A structural equation model of posttraumatic growth after prostate cancer

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Abstract

Background: Posttraumatic growth (PTG) encompasses an individual's perception of positive personal changes as a consequence of a traumatic incident. The current study tested a theoretical model of PTG with the inclusion of resilience in the context of cancer survivors.

Methods: Members of a prostate cancer support network were invited to complete a cross-sectional mail survey ($N = 514$, 52.8% response; mean age 70.17 years, and time since diagnosis 7.5 years).

Results: Challenge appraisal ($\beta = 0.361$), examining core beliefs ($\beta = 0.474$), intrusive rumination ($\beta = 0.130$), and peer support factors ($\beta = 0.104$) had significant direct effects on PTG. Resilience ($\beta = 0.164$), challenge appraisal ($\beta = 0.215$), distress ($\beta = 0.186$), and examining core beliefs ($\beta = 0.105$) had significant indirect effects on PTG.

Conclusions: Results support the notion that the appraisal of cancer, disruption of fundamental beliefs, and experience of intrusive cancer-related rumination are associated with PTG. Additionally, a sense of connection with peers and seeking an understanding of the cancer experience through peers is important for the perception of PTG. Possible indirect pathways were also proposed between resilience and PTG. Copyright © 2014 John Wiley & Sons, Ltd.

An individual will experience at least one traumatic or aversive event throughout their lifetime [1]. Although such events often lead to negative psychological consequences, positive outcomes, or *posttraumatic growth* (PTG), can also be reported [2–4]. PTG can encompass changes in self-perception, social relationships, life philosophy, priorities, and life goals or greater appreciation of life [5]. PTG is common following a cancer diagnosis, with 53–95% of cancer survivors reporting some degree of growth [6–9]. Positive life changes are not an inevitable posttrauma outcome, and several factors are proposed in a theoretical model outlining the process leading to PTG [2].

In the proposed PTG model, pretrauma individual characteristics, such as personality or gender, can impact appraisal of the traumatic event and perception of growth [2]. The initial appraisal allows an assessment of threat or challenge [10], with challenge appraisals being associated with PTG [11]. Initial appraisals and levels of distress can lead to examining core beliefs and intrusive rumination [2,5,12]. Examining core beliefs assists in understanding causes for events, helps to guide actions, and provides a sense of purpose or meaning [5,13,14]. Intrusive rumination signifies unresolved concerns about the trauma and is a common initial reaction to a traumatic experience consisting of uncontrollable automatic thoughts and images about the event [5]. Deliberate rumination generally occurs later in the process as core beliefs are rebuilt through making sense of the traumatic experience [15]. Self-disclosure and self-analysis, in addition to fewer social constraints and greater access to support and role models, may also mediate the progression into more deliberate rumination and recreating core beliefs [16].

In the context of cancer, peer support can act as a sociocultural influence [2], by providing a reference group that guides norms and behaviours. Peer support can assist in rebuilding core beliefs by providing an understanding of the cancer experience and opportunities to relate to other survivors and engage in deliberate rumination [17–20]. Although peer support may not always be beneficial [17], these networks can provide positive role models as the cancer survivor upwardly compares their own situation with that of others who have experienced PTG [21,22]. Individuals who feel a sense of belonging to peers are likely to perceive enhanced positive well-being and greater growth [17,23].

In addition to components of the PTG model already discussed, emerging research indicates resilience can impact upon an individual's perception of growth [24]. Resilience may be a consequence of previous exposure to trauma, with individuals who have previously

perceived PTG having a greater sense of self-reliance and capability when confronted with further difficult challenges [24]. Thus, exposure to more traumas over time may promote resilience. However, more research is needed to understand the complex relationship between resilience and PTG.

