BASIC RESEARCH ARTICLE

Posttraumatic growth in women with breast cancer: emotional regulation mediates satisfaction with basic needs and maladaptive schemas

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ABSTRACT

Background: Despite the negative consequences of breast cancer, many women experience positive changes after diagnosis.

Objective: The aim of this study was to examine the mediating role of emotion regulation between post-traumatic growth (PTG), satisfaction of basic needs and maladaptive schemas.

Method: A total of 210 female patients diagnosed with breast cancer for at least six months were assessed using measures of the PTG Inventory, Basic Psychological Needs Satisfaction Scale, Young Schema Questionnaire–Short Form, and the Emotion Regulation Questionnaire. The collected data was analysed using structural equation modelling by SPSS and Amos 23.0.

Results: Basic needs and maladaptive schema paths to emotion regulation and PTG, and emotion regulation path to PTG were significant. In addition, maladaptive schemas path to emotion regulation was insignificant.

Conclusion: The current results show that focusing on satisfaction of basic needs and using positive emotion regulation strategies positively affect PTG. Additionally, activating maladaptive schemas and using negative emotion regulation strategies have a negative effect on PTG.

Crecimiento postraumático en mujeres con cáncer de mama: La regulación emocional media la satisfacción con las necesidades básicas y los esquemas desadaptativos.

Antecedentes: A pesar de las consecuencias negativas del cáncer de mama, muchas mujeres experimentan cambios positivos después del diagnóstico.

Objetivo: El objetivo de este estudio fue examinar el rol mediador de la regulación emocional entre el crecimiento postraumático (PTG, por sus siglas en ingles), la satisfacción de las necesidades básicas y los esquemas desadaptativos.

Método: Fueron evaluadas un total de 210 pacientes mujeres con un diagnóstico de cáncer de mama de al menos 6 meses empleándose las medidas del Inventario del PTG, la Escala de Satisfacción de Necesidades Psicológicas Básicas, la forma abreviada del Cuestionario de Esquema de Young y el Cuestionario de Regulación Emocional. Los datos recolectados se analizaron usando modelos de ecuaciones estructurales mediante el SPSS y Amos 23.0.

Resultados: Tanto las redes de las necesidades básicas y de los esquemas desadaptativos hacia la regulación emocional y el PTG, como la red de la regulación emocional hacia el PTG fueron significativas. Además, la red de los esquemas desadaptativos hacia la regulación emocional fue insignificante.

Conclusión: Los resultados actuales muestran que focalizarse en la satisfacción de las necesidades básicas y en el uso de estrategias de regulación emocional positivas afecta positivamente al PTG. Adicionalmente, la activación de esquemas desadaptativos y el uso de estrategias de regulación emocional negativas tienen un efecto negativo en el PTG.

乳腺癌女性的创伤后成长:情绪调节中介基本需求满意度和适应不良图式

背景:尽管乳腺癌有负面影响, 许多女性在确诊后会经历积极的变化。

目的:本研究旨在考查情绪调节在创伤后成长 (PTG), 基本需求满意度和适应不良图式之间的中介作用。

方法:使用 PTG 量表, 基本心理需求满意度量表, Young图式问卷简版和情绪调节问卷的测量对总共 210 名诊断有乳腺癌至少 6 个月的女性患者进行评估。收集到的数据使用SPSS和Amos 23.0的结构方程模型分析。

结果:基本需求和适应不良图式到情绪调节和PTG的路径, 以及情绪调节到PTG的路径显著。此外, 适应不良图式到情绪调节的路径不显著。

结论:当前结果表明, 关注基本需求满意度和使用正性情绪调节策略对 PTG 有积极的影响。此外, 激活适应不良图式和使用负性情绪调节策略对 PTG 有负面影响。

HIGHLIGHTS
- The current study's model showed that the emotion regulation played a mediatory role in the relationship between basic needs satisfaction and PTG but not between maladaptive schemas and PTG.

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1. Introduction

Breast cancer, a leading type of cancer in women, ranked the second most common cancer type globally in 2018, with more than two million cases (Clinton, Giovannucci, & Hursting, 2020). After being diagnosed with breast cancer and up to several months after treatment, women are likely to experience diverse psychological symptoms. Some of these symptoms include anxiety, depression, fatigue, somatic limitations, social isolation, cognitive dysfunction, insomnia, and fear of recurrence (Baník & Gajdošová, 2014; Evans, Gorber, Spence, & Will, 2005; Morris, Chambers, Campbell, Dwyer, & Dunn, 2012; Sumalla, Ochoa, & Blanco, 2009). Breast cancer can also be a significant threat to a women's identity, challenging cultural ideals of femininity, sexuality, beauty, and maternal abilities (Cebeci, Yangın, & Tekeli, 2012; Fang, Shu, & Chang, 2013). Women with breast cancer often deal with additional issues as a result of changes in their bodies, family functions, and social and professional roles. These factors along with the cancer experience usually result in a traumatic experience for the individual (Cebeci et al., 2012).

Until mid-1990, oncologists addressing the mental health aspects of breast cancer assumed a traumatic incident like cancer would only hinder the normal flow of life and lead to psychological distress (Scrignaro et al., 2016). In continued research, specialists later found that not only can individuals adapt to cancer, but that this positive adaptation does not necessarily occur in the absence of psychological distress. While a cancer diagnosis is typically a terrible and unexpected life-changing event that challenges core beliefs about the world, the meaning of life, and self-confidence (Stanton & Low, 2012), several studies have shown that cancer survivors are more likely to report positive changes after the experience. This finding has attracted researchers to investigate posttraumatic growth (PTG) (Manne et al., 2004; Sumalla et al., 2009), the experience of positive psychological growth after an encounter with traumatic events (Tedeschi & Calhoun, 1995).

