−0.01	−0.11			
Step 2: clinical				0.23	0.20	0.13
Comorbid psychological	0.74	0.22	3.73**			
Time since diagnosis	−0.01	−0.02	−0.26			
In treatment	0.37	0.12	1.82			
Step 4: MRIS				0.48	0.45	0.25
MRIS_INTR	0.03	0.18	1.95			
MRIS_BROOD	0.06	0.43	4.60**			
MRIS_INSTR	−0.04	−0.16	−2.68**			
Anxiety						
Final model $F(6, 176 = 10.29$, $p < 0.01)$						
Step 1: social support				0.05	0.04	0.05
MOS-EMOT	0.18	0.13	1.07			
MOS-INTERACT	−0.26	−0.18	−1.48			
Step 2: clinical						
Comorbid psychological	0.51	0.17	2.54*	0.12	0.10	0.06
Step 3: MRIS				0.26	0.23	0.15
MRIS_INTR	0.01	0.06	0.58			
MRIS_BROOD	0.05	0.36	3.31**			
MRIS_INSTR	0.00	0.00	0.04			
Stress						
Final model $F(6, 176 = 16.30$, $p < 0.01)$						
Step 1: social support				0.04	0.03	0.04
MOS-INTERACT	0.21	0.03	0.38			
Step 2: clinical						
Comorbid psychological	4.28	0.24	3.82**	0.16	0.14	0.12
Time since diagnosis	−0.16	−0.07	−1.10			
Step 3: MRIS				0.36	0.34	0.20
MRIS_INTR	0.24	0.29	2.96**			
MRIS_BROOD	0.19	0.25	2.44*			
MRIS_INSTR	−0.29	−0.23	−3.55**			
Post-traumatic growth—relate						
Final model $F(8, 174 = 10.45$, $p < 0.01)$						
Step 1: demographics (education)	−1.08	−0.17	−2.70**	0.02	0.02	0.02
Step 2: social support				0.22	0.19	0.19
MOS-AFFECT	0.66	0.09	0.86			
MOS-EMOT	3.01	0.40	3.30**			
MOS-INTERACT	0.93	0.12	0.80			
MOS-TANG	−1.44	−0.21	−2.22*			
Step 3 MRIS				0.33	0.30	0.11
MRIS_INTR	0.16	0.21	2.02*			
MRIS_BROOD	−0.11	−0.15	−1.42			
MRIS_INSTR	0.36	0.30	4.49**			
Post-traumatic growth—possibility						
Final model $F(8, 174 = 7.53)$						
Step 1: social support				0.06	0.05	0.06
MOS-AFFECT	0.17	0.03	0.28			
MOS-EMOT	1.48	0.25	2.02*			
MOS-INTERACT	−0.14	−0.02	−0.16			
Step 3: clinical variables				0.10	0.07	0.03
In treatment	−0.84	−0.07	−0.94			
Time since diagnosis	0.20	0.12	1.58			

(Continues)

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Table 3. (Continued)

Variable	*B*	Std. beta	*t*	R^2	Adj. R^2	R^2 Δ
Step 4: MRIS				0.26	0.22	0.16
MRIS_INTR	0.29	0.47	4.30**			
MRIS_BROOD	−0.25	−0.44	−3.97**			
MRIS_INSTR	0.28	0.30	4.27**			
Post-traumatic growth—strength						
Final model $F(5, 177 = 5.60, p < 0.01)$						
Step 1: social support				0.04	0.03	0.04
MOS-AFFECT	0.36	0.08	0.81			
MOS-EMOT	0.58	0.13	1.23			
Step 2 MRIS				0.14	0.11	0.10
MRIS_INTR	0.07	0.15	1.28			
MRIS_BROOD	−0.06	−0.13	−1.09			
MRIS_INSTR	0.22	0.30	4.04**			
Post-traumatic growth—spiritual						
Final model $F(4, 178 = 3.77, p < 0.01)$						
Step 1: clinical variables						
Comorbid psychological	0.92	0.16	2.14*	0.02	0.02	0.02
Step 2: MRIS				0.08	0.06	0.06
MRIS_INTR	0.06	0.22	1.91			
MRIS_BROOD	−0.08	−0.32	−2.48*			
MRIS_INSTR	0.07	0.18	2.69**			
Post-traumatic growth—appreciation						
Final model $F(6, 176 = 6.29, p < 0.01)$						
Step 1: social support				0.06	0.04	0.06
MOS-AFFECT	0.54	0.18	1.54			
MOS-EMOT	0.52	0.16	1.24			
MOS-INTERACT	−0.40	−0.12	−0.78			
Step 2: MRIS				0.18	0.15	0.12
MRIS_INTR	0.07	0.20	1.77			
MRIS_BROOD	−0.07	−0.22	−1.91			
MRIS_INSTR	0.17	.34	4.67**			

