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A Structural Model of Posttraumatic Growth Based on Cognitive Appraisal with the Mediating Role of Intrusive and Deliberate Rumination in Cancer Patients

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ABSTRACT

Objective: This study aimed to develop a structural model of posttraumatic growth based on cognitive appraisal, with intrusive and deliberate rumination as mediating variables among cancer patients.

Methods and Materials: This descriptive-correlational study was conducted using structural equation modeling. The sample consisted of 202 cancer patients referred to hospitals in Arak, Iran, in 2025, who were selected through convenience sampling. Data were collected using the Posttraumatic Growth Inventory, Cognitive Appraisal Scale, and Event-Related Rumination Inventory. Data were analyzed using descriptive statistics, Pearson correlation coefficients, and structural equation modeling in R software. Model fit was evaluated using standard fit indices.

Findings: The proposed structural model demonstrated acceptable fit: $\chi^2/df = 1.257$, RMSEA = .036, CFI = .984, NFI = .930, TLI = .978, IFI = .985, GFI = .943, and AGFI = .902. Threat appraisal negatively predicted posttraumatic growth (β = −.22, p = .01), whereas challenge appraisal (β = .12, p = .03) and resource appraisal (β = .18, p = .01) positively predicted posttraumatic growth. Intrusive and deliberate rumination significantly mediated the relationships between cognitive appraisal components and posttraumatic growth. Threat appraisal showed negative indirect effects through intrusive rumination (β = −.11, p = .01) and deliberate rumination (β = −.04, p = .04), while challenge and resource appraisals showed positive indirect effects through both rumination pathways.

Conclusion: Cognitive appraisal contributes to posttraumatic growth in cancer patients both directly and indirectly through rumination processes. Interventions targeting maladaptive threat appraisal and promoting adaptive meaning-making may facilitate psychological growth.

Keywords: Posttraumatic Growth, Cognitive Appraisal, Intrusive Rumination, Deliberate Rumination, Cancer Patients.

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Introduction

Cancer is one of the most challenging chronic and life-threatening diseases and is often experienced not only as a medical condition but also as a major psychological crisis. A cancer diagnosis can disrupt the continuity of life, threaten assumptions about health and safety, and confront patients with uncertainty, fear of recurrence, treatment-related burden, changes in body image, interpersonal difficulties, and concerns about mortality. For many patients, cancer functions as a potentially traumatic event because it challenges core beliefs about the self, the world, and the future (Gregurek et al., 2010). Although the psychological consequences of cancer may include anxiety, depression, distress, and posttraumatic stress symptoms, research has also shown that some patients report positive psychological changes following their struggle with the disease. These positive changes are commonly conceptualized as posttraumatic growth (Tedeschi & Calhoun, 2004). The present study examined a structural model of posttraumatic growth based on cognitive appraisal with the mediating role of intrusive and deliberate rumination in cancer patients (Stanton & Bower, 2015).

Posttraumatic growth refers to positive psychological changes that occur as a result of struggling with highly challenging life circumstances. This construct does not imply that trauma itself is beneficial or that distress is absent; rather, it emphasizes that individuals may develop new perspectives, priorities, strengths, relationships, and existential meanings while attempting to adapt to traumatic experiences. Tedeschi & Calhoun (2004) proposed that posttraumatic growth may appear in several domains, including greater appreciation of life, improved relationships with others, recognition of new possibilities, increased personal strength, and spiritual or existential development. In cancer patients, posttraumatic growth may involve a deeper appreciation of life, redefinition of personal goals, greater closeness with significant others, increased sense of inner strength, and more meaningful engagement with life after diagnosis.

Cancer provides a clinically important context for studying posttraumatic growth because it involves a continuing and internal threat rather than a single external traumatic event. Unlike many acute traumas, cancer-related stress may extend across diagnosis, treatment, remission, follow-up, and fear of recurrence. The patient may repeatedly encounter uncertainty and bodily reminders of illness, which can reactivate distress and cognitive processing. Therefore, posttraumatic growth in cancer patients should be understood as a dynamic process that develops through ongoing attempts to interpret the illness, regulate distress, reconstruct meaning, and integrate the cancer experience into the individual's life narrative. In this process, cognitive appraisal plays a central role.

