Post-traumatic growth in breast cancer: How and when do distress and stress contribute?

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Abstract

Objective

While several theoretical models provide explanation for the genesis and development of post traumatic growth (PTG) in the aftermath of stressful events, empirical evidence regarding the predictors and consequences of PTG in breast cancer patients in active treatment and early survivorship is inconclusive. This study, therefore, examines the role of distress and stress, as predictors and outcomes of post-traumatic growth in women with breast cancer over an 18-month period.

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Methods

These effects are tested in two structural equation models that track pathways of PTG in a sample of 253 recently diagnosed women. Questionnaires were completed at diagnosis and at 4 follow up time points assessing cancer-specific stress (IES), global stress (PSS), depression and anxiety (HADS). Post-traumatic growth (SLQ -38) was assessed at follow up time points.

Results

Cancer-specific stress was related to higher PTG concurrently and longitudinally. Anxiety was related concurrently to higher PTG but overall general distress had minimal impact on post-traumatic growth. Global stress was inversely related to PTG. Positive growth at six months was associated with subsequent reduction in stress.

Conclusions

This study showing that early stage higher cancer-specific stress and anxiety were related to positive growth supports the idea that struggle with a challenging illness may be instrumental in facilitating PTG and findings show positive implications of PTG for subsequent adjustment.

Key words: cancer, post-traumatic growth, distress, stress, oncology, breast cancer.

Background

The last two decades have seen a growing body of research focused on post-traumatic growth (PTG) in the aftermath of highly stressful life events. Such positive growth may include better appreciation of life, better relationships with others, deeper spirituality, increased personal strength, recognition of new possibilities [1] and a positive change in health behaviour [2, 3].

Theoretical explanations for these positive changes propose that growth emanates from disruptions in worldviews necessitating a revision of beliefs to reflect a new reality [1, -5]. These disruptions cause distress but also act as a potential catalyst for PTG [5, 6]. Breast cancer, being a potentially traumatic stressor, can challenge the core assumptions of the patient about the world [7] with attendant increases in PTG. If positive growth exists because of a struggle with a challenging event, paradoxically, then one could hypothesize that heightened distress and event-specific stress may be necessary drivers of post-traumatic growth [1, 6, 8]. Cancer diagnosis and active treatment should, therefore, be a period of particular relevance when examining predictors of PTG.

Empirical evidence, however, on the role of distress in PTG is mixed. Some studies show a positive correlation between distress and positive growth [9-10], others show a negative association [11], while still others show no relationship [2, 12] or found a curvilinear relationship [13], such that those with moderate levels of positive growth had the highest distress whereas lower levels of distress were coupled with both lower and higher levels of positive growth

Research in breast cancer suggests that appraisals of disease, life threat [12], intensity [14] and perceived trauma [15] are positively related to PTG. Results from studies which measure stress symptoms (e.g. intrusion and avoidance responses), however, are varied. Some report that cancer-specific stress is associated with more PTG concurrently [16] and over time [2], whereas others [17-18] found no such relationship. Studies of global levels of perceived stress in breast cancer patients have also generated conflicting findings. Greater global stress was inversely related to PTG [17, 19], showed no relationship [16] or

demonstrated a curvilinear relationship such that moderate global stress was associated with the highest PTG [18].

Overall, the empirical evidence linking distress and stress with post-traumatic growth among breast cancer patients is inconclusive. Importantly, all studies in this area have assessed predictors of PTG during or post treatment usually within the first year but none have included diagnosis, a very traumatic time for most women.

In an effort to advance upon existing studies, the current study sought to clarify the role of distress (anxiety and depression) and stress (cancer-specific and global) on PTG over an 18 month period which includes diagnosis, treatment and early survivorship, a re-entry phase which can present unanticipated and lingering difficulties in multiple life domains [20]. The current study thus provided a unique opportunity to investigate predictors of PTG across this lengthy stressful period.