Most PTG research after cancer is conducted with breast cancer survivors, and studies in prostate cancer are scarce [6,25]. Prostate cancer is one of the most prevalent cancers in the male population, typically affecting men over the age of 65 years [26]. A total of 19 438 cases of prostate cancer were recorded in Australia in 2009, equating to 30.2% of all male cancer diagnoses, and one in five men receive a diagnosis before the age of 85 years [26]. Survivors may experience long-lasting physical symptoms including significant deficits in both urinary and bowel functions, difficulty with erectile and sexual functioning, and consequent effects on masculine self-image and intimate relationships [27,28]. The distinctive challenges evident for prostate cancer survivors, in conjunction with the tendency for men to report less personal growth than women [29], make this a unique population to investigate processes leading to PTG.

The primary aim of this study was to test direct and indirect effects of variables on PTG with prostate cancer survivors. On the basis of the PTG model [2] and previous research, it is hypothesised that positive associations with PTG will be found with challenge appraisal, distress, examining core beliefs, intrusive and deliberate ruminations, and peer support factors. Furthermore, as resilient individuals may be less likely to experience distress and examine their core beliefs, resilience will be negatively associated with PTG. As social support and emotional expression are suggested to positively predict PTG, it is hypothesised that social constraints will be negatively correlated with PTG. The secondary aim of the study was to assess the relationships between the antecedent variables as proposed in the PTG model [2]. As many relationships between these variables are yet to be tested, hypotheses have not been stated for these exploratory analyses.

Method

Participants and procedure

The Human Research Ethics Committee of Griffith University (PSY/35/12/HREC) granted approval to conduct this study. Participants were recruited through the Brisbane Prostate Support Network (BPSN), which is affiliated with the Prostate Cancer Foundation of Australia and Cancer Council Queensland (CCQ). The BPSN provides support for prostate cancer survivors through support group meetings and information forums. Not all members attend face-to-face events; however, contact is maintained with all members through a monthly newsletter. Members (N = 973) were mailed study materials with paid reply envelopes to return surveys. Completed surveys were returned (N = 514) with a 53% response rate, which is typical for studies conducted through CCQ [30]. Participants were 70.04 (SD = 8.36) years of age and 7.50 (SD = 4.66) years since diagnosis. Frequencies of sociodemographic and cancer-related variables can be found in Table 1.

Measures

In addition to sociodemographic and cancer-related information, the following measures were collected:

Table 1. Frequencies of sociodemographic and cancer-related variables (N = 514)

	N	%
Relationship status		
Married/partner	433	84.2
Single/divorced/separated/widowed	75	14.6
Education		
University/college degree	185	36.0
Trade or technical college or diploma	168	32.7
High school	126	24.6
Primary school/did not attend school	27	5.3
Private health insurance		
Yes, full cover (including DVA)	388	75.5
Yes, partial cover	55	10.7
No	66	12.8
Work status		
Retired	345	67.1
Employed full time	99	19.3
Employed part time/casual	52	10.1
Permanently ill/unable to work	11	2.1
Income		
<$20 000	53	10.3
$20 000–$39 999	132	25.7
$40 000–$59 999	110	21.4
$60 000–$79 999	60	11.7
$80 000 and above	125	24.3
Other diagnosed health conditions (nonexclusive)		
High blood pressure	196	38.1
Arthritis or osteoporosis	187	36.4
High cholesterol	153	29.8
Depression or anxiety/nervous disorder	133	25.9
Other cancers	108	21.0
Heart disease	101	19.6
Lung disease	53	10.3
Diabetes	45	8.8
Stroke	20	3.9
Types of PC treatment (nonexclusive)		
Radical prostatectomy	294	57.2
External beam radiation	169	32.9
Hormone therapy	121	23.5
Brachytherapy	64	12.5
Watchful waiting[a]	37	7.2
Active surveillance[a]	24	4.7
Orchidectomy	9	1.8
Other	34	6.6

Frequencies do not always equal 100% because of missing data or variable responses being nonexclusive.
DVA, Department of Veterans Affairs health insurance; PC, prostate cancer.
[a]Active surveillance refers to initially deferring treatment for low-risk diagnoses while maintaining regular testing (PSA assessments and biopsies). Watchful waiting is generally offered to older men who are advised to delay treatment until symptoms for advanced disease are evident [50].