PTG postulates that the process of going through a traumatic event that disrupts an individual's life can lead them towards new helpful beliefs. Similarly, examining and reconciling pre-traumatic beliefs is another mechanism through which a traumatic incident can lead to improved PTG (Antoni et al., 2001; Calhoun & Tedeschi, 1999). PTG consists of three main components: 1) perception of change in self, which includes a sense of personal empowerment and resiliency, 2) a changed feeling in relation to others, such as accepting differing attitudes, increased compassion, and sympathy, 3) and perception of change in life philosophy, which encompasses change in life priorities and values, increased respect for life, and a better understanding of personal spirituality and existential concerns (Calhoun & Tedeschi, 2006). Relevant studies show that breast cancer patients reported higher PTG rates in regards to relationships with others, spirituality, and life appreciation than their counterparts of similar age and education in the control group (Cordova, Cunningham, Carlson, & Andrykowski, 2001). Additionally, research has found that during the process of adapting to cancer, recognizing opportunities for and making choices for positive change can help individuals protect themselves against the harmful effects of cancer (Groarke et al., 2017; Jim & Jacobsen, 2008; Silva, Moreira, & Canavarro, 2012).

Several factors work together to improve PTG, of particular importance is the ability to confront adverse circumstance in life in order to continue satisfying basic needs (Cann et al., 2011; Hammer et al., 2019; Yeung, Lu, Wong, & Huynh, 2016). Self-determination theory also proposes that there is a connection between psychological elements and growth tendencies. As active and goal oriented creatures, it posits that people tend to be driven by a need to grow and gain fulfilment and use an integrated sense of self and their view of themselves in a larger social structure to have an active role in their own growth (Deci & Ryan, 2000). Self-determination theory introduces three universal and intrinsic needs (autonomy, competence, and relatedness) as a path for developing the ideal environment for personal growth. Autonomy allows individuals to feel that their actions are based on their own will and consistent with personal values, as opposed to behaviours derived from force or obligation. Competence reflects the need to feel effective while operating within our environment (Deci & Ryan, 2000). Relatedness is the need for deep and meaningful relationships with close contacts and the need for connection with society as a whole (Deci & Ryan, 2008). According to self-determination theory, the satisfaction of these three needs is essential and when the social environment meets these needs, individuals tend to experience positive personal growth and can thrive. However, when these needs are not fully satisfied, psychological and overall health is endangered (Deci & Ryan, 2000).

Yeung et al. (2016) showed that the use of effective emotional and cognitive coping strategies along with an environment supporting satisfaction of basic needs had a facilitative role in enhancing PTG. When people feel self-autonomous, competent, and related to the social environment during an encounter with a stressor, they are more likely to assess the incident as a challenge they can overcome. However, if basic needs remain unsatisfied, individuals are more likely

to feel out of control, helpless, and alienated (Ntoumanis, Edmunds, & Duda, 2009). Scrignaro, Barni, and Magrin (2011) found that the satisfaction of a cancer patient's basic needs relating to caregivers, correlated with higher degrees of PTG, disease acceptance, and perception of social support accessibility. Similarly, in managing post-cancer stress, self-motivated individuals have better access to adaptive emotional resources to fulfill their objectives and are more inclined to adaptive actions. These valuable personal resources help people choose actions that satisfy their specific needs and preserve what they feel is the most important in life. Such resources also facilitate a move towards opening up about their experience, allowing them to tolerate negative experiences more easily, and reworking them into positive ones (Deci & Ryan, 2000; Skinner & Edge, 2002). Therefore, satisfying these basic needs can not only create a psychological space to process and integrate experiences but also promote post-cancer personal growth.

A more comprehensive theoretical model regarding PTG process is the cognitive, emotional, and social model. This model states that in order to promote PTG, incidents must create a mental divide that pushes the individual to reinvestigate core beliefs about the universe and their position in it (Janoff-Bulman, 2010). Core beliefs are defined as a general set of individual beliefs about the surrounding world, how it works, and their position in it (Calhoun & Tedeschi, 2012). Schemas may provide another helpful framework in considering PTG. Schemas are patterns of thought that organize categories of information and are considered the deepest level of cognition (Young, Klosko, & Weishaar, 2006). Traumatic incidents can create a challenge for individuals, especially when conflicting with core beliefs. The challenge and ensuing upheaval created by trauma leads to the initiation of cognitive processing in the form of repetitive thoughts related to what has happened. This psychological perseverance can lead to identifying positive changes or adaptations to schemas and has a positive relationship with PTG (Hammer et al., 2019; Taku, Cann, Tedeschi, & Calhoun, 2015).

According to the organismic valuing theory, traumatic incidents often lead to maladaptation between core beliefs and new information involving the trauma. This has the effect of forcing new information to be merged with existing approach and creates a new perspective of the world. Consequently, these invasive and often distressing initial experiences and psychological variables come together to produce a constructive process (Joseph & Linley, 2005). An important variable in this process is the use of emotion regulation strategies. Since emotion regulation mediates the relationship between stress and health consequences, it is considered a principal process and therefore an intervention type that minimizes the risk of stress (Taylor & Stanton, 2007). Similarly, PTG is considered a positive outcome of distress management in cancer survivors (Thornton & Perez, 2006; Yu et al., 2014). Larsen and Berenbaum (2015) studied adult women who had experienced traumatic events within the past three years and determined that emotion regulation strategies had a considerable indirect effect on the PTG.

Emotion regulation is a process by which an individual alters the degree, duration, and expression of emotion (Gross & John, 2003). Emotion regulation includes two main strategies, cognitive reappraisal and expressive suppression. Cognitive reappraisal is a form of cognitive change by which individuals alter their focus from the negative aspects of trauma to the positive aspects (Nes & Segerstrom, 2006). Prior studies have reported that using cognitive reappraisal was associated with cancer survivors having lower psychological distress (Li et al., 2015; Nakatani et al., 2014). Cognitive reappraisal can also lead to increases in positive emotion and offers a means for change in patients with low hope. Furthermore, use of this adaptive emotion-regulation strategy can help protect individuals from emotional disorders (Alvarez & Leal, 2010; Larsen & Berenbaum, 2015), diminish the severity of Post-Traumatic Stress Disorder (PTSD) (Boden, Bonn-Miller, Kashdan, Alvarez, & Gross, 2012), and enhance the rate of PTG (Brans, Koval, Verduyn, Lim, & Kuppens, 2013; Orejuela-Dávila, Levens, Sagui-Henson, Tedeschi, & Sheppes, 2019).