If post-traumatic growth is a transformative positive experience what does it mean for those who report it? According to some conceptual models [5] the meaning making process involved in positive personal change following trauma can lead to better adjustment to the stressful event. Evidence to date for an association with improved mood in cancer patients is inconclusive. Longitudinal studies of women within the first year of diagnosis of breast cancer, found no link between positive growth and reduced distress [2, 21] or found that PTG was associated with higher negative affect [9]. In contrast, other studies found that positive growth was linked with reduced distress at 4 months [22] and over a longer period (5-8 years later) [23]. The influence of PTG on subsequent distress thus warrants further attention.

Surprisingly, the impact of positive growth on subsequent stress in women with breast cancer has not been addressed to date even though it has been hypothesized that positive growth may change people's perceptions of future stressors [24]. Therefore, the question of when PTG is adaptive remains a critical question for future research.

The current study assessed Irish women with breast cancer at five time points corresponding to the challenging periods of diagnosis, treatment (3 and 6 month follow-up), and early survivorship (12 and 18 month follow-up). It compares, for the first time, the impact of both distress and stress as predictors and outcomes of PTG over time. In line with theory [4, 8, 25] it is expected that high distress and stress will be linked with more positive growth. Given the equivocal findings to date we do not posit a priori hypotheses but we suggest that early rather than later stage distress and stress may be more influential for the development of PTG over an 18 month period We also explore the possibility that early stage PTG is associated with late stage reductions in distress and stress.

Method

Participants

The present analyses are part of a larger investigation of predictors of adjustment (emanating from the transactional model of stress [26]) in women with breast cancer. The study protocol was approved by the University Hospital Ethics Committee. Consecutive women presenting at the Breast Symptomatic Unit in a university-affiliated hospital were eligible to participate. Inclusion criteria were women with a first diagnosis of breast cancer who were awaiting surgery. Exclusion criteria were prior cancer diagnosis or other serious medical comorbidities, 75 years or older, diagnoses of intellectual disability or severe psychopathology and lack of fluency in English. Patients were screened over a two-year period and a total of 503 breast cancer patients attended the unit during that period. Applying the exclusion criteria, 383 patients were eligible and invited to participate immediately post-diagnosis. Of those approached, 253 women (66.1%) agreed to take part and completed the baseline assessment.

Procedure

Informed written consent was obtained from the women at diagnosis in the clinic. Within two weeks of diagnosis, one day prior to surgery, the principal researchers administered the questionnaires within a semi-structured interview (*M* = 40mins, *Range* = 30-50mins). The women were contacted by post for follow-up assessments three, six, twelve and eighteen months later. The post-traumatic growth questionnaire was completed only at follow-ups. One reminder letter was sent at each follow up time point to participants who did not return their questionnaires.

Materials

Demographic and Medical Variables: Information on age and stage of disease were obtained from hospital records.

Psychological Measures

Global stress. The Perceived Stress Scale (PSS) [27] is a 14-item scale which measures the degree to which situations in one's life over a one month time frame are appraised as stressful. Respondents indicate how often they thought or felt a certain way on a five point Likert scale from 0 "never" to 4 "very often". Scores can range from 0-56 with higher scores indicating more perceived stress.

Cancer-specific stress. The Impact of Events Scale [28] (IES) is a 15-item measure of stress related intrusive thoughts, denial of thoughts and avoidant behaviours. Participants rated each item as experienced in the previous week by using a 4 point Likert scale 0 (not at all), 1 (rarely), 3 (sometimes), 5 (often). Higher scores (0-75) indicate higher levels of cancer-specific stress.

Distress. The Hospital Anxiety and Depression Scale (HADS) [29] is a 14-item scale with 7 items measuring anxiety and 7 measuring depression. Respondents indicate their level of agreement with statements on a 4-point scale from 0 (most of the time) to 3 (not at all). Scores range from 0 to 21 for each scale, and higher scores indicate greater levels of anxiety or depression.

Post-Traumatic Growth. The Silver Lining Questionnaire (SLQ-38) [30] is a 38 item uni-dimensional scale of adversarial growth in which respondents rate positive aspects of their illness experience (e.g. “my illness made me more mature”) on a 5 point scale from ‘strongly agree’ (1), ‘agree’ (1), ‘not sure’ (0) ‘disagree’ (0) to ‘strongly disagree’ (0). Scores range between 0 (agreement with no items) and 38 (agreement at some level with all the items) with a higher score corresponding to high positivity.