Resilience. The Connor–Davidson Resilience Scale [31] measured perception of stress coping ability. Participants indicated how they felt in regard to 10 items in the past month on a 5-point Likert scale ranging from 0 (not true at all) to 4 (true nearly all of the time). Items included 'I can achieve goals despite obstacles' and 'I am able to adapt to change'. Higher total scores indicated greater coping ability. The internal consistency of this scale was high ($\alpha = 0.92$).

Stress appraisal. A revised version of a subscale from the Stress Appraisal Measure [32,33] assessed whether the cancer experience was appraised as a challenge. Items were rephrased to refer to 'the situation', and one item was deleted, as it was not relevant to a cancer diagnosis ('I am excited about the potential outcome'). Participants were instructed 'As you rate the following questions, we would like you to consider how you feel when thinking about your prostate cancer' and rated six items on a 5-point Likert scale from 1 (not at all) to 5 (extremely). Higher scores indicated greater optimism and self-efficacious thoughts (e.g. 'I feel I have what it takes to do well in this situation'), and internal consistency was high ($\alpha = 0.85$).

Cancer-related distress. The Impact of Event Scale (IES) assessed cancer-related distress [34]. Respondents rated how distressing the 15 items were in relation to their cancer on a scale from 0 (not at all), 1 (rarely), 3 (sometimes) to 5 (often). Example items included 'I thought about it when I didn't mean to' (intrusion) and 'I tried not to talk about it' (avoidance). Higher scores equated to greater distress, and internal consistencies of the intrusion and avoidance subscales were high ($\alpha = 0.92$ and 0.90, respectively).

Core beliefs. The Core Beliefs Inventory [35] measured the degree to which an individual examined their core beliefs following a stressful event. Nine items were rated on a 6-point Likert scale ranging from 0 (not at all) to 5 (to a very great degree). Higher scores indicated a greater degree of examination of core beliefs as a result of cancer (e.g. 'Because of the event, I seriously examined my beliefs about the meaning of my life'). Internal consistency for the measure was high ($\alpha = 0.92$).

Rumination. Intrusive and deliberate ruminations were measured using the Event Related Rumination Inventory [36], asking participants to rate how often they experienced each of the 20 items on a 4-point Likert scale ranging from 0 (not at all) to 3 (often). Items included 'I could not keep images or thoughts about the event from entering my mind' (intrusive rumination) and 'I forced myself to think about my feeling about my experience' (deliberate rumination). Higher

scores indicated greater levels of rumination. Internal consistency was high for intrusive and deliberate subscales ($\alpha = 0.96$ and 0.90, respectively).

Peer support factors. An adapted version of the Multigroup Ethnic Identity Measure [37] identified level of connection to peers and whether participants sought an understanding of their cancer through peers. The original scale was rephrased to assess identification with 'other men with prostate cancer' (e.g. 'I feel a strong connection to other men with prostate cancer' and 'I have spent time trying to find out more about other men with prostate cancer'). Participants rated six items on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Higher scores reflected a greater level of connection or seeking understanding of cancer through peers, and internal consistency for subscales was acceptable ($\alpha = 0.80$ and 0.76, respectively).

Social constraints. The Social Constraints Scale [38,39] measured the extent to which participants perceived they were unable to disclose thoughts and feelings about their cancer to people close to them. Participants rated how often they experienced each of the 15 items in the past month using a 4-point Likert scale from 1 (never) to 4 (often). Items included 'How often did your partner minimise your problems' and 'How often did your partner tell you not to worry so much about your health'. Participants were instructed to think of close friends or family if they did not have a partner. Greater scores indicated higher social constraints, and high internal consistency was found ($\alpha = 0.93$).