Cognitive appraisal refers to the way individuals interpret and evaluate a stressful or traumatic event. According to cognitive theories of stress, the impact of an event depends not only on the objective characteristics of the situation but also on the meaning assigned to it by the individual. A cancer diagnosis may be appraised as a threat, a loss, a challenge, or an event that requires mobilization of personal and interpersonal resources. When the disease is appraised primarily as a severe and uncontrollable threat, patients may experience higher distress, helplessness, and intrusive thoughts. In contrast, when the illness is appraised as a challenge that can be faced, understood, and managed, patients may become more likely to engage in adaptive coping and meaning-making processes (Lazarus & Folkman, 1984).

In the context of cancer, cognitive appraisal may shape the direction and quality of psychological adaptation. Threat appraisal may intensify fear, uncertainty, and negative expectations, whereas challenge appraisal may support active coping, psychological flexibility, and meaning reconstruction. Resource appraisal is also important because patients' perceptions of their ability to cope with illness-related demands may influence their emotional and cognitive responses. Patients who perceive greater internal or external resources may be better able to tolerate distress, engage in reflective processing, and reorganize their life assumptions. Therefore, cognitive appraisal can be considered a key predictor of posttraumatic growth in cancer patients because it determines how the illness is interpreted and how the patient engages with its psychological consequences.

The theoretical model of posttraumatic growth emphasizes that traumatic experiences can disrupt the individual's assumptive world and activate cognitive processing. When a traumatic event challenges previously held beliefs, the person may initially

experience intrusive, automatic, and unwanted thoughts about the event. These thoughts are commonly referred to as intrusive rumination. Intrusive rumination is usually repetitive, involuntary, and distressing. It often focuses on negative aspects of the trauma, unanswered questions, fear, uncertainty, and attempts to understand why the event occurred. In cancer patients, intrusive rumination may involve repeated thoughts about diagnosis, treatment outcomes, mortality, recurrence, bodily changes, and the consequences of illness for family and future life (Ogińska-Bulik & Kobylarczyk, 2019).

Although intrusive rumination is often associated with distress, it may also signal that the traumatic experience has not yet been cognitively integrated. According to models of posttraumatic growth, intrusive rumination may represent the early stage of cognitive processing following trauma. At this stage, the individual is repeatedly confronted with the discrepancy between previous assumptions and the new reality created by the disease. However, intrusive rumination alone is usually not sufficient for growth because it tends to be uncontrolled and negatively focused. For growth to occur, the cognitive process often needs to shift from intrusive rumination to deliberate rumination.

Deliberate rumination refers to purposeful, reflective, and meaning-oriented thinking about the traumatic event and its implications. Unlike intrusive rumination, deliberate rumination involves intentional efforts to understand the experience, reinterpret its meaning, identify possible lessons, and reconstruct personal beliefs and goals. In cancer patients, deliberate rumination may include questions such as what the illness means for one's life, which priorities should change, how relationships can be strengthened, what personal strengths have emerged, and how one can live more meaningfully despite uncertainty. This reflective process can help patients rebuild their assumptive world and transform distress into a source of psychological growth (Cann et al., 2011; Tedeschi & Calhoun, 2004).

The distinction between intrusive and deliberate rumination is especially important in explaining posttraumatic growth. Intrusive rumination may initially reflect the cognitive impact of trauma and the disruption of existing beliefs. Over time, however, adaptive psychological growth is more likely when intrusive thoughts are gradually transformed into deliberate and reflective processing. Deliberate rumination can help patients make sense of the cancer experience, revise previous assumptions, develop new life meanings, and perceive positive changes despite suffering. Therefore, intrusive and deliberate rumination may function as mediating mechanisms between cognitive appraisal and posttraumatic growth.

Cognitive appraisal may influence posttraumatic growth directly and indirectly through rumination. For example, when cancer is appraised as an overwhelming threat, patients may experience more intrusive rumination, which may maintain distress and weaken growth if it remains uncontrolled. However, when patients appraise the illness as a challenge or perceive adequate coping resources, they may become more able to engage in deliberate rumination. This type of reflective processing can support meaning-making, reconstruction of personal priorities, and development of posttraumatic growth. Therefore, the relationship between cognitive appraisal and posttraumatic growth may depend partly on whether patients remain trapped in intrusive rumination or move toward deliberate rumination.