The second emotion regulation strategy, expressive suppression, is when an individual chooses to suppresses their emotions and diminish behavioural aspects of their emotional response tendencies (Brans et al., 2013). Cross-sectional and longitudinal expressive suppressions are typically accompanied by psychological distress, anxiety, depression, and restlessness in patients with breast cancer, as well as other types of cancer (Nakatani et al., 2014; Tamagawa et al., 2013). Zhou, Wu, and Zhen (2017) studied the relationship between social support and emotion regulation with PTSD and PTG, and found that social support had an indirect and significant relationship with PTSD through expressive suppression mediation. However, social support was an indirect and insignificant predictor of PTG through expressive suppression mediation.

Due to the high morbidity and mortality rates of breast cancer and its impact on self-concept, breast cancer is regarded as a significant stressor for women worldwide. Approximately 50–83% of women with breast cancer experience psychological distress to some extent (Ramakrishnan & Damodaran, 2018; Scaunasu et al., 2018). Breast cancer is pervasive among Iranian women and encompasses nearly one-fourth of cancers within this group (Jazayeri, Saadat, Ramezani, & Kaviani, 2015). According to recent

studies, the average age for breast cancer has also decreased from age 40 to 30 among Iranian women (Fouladi, Firouzi, Sharghi, & Nayebyazdi, 2011). Previous investigations, mainly conducted by western countries, have examined PTG and considered related psychological concepts, including satisfaction of basic needs, maladaptive schemas and emotion regulation. All were determined to be important factors in well-being and psychological disorders, and emotion regulation was found to be a principal predictor of psychological reactions to severe stressors. This study used these concepts with proven effective PTG development roles to measure associations with perceived PTG rate among Iranian women and investigate these variables within an integrated framework. The authors also aimed to investigate predictor roles of basic needs satisfaction and early maladaptive schemas in PTG development by considering the mediating role of emotion regulation. The hope is that the concurrent examination of the relationships among these emotional and cognitive factors and perceived PTG rate in patients will pave the way for further research into the key factors that help promote psychological improvement in cancer patients

2. Methods

2.1. Procedures

This cross-sectional research study has a covariance-based structural equation modelling (CBSEM) design. Structural equation modelling (SEM) is the extension of the general linear model, which enables the researcher to test a set of regression equations simultaneously (Meyers, Gamst, & Guarino, 2016). SEM was used to evaluate the proposed model along with the utilization of the convenient sampling method. In order to recruit patients, the current study focused on female cancer patients visiting Shahid Motahari Healthcare Center in Shiraz, Iran for check-up sessions from September 2019 to January 2020. The study was approved first by the Ethical Committee of Shiraz University of Medical Sciences (*IR.SUMS.REC.1398.645*) and then evaluated and approved by the Research Center of Dr. Taleie Breast Cancer Clinic in Shahid Motahari Healthcare Center. Once approved, the required data was collected with the help of specialists and staff at the clinic.

2.2. Participants

Data was collected from 230 participants visiting the Dr. Taleie Breast Cancer Clinic. Before collecting data, each participant received an informed consent to complete and the study objectives were explained individually to participants. Participant demographic data was collected after obtaining signed consent forms and research tools were provided to the subjects. The

inclusion criteria were participants diagnosed with breast cancer with at least six months having passed since the last surgery or chemotherapy, the absence of other physical or psychological diseases, literacy, and an age range from 18 to 70 years old.

2.3. Measures

2.3.1. Posttraumatic growth inventory (PTGI)
The Persian version of the 21-item PTGI (Tedeschi & Calhoun, 1996) measures PTG across five domains (*relating to others, new possibilities, personal strength, spiritual change*, and *appreciation of life*), using a 6-point Likert scale. The PTGI was found to have appropriate internal consistency ($\alpha = .90$) and test-retest reliability over a two-month interval (r = 0.71), where scores did not correlate with social desirability and responses tended to be corroborated by others (Shakespeare-Finch & Enders, 2008).

2.3.2. Satisfaction of basic psychological needs
The Persian version of the 21-item Basic Psychological Needs Satisfaction Scale (Gagné, 2003) measures participants perception of satisfied basic psychological needs in daily life, including three subscales: competence, autonomy, and relatedness. Participants were asked to rate items on a 7-point scale. Higher mean scores in the subscales indicate higher levels of need satisfaction. The three subscales were reliable among college students (α for autonomy, competence, and relatedness: 0.68, 0.75, and 0.85, respectively).

2.3.3. Young schema questionnaire – short form (YSQ-SF)
The Persian version of the YSQ-SF consists of 75 items that participants score from 1 to 6. Higher scores reflect more significant maladaptive schemas. Adequate psychometric properties were demonstrated for the YSQ-SF, and alpha coefficients for subscales were reported from 0.71 to 0.93 with a mean of 0.83 (Glaser, Campbell, Calhoun, Bates, & Petrocelli, 2002). In this study, four maladaptive schemas were measured using this questionnaire: Emotional Deprivation, Social Isolation/ Alienation, Vulnerability to Harm or Illness, and Insufficient Self-Control/Self-Discipline.

2.3.4. Emotion regulation questionnaire (ERQ)
The Persian version of the ERQ (Gross & John, 2003) was used to assess emotion regulation. The ERQ measures two emotion regulation strategies: Cognitive reappraisal and suppression, and has high external and internal reliability and convergent and discriminant validity in the United States. Participants rated the 10 items using a 7-point scale. Alpha reliabilities averaged 0.79 for reappraisal and 0.73 for suppression. The test-retest reliability across three months was 0.69 for both scales (Gross & John, 2003).