Posttraumatic growth. The Posttraumatic Growth Inventory (PTGI) [40] assessed positive life changes following a traumatic event, including strengthened relationships, appreciation of life, personal strength, new possibilities, and spiritual change. Respondents indicated the degree to which the change had occurred in their life as a result of prostate cancer. Participants rated 21 items on a 6-point Likert scale ranging from 0 (not at all) to 5 (to a very great degree). Items included 'My priorities about what is important in life' and 'Putting effort into my relationships'. Higher scores indicated greater levels of positive life changes. Internal consistencies for the total scale ($\alpha = 0.95$) and subscales ($\alpha = 0.79–0.92$) were acceptable.

Statistical analyses

Analyses were conducted using SPSS (version 21, IBM, Armonk, NY, USA) and AMOS (version 20, IBM, Armonk, NY, USA). Positively skewed (IES, intrusion; IES, avoidance and social constraints; PTGI, spiritual change) and negatively skewed (Multigroup Ethnic

Identity Measure - Revised, understanding; PTGI, appreciation of life) variables were transformed using logarithm-10 transformation. Significance of analyses did not differ prior to and after transformation. Results were reported using untransformed variables to preserve comparability when interpreting the data [41]. Analyses of variance, Pearson's bivariate correlations, and t-tests showed that sociodemographic and cancer-related variables were not associated with, or created differences in, PTG ($p > 0.05$). Thus, sociodemographic and cancer-related variables were not included in the structural equation modelling (SEM).

Structural equation modelling is an invaluable tool allowing for a model of best fit to be judged while assessing multiple causal pathways simultaneously and taking error into account [42]. Positioning of variables and directions of unidirectional paths were placed in accordance with previous studies and the PTG model [2]. Resilience predicted challenge appraisal, distress, examining core beliefs, intrusive rumination, social constraints, peer support, deliberate rumination, and PTG. Challenge appraisal predicted distress, examining core beliefs, intrusive rumination, social constraints, peer support, deliberate rumination, and PTG. Cancer-related distress predicted an examining core beliefs, intrusive rumination, social constraints, peer support, deliberate rumination, and PTG. Examining core beliefs predicted intrusive rumination, social constraints, peer support, deliberate rumination, and PTG. Intrusive rumination predicted social constraints, peer support, deliberate rumination, and PTG. Social constraints predicted deliberate rumination and PTG. Peer support predicted deliberate rumination and PTG. Deliberate rumination predicted PTG.

Resilience, challenge appraisal, examining core beliefs, intrusive rumination, social constraints, and deliberate rumination were entered into the SEM as observed variables. Cancer-related distress, peer support, and PTG were entered into the model as latent variables. Parameters were assessed as significant at $p < 0.05$, and indices assessed model fit as per current guidelines for normed fit index (NFI; >0.90), comparative fit index (CFI; >0.90), and root mean square error of approximation (RMSEA; <0.60), indicating the appropriateness of the model [43]. Indirect effects were assessed through bootstrapping, which generates repeated estimates of the indirect effect [42]. Using this method, multiple mediators can be tested simultaneously, and indirect effects were assessed through 95% bias-corrected confidence intervals.

Results

Descriptive statistics and bivariate correlations can be seen in Table 2, and the total PTGI score was $M = 50.20$ ($SD = 22.99$). Initially, SEM indices of fit suggested that this model could be improved: NFI = 0.94, CFI = 0.96,

RMSEA = 0.07, $\chi^2(59) = 200.04$, $p < 0.001$. Examination of modification indices signified that covariance parameters could be placed between resilience and PTGI personal strength subscale and between peer support and PTGI relating to other subscales. As these relationships were consistent with theoretical considerations, covariance parameters were included in the model. Indices of fit suggested that this model fit the data better than the initial model within suggested cut-offs: NFI = 0.96, CFI = 0.97, RMSEA = 0.06, $\chi^2(59) = 154.28$, $p < 0.001$.