Understanding these pathways has important clinical implications. If cognitive appraisal and rumination explain posttraumatic growth in cancer patients, psychological interventions can be designed to reduce maladaptive threat appraisals, support challenge-based appraisals, and help patients transform intrusive rumination into deliberate meaning-making. Such interventions may include cognitive restructuring, narrative therapy, meaning-centered therapy, supportive-expressive interventions, and psychoeducation about trauma-related cognitive processing. In clinical oncology settings, helping patients interpret their illness in less threatening and more manageable ways may facilitate adaptive rumination and increase the likelihood of growth.

Despite growing interest in posttraumatic growth among cancer patients, the mechanisms through which cognitive appraisal contributes to growth remain insufficiently clarified. In particular, the mediating roles of intrusive and deliberate rumination require further examination in structural models. Identifying these pathways can help explain why some cancer patients experience persistent distress, whereas others report positive psychological changes after struggling with the

disease. A structural model can provide a more integrated understanding of how appraisal processes and post-event rumination jointly contribute to posttraumatic growth.

Accordingly, the present study aimed to determine a structural model of posttraumatic growth based on cognitive appraisal with the mediating role of intrusive and deliberate rumination in cancer patients. It was expected that cognitive appraisal would have both direct and indirect effects on posttraumatic growth. Specifically, threat-based appraisal was expected to be associated with more intrusive rumination and lower posttraumatic growth, whereas challenge and resource-based appraisals were expected to facilitate deliberate rumination and higher posttraumatic growth. This model may contribute to a better understanding of the cognitive mechanisms underlying positive psychological adaptation in cancer patients.

Methods and Materials

Study Design

The present study used an applied, descriptive-correlational design and was conducted through structural equation modeling. The aim was to determine a structural model of posttraumatic growth based on cognitive appraisal, with the mediating role of intrusive and deliberate rumination in cancer patients. In this model, cognitive appraisal was considered the exogenous predictor variable, intrusive and deliberate rumination were considered mediating variables, and posttraumatic growth was considered the endogenous outcome variable. The use of structural equation modeling made it possible to examine both the direct effect of cognitive appraisal on posttraumatic growth and the indirect effects operating through intrusive and deliberate rumination.

Participants and Sampling Procedure

The statistical population consisted of cancer patients who referred to hospitals in Arak, Iran, in 2025. The sample included 202 patients with cancer who were selected using convenience sampling. Participants were recruited from hospital settings after coordination with the relevant authorities. Eligible patients were invited to participate in the study after receiving information about the research purpose, confidentiality of responses, and voluntary nature of participation. The final sample size was considered adequate for testing the proposed structural model because structural equation modeling requires a sufficient number of participants relative to the number of observed variables and estimated paths.

Inclusion and Exclusion Criteria

The inclusion criteria were having a confirmed cancer diagnosis, being willing to participate in the study, having sufficient physical and psychological ability to respond to the questionnaires, and providing informed consent. Participants also had to be able to understand the questionnaire items and complete the research instruments independently or with minimal assistance when needed.

The exclusion criteria included unwillingness to continue participation, failure to complete the questionnaires, providing incomplete or invalid responses, and experiencing a physical or psychological condition that prevented completion of the assessment. Participants who did not complete the main study measures were excluded from the final analysis.

Instruments

Data were collected using standardized self-report questionnaires assessing posttraumatic growth, cognitive appraisal, and event-related rumination. The questionnaires were administered to participants in hospital settings under similar conditions.

Posttraumatic growth was measured using the Posttraumatic Growth Inventory developed by Tedeschi & Calhoun (2004). This instrument includes 21 items and assesses positive psychological changes that may occur following a traumatic or highly stressful event. The inventory evaluates several domains of growth, including appreciation of life, relating to others, new possibilities, personal strength, and spiritual or existential change. Items are scored on a Likert-type scale, with higher scores indicating greater posttraumatic growth. In the present study, the operational definition of posttraumatic growth was the total score obtained from this inventory.