*$p < 0.05$.
**$p < 0.01$.

of depression, anxiety and stress in some breast cancer patients, with at least moderate levels of depressive symptoms reported in 17.3% of participants, anxiety symptoms in 17.8% and stress symptoms in 17.3%. The presence of negative psychological outcomes likely reflects the influence of many physical and psychological challenges [4]. As predicted, there was strong support for the main hypothesis that rumination would be associated with heightened depression, anxiety and stress, with confirmation of a differential relation with individual components of rumination. The negatively orientated dimension of brooding was positively associated with depression, anxiety and stress, consistent with previous research in clinically well populations [30]. Typically, brooding enables sustained processing of problems and associated emotions without progression to action [42]; thus, it perpetuates a relatively negative style of hopelessness and negative outcome expectancies [43]. In this study, intrusion, representing the intensity and repetitiveness of rumination, was associated with stress, that is, chronic non-specific arousal. The lack of a relationship to depression and anxiety may reflect the low levels of psychological distress reported in the overall sample and that feelings and emotions accompanying their ruminations were more positively orientated. However, the relationship to stress may indicate the aversive nature of intrusive thoughts experienced over an extended period of time given that the majority of the sample was more than 1 year out from diagnosis [35].

While all participants reported some degree of PTG, overall mean levels were lower compared to other breast cancer studies [11,12], possibly reflecting cultural differences related to growth that may not be adequately assessed by the post-traumatic growth inventory [44]. For some participants, PTG was in the presence of significant depression, anxiety or stress symptoms, confirming earlier research that psychological distress and PTG are not mutually exclusive entities [12]. For PTG, the subcomponents of instrumental, intrusion and brooding ruminations demonstrated significant relationships, consistent with previous research [45]. As

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expected, instrumental rumination was positively associated with all five PTG dimensions. Instrumental, or reflective, rumination represents an active processing of content, both to understand change in circumstances following diagnosis and the initiation of adaptive behaviours to reduce the disparity between real or 'unhealthy' self and ideal or 'healthy' self [21]. Instrumental rumination is likely to be both purposeful and deliberate, working out solutions to issues that arise out of the cancer experience, such as dealing with treatment effects [35].

As hypothesised, intrusion was positively related to PTG, specifically to relating to others and new possibilities when social support was included in the model. The relationship between intrusion and these dimensions is not unexpected, as cognitive processing may represent an attempt to increase understanding of changed personal circumstances, including a revision of goals and priorities [21,24]. The importance of emotional/informational social support reflects the role of social context in PTG, through self-disclosure and the availability of fresh perspectives [39].

Conversely, brooding was negatively associated with the PTG dimensions of new possibilities and spiritual growth when emotional/informational social support was included in the model. Brooding can involve thoughts of what life might have been like if the cancer diagnosis had not occurred and thus interfere with disengagement from a prior worldview, thereby preventing the creation of new goals inherent in personal growth [39]. Rumination has been shown to be a reclusive activity, so that individuals who brood have a lower level of social interaction, reducing the opportunity for new perspectives [46].

In contrast to previous research reporting a positive relationship between psychological distress and PTG [10], the current research found no such relationship. This may reflect that, in spite of a subgroup that demonstrated moderate to high levels of depression, anxiety and stress, more generally, low levels of psychological distress were reported. Participants also reported that feelings and emotions accompanying their ruminations were more positively orientated.

These findings have implications for all women diagnosed with breast cancer. In the period immediately following a stressor, intrusive rumination may act as a starting point for PTG [28], but when sustained over a longer time frame, it has been linked to psychological distress [35]. Intrusion, where excessive, and brooding may indirectly interfere with adherence to recommended treatment and self-care regimens through their influence on negative psychological states, with the potential for adverse health outcomes [18]. Identifying such ruminative processes can therefore highlight individuals at particular risk of negative psychological outcomes through excessive intrusion and brooding, and direct psychological interventions to both minimise these processes and facilitate the adoption of instrumental rumination to promote PTG. While cognitive-behavioural therapy (CBT) has been used successfully within the cancer context in the management of pain and distress [47], CBT does not specifically address rumination. Newer CBT modalities such as mindfulness-based CBT, which target rumination through the addition of disclosure techniques and mindfulness meditation, seem promising, but further evaluation of their effectiveness is warranted [48].