Statistical Analyses

Multiple assessments enabled examination of the effect of distress and stress on PTG over time, while controlling for the effects of PTG on previous test occasions.. Given the level of statistical control with this time-series path analysis, effect sizes were expected to be small to moderate.

Path analysis is a variant of structural equation modelling dealing only with observed variables. A path model was fit in Amos 22 [31] using maximum likelihood estimation. Two models were tested separately in order to minimize the complexity of studying all variables simultaneously, and to maximize power[1]. Model 1 (see Figure 1) examined (i) the effects of distress (anxiety and depression) on PTG cross-sectionally and over time, and (ii) the effects of PTG on distress over time. Model 2 (see Figure 2) examined (i) the effects of stress (global and cancer-specific stress) on PTG cross-sectionally and over time, and (ii) the effects of PTG on stress over time.

Error terms were co-varied within assessment periods for related constructs (e.g. anxiety and depression). Model fit was assessed using the chi square test [32], the normed chi-square index (Q) [33-34], the comparative fit index (CFI), the Tucker Lewis index (TLI), [34] and the root mean square error of approximation (RMSEA) [35], with non-significant chi square, Q values ranging from 2 – 5, CFI and TLI greater than .90, and RMSEA less than

[1] The basic structure of the time-series model employed in each case is available as supporting information (see Figure 3).

.08 indicating good model fit.

Results

Data Screening

Prior to analyses, the data were assessed for normality and presence of outliers. Scores on all psychological measures included in this study are presented in Tables 1 and 2.

Missing Data

The proportion of missing data varied from <5% at time 1 to 59% at time 5. A series of t-tests were carried out comparing those who completed follow-ups and those who dropped out. No significant differences were found on any demographic, medical or psychological variable assessed at any time point (all $p > .05$). Further, Little's MCAR test showed the data were missing completely at random ($X^2_{(273)} = 303.34$, $p = .10$), thus missing data were addressed using maximum likelihood estimation.

Sample Characteristics

Participants, the majority of whom were Caucasian, had a mean age of 54.21 (*SD* = 10.87), the majority were married and all had completed second level education. At the time of diagnosis 80% of the women had been diagnosed with stage I-IIB breast cancer. On type of surgery, 41% had undergone mastectomy and the remainder (59%) excision/lumpectomy procedures. The majority (77%) had received adjuvant therapy post-surgery (3–6 months post diagnosis).

Distress Model

Anxiety, depression, age and stage of disease at the diagnosis phase were entered as exogenous variables in the Distress Model, along with concurrent and longitudinal paths between distress and PTG across all time points. Initial model fit was acceptable ($X^2_{(47)}$ = 164.07, *p* = .001; *Q* = 3.49; CFI = .90; TLI = .69; RMSEA = .09 [90% CI =.08, .11]). Non-significant pathways were trimmed in an iterative process, with 14 remaining. This model provided a reasonably good fit to the data ($X^2_{(96)}$ = 197.68, *p* = .001; *Q* = 2.06; CFI = .91; TLI = .87; RMSEA = .06 [90% CI = .05, .08]). Results are presented in Figure 1.

Stage of disease positively predicted depression 3 months later, and negatively predicted PTG 18 months later. Breast cancer patients with more severe disease status were more depressed, and showed less positive growth over time. Higher anxiety predicted higher PTG concurrently at the 6 month follow-up, and together with previous level of PTG, accounted for 52% of the variance (*r* square) in PTG at this time. These findings provide some support for the hypothesis that distress (as measured by anxiety) is positively related to PTG. The suggestion that post-traumatic growth will reduce distress was not supported.