Cognitive appraisal was assessed using the Cognitive Appraisal Scale developed by Peacock and Wong. This measure was designed based on the transactional model of stress and evaluates cognitive processes involved in responding to stressful experiences. The scale includes 14 items and measures three components of cognitive appraisal: threat appraisal, challenge appraisal, and resource appraisal. Items are scored on a five-point

Likert scale. In the present study, cognitive appraisal was operationally defined as the scores obtained from the threat, challenge, and resource components of this scale.

Intrusive and deliberate rumination were assessed using the Event-Related Rumination Inventory developed by Cann and colleagues. This instrument includes 20 items and measures two dimensions of rumination after a stressful or traumatic event: intrusive rumination and deliberate rumination. Intrusive rumination refers to unwanted, automatic, and repetitive thoughts about the traumatic experience, whereas deliberate rumination refers to purposeful and reflective thinking aimed at understanding the meaning and implications of the event. Items are scored on a four-point Likert scale. In this study, the operational definition of intrusive and deliberate rumination was the scores obtained from the two subscales of this inventory.

Procedure

After obtaining the required permissions, the researcher referred to hospitals in Arak and identified eligible cancer patients. The purpose of the study was explained to the participants, and they were assured that participation was voluntary and that their information would remain confidential. After informed consent was obtained, participants completed the demographic information form and the study questionnaires, including the Posttraumatic Growth Inventory, the Cognitive Appraisal Scale, and the Event-Related Rumination Inventory.

Questionnaires were reviewed after completion to ensure that the data were complete and usable. Incomplete questionnaires were excluded before analysis. The final dataset was prepared for statistical analysis, and the proposed structural model was tested to examine the direct and indirect relationships among cognitive appraisal, intrusive rumination, deliberate rumination, and posttraumatic growth.

Ethical Considerations

Ethical principles were observed throughout the study. Participants were informed about the purpose of the research, the voluntary nature of participation, and their right to withdraw from the study at any stage. Confidentiality of personal information was maintained, and all responses were analyzed anonymously. Because the study involved cancer patients, attention was paid to participants' physical and emotional condition during questionnaire completion. No identifying information was included in the analysis or reporting of results.

Data Analysis

Data were analyzed using descriptive statistics, correlation analysis, and structural equation modeling. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe demographic characteristics and the main study variables. Pearson correlation coefficients were used to examine the relationships among cognitive appraisal, intrusive rumination, deliberate rumination, and posttraumatic growth.

Structural equation modeling was used to test the proposed model. Model fit was evaluated using standard fit indices, including chi-square divided by degrees of freedom, comparative fit index, Tucker–Lewis index, goodness-of-fit index, root mean square error of approximation, and standardized root mean square residual. Direct effects were examined to determine the predictive role of cognitive appraisal in posttraumatic growth. Indirect effects were examined to test the mediating role of intrusive and deliberate rumination. The significance of indirect effects was evaluated using the appropriate mediation testing procedure. The analyses were conducted using R software.

Findings and Results

The sample consisted of 202 patients with cancer. The main variables examined in the proposed model were posttraumatic growth, cognitive appraisal, intrusive rumination, and deliberate rumination. Descriptive statistics showed that, among the cognitive appraisal components, threat appraisal had a mean score of 21.55 (SD = 4.45), challenge appraisal had a mean score of 13.18 (SD = 2.37), and resource appraisal had a mean score of 9.16 (SD = 2.13). Regarding posttraumatic growth dimensions, the highest mean was observed for relating to others (M = 18.59, SD = 6.81), followed by new possibilities (M = 12.29, SD = 4.87), personal strength (M = 10.45, SD = 3.81), appreciation of life (M = 8.09, SD = 3.10), and spiritual change (M = 5.63, SD = 1.72). The mean score for intrusive rumination was 23.88 (SD = 5.51), and the mean score for deliberate rumination was 24.79 (SD = 5.78) (Table 1).