2.4. Statistical analysis

Descriptive statistics were used to assess the participant demographic characteristics. The Pearson correlation coefficient was used to test the relationship between the main variables. The proposed model was evaluated using the SEM method, where the structural coefficient was evaluated to assess model fitness. For the fitness index of relative chi-square (χ^2/Df or *CMIN/DF*), values lower than five are acceptable, and the closer the value to zero, the higher the model fitness. For indices such as Goodness-of-Fit Index (GFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), and Tucker-Lewis Index (TLI), values close to 0.90 and higher are considered an acceptable fit, indicating the suitability of the model. In addition, values close to 0.05 or lower for the Root Mean Square Error of Approximation (RMSEA) index indicate model fitness, while a value of 0.08 or lower indicates reasonable approximation error. However, values higher than 0.10 indicate rejection of the model. Bootstrapping was applied to investigate mediation effects. All the analyses in the current study were done using SPSS and AMOS Ver. 23.

In this study, collected data was entered into SPSS software and 20 rows with more than 10% empty cells were eliminated from the analysis to resolve the missing data issue. To replace the missing data, rows with fewer than five empty cells were then completed based on the cell data before and after the missing cell in the row. A total of 210 acceptable completed questionnaires were obtained from 230 participants. Based on one-sample Kolmogorov-Smirnov test results presented in Table 1, the data for all four main variables of the study had a normal distribution considering a significance level of *P* > .05. The results indicated that McDonald's omega (ω) was 0.726 representing the research variables internal consistency.

Table 1. The one-sample kolmogorov-smirnov test normality statistic for the distribution of research variables.

Variables	Normality test	
	Z	P
Maladaptive Schemas	1.09	0.187
Basic Needs Satisfaction	0.54	0.934
Emotion Regulation	0.75	0.624
PTG	1.17	0.132

Table 2. Demographic information.

Variables		Frequency	Percentage
Education	Secondary school education	78	37.1
	High school diploma	69	32.9
	Associate degree	18	8.6
	Bachelor's degree	36	17.1
	Master's degree	9	4.3
Age	20–30	14	6.7
	31–40	38	18.1
	41–50	84	40.0
	51–60	45	21.4
	61–70	29	13.8
Marital Status	Single	22	10.5
	Married	175	83.3
	Widowed	5	2.4
	Divorced	8	3.8

3. Results

3.1. Descriptive data and correlation between measures

Descriptive statistics showed that presented in Table 2, the majority of the participants had a high school diploma or lower level of education. The majority of the participants ranged in age from 41 to 50 years (mean age 47.6 ± 10.48 years) and the majority of the participants (83.3%) were married. The results presented in Table 3 indicated that the kurtosis skewness values of the variables were less than 1. Therefore, it can be said that the variables were normally distributed. The correlations between the main measures and the means (± standard deviations) are also presented in Table 3. The results obtained from Pearson's correlation showed significant relationships between all the main variables, except for maladaptive schemas and basic needs satisfaction with emotion regulation ($p < .05$).

3.2. Evaluating the proposed model using SEM

Table 4 represents the fitness of structural equations of the initial model based on fitness indices used in this study, indicating the need for improving the proposed model. In the next step, the covariance path between maladaptive schemas and satisfying basic needs, and the regression path between satisfying basic needs and suppression were added to the model based on modification indices (MI) in the output obtained from AMOS 23. The model was then improved by applying these modifications, and the fitness indices for the final model are satisfactory. The value of *CMIN/DF* is 2.116,

Table 3. Means, standard deviations, correlations, skewness and kurtosis between basic needs satisfaction, maladaptive schemas, emotion regulation, and PTG.

	M± SD	1	2	3	4	Skewness	Kurtosis
1. Maladaptive schemas	42.12 ± 13.29	1				.757	.346
2. Basic Needs Satisfaction	107.38 ± 14.72	−.564**	1			−.014	−.133
3. Emotion regulation	44.98 ± 9.35	.103	−.026	1		−.269	.452
4. PTG	77.21 ± 17.33	−.194**	.516**	.244**	1	−.388	−.363

**$p < 0.01$.

Table 4. Fitness indices for the designed models and the final model.

	X^2	Df	X^2/Df	NPAR	GFI	IFI	TLI	CFI	RMSEA	RMSEA 90% CI Low	RMSEA 90% CI High
Initial model	276.298	73	3.785	32	0.841	0.833	0.788	0.83	0.115	–	–
Modified model	150.206	71	2.116	34	0.90	0.935	0.915	0.934	0.073	.057	.089
Independence Model	1287.256	91	14.146	14	0.412	0.001	0.001	0.001	0.142	.239	.263

NPAR: Number of Parameters, GFI: Goodness-of-Fit Index, IFI: Incremental Fit Index, TLI: Tucker-Lewis Index, CFI: Comparative Fit Index, RMSEA: Root Mean Square Error of Approximation.
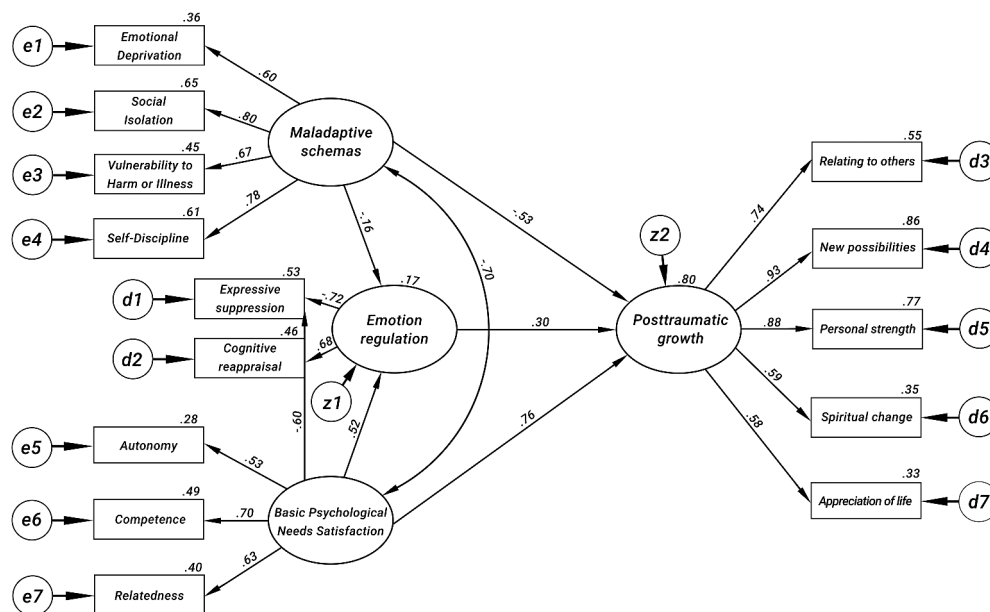
Figure 1. The designed model for predicting posttraumatic growth based on basic needs satisfaction and maladaptive schemas with the mediatory role of emotion regulation in the current study.