A number of limitations to this study need to be considered. As the study was based on a female-only breast cancer sample, it was not possible to explore the influence of gender, demonstrated to be important in the context of rumination [49], or to generalise the findings to other cancer groups. Consequently, further research is needed to address the impact of rumination in the context of the unique challenges presented by other cancers and illnesses. While the sample was representative of women with breast cancer [50], generalisability is limited in that the sample was based on self-selection over the Internet from a number of community-based breast cancer groups. It is possible that being associated with these community organisations reduces the prevalence of reported rumination given the documented relationship between social support and psychological outcomes [5–7]. Although adopted to ensure a good ratio of cases to independent variables, the use of bivariate correlations to identify variables for the analysis potentially raises the issue of over-specification of the model. Finally, as a cross-sectional study, inferences about causality cannot be made. Future research should extend this work to other cancer and illness groups to facilitate comparisons by gender and between different illness groups. The adoption of a longitudinal approach would also allow for how patterns of rumination might differentially affect psychological outcomes along the trajectory of an illness.

Overall, by examining the differential impacts of the various subcomponents of rumination on distinct dimensions of PTG, these findings have extended prior research that has demonstrated the role of rumination in psychological distress and in PTG [15,27]. In particular, the identification of specific dimensions of rumination involved in promoting negative and positive psychological responses in women diagnosed with breast cancer provides a basis from which psychosocial interventions can be improved to minimise distress and optimise PTG. In addition, the study provided further confirmation for the applicability of the MRIS as a measure of rumination within an oncology population.

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Appendix Table 1: Pearson correlations among key study variables

	Age	Ptnr	Educ	Stage	Time dx	Compl	Treat	MOS-E	MOS-T	MOS-A	MOS-I	Phys	Psych	Intr	Brood	Instr	DASS-D	DASS-A	DASS-S	PTGI-R	PTGI-P	PTGI-ST	PTGI-SP
Ptnr	−0.07																						
Educ	−0.02	−0.06																					
Stage	−0.04	−0.01	0.18*																				
Time dx	0.34**	0.10	−0.04	0.01																			
Compl	0.20**	0.01	−0.04	−0.19*	.51																		
Treat	−0.24	−0.11	0.01	0.22**	−0.45**	−0.68**																	
MOS-E	0.02	0.20**	0.02	0.01	0.09	−0.02	−0.02																
MOS-T	−0.00	0.25**	0.04	0.08	0.03	−0.12	0.12	0.68**															
MOS-A	−0.04	0.47**	−0.01	0.12	0.07	−0.08	−0.04	0.71**	0.67**														
MOS-I	0.07	0.30**	0.00	0.02	0.08	−0.03	−0.07	0.85**	0.73**	0.80**													
Phys	0.27**	−0.12	0.20**	0.03	−0.04	0.02	−0.01	0.03	−0.01	−0.05	−0.02												
Psych	−0.07	−0.15*	0.11	0.02	0.00	0.09	−0.03	−0.11	−0.12	−0.14	−0.18*	0.16*											
Intr	−0.25**	0.05	−0.03	0.04	−0.16*	0.07	−0.02	−0.31**	−0.22**	−0.22**	−0.32**	−0.06	0.24**										
Brood	−0.22**	0.04	0.04	0.17*	−0.16*	−0.06	0.10	−0.25**	−0.14	−0.19**	−0.27**	−0.03	0.24**	0.78**									
Instr	−0.14	0.03	0.12	0.07	−0.04	−0.03	0.02	0.07	0.02	0.06	0.04	0.00	0.06	0.26**	0.33**								
DASS-D	−0.10	−0.03	−0.05	0.03	−0.17*	−0.03	0.16*	−0.25**	−0.17*	−0.21**	−0.30**	0.08	0.37**	0.56**	0.61**	0.49							
DASS-A	−0.03	0.04	0.01	0.12	−0.10	−0.06	0.09	−0.15*	−0.02	−0.09	−0.22**	0.05	0.29**	0.41**	0.47**	0.15*	0.65**						
DASS-S	−0.05	0.09	0.03	0.07	−0.15*	−0.01	0.08	−0.14	−0.09	−0.07	−0.19**	0.05	0.35**	0.49**	0.46**	−0.06	0.72**	0.54**					
PTGI-R	−0.05	0.05	−0.15*	−0.01	0.08	0.00	−0.03	0.40**	0.18*	0.33**	0.36**	−0.01	−0.05	0.04	−0.01	0.32**	−0.03	0.02	−0.06				
PTGI-P	−0.11	0.03	−0.02	−0.02	0.16*	0.15*	−0.18*	0.25**	0.04	0.20**	0.21**	−0.02	0.04	0.11	−0.06	0.29**	−0.06	−0.04	−0.06	0.74**			
PTGI-ST	−0.14	0.00	−0.10	0.01	0.12	−0.01	−0.01	0.19*	0.04	0.18*	0.12	−0.10	0.06	0.07	0.04	0.31**	−0.02	0.02	−0.03	0.75**	0.72**		
PTGI-SP	0.08	−0.02	−0.01	−0.03	0.09	0.13	−0.09	0.13	−0.07	0.09	0.07	0.01	0.15*	0.06	−0.05	0.15*	−0.05	−0.02	−0.03	0.49**	0.52**	0.47**	
PTGI-A	−0.08	0.07	−0.02	0.04	0.08	0.06	−0.06	0.20**	0.07	0.21**	0.17*	−0.04	−0.05	0.07	0.01	0.34**	0.00	−0.02	−0.10	0.70**	0.68**	0.60**	0.44**