Table 1

Descriptive Statistics of the Main Study Variables

Variable	Component	Minimum	Maximum	M	SD
Cognitive appraisal	Threat	11	31	21.55	4.45
	Challenge	6	20	13.18	2.37
	Resources	3	14	9.16	2.13
Posttraumatic growth	Relating to others	1	34	18.59	6.81
	New possibilities	2	25	12.29	4.87
	Personal strength	1	20	10.45	3.81
	Spiritual change	0	10	5.63	1.72
	Appreciation of life	0	14	8.09	3.10
Event-related rumination	Intrusive rumination	11	38	23.88	5.51
	Deliberate rumination	12	38	24.79	5.78

Pearson correlation analysis showed meaningful relationships among cognitive appraisal, posttraumatic growth, and rumination variables. Threat appraisal was negatively correlated with the dimensions of posttraumatic growth, including relating to others (r = -.47), new possibilities (r = -.35), personal strength (r = -.42), spiritual change (r = -.40), and appreciation of life (r = -.37). In contrast, challenge and resource appraisals showed positive correlations with posttraumatic growth dimensions. For example, challenge appraisal was positively correlated with relating to others (r = .32), and resource appraisal was positively correlated with new possibilities (r = .37). Intrusive rumination was negatively associated with posttraumatic growth dimensions, whereas deliberate rumination showed positive associations with these dimensions.

Structural equation modeling was used to test the proposed model of posttraumatic growth based on cognitive appraisal with the mediating role of intrusive and deliberate rumination. The model demonstrated good fit to the data. The chi-square to degrees of freedom ratio was 1.257, which was below the recommended cutoff of 3. The RMSEA was .036, indicating excellent fit. Other fit indices also supported the adequacy of the model: CFI = .984, NFI = .930, NNFI = .978, TLI = .978, IFI = .985, GFI = .943, and AGFI = .902. These values indicate that the proposed structural model adequately explained the observed data (Table 2).

Table 2

Fit Indices for the Structural Model of Posttraumatic Growth

Fit index	Value	Recommended criterion
χ^2/df	1.257	< 3
RMSEA	.036	< .08
CFI	.984	> .90
NFI	.930	> .90
NNFI	.978	> .90
TLI	.978	> .90
IFI	.985	> .90
GFI	.943	> .90
AGFI	.902	> .90

The direct paths from cognitive appraisal components to posttraumatic growth were significant. Threat appraisal had a negative and significant effect on posttraumatic growth (β = -.22, SE = .07, z = -3.72, p = .01), indicating that higher perceived threat was associated with lower posttraumatic growth. Challenge appraisal had a positive and significant effect on posttraumatic growth (β = .12, SE = .13, z = 2.18, p = .03). Resource appraisal also had a positive and significant effect on posttraumatic growth (β = .18, SE = .15, z = 3.06, p = .01). These results show that cognitive appraisal significantly predicted posttraumatic growth in cancer patients (Table 3).

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Table 3

Direct Effects of Cognitive Appraisal Components on Posttraumatic Growth

Outcome variable	Predictor	β	SE	z	p
Posttraumatic growth	Threat appraisal	-.22	.07	-3.72	.01
Posttraumatic growth	Challenge appraisal	.12	.13	2.18	.03
Posttraumatic growth	Resource appraisal	.18	.15	3.06	.01

The mediating role of intrusive and deliberate rumination was examined in the relationship between cognitive appraisal and posttraumatic growth. The results showed that all indirect paths were statistically significant. Threat appraisal had a negative indirect effect on posttraumatic growth through intrusive rumination (β = -.11, SE = .04, z = -3.69, p = .01) and deliberate rumination (β = -.04, SE = .02, z = -2.08, p = .04). This indicates that higher threat appraisal reduced posttraumatic growth through maladaptive rumination processes.

Challenge appraisal had a positive indirect effect on posttraumatic growth through intrusive rumination (β = .05, SE = .05, z = 2.04, p = .04) and deliberate rumination (β = .05, SE = .05, z = 2.19, p = .03). Resource appraisal also had a positive indirect effect on posttraumatic growth through intrusive rumination (β = .06, SE = .06, z = 2.57, p = .01) and deliberate rumination (β = .05, SE = .06, z = 2.24, p = .02). These findings support the mediating role of both intrusive and deliberate rumination in the relationship between cognitive appraisal and posttraumatic growth (Table 4).