Figure 1 provides an overview of significant parameters only. Nonsignificant parameters that were tested, but not displayed in Figure 1, included resilience, which was not related to examining core beliefs ($\beta = -0.024$, $p = 0.635$), intrusive rumination ($\beta = -0.077$, $p = 0.052$), social constraints ($\beta = -0.070$, $p = 0.126$), and PTG ($\beta = -0.010$, $p = 0.806$). Challenge appraisal was not associated with intrusive rumination ($\beta = 0.075$, $p = 0.062$) and social constraints ($\beta = -0.015$, $p = 0.748$). Distress was not associated with peer support ($\beta = 0.028$, $p = 0.599$) and PTG ($\beta = -0.010$, $p = 0.828$). Examining core beliefs was not related to social constraints ($\beta = 0.042$, $p = 0.432$) and deliberate rumination ($\beta = -0.026$, $p = 0.593$). Intrusive rumination was not related to peer support ($\beta = 0.084$, $p = 0.176$). Social constraints were not associated with deliberate rumination ($\beta = 0.037$, $p = 0.386$) or PTG ($\beta = -0.044$, $p = 0.297$). Deliberate rumination was not related to PTG ($\beta = -0.009$, $p = 0.856$).

Discussion

Participants reported similar levels of PTG to prostate cancer survivors in other studies (e.g. $N = 82$) [25], which tend to be lower than that found with breast cancer survivors (e.g. $N = 51$, $M = 75.68$, $SD = 18.73$, which is significantly higher than the current study at $p < 0.05$) [22]. Results partially support hypotheses as challenge appraisal and examining core beliefs had moderate positive relationships with PTG and intrusive rumination and peer support factors had small positive relationships with PTG. Appraising cancer as a challenge is associated with approach coping strategies such as seeking support from friends, positive interpretation, and acceptance, which are coping strategies commonly associated with PTG [29]. Hence, challenge appraisals may equip cancer survivors with appropriate strategies to cope and perceive PTG as a result of dealing with these challenges [10]. Examining core beliefs and intrusive rumination were associated with PTG, supporting the notion that disrupting fundamental beliefs and realigning core beliefs to accommodate a new reality is associated with growth [35,44]. The relationship between peer support and PTG suggests that the sense of connection and seeking an understanding of the cancer experience through peers creates an environment conducive to growth [17]. Shared experiences and unique understanding through

Table 2. Descriptive statistics and Pearson's bivariate correlations

	Scale range	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Resilience	0–65	29.91 (6.49)														
2. Challenge appraisal	1–5	3.11 (0.92)	0.376***													
3. IES, intrusion	0–5	0.00 (0.63)^a	−0.263***	0.029												
4. IES, avoidance	0–5	0.14 (1.00)^a	−0.235***	0.047	0.911***											
5. Core beliefs	0–5	1.98 (1.25)	−0.007	0.264**	0.244***	0.301***										
6. Deliberate rumination	0–30	13.11 (8.05)	−0.310***	−0.049	0.480***	0.521***	0.405***									
7. Intrusive rumination	0–30	11.95 (7.05)	−0.123*	0.182***	0.435***	0.494***	0.621***	0.635***								
8. Social constraints	1–4	1.20 (0.53)^a	−0.222***	0.006	0.514***	0.507***	0.287***	0.378***	0.373***							
9. Connection to peers	1–5	3.67 (0.74)	0.113*	0.305***	0.147**	0.175***	0.390***	0.252***	0.291***	0.113***						
10. Understanding through peers	1–5	3.67 (1.00)^a	0.173***	0.322***	0.154***	0.191***	0.428***	0.201***	0.325***	0.104*	0.744***					
11. PTGI, new Possibilities	0–25	9.69 (6.43)	0.186***	0.472***	0.083	0.144**	0.573***	0.148**	0.449***	0.111*	0.366***	0.432***				
12. PTGI, Personal Strength	0–20	10.87 (4.75)	0.299***	0.549***	0.041	0.076	0.475***	0.071	0.309***	0.047	0.292***	0.324***	0.686***			
13. PTGI, appreciation of life	0–15	10.00 (5.00)^a	0.074	0.366***	0.179***	0.203***	0.566***	0.321***	0.470***	0.142**	0.336***	0.318***	0.616***	0.670***		
14. PTGI, spiritual Change	0–10	2.00 (6.00)^a	0.058	0.270***	0.124**	0.149**	0.442***	0.080	0.309***	0.146**	0.210***	0.224***	0.470***	0.450***	0.389***	
15. PTGI, relating to others	0–35	19.00 (8.32)	0.128**	0.456***	0.156**	0.188***	0.555***	0.201***	0.384***	0.081	0.433***	0.429***	0.721***	0.713***	0.673***	0.488***