Ptnr, partner; Educ, education; Time dx, time since diagnosis; Compl, time since completed treatment; Treat, in treatment; MOS-E, medical outcomes social support survey (emotional subscale); MOS-T, medical outcomes social support survey (tangible subscale); MOS-A, medical outcomes social support survey (affectionate subscale); MOS-I, medical outcomes social support survey (positive social interaction subscale); Phys., comorbid physical conditions; Psych., psychological comorbid conditions; DASS-D, Depression Anxiety Stress Scale (depression subscale); DASS-A, Depression Anxiety Stress Scale (anxiety subscale); DASS-S, Depression Anxiety Stress Scale (stress subscale); PTGI-R, post-traumatic growth inventory (relating to others subscale); PTGI-P, post-traumatic growth inventory (new possibilities subscale); PTGI-ST, post-traumatic growth inventory (personal strength subscale); PTGI-SP, post-traumatic growth inventory (spirituality subscale); PTGI-A, post-traumatic growth inventory (appreciation subscale).

***p* < 0.05.**

****p* < .01.**

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Conflict of interest

No potential conflict of interest reported.

References

1. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman, D. Global cancer statistics. *CA Cancer J Clin* 2011;**61**:69–90. DOI:10.3322/caac.20107.
2. Cancer Australia. Report to the Nation – Breast Cancer 2012. Cancer Australia: Surrey Hills, NSW, 2012.
3. Jemal A, Center MM, Desantis C, Ward EM. Global patterns of cancer incidence and mortality rates and trends. *Canc Epidemiol Biomarkers Prev* 2010;**19**:1893–1907. DOI: 10.1158/1055-9965
4. Hewitt M, Herdman R, Holland J. Meeting Psychosocial Needs of Women with Breast Cancer. The National Academies Press: Washington, DC, 2004.
5. Burgess C, Cornelius V, Love S, Graham J, Richards M, Ramirez A. Depression and anxiety in women with early breast cancer: five year observational cohort study. *Br Med J* 2005;**330**:702–705. DOI:10.1136/bmj.38343.670868.D3.
6. Rodrigue JR, Park, T. General and illness-specific adjustment to cancer: relationship to marital status and marital quality. *J Psychosom Res* 1996;**40**:29–36.
7. Wong-Kim EC, Bloom JR. Depression experienced by young women newly diagnosed with breast cancer. *Psycho-Oncology* 2005;**14**:564–573. DOI: 10.1002/pon.873
8. Smith EM, Gomm SA, Dickens CM. Assessing the independent contribution to quality of life from anxiety and depression in patients with advanced cancer. *Palliat Med* 2003;**17**:509–513. DOI: 10.1191/0269216303pm781oa
9. Pasquini M, Biondi M. Depression in cancer patients: a critical review. *Clin Pract Epidemiol Ment Health* 2007;**3**:2. DOI: 1.1186/1745-0179.3.2.
10. Sears SR, Stanton AL, Danoff-Burg S. The yellow brick road and the emerald city: benefit finding, positive reappraisal coping and posttraumatic growth in women with early-stage breast cancer. *Health Psychol* 2003;**22**:487–497. DOI: 10.1037/0278-6133.22.5.487
11. Cordova MJ, Cunningham LL, Carlson CR, Andrykowski MA. Posttraumatic growth following breast cancer: a controlled comparison study. *Health Psychol* 2001;**22**:487–497. DOI: 10.1037/0278-6133.20.3.176
12. Cordova MJ, Giese-Davis J, Golant M, Kronenwetter C, Chang V, Spiegel D. Breast cancer as trauma: posttraumatic stress and post-traumatic growth. *J Clin Psychol Med Settings* 2007;**14**:308–319. DOI:10.1007/s10880-007-9083-6
13. Ruini C, Vescovelli F, Albieri E. Post-traumatic growth in breast cancer survivors: new insights into its relationships with well-being and distress. *J Clin Psychol Med Settings* 2012; **20**:383–391. DOI: 10.1007/s10880-012-9340-1
14. Schroevers MJ, Helgeson VS, Sanderman R, Ranchor AV. Types of social support matters for prediction of posttraumatic growth among cancer survivors. *Psycho-Oncology* 2010;**19**:46–53. DOI: 10.1002/pon.1501
15. Chan MW, Ho SM, Tedeschi RG, Leung, CW. The valence of attentional bias and cancer-related rumination in posttraumatic stress and posttraumatic growth among women with breast cancer. *Psycho-Oncology* 2011;**20**:544–552. DOI: 10.1002/pon.1761.