Table 4

Indirect Effects of Cognitive Appraisal on Posttraumatic Growth through Rumination

Outcome variable	Predictor	Mediator	β	SE	z	p
Posttraumatic growth	Threat appraisal	Intrusive rumination	-.11	.04	-3.69	.01
Posttraumatic growth	Challenge appraisal	Intrusive rumination	.05	.05	2.04	.04
Posttraumatic growth	Resource appraisal	Intrusive rumination	.06	.06	2.57	.01
Posttraumatic growth	Threat appraisal	Deliberate rumination	-.04	.02	-2.08	.04
Posttraumatic growth	Challenge appraisal	Deliberate rumination	.05	.05	2.19	.03
Posttraumatic growth	Resource appraisal	Deliberate rumination	.05	.06	2.24	.02

Overall, the findings indicated that the proposed structural model had acceptable fit and that cognitive appraisal significantly predicted posttraumatic growth in cancer patients. Threat appraisal negatively predicted posttraumatic growth, whereas challenge and resource appraisals positively predicted it. In addition, intrusive and deliberate rumination significantly mediated the relationship between cognitive appraisal and posttraumatic growth. These results suggest that posttraumatic growth in cancer patients is shaped not only by how patients cognitively appraise their illness but also by the type of post-event rumination that follows this appraisal.

Discussion and Conclusion

The present study aimed to determine a structural model of posttraumatic growth based on cognitive appraisal with the mediating role of intrusive and deliberate rumination in cancer patients. The findings showed that the proposed model had acceptable fit with the observed data. This result indicates that posttraumatic growth in cancer patients can be explained through the interaction of cognitive appraisal and post-event rumination processes. In other words, the way cancer patients evaluate their illness appears to influence their level of posttraumatic growth both directly and indirectly through intrusive and deliberate rumination.

The first finding showed that threat appraisal had a negative and significant effect on posttraumatic growth. This means that patients who perceived cancer mainly as a threatening, overwhelming, and uncontrollable event reported lower levels of positive psychological change. This result is consistent with cognitive theories of stress, which emphasize that individuals' psychological responses to stressful events depend heavily on how they interpret and evaluate the event. When cancer is appraised primarily as a severe threat, the patient may

experience helplessness, fear, uncertainty, and persistent distress. Such appraisals can restrict adaptive coping and reduce the possibility of meaning reconstruction, thereby limiting posttraumatic growth (Lazarus & Folkman, 1984; Tedeschi & Calhoun, 2004).

This finding can also be explained by the traumatic nature of cancer. A cancer diagnosis may challenge patients' assumptions about health, safety, predictability, and control. When the disease is evaluated as a continuing threat to life, the patient's cognitive system may remain focused on danger, recurrence, treatment complications, and possible death. This threat-centered cognitive orientation may intensify psychological distress and prevent patients from engaging in reflective processing that supports growth. Therefore, reducing exaggerated threat appraisal may be an important clinical target for facilitating posttraumatic growth in cancer patients (Salsman et al., 2009).

The second finding showed that challenge appraisal had a positive and significant effect on posttraumatic growth. Patients who interpreted cancer as a challenge that could be faced, understood, and managed reported higher levels of posttraumatic growth. This result supports the view that challenge appraisal can activate adaptive coping, problem solving, meaning-making, and psychological flexibility. When patients perceive the illness as a difficult but meaningful challenge, they may become more willing to reconsider life priorities, strengthen relationships, recognize personal strengths, and search for new possibilities. Thus, challenge appraisal may function as a cognitive pathway through which distress is transformed into growth.

The positive effect of challenge appraisal is consistent with the model of posttraumatic growth proposed by Tedeschi & Calhoun (2004), which emphasizes that growth emerges from the struggle with trauma rather than from the traumatic event itself. In this model, individuals who actively engage with the meaning of the event are more likely to reconstruct their assumptions and develop new perspectives. Cancer patients who appraise their illness as a challenge may be more likely to engage in this type of cognitive work. They may ask purposeful questions about the meaning of the illness, the value of life, the importance of relationships, and the changes they want to make in the future.