Stress Model

Age and stage of disease, global stress and cancer-specific stress assessed at diagnosis were included as exogenous variables, and path effects estimated along with concurrent and longitudinal paths between stress and PTG across all time points. The initial model specified was an acceptable fit ($X^2_{(47)}$ = 134.33, *p* = .001; *Q* = 2.86; CFI = .91; TLI = .74; RMSEA = .08 [90% CI = .06, .10]). Non-significant pathways were trimmed from the model, with 17 significant pathways remaining. No further modifications were made, and this final model was a good fit to the data ($X^2_{(93)}$ = 170.72, *p* = .001; *Q* = 1.83; CFI = .92; TLI = .88; RMSEA = .06 [90% CI = .04, .07]). The results of the path model are presented in Figure 2.

It was found that 53% of the variance in PTG 6 months post-diagnosis was predicted by level of PTG 3 months post-diagnosis, but also by lower general stress and higher cancer-specific stress cross-sectionally. Consistent with our hypothesis, high cancer-specific stress at diagnosis predicted greater PTG at the 6 month follow up. Additionally, greater PTG at 6 month follow up predicted less cancer-specific stress at 12 months follow-up, and less global stress at 18-months follow-up. Those with a higher stage of disease showed less PTG over the 18 month follow up period, and together with previous PTG these effects accounted for 70% of the variance in PTG at the final follow-up assessment. These findings provide support for the hypothesis that cancer-specific stress is related to higher PTG. There was support for the suggestion that PTG was associated with less stress over time, and these effects were observed for both cancer-specific and global types of stress.

Discussion

This study, investigating distress, stress and post-traumatic growth across five points in time, in 253 women with early stage disease is one of the largest longitudinal studies of PTG in breast cancer. Importantly age and stage of disease were accounted for in all analyses. Notably, age had no effect on outcomes, whereas stage of disease at diagnosis had a negative influence on PTG at a single time point, 18 months, a finding that is consistent with

prior studies [36-37]. PTG at this phase of re-entry and early survivorship may be reduced for those overcoming a more severe disease status as they may experience greater fear of recurrence. This warrants further investigation.

The current study did find some evidence to support the hypothesis that stress is related to higher post-traumatic growth. Specifically, greater cancer-specific stress at diagnosis predicted higher PTG six months later. It was also linked with higher PTG concurrently at 6 months. This fits with theoretical models [4, 25] suggesting that a traumatic event precipitates cognitive processing which trigger attempts to establish meaning in response to the event. Others using the same measure of cancer-specific stress (IES) have also reported a positive relationship between breast cancer stress and PTG over time [2]. Moreover, studies using other measures of cancer stress (e.g. disease threat and concerns) found a relationship between higher cancer stress and higher PTG cross-sectionally [14-15]. Findings in the present study extend previous research and provide some additional support for the idea that struggle with a challenging illness may be instrumental in facilitating positive growth. Cancer-specific stress may be important in promoting post-traumatic growth and should be included in future theoretical frameworks. This is the first study to examine stress at diagnosis and at regular intervals throughout an 18 month period and findings highlight a potentially important role of early stress on concurrent and subsequent PTG outcomes which warrant further attention.

In contrast, greater perceived global stress at 6 month follow-up was linked to lower PTG concurrently, as shown in other cross-sectional studies [17, 19]. Moreover, global stress did not predict PTG at subsequent points in time, consistent with results reported by McDonough et al. [16]. It would appear that experience of global stress, in contrast to cancer-specific stress, may mitigate against positive growth. It is plausible that greater cancer-specific stress (i.e., experiencing thoughts about breast cancer) focus women's energy on a search for meaning, whereas general "background" stress may detract or distract them from this process. Of interest in this context, we found that a cognitive

behavioural stress management intervention that reduced global stress (PSS) in women with recently diagnosed breast cancer increased positive growth [38].

Both types of stress appear to have different effects and differential temporal relationships with PTG and future studies should try to disentangle these issues, possibly exploring the interaction between cancer-specific and global stress, or examining PTG as a moderator of the relationship between early and later stress. At the same time, when examining the subsequent impact of post-traumatic growth, reassuringly, results show that PTG was linked with a reduction in both cancer-specific and global stress over time. This supports the view that PTG may help to reinterpret perception of future stressors [24] and so helps women to cope with threatening aspects of events. While this warrants further investigation, cross sectional analysis with breast cancer survivors, has shown that positive growth moderated the effects of post- traumatic stress symptoms (PTSD) on distress [39].