16. Lelorain S, Tessier P, Florin A, Bonnaud-Antignac A. Post-traumatic growth in long-term breast cancer survivors: relation to coping, social support and cognitive processing. *J Health Psychol* 2012;**17**:637–639. DOI: 10.1177/1359105311427475
17. Helgeson VS, Reynolds KA, Tomich PL. A meta-analytic review of benefit finding and growth. *J Consult Clin Psychol* 2006;**74**:797–816. DOI:10.1037/0022006X.74.5.797
18. Fann JR, Thomas-Rich AM, Katon WJ, et al. Major depression after breast cancer: a review of epidemiology and treatment. *Gen Hosp Psychiatry* 2008;**30**:112–126. DOI:10.1016/j.genhosppsych.2007.10.008.
19. Hjerl K, Andersen EW, Keiding N, Mouridsen HT, Mortensen PB, Jorgensen T. Depression as a prognostic factor for breast cancer mortality. *Psychosomatics* 2003;**44**:24–30. DOI:10.1176/ appi.psy.44.1.24.
20. Tedeschi RG, Calhoun LG. The posttraumatic growth inventory: measuring the legacy of trauma. *J Trauma Stress* 1996;**9**:455–472. DOI: 10.1002/jts.2490090305
21. Greenberg MA. Cognitive processing of traumas: the role of intrusive thoughts and reappraisals. *J Appl Soc Psychol* 1995;**25**:1262–1296. DOI: 10.1111/j.1559-1816.1995.tb02618.x
22. Roesch SC, Weiner B. A meta-analytic review of coping with illness. Do causal attributions matter? *J Psychosom Res* 2001;**50**:205–219.
23. Watkins ER. Constructive and unconstructive repetitive thought. *Psychol Bull* 2008;**134**:163–206. DOI: 10.1037/0033-2909.134.2.163
24. Calhoun LG, Tedeschi RG. Beyond recovery from trauma: implications for clinical practice and research. *J Soc Issues* 1998;**54**:357–371. DOI: 10.1111/j.1540-4560.1998.tb01223.x
25. Nolen-Hoeksema S. Responses to depression and their effects on the duration of depressive episodes. *J Abnorm Psychol* 1991;**100**:569–582. DOI: 10.1037/0021-843X.100.4.569
26. Segerstrom SC, Tsao JCI, Alden LE, Craske MG. Worry and rumination: repetitive thoughts as a concomitant and predictor of negative mood. *Cognit Ther Res* 2000;**24**:671–688. DOI: 10.1023/A:1005587311498
27. Linley PA, Joseph S. Positive change following trauma and adversity: a review. *J Trauma Stress* 2004;**17**:11–21. DOI: 10.1023/B:JOTS.0000014671.27856.7e
28. Stockton H, Hunt N, Joseph S. Cognitive processing, rumination and posttraumatic growth. *J Trauma Stress* 2011;**24**:85–92. DOI: 10.1002/jts.20606
29. Treynor W, Gonzalez R, Nolen-Hoeksema S. Rumination reconsidered: a psychometric analysis. *Cognit Ther Res* 2003;**27**:247–259. DOI: 10.1023/A:1023910315561
30. Burwell RA, Shirk SR. Subtypes of rumination in adolescence: associations between brooding, reflection, depressive symptoms and coping. *J Clin Child Adolesc Psychol* 2007;**36**:56–65. DOI: 10.1080/15374410709336568.
31. Affleck G, Tennen H. Construing benefits from adversity: adaptational significance and dispositional underpinnings. *J Pers* 1996;**64**:899–922.
32. Mehnert A, Koch U. Psychological comorbidity and health-related quality of life and its association with awareness, utilization and need for psychosocial support in a cancer register-based sample of long-term breast cancer survivors. *J Psychosom Res* 2008;**64**:383–391. DOI:10.1016/j.jpsychores.2007.12.005
33. Helgeson, VS, Cohen, S. Social support and adjustment to cancer: reconciling descriptive, correlational and intervention research. *Health Psychol* 1996;**15**:135–148.
34. Kissane DW, Clarke DM, Ikin J, et al. Psychological morbidity and quality of life in Australian women with early-stage breast cancer: a cross-sectional survey. *Med J Aust* 1998;**169**:192–196.
35. Calhoun, LG, Tedeschi, RG. Facilitating posttraumatic growth: a clinician's guide. Erlbaum: Mahwah, NJ, 1999.
36. Soo H, Sherman K, Kangas M. Assessing rumination in response to illness: the development and validation of the Multi-Dimensional Rumination in Illness Scale (MRIS). *J Behav Med* 2013. DOI: 10.1007/s10865-013-9531-8.
37. Lovibond P, Lovibond S. Manual for the Depression Anxiety Stress Scales. The Psychology Foundation of Australia: Sydney, 1995.
38. Brown TA, Chorpita, BF, Korotitsch W, Barlow DH. Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. *Behav Res Ther* 1997;**35**:79–89.