The third finding showed that resource appraisal had a positive and significant effect on posttraumatic growth. This means that patients who perceived themselves as having sufficient personal or situational resources for coping with cancer reported greater growth. Resource appraisal may include perceptions of personal strength, coping ability, access to support, treatment resources, and psychological readiness. When patients believe that they have adequate resources to manage illness-related demands, they may experience less helplessness and more agency. This perceived agency can support adaptive rumination and meaning-making, which are central to posttraumatic growth.

The effect of resource appraisal can also be understood through the transactional model of stress and coping. According to this model, stress responses depend not only on primary appraisal of the event but also on secondary appraisal of coping resources. Even when cancer is experienced as highly stressful, patients who perceive greater coping resources may feel more capable of managing its consequences. This sense of capability can facilitate cognitive processing and help patients integrate the illness experience into a more coherent life narrative (Lazarus & Folkman, 1984).

Another important finding was the mediating role of intrusive rumination. The results showed that intrusive rumination mediated the relationship between cognitive appraisal and posttraumatic growth. Intrusive rumination refers to unwanted and automatic thoughts about the stressful event. In cancer patients, such thoughts may include repeated concerns about diagnosis, treatment, recurrence, mortality, family responsibilities, and uncertainty about the future. The negative indirect effect of threat appraisal through intrusive rumination suggests that when patients perceive cancer mainly as a threat, they may experience more distressing and uncontrolled thoughts, which in turn may reduce growth.

This finding is consistent with theoretical models that describe intrusive rumination as an early cognitive response to trauma. After a traumatic event disrupts core beliefs, intrusive thoughts may arise because the event has not yet been integrated into the individual's meaning system. However, when intrusive rumination remains dominant and negatively focused, it can maintain distress and prevent adaptive reconstruction. Therefore, intrusive rumination may have a dual role: it can signal the need for cognitive processing, but if it remains uncontrolled, it may interfere with

posttraumatic growth (Cann et al., 2011; Tedeschi & Calhoun, 2004).

The results also showed that deliberate rumination mediated the relationship between cognitive appraisal and posttraumatic growth. Deliberate rumination refers to intentional, reflective, and meaning-oriented thinking about the event and its implications. This type of rumination can help patients understand the cancer experience, reorganize life goals, identify personal strengths, deepen relationships, and develop a more meaningful perspective on life. The positive indirect effects of challenge and resource appraisals through deliberate rumination indicate that adaptive appraisals may promote growth by encouraging purposeful cognitive processing.

This finding supports the posttraumatic growth model, which considers deliberate rumination one of the key mechanisms of growth. Deliberate rumination helps individuals move beyond repetitive distress toward meaning-making and reconstruction of assumptions. In the context of cancer, deliberate rumination may help patients ask constructive questions such as: What has this illness taught me? What matters most now? How can I live more meaningfully? Which relationships need more attention? What strengths have I discovered in myself? Through this process, patients may transform the cancer experience into a source of psychological development.

The distinction between intrusive and deliberate rumination is clinically important. Intrusive rumination is often distressing, repetitive, and uncontrolled, whereas deliberate rumination is more reflective and purposeful. The findings suggest that psychological growth may depend partly on the transition from intrusive rumination to deliberate rumination. In other words, cancer patients may initially experience unwanted thoughts and emotional distress, but growth becomes more likely when these thoughts gradually shift toward intentional reflection, meaning-making, and cognitive reorganization.

The overall pattern of findings indicates that cognitive appraisal and rumination are interconnected processes in the development of posttraumatic growth. Threat appraisal may increase maladaptive cognitive processing and reduce growth, while challenge and resource appraisals may support deliberate reflection and facilitate growth. Therefore, posttraumatic growth should not be viewed as a simple outcome of exposure to cancer. Rather, it appears to result from an active cognitive process in which patients interpret, process, and reconstruct the meaning of their illness experience (Beck et al., 2023).

From a clinical perspective, these findings highlight the importance of assessing cognitive appraisal and rumination patterns in cancer patients. Patients who interpret cancer mainly as a threat and remain trapped in intrusive rumination may be at greater risk for psychological distress and lower posttraumatic growth. In contrast, patients who can reframe the illness as a challenge and perceive adequate coping resources may be more likely to engage in deliberate rumination and experience growth. Therefore, psychological interventions should aim to reduce maladaptive threat appraisal, strengthen resource appraisal, and facilitate the transformation of intrusive rumination into deliberate meaning-making.