PTGI, Posttraumatic Growth Inventory; IES, Impact of Events Scale.
^{a}Median (interquartile range) reported for skewed variables.
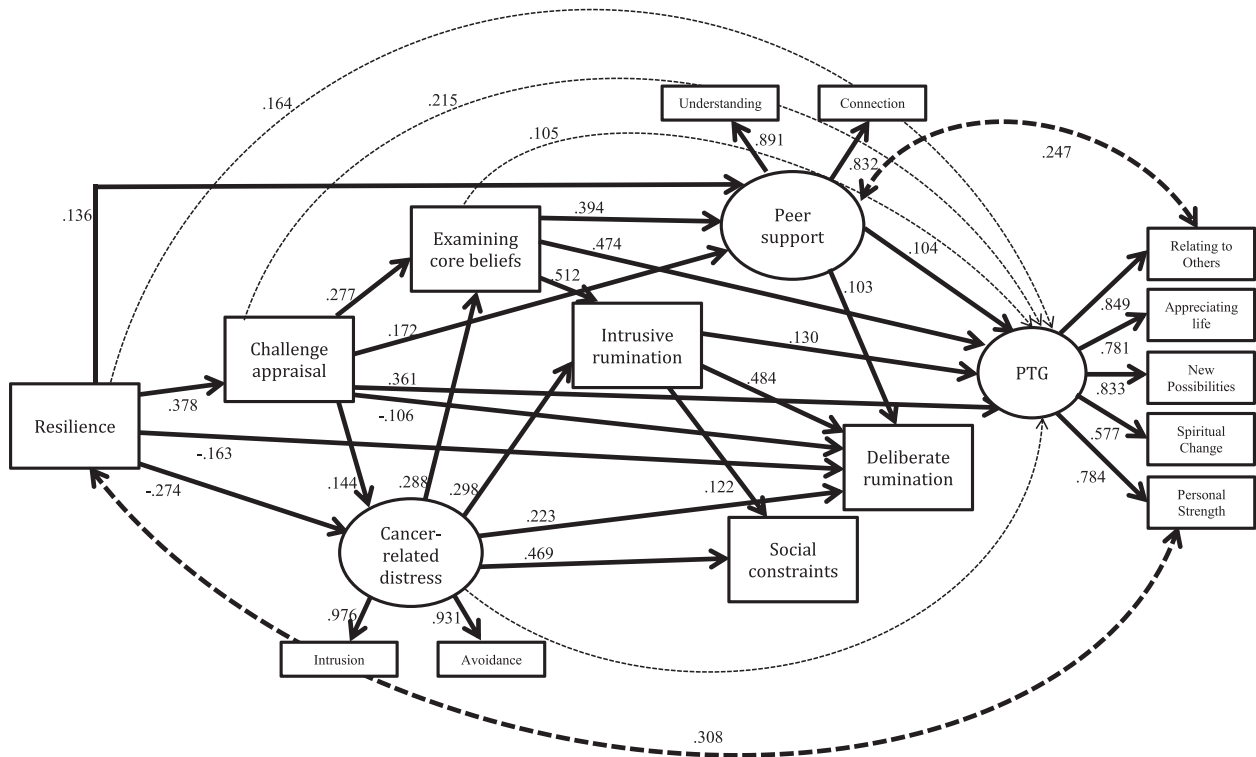*$p < 0.05$,
**$p < 0.01$,
***$p < 0.001$.