39. Tedeschi RG, Calhoun LG. Posttraumatic growth: conceptual foundations and empirical evidence. *Psychol Inq* 2004;**15**:1–15.
40. Sherbourne CD, Stewart, AL. The MOS social support survey. *Soc Sci Med* 1991;**32**:705–714.
41. Vernon SW, Gritz ER, Peterson SK, et al. Correlates of psychologic distress in colorectal cancer patients undergoing genetic testing for hereditary colon cancer. *Health Psychol* 1997;**16**:73–86.
42. Nolen-Hoeksema S, Wisco BE, Lyubomirsky S. Rethinking rumination. *Perspect Psychol Sci* 2008;**3**:400–424. DOI: 10.1111/j.1745-6924.2008.00088.x
43. Lyubomirsky S, Nolen-Hoeksema S. Self-perpetuating properties of dysphoric rumination. *J Pers Soc Psychol* 1993;**65**:339–349. DOI: 10.1037/0022-3514.65.2.339
44. Shakespeare-Finch J, Copping A. A grounded theory approach to understanding cultural differences in posttraumtic growth. *J Loss Trauma* 2006;**11**:355–371. DOI: 0.1080/15325020600671949.
45. Morris BA, Shakespeare-Finch J. Rumination, post-traumatic growth and distress: structural equation modeling with cancer survivors. *Psycho-Oncology* 2011;**20**:1176–1183. DOI: 10.1002/pon.1827.
46. Nolen-Hoeksema S, Davis CG. "Thanks for sharing that": ruminations are their social support networks. *J Pers Soc Psychol* 1999;**77**:801–814.
47. Tatrow K, Montgomery GH. Cognitive-behavioral therapy techniques for distress and pain in breast cancer patients: a meta-analysis. *J Behav Med* 2006;**29**:17–27. DOI: 10.1007/s10865-005/9036-1.
48. Watkins E. Cognitive-behaviour therapy for depressive rumination [Internet]. 1-17. Available from: http://www.psychologytoday.com/files/attachments/84564/cbtfordepressive-ruminationpaperscientistpractitioner.pdf
49. Nolen-Hoeksema S. Sex differences in unipolar depression: evidence and theory. *Psychol Bull* 1987;**101**:259–282.
50. Australian Institute of Health and Welfare. Breast cancer in Australia: an overview. 2012. Cancer series no. 71. Cat no. CAN 67. Canberra: AIHW.