Table 5. The structural model of the paths and their standard coefficients in the final model.

Path			Standardized ß	R^2	Unstandardized ß	Std. Error	CR	p
Maladaptive schemas	→	PTG	−0.53	0.27	−0.890	0.273	−3.26	0.001
Basic needs	→	PTG	0.76	0.58	1.23	0.261	4.72	0.001
Maladaptive schemas	→	Emotion Regulation	−0.16	0.026	−0.242	0.232	−1.04	0.297
Basic needs	→	Emotion Regulation	0.52	0.27	0.558	0.201	2.77	0.001
Emotion regulation	→	PTG	0.30	0.09	0.342	0.114	2.99	0.003
**Maladaptive schemas		Basic Needs	−0.70	-	−7.02	1.45	−4.84	0.001
**Basic needs	→	Suppression	−0.60	0.36	−0.904	0.16	−5.65	0.001

**Paths added to initial model.

indicating (Figure 1), that the model is acceptable. Moreover, all the values of RMSEA (0.073) with 90% confidence interval between .057 and .089, TLI (0.915), CFI (0.934), GFI (0.90), and IFI (0.935) are acceptable. Based on the fitness indices for the final (the designed) model, it can be argued that the model proposed in this study is acceptable. Table 5 illustrates the coefficients for the direct paths between the final model variables and their significance levels.

3.3. Analysis of the direct and indirect effects

The results obtained from testing the model revealed regression coefficients of −0.53 ($p \leq 0.05$) between maladaptive schemas and PTG equals, 0.76 ($p \leq 0.05$) between basic needs satisfaction and PTG, 0.52

($p \leq 0.05$) between basic needs satisfaction and emotion regulation, and 0.30 ($p \leq 0.05$) between emotion regulation and PTG. The paths added to the initial model show that the covariance coefficient between maladaptive schemas and basic needs satisfaction is -0.70 ($p \leq 0.05$). Therefore, there is a significant negative relationship between maladaptive schemas and satisfying basic needs. The regression coefficient between satisfying basic needs and expressive suppression is −0.60 ($p \leq 0.05$) which shows expressive suppression has a negative and significant impact on basic needs satisfaction. Based on the overall results, maladaptive schemas and basic needs satisfaction explain 80% of the variance in PTG through the mediatory role of emotion regulation, indicating the significant impact of these three variables on PTG.

Table 6. Coefficients of the indirect paths in the final model.

Path					Unstandardized estimate	Lower limit	Upper limit	Standardized estimate	*P*
Maladaptive schemas	→	Emotion Regulation	→	PTG	0.157	0.097	0.211	0.093	0.174
Basic Needs	→	Emotion Regulation	→	PTG	0.271	0.135	0.398	0.231	0.001

The mediatory role of emotion regulation in the relationship between maladaptive schemas, basic needs satisfaction, and PTG was evaluated using the Bootstrap command in the AMOS software application. Data analysis showed that presented in Table 6, the significance level of the indirect relationship between maladaptive schemas and PTG through emotion regulation was higher than 0.05 (β = 0.093, p < .05). Therefore, emotion regulation did not play a mediatory role in the relationship between maladaptive schemas and PTG. The significance level of the indirect relationship between basic needs satisfaction and PTG through emotion regulation was lower than 0.05 (β = 0.231, p < .05). Consequently, emotion regulation played a mediatory role in the relationship between satisfying basic needs and PTG. The value of β equals 0.231, meaning that 23.1% of the relationship between satisfying basic needs and PTG is explained through emotion regulation.

4. Discussion and conclusion

This study aimed to predict PTG based on basic needs and maladaptive schemas with emotion regulation mediation in patients diagnosed with breast cancer. The resulting data shows that basic needs satisfaction had a direct and positive relationship with PTG. This finding is in line with other similar studies that have shown a positive relationship between basic needs satisfaction and PTG (Hammer et al., 2019; Scrignaro et al., 2011; Yeung et al., 2016). Since the human being is a goal-oriented and active creature, always seeking to integrate identity, when this integration is threatened by cancer, it is necessary to contemplate the meaning of this incident and find a way to reintegrate identity. Satisfaction of basic psychological needs most likely facilitates patient movement towards integration and growth. Patients whose need for autonomy, competence, and relatedness are adequately met, will most likely do better when encountering difficulties. Feeling self-autonomous against cancer can help patients see the situation as an opportunity for change and create a more manageable situation through positive changes connected to confidence in being able to confront problems and control events in their life. Satisfaction that comes from meeting the need for relatedness helps individuals feel that they have enough support from the people around them to fight and confront the problem, as well as knowing that they count on others in times of need and that they are not alone in this journey. Satisfaction that comes from meeting the need for competence also helps individuals confront problems and challenges. Conversely, if the basic psychological needs are not met, individuals are more likely to feel distressed, lack control, and feel alienated. The regression analysis results also indicated that autonomy has a lower prediction power than the other two needs.