Figure 1. Structural equation model with standardised regression weights for path coefficients ($p < 0.05$). Nonsignificant paths were not shown for clarity purposes. Significant indirect relationships with posttraumatic growth are represented by faint curved dotted lines. Covariance parameters are represented by bold curved dotted lines

peers provide the opportunity for PTG-modelled behaviour that can promote growth [45].

Hypotheses were not fully supported in that resilience, distress, social constraints, and deliberate rumination were not directly related to PTG. The lack of direct relationship between these variables and PTG may be due to the length of time since diagnosis (>7 years postdiagnosis). Perhaps current levels of resilience, cancer-related distress, and deliberate rumination about cancer were not as relevant as these factors would be if assessed immediately postdiagnosis. Cancer-related distress and intrusive rumination were related to social constraints; however, contrary to predictions, social constraints within close relationships did not play a significant direct role in perceived PTG. As indicated by the significant relationship between peer support factors and PTG, it may be that for this cohort of participants, peers were more relevant to PTG in this context.

Although direct relationships were not evident from resilience and cancer-related distress to PTG, small indirect effects were found. Small indirect relationships were also evident between challenge appraisal and examining core beliefs with PTG. As seen in Figure 1, multiple potential pathways were evident between these variables and growth. For example, in regard to resilience and PTG, lower resilience was associated with higher distress, which was related to higher intrusive rumination and examining core beliefs, which in turn were both associated

with greater PTG. On the other hand, resilience was associated with connection to peers and seeking information and experiences relating to peers, which was related to higher PTG. Another possible indirect pathway showing moderate coefficients, suggests that resilience was related to greater challenge appraisal, which was then associated with higher levels of PTG.

Limitations, strengths, and implications

Although the current study provides a robust test of the theoretical model of PTG, causation cannot be inferred with the cross-sectional design. The results and direction of relationships between variables have been discussed in accordance with the PTG model. However, alternate interpretations can be considered. For example, peer support factors may predict PTG. Conversely, perhaps the perception of positive life changes enhances the experience that prostate cancer survivors have with their peers. Further studies can assess this model in a longitudinal context to tease out nuances of these variables over time.

Most cancer survivors do not access support outside of family and friends [46,47], and although the men in this sample did not necessarily attend support group meetings, they were affiliated with a peer network. Therefore, this sample of participants may not be representative of all prostate cancer survivors. A further limitation is length of time since

diagnosis, as some measures in the survey required responses regarding time at diagnosis. Therefore, recall biases may have influenced accuracy of survey responses because of the extended length of time since diagnosis. Also, the study used an unsolicited mail survey, and differences may exist between responders and nonresponders, which were unable to be assessed with the current study design.

To date, the PTG literature has been dominated by studies with breast cancer survivors, and the current study provides a valuable investigation with prostate cancer survivors. However, results must be interpreted in light of the sample consisting solely of men, as gender may influence relationships in the model. One such example could be found in the relationship between social constraints and intrusion, with a previous study finding stronger relationships with prostate cancer survivors compared with women with gynaecological cancers [48]. Further studies with a mixed-gender sample of colorectal cancer, for example, would highlight potential gender differences. This study has highlighted the importance of cognitive processes and a supportive network of peers in perceiving positive life changes after prostate cancer. This has implications for factors that can be addressed when providing supportive care after cancer and the promotion of PTG.

Conclusion

Appraising the cancer experience as a challenge, examining core beliefs, higher levels of intrusive rumination, and peer support factors were associated with PTG, highlighting aspects of the postdiagnosis experience that are salient for life transformation or growth to occur. This is synonymous with the notion that a great disruption is required before someone can perceive personal growth [49] and that peer support is a valuable resource for cancer survivors [21,22]. A direct relationship between resilience and PTG was not found with these cancer survivors. However, future research can explore this notion further, particularly looking at possible indirect paths through factors such examining core beliefs and peer support. By expanding upon this knowledge base, we can potentially enhance positive psychological outcomes by tailoring interventions specifically to the postdiagnosis experience.

Conflict of interest

The authors have no financial and personal conflicts of interest to declare.

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