Interventions such as cognitive-behavioral therapy, meaning-centered therapy, narrative therapy, acceptance and commitment therapy, and supportive-expressive therapy may be useful for this purpose. These approaches can help patients identify catastrophic interpretations, develop more balanced appraisals, process intrusive thoughts, and construct new meanings from the cancer experience. In oncology settings, integrating psychological care into medical treatment may help patients not only reduce distress but also develop personal growth, improved relationships, and greater appreciation of life.

Conclusion

The findings of the present study showed that the proposed structural model of posttraumatic growth based on cognitive appraisal with the mediating role of intrusive and deliberate rumination had acceptable fit in cancer patients. Cognitive appraisal significantly predicted posttraumatic growth. Threat appraisal had a negative effect on posttraumatic growth, whereas challenge appraisal and resource appraisal had positive effects. In addition, intrusive and deliberate rumination significantly mediated the relationship between cognitive appraisal and posttraumatic growth.

Overall, the results indicate that posttraumatic growth in cancer patients is shaped by how patients evaluate their illness and how they cognitively process the experience after diagnosis. Appraising cancer as a

threat may reduce growth, especially when it leads to persistent intrusive rumination. In contrast, appraising cancer as a challenge and perceiving adequate coping resources may increase growth by promoting deliberate rumination and meaning-making.

These findings suggest that posttraumatic growth is not merely a spontaneous consequence of cancer, but rather the outcome of cognitive and reflective processes through which patients reconstruct meaning, revise life priorities, and integrate the illness into their personal narrative. Therefore, cognitive appraisal and rumination should be considered important therapeutic targets in psychological interventions for cancer patients.

Practical Implications

The findings have important implications for psycho-oncology practice. First, clinicians should assess how cancer patients appraise their illness, especially whether they perceive it primarily as a threat, a challenge, or a manageable condition. Second, interventions should help patients reduce catastrophic and threat-based interpretations of cancer while strengthening perceptions of coping resources. Third, therapists should help patients manage intrusive rumination and gradually transform it into deliberate, reflective, and meaning-oriented processing.

Psychoeducational programs for cancer patients can include training on the difference between intrusive and deliberate rumination. Patients may benefit from learning that unwanted thoughts after diagnosis are common, but that these thoughts can be redirected toward constructive reflection and meaning-making. Psychological interventions that encourage narrative reconstruction, value clarification, acceptance, and cognitive reframing may promote posttraumatic growth.

Limitations

Several limitations should be considered. First, the study used a correlational design; therefore, causal conclusions cannot be made with certainty. Although structural equation modeling allows examination of theoretically based pathways, longitudinal or experimental studies are needed to confirm causal directions. Second, the sample consisted of cancer patients from hospitals in Arak, which may limit the generalizability of the findings to patients in other regions or treatment settings. Third, data were collected using self-report questionnaires, which may be influenced by response bias, social desirability, or participants' emotional state at the time of assessment. Fourth, the study did not separate patients based on cancer type, disease stage, treatment phase, or time since diagnosis, variables that may influence cognitive appraisal, rumination, and posttraumatic growth.

Suggestions for Future Research

Future studies are recommended to use longitudinal designs to examine how cognitive appraisal, intrusive rumination, deliberate rumination, and posttraumatic growth change over time from diagnosis through treatment and survivorship. Future research should also compare patients with different types and stages of cancer to determine whether the structural model is consistent across clinical subgroups. It is also suggested that future studies include psychological distress, fear of recurrence, coping strategies, and meaning in life as additional variables in the model.

Researchers may also examine whether psychological interventions that target cognitive appraisal and rumination can increase posttraumatic growth in cancer patients. Finally, using mixed-method designs could provide deeper understanding of how patients personally interpret cancer, how intrusive thoughts shift into deliberate reflection, and how meaning-making contributes to growth after diagnosis.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Declaration of Helsinki, which provides guidelines for ethical research involving human participants. Ethical considerations in this study were that participation was entirely optional.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this study.

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