Another finding of the current study is the positive and significant relationship between emotion regulation and PTG, which is in line with that of Boden et al. (2012). Confirming that those who use the emotional regulation strategy of cognitive reappraisal to assess the situation in a more positive manner are also more likely to search for opportunities existing amid their stressful situation and look for greater meaning in the incident (Groarke et al., 2017; Jim & Jacobsen, 2008). Similarly, such people are more likely to reassess their priorities and participate in activities with more significance. Instead of considering the stressful incident as an irreversible challenge, they will likely assess it as a challenge with opportunities to grow (Orejuela-Dávila et al., 2019). The use of cognitive reappraisal leads individuals to face negative emotions instead of suppressing them. As a result, they are better able to manage their distress and experience more positive emotions (Silva et al., 2012). Expressing emotions and refraining from suppressing them allows individuals to concentrate on emotions and typically increases understanding of their nature and purpose. Additionally, accepting and understanding the function of the emotions and extracting meaning from them can help individuals move towards experiencing them more consciously. This allows for changes in emotions and in understanding experiences and the meaning of a situation. As a result, emotions are not repressed and accumulated and do not result in problems such as depression (Gross & John, 2003).

This study also found there was a direct and negative relation between maladaptive schemas and PTG. Individuals with high emotional deprivation scores, social isolation, disease vulnerability, and inadequate self-control or maladaptive schemas are less likely to use cognitive processes and are more affected by emotions. Since these schemas are maladaptive, they typically create maladaptive behaviours in people. With the activation of initial maladaptive schemas, these individuals often feel that there is nobody among their close contacts to support them emotionally and understand

them, thus they do not expect others to empathize with them (Young et al., 2006). Furthermore, they may also feel that nobody cares about their problems and subsequently are more likely to become distant from society and receive less social support. In their mind they are waiting for an impending disaster and think there is no remedy for their disease. These individuals typically tire quickly in their efforts and do not have the patience to persist in activities and connections (Young et al., 2006). Consequently, they are less likely to participate in meaningful or enriching activities nor do they communicate with others, which leads to feeling powerless in changing their condition.

Satisfaction of basic psychological needs was found to have an indirect relationship with PTG through emotion regulation. Individuals who felt capable and empowered, often with support from others, to confront the incident were less likely to be affected by negative emotions. They were also less likely to be affected by the negative aspects of their disease and more likely to search for opportunities to change their life over time. These patients tend to seek social support more often and are less isolated. Patients suffering from breast cancer, who make use of cognitive reappraisal, are also less likely to be impacted by negative emotions. They tend to think about the meaning of changes caused by the disease and look for opportunities that may be latent in these changes. By re-evaluating their situation, these patients try their best to deal with limitations, evaluate their priorities, consider their disease as a sign of changing priorities, and assign more value and importance to spiritual and other meaningful issues. They are also more likely to move towards managing emotions and eliciting support from their companions by expressing emotions and refraining from suppressing them.

The current study results showed that basic needs satisfaction and the emotion regulation positively affect PTG. Showing that the more a patient is satisfied in terms of basic psychological needs, and the more they use reappraisal, that they are more likely to have personal, spiritual, and interpersonal growth. Additionally, it was revealed that maladaptive schemas had a reverse relationship with PTG, the higher the score of an individual in maladaptive schemas, the lower the growth experienced by the individual. The results also showed that emotion regulation played a mediatory role in the relationship between basic needs satisfaction and PTG, but not between maladaptive schemas and PTG. However, while emotion regulation results in reducing negative effects of maladaptive schemas, it cannot neutralize the negative impact of maladaptive schemas on its own.

5. Strength, limitations and future directions

This model has a solid history and was first investigated in the theoretical literature on PTG. It also has practical applications for treatment and applying strategies to promote positive growth and increase resiliency among cancer patients. Emotion regulation strategies are easily taught and can be employed as a mediator to improve the effect of maladaptive schemas and reinforce basic needs satisfaction.

This research for this study was cross-sectional with a statistical population that only included patients diagnosed with breast cancer. All the data was collected from a clinic in an Iranian city and one should be careful with establishing causal relations among the variables or generalizations of other patient populations or societies. In addition, since the research subjects were all female, the comparison to male subjects must be considered to avoid faulty generalizations. Similarly, cognitive processes and emotion management strategies may undergo change over time and results should be cautiously generalized to other temporal periods.

It would be beneficial to investigate other factors affecting PTG in patients with breast cancer and consider the impact of these and other potential variables on PTG in patients with other types of cancer or experiencing other types of trauma. Understanding the severity of a disease is an important factor that can influence trauma experienced and subsequent growth. Investigation of this aspect could also be helpful in future studies. Similarly, longitudinal studies would be beneficial in understanding the interaction between these factors and their effects on development over time. And finally, qualitative designs could be employed to explore and discover other influential factors on PTG.

The purpose of this study was to explore the role of maladaptive schemas and satisfaction of basic needs in predicting PTG, as well as the contribution of emotion regulation to the relationship of these variables and PTG. Social workers and psychologists are encouraged to consider the role of these factors when developing therapeutic plans and daily clinical interventions to work with breast cancer patients. Helpful interventions might include targeting maladaptive schemas, informing patients about the impact of basic needs satisfaction on different aspects of their life, and training them in adaptive emotion regulation skills.

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References

Alvarez, I., & Leal, I. (2010). Cognitive emotion regulation predicting posttraumatic stress and posttraumatic growth in breast cancer survivors. *Psychology & Health*, 25, 142.

Antoni, M. H., Lehman, J. M., Kilbourn, K. M., Boyers, A. E., Culver, J. L., Alferi, S. M., ... Carver, C. S. (2001). Cognitive-behavioral stress management intervention decreases the prevalence of depression and enhances benefit finding among women under treatment for early-stage breast cancer. *Health Psychology*, 20(1), 20–32. doi:10.1037/0278-6133.20.1.20

Baník, G., & Gajdošová, B. (2014). Positive changes following cancer: Posttraumatic growth in the context of other factors in patients with cancer. *Supportive Care in Cancer*, 22(8), 2023–2029. doi:10.1007/s00520-014-2217-0

Boden, M. T., Bonn-Miller, M. O., Kashdan, T. B., Alvarez, J., & Gross, J. J. (2012). The interactive effects of emotional clarity and cognitive reappraisal in posttraumatic stress disorder. *Journal of Anxiety Disorders*, 26(1), 233–238. doi:10.1016/j.janxdis.2011.11.007

Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The regulation of negative and positive affect in daily life. *Emotion*, 13(5), 926–939. doi:10.1037/a0032400

Calhoun, L. G., & Tedeschi, R. G. (1999). *Facilitating posttraumatic growth: A clinician's guide*. New York: Routledge.