Thus, post-traumatic growth is an important phenomenon which has implications for subsequent psychological adjustment but the mechanisms for this influence need to be understood. Perhaps, for example, aspects of PTG (e.g. finding a deeper spirituality and a stronger sense of personal meaning) may mobilise effective coping strategies which lessen some of the negative effects of a cancer diagnosis. Alternatively, positive growth may be a successful coping outcome in the face of adversity which relates to a reduction in stress symptoms [40]. These present potential avenues for further research.

The current study found one concurrent positive relationship between general anxiety and PTG six months after diagnosis which supports a number of other studies in breast cancer [9-10]. No other significant pathways between anxiety, depression and PTG emerged, and taken overall, indicated a minimal role for non-specific anxiety and depression in predicting PTG over time. Notwithstanding that nonlinear relationships can exist between distress and PTG [13] our finding was interesting given some current theoretical viewpoints, which highlight that distress is central to post traumatic growth [1, 6]. We propose that cancer-

specific stress, rather than global stress and distress, plays a more critical role in altering schemas that act as a potential catalyst for post-traumatic growth [5-6].

Overall, heightened cancer-specific stress appears useful as a potential determinant of PTG and this positive growth can predict less subsequent stress. The current study thus informs a growing theoretical framework seeking to investigate the predictors and consequences of post-traumatic growth. Moreover, our results suggest that six months post diagnosis could be a pivotal time for this research focus as the majority of women will have completed their treatment. With the cessation of this stressor women may now be more open to reflective appraisal of their experience, potentially giving rise to enhanced PTG at this time.
There were a number of limitations that should be considered in efforts to interpret the findings of the current study. First, the majority of women in the study were at early stage of breast cancer and the moderate rate of participation (66%) in the study limits the generalizability of the findings. Second, while a number of significant pathways were identified in the models these were not consistent across all time points. Additionally, many non-significant effects were pruned from each model increasing the risk of Type 1 error. Effect sizes were for the most part small to medium. However, this conservative approach to modeling the data may also strengthen our confidence in relation to the significance of the unique effects observed. The models tested also proved a good fit of the data. At the same time, there may be alternative models that fit the data equally well, and further research should seek to explore other factors that influence the evolution of post-traumatic growth in the first 18 months of the breast cancer experience.

Despite these limitations, this study advances and adds to the body of literature on post-traumatic growth in breast cancer. This is a longitudinal study of women with early breast cancer tracking pathways to and from PTG, from diagnosis up to 18 months follow up, thereby encompassing the period of diagnosis, primary treatment and entry into early survivorship. This is the first study to include an assessment of stress and distress at

diagnosis. Future research is needed to confirm and expand the current findings on temporal dimensions of post-traumatic growth in women with breast cancer across all phases of survivorship.

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Table 1. *Bivariate Correlations among Variables used in the Distress Model, along with Means, Standard Deviations (SD) and Cronbach's alpha for each scale.*

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	PTG														
1	Time 2														
2	Time 3	.72**													
3	Time 4	.72**	.83**												
4	Time 5	.67**	.76**	.81**											
	Anxiety														
5	Time 1	-.09	-.02	-.08	-.10										
6	Time 2	-.05	.03	-.11	-.14	.70**									
7	Time 3	-.02	.11	.04	.04	.62**	.74**								
8	Time 4	-.04	.02	-.07	-.05	.64**	.69**	.76**							
9	Time 5	-.05	-.04	-.10	-.10	.59**	.68**	.67**	.78**						
	Depression														
10	Time 1	.01	.07	.01	-.10	.71**	.52**	.37**	.46**	.47**					