Calhoun, L. G., & Tedeschi, R. G. (2006). The foundations of posttraumatic growth: An expanded framework. In L. G. Calhoun & R. G. Tedeschi (Eds.), *Handbook of posttraumatic growth: Research and practice* (pp. 3–23). Lawrence Erlbaum Associates Publishers.

Calhoun, L. G., & Tedeschi, R. G. (2012). *Posttraumatic growth in clinical practice*. New York: Routledge.

Cann, A., Calhoun, L. G., Tedeschi, R. G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C. M. (2011). Assessing posttraumatic cognitive processes: The event related rumination inventory. *Anxiety, Stress, and Coping*, 24(2), 137–156. doi:10.1080/10615806.2010.529901

Cebeci, F., Yangın, H. B., & Tekeli, A. (2012). Life experiences of women with breast cancer in south western Turkey: A qualitative study. *European Journal of Oncology Nursing*, 16(4), 406–412. doi:10.1016/j.ejon.2011.09.003

Clinton, S. K., Giovannucci, E. L., & Hursting, S. D. (2020). The world cancer research fund/American Institute for cancer research third expert report on diet, nutrition, physical activity, and cancer: Impact and future directions. *The Journal of Nutrition*, 150(4), 663–671. doi:10.1093/jn/nxz268

Cordova, M. J., Cunningham, L. L. C., Carlson, C. R., & Andrykowski, M. A. (2001). Posttraumatic growth following breast cancer: A controlled comparison study. *Health Psychology*, 20(3), 176. doi:10.1037/0278-6133.20.3.176

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. doi:10.1207/S15327965PLI1104_01

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, 49 (3), 182–185. doi:10.1037/a0012801

Evans, W. K., Gorber, S. K. C., Spence, S. T., & Will, B. P. (2005). Pour le programme Impact sur la santé de la population (ISP) des maladies au Canada. *Descriptions des états de santé au Canada: cancers. Statistique Canada no 82-619MIF2005001 au catalogue*. Ottawa: Statistique Canada.

Fang, S.-Y., Shu, B.-C., & Chang, Y.-J. (2013). The effect of breast reconstruction surgery on body image among women after mastectomy: A meta-analysis. *Breast Cancer Research and Treatment*, 137(1), 13–21. doi:10.1007/s10549-012-2349-1

Fouladi, N., Firouzi, A., Sharghi, A., & Nayebyazdi, N. (2011). Five year survival of women with breast cancer in Ardabil, north-west of Iran. *Asian Pacific Journal of Cancer Prevention: APJCP*, 12(7), 1799–1801. http://journal.waocp.org/article_25789.html

Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion*, 27(3), 199–223. doi:10.1023/A:1025007614869

Glaser, B. A., Campbell, L. F., Calhoun, G. B., Bates, J. M., & Petrocelli, J. V. (2002). The early maladaptive schema questionnaire-short form: A construct validity study. *Measurement and Evaluation in Counseling and Development*, 35(1), 2–13. doi:10.1080/07481756.2002.12069043

Groarke, A., Curtis, R., Groarke, J. M., Hogan, M. J., Gibbons, A., & Kerin, M. (2017). Post-traumatic growth in breast cancer: How and when do distress and stress contribute? *Psycho-oncology*, 26(7), 967–974. doi:10.1002/pon.4243

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85(2), 348. https://psycnet.apa.org/doi/10.1037/0022-3514.85.2.348

Hammer, C., Podlog, L., Wadey, R., Galli, N., Forber-Pratt, A. J., & Newton, M. (2019). From core belief challenge to posttraumatic growth in para sport athletes: Moderated mediation by needs satisfaction and deliberate rumination. *Disability and Rehabilitation*, 41(20), 2403–2411. doi:10.1080/09638288.2018.1466203

Janoff-Bulman, R. (2010). *Shattered assumptions*. New York, NY: Simon and Schuster.

Jazayeri, S. B., Saadat, S., Ramezani, R., & Kaviani, A. (2015). Incidence of primary breast cancer in Iran: Ten-year national cancer registry data report. *Cancer Epidemiology*, 39(4), 519–527. doi:10.1016/j.canep.2015.04.016

Jim, H. S. L., & Jacobsen, P. B. (2008). Posttraumatic stress and posttraumatic growth in cancer survivorship: A review. *The Cancer Journal*, 14(6), 414–419. doi:10.1097/PPO.0b013e31818d8963

Joseph, S., & Linley, P. A. (2005). Positive adjustment to threatening events: An organismic valuing theory of growth through adversity. *Review of General Psychology*, *9*(3), 262–280. doi:10.1037/1089-2680.9.3.262

Larsen, S. E., & Berenbaum, H. (2015). Are specific emotion regulation strategies differentially associated with post-traumatic growth versus stress? *Journal of Aggression, Maltreatment & Trauma*, *24*(7), 794–808. doi:10.1080/10926771.2015.1062451

Li, L., Yang, Y., He, J., Yi, J., Wang, Y., Zhang, J., & Zhu, X. (2015). Emotional suppression and depressive symptoms in women newly diagnosed with early breast cancer. *BMC Women's Health*, *15*(1), 91. doi:10.1186/s12905-015-0254-6

Manne, S., Ostroff, J., Winkel, G., Goldstein, L., Fox, K., & Grana, G. (2004). Posttraumatic growth after breast cancer: Patient, partner, and couple perspectives. *Psychosomatic Medicine*, *66*(3), 442–454. doi:10.1097/01.psy.0000127689.38525.7d

Meyers, L. S., Gamst, G., & Guarino, A. J. (2016). *Applied multivariate research: Design and interpretation*. Thousand Oaks, CA: Sage publications.