11	Time 2	-.13	-.08	-.18	-.10	.45**	.53**	.41**	.34**	.41**	.44**				
12	Time 3	-.05	-.08	-.09	-.11	.59**	.56**	.53**	.43**	.29*	.57**	.62**			
13	Time 4	-.03	-.02	-.09	-.00	.39**	.42**	.41**	.63**	.50**	.49**	.54**	.61**		
14	Time 5	-.05	-.07	-.24	-.15	.37**	.49**	.35**	.53**	.58**	.54**	.58**	.58**	.73**	
		PTG				**Anxiety**					**Depression**				
	Mean	17.39	18.29	17.70	18.51	9.10	5.69	5.83	5.01	5.52	4.53	3.81	3.67	3.43	3.85
	SD	10.14	10.05	10.29	10.90	4.94	4.22	3.82	3.80	3.85	3.94	3.39	3.24	3.43	3.14
	Cronbach's α	.94	.94	.94	.95	.89	.88	.85	.84	.86	.85	.83	.83	.84	.82

Note. *p < .05, one-tailed; **p <.01, one-tailed

Table 2. *Bivariate Correlations among Variables used in the Stress Model, along with Means, Standard Deviations (SD) and Cronbach's alpha for each scale.*

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	PTG														
1	Time 2														
2	Time 3	.72**													
3	Time 4	.72**	.83**												
4	Time 5	.67**	.76**	.81**											
	Global Stress														
5	Time 1	-.03	.02	-.09	.03										
6	Time 2	-.13	-.03	-.16	-.12	.60**									
7	Time 3	-.12	-.10	-.14	-.14	.56**	.74**								
8	Time 4	-.06	.01	-.06	.01	.55**	.67**	.74**							
9	Time 5	-.13	-.12	-.18	-.06	.53**	.71**	.66**	.75**						
	Cancer Stress														
10	Time 1	-.07	.10	.04	.06	.53**	.53**	.41**	.40**	.29**					

11	Time 2	.04	.08	.07	.12	.38**	.56**	.48**	.47**	.47**	.50**				
12	Time 3	.11	.18	.15	.12	.36**	.55**	.59**	.55**	.40**	.55**	.73**			
13	Time 4	-.01	.01	.02	-.05	.38**	.62**	.46**	.55**	.47**	.48**	.71**	.73**		
14	Time 5	-.00	.10	.02	.08	.41**	.61**	.46**	.54**	.53**	.58**	.55**	.61**	.73**	
		PTG				**Global Stress**					**Cancer Stress**				
	Mean	17.39	18.29	17.70	18.51	24.78	20.51	20.94	20.28	21.44	32.92	19.61	20.76	14.55	17.76
	SD	10.14	10.05	10.29	10.90	8.66	8.00	8.06	8.32	8.56	17.19	17.19	17.03	15.29	18.64
	Cronbach's α	.94	.94	.94	.95	.82	.81	.82	.82	.84	.90	.93	.93	.93	.94