Morris, B. A., Chambers, S. K., Campbell, M., Dwyer, M., & Dunn, J. (2012). Motorcycles and breast cancer: The influence of peer support and challenge on distress and posttraumatic growth. *Supportive Care in Cancer*, *20*(8), 1849–1858. doi:10.1007/s00520-011-1287-5

Nakatani, Y., Iwamitsu, Y., Kuranami, M., Okazaki, S., Shikanai, H., Yamamoto, K., . . . Miyaoka, H. (2014). The relationship between emotional suppression and psychological distress in breast cancer patients after surgery. *Japanese Journal of Clinical Oncology*, *44*(9), 818–825. doi:10.1093/jjco/hyu089

Nes, L. S., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and Social Psychology Review*, *10*(3), 235–251. doi:10.1207/s15327957pspr1003_3

Ntoumanis, N., Edmunds, J., & Duda, J. L. (2009). Understanding the coping process from a self-determination theory perspective. *British Journal of Health Psychology*, *14*(2), 249–260. doi:10.1348/135910708X349352

Orejuela-Dávila, A. I., Levens, S. M., Sagui-Henson, S. J., Tedeschi, R. G., & Sheppes, G. (2019). The relation between emotion regulation choice and posttraumatic growth. *Cognition & Emotion*, *33*(8), 1709–1717. doi:10.1080/02699931.2019.1592117

Ramakrishnan, K., & Damodaran, S. (2018). Psychosocial morbidity in patients undergoing mastectomy for breast cancer. . *Journal of Evidence Based Medicine and Healthcare*, *5*(7), 609–614. doi:10.18410/jebmh/2018/125

Scaunasu, R. V., Voiculescu, Ş., Popescu, B., Popa, R., Bălălău, D., Răducu, L., . . . Jecan, C. R. (2018). Depression and breast cancer; postoperative short-term implications. *Journal of Mind and Medical Sciences*, *5*(1), 82–84. doi:10.22543/7674.51.P8284

Scrignaro, M., Barni, S., & Magrin, M. E. (2011). The combined contribution of social support and coping strategies in predicting post-traumatic growth: A longitudinal study on cancer patients. *Psycho-Oncology*, *20*(8), 823–831. doi:10.1002/pon.1782

Scrignaro, M., Sani, F., Wakefield, J. R. H., Bianchi, E., Magrin, M. E., & Gangeri, L. (2016). Post-traumatic growth enhances social identification in liver transplant patients: A longitudinal study. *Journal of Psychosomatic Research*, *88*, 28–32. doi:10.1016/j.jpsychores.2016.07.004

Shakespeare-Finch, J., & Enders, T. (2008). Corroborating evidence of posttraumatic growth. *Journal of Traumatic Stress*, *21*(4), 421–424. doi:10.1002/jts.20347

Silva, S. M., Moreira, H. C., & Canavarro, M. C. (2012). Examining the links between perceived impact of breast cancer and psychosocial adjustment: The buffering role of posttraumatic growth. *Psycho-Oncology*, *21*(4), 409–418. doi:10.1002/pon.1913

Skinner, E., & Edge, K. (2002). Self-determination, coping, and development. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 297–337). University of Rochester Press.

Stanton, A. L., & Low, C. A. (2012). Dispositional and stressor-related emotion regulation in the context of a chronic, life-limiting stressor. *Journal of Personality*, *80*(2), 287–311. doi:10.1111/j.1467-6494.2011.00732.x

Sumalla, E. C., Ochoa, C., & Blanco, I. (2009). Posttraumatic growth in cancer: Reality or illusion? *Clinical Psychology Review*, *29*(1), 24–33. doi:10.1016/j.cpr.2008.09.006

Taku, K., Cann, A., Tedeschi, R. G., & Calhoun, L. G. (2015). Core beliefs shaken by an earthquake correlate with posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(6), 563–569. doi:10.1037/tra0000054

Tamagawa, R., Giese-Davis, J., Speca, M., Doll, R., Stephen, J., & Carlson, L. E. (2013). Trait mindfulness, repression, suppression, and self-reported mood and stress symptoms among women with breast cancer. *Journal of Clinical Psychology*, *69*(3), 264–277. doi:10.1002/jclp.21939

Taylor, S. E., & Stanton, A. L. (2007). Coping resources, coping processes, and mental health. *Annual Review of Clinical Psychology*, *3*(1), 377–401. doi:10.1146/annurev.clinpsy.3.022806.091520

Tedeschi, R. G., & Calhoun, L. G. (1995). *Trauma & transformation: Growing in the aftermath of suffering*. Sage Publications, Inc. doi:10.4135/9781483326931

Tedeschi, R. G., & Calhoun, L. G. (1996). The posttraumatic growth inventory: Measuring the positive legacy of trauma. *Journal of Traumatic Stress*, *9*(3), 455–471. doi:10.1007/BF02103658

Thornton, A. A., & Perez, M. A. (2006). Posttraumatic growth in prostate cancer survivors and their partners. *Psycho-Oncology*, *15*(4), 285–296. doi:10.1002/pon.953

Yeung, N. C. Y., Lu, Q., Wong, C. C. Y., & Huynh, H. C. (2016). The roles of needs satisfaction, cognitive appraisals, and coping strategies in promoting posttraumatic growth: A stress and coping perspective. *Psychological Trauma: Theory, Research, Practice, and Policy*, *8*(3), 284–292. doi:10.1037/tra0000091

Young, J. E., Klosko, J. S., & Weishaar, M. E. (2006). *Schema therapy: A practitioner's guide*. New York: Guilford Press.

Yu, Y., Peng, L., Tang, T., Chen, L., Li, M., & Wang, T. (2014). Effects of emotion regulation and general self-efficacy on posttraumatic growth in Chinese cancer survivors: Assessing the mediating effect of positive affect. *Psycho-Oncology*, *23*(4), 473–478. doi:10.1002/pon.3434

Zhou, X., Wu, X., & Zhen, R. (2017). Understanding the relationship between social support and posttraumatic stress disorder/posttraumatic growth among adolescents after Ya'an earthquake: The role of emotion regulation. *Psychological Trauma: Theory, Research, Practice, and Policy*, *9*(2), 214–221. doi:10.1037/tra0000213