Note. *p < .05, one-tailed; **p <.01, one-taile

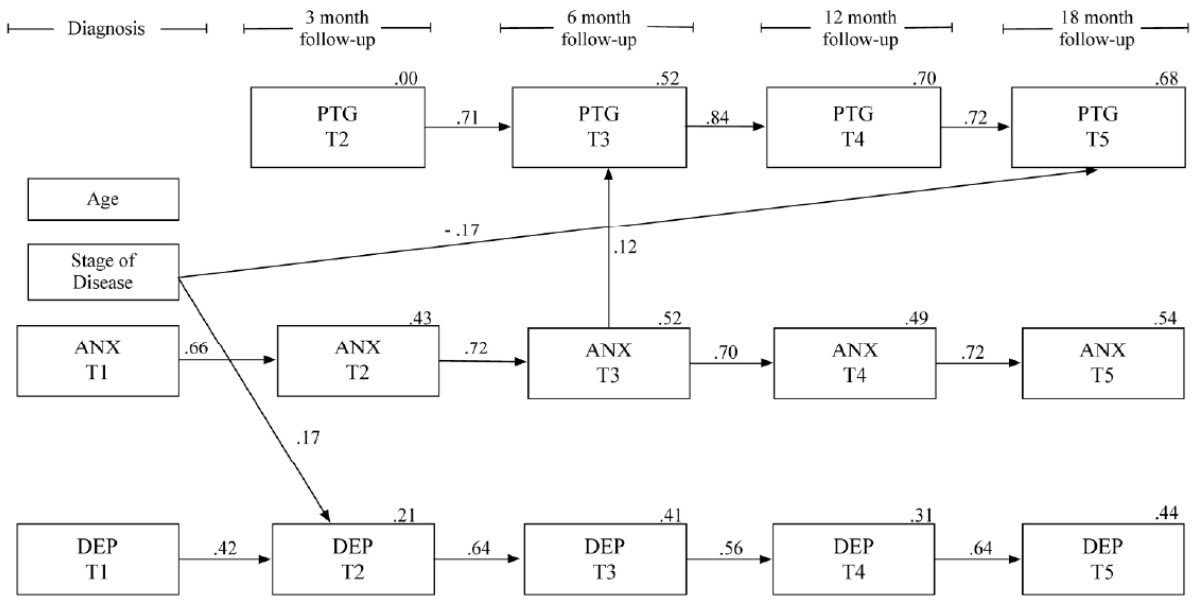

Figure 1. Distress Model presenting significant pathways only ($p < .05$). All path estimates available on request. r-squared values are presented at the top right corner of each endogenous variable. PTG = Post- Traumatic Growth measured by the SLQ-38; ANX = Anxiety measured by the HADS; DEP = Depression measured by the HADS.

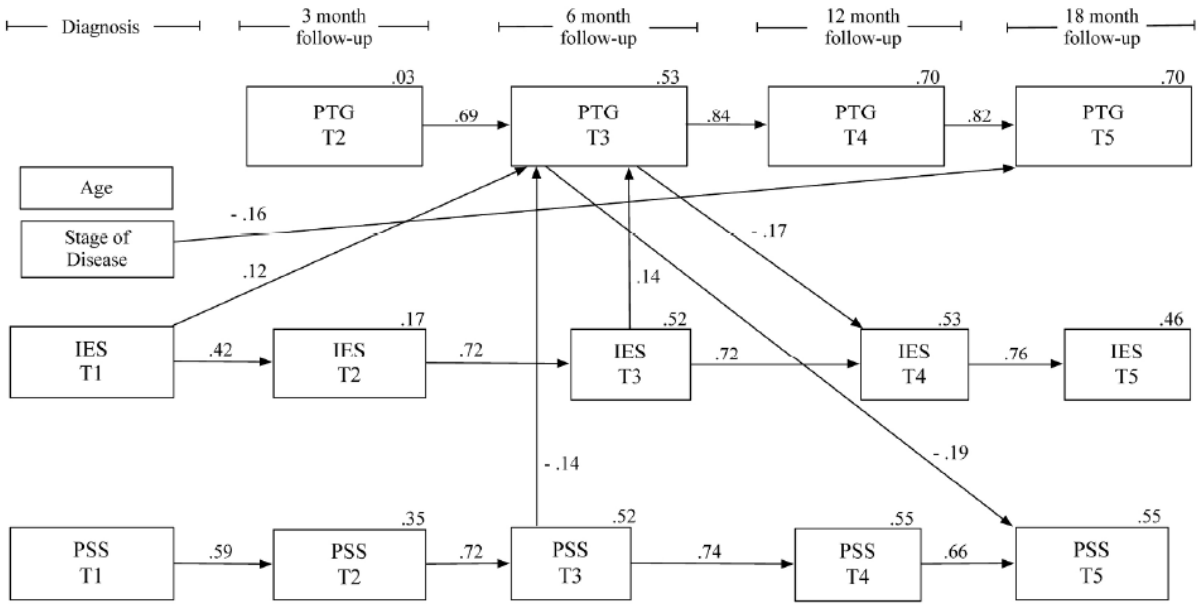

Figure 2. Stress Model presenting significant pathways only ($p < .05$). All path estimates available on request. r-squared values are presented at the top right corner of each endogenous variable. PTG = Post- Traumatic Growth measured by the SLQ-38; IES = Impact of Events Scale measuring Cancer-related Stress; PSS = Perceived Stress Scale measuring Global Stress.