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RESEARCH ARTICLE

Association of cancer response styles and alexithymia with posttraumatic growth in breast cancer patients

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ABSTRACT

Objective: Breast cancer (BC) is one of the most common types of cancer seen in women. Many studies have been conducted to examine negative changes observed in patients diagnosed with BC. However, the traumatic experience of a cancer diagnosis can also have positive consequences, including post-traumatic growth (PTG), a positive life change that develops following a stressful experience. This study was an investigation of the relationship between PTG seen in female BC patients, cancer response style, and alexithymia, the inability to recognize and express one's emotions.

Method: A total of 89 female patients who were diagnosed with BC and receiving treatment were enrolled in the study. The Mental Adjustment to Cancer scale, the Toronto Alexithymia Scale, and the Posttraumatic Growth Inventory (PGTI) were administered to the participants. Pearson correlation and multiple linear regression analyses and structural equation modeling (SEM) were used to assess the relationships between normally distributed variables.

Results: There was a significant, positive relationship between the fighting spirit reaction style and the PTGI total score ($r=0.49$; $p<0.001$), and a significant, negative relationship between the helplessness-hopelessness reaction style and the PTGI total score ($r=-0.46$; $p<0.001$). Multiple regression analyses revealed that education level (years) was associated with PTG ($\beta=1.13$; $t[82]=2.31$; $p=0.02$) ($F[6, 82=1.47]$; $p=0.2$; $R^2=0.10$), and the subfactors of changes in philosophy of life (CPL) ($\beta=0.59$; $t[82]=3.28$; $p=0.002$) and changes in self-perception (CSP) ($\beta=0.54$; $t[82]=2.21$; $p=0.03$); and the length of time since diagnosis was associated with CPL ($\beta=3.91$; $t[82]=2.37$; $p=0.02$). SEM analysis showed that a fighting spirit response style to cancer partially mediated the relationship between alexithymia and PTG ($\chi^2[12, n=89]=14.24$; $p=0.29$; $\chi^2/df=1.19$; root mean square error of approximation [RMSEA]=0.05; comparative fit index [CFI]=0.99; incremental fit index [IFI]=0.99; normed fit index [NFI]=0.93). The other cancer response styles did not have a mediating effect on the relationship between alexithymia and PTG.

Conclusion: Alexithymia is an important consideration in BC patients. Promoting a fighting spirit response in BC patients, and particularly alexithymic patients, could contribute to the development of PTG.

Keywords: Alexithymia, breast cancer, cancer response style, post-traumatic growth

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INTRODUCTION

As with all types of cancer, the diagnosis and treatment process can be physically and mentally exhausting for patients with breast cancer (BC). A cancer diagnosis is typically a stressful experience and can have negative physical, mental, and social effects. Reactions to this life event may include fear, sadness, anger, anxiety, and depression (1). Greer et al. (2) developed 5 groups describing the patient's reaction to cancer using information obtained in clinical interviews: anxious preoccupation, fighting spirit, helplessness-hopelessness, fatalism, and denial-avoidance. A patient's response style may be affected by factors such as personality traits, cognitive evaluations, coping style, the availability of social support, and the ability to express their emotions.

The American Psychiatric Association has defined trauma as direct personal experience of an event that involves actual or threatened death, serious injury, or other threat to one's physical integrity, or witnessing an event that involves death, injury, or a threat to the physical integrity of another (3). Therefore, it might be appropriate to evaluate the emotional and cognitive responses to the sudden onset of severe illness within the scope of the psychological symptoms of trauma (4). The reactions of cancer patients can include elements seen in post-traumatic stress disorder (PTSD), including intrusive ideation, reactivity to reminders, and avoidance (1). Cancer has been reported to be a traumatic stress factor in several studies (5,6).

Post-traumatic growth (PTG) is a concept used to describe positive changes resulting from the experience of confronting a difficult life crisis (7). The Posttraumatic Growth Inventory (PTGI) examines 5 areas: relating to others, new possibilities, personal strength, spiritual change, and appreciation of life (8). There have been many important studies of negative changes resulting from trauma, including those experienced by patients with BC (4). However, the number of studies investigating PTG in patients with BC is limited. The available research has focused on the relationship between PTG and response styles to cancer and positive effects on prognosis (9-14).

Alexithymia is another factor that has been studied in cancer patients and has been reported to be associated with PTG. The Toronto Alexithymia Scale which evaluates alexithymic personality traits, measures 3 features: difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and an externally-oriented thinking (EOT) (15). Freyberger (16) stated that alexithymia is divided into 2 types: primary, a life-long condition developing in childhood, and secondary, which arises as a consequence of events experienced later in life, such as might be observed in cancer patients and those with other severe physical ailments. Studies comparing alexithymic characteristics in cancer patients and healthy control groups have yielded conflicting trait or state results. While some research has indicated that alexithymia may be a personality trait, other studies suggest that alexithymia may be linked to the immune system or other factors that lead to a susceptibility to cancer (17). Despite this uncertainty about the nature of alexithymia, the literature indicates that alexithymia is more common in cancer patients than healthy individuals, and it has been noted as a negative predictor for PTG (18-20). Alexithymic personality traits have been reported to be closely related to avoidance or negative coping styles in the face of traumatic events (21). The ability to express feelings associated with trauma has been seen to have a positive correlation with PTG (19).

This study was designed to examine the relationship between PTG, alexithymic characteristics, and the response style to cancer in BC patients. It was hypothesized that alexithymic features would have a negative effect on PTG in patients with BC, and the objective was to investigate the potential mediating effect of response style to the cancer diagnosis. A prolonged negative reaction to trauma can delay both physical and mental recovery. Studies have shown that individuals who demonstrate PTG after a cancer diagnosis have a better prognosis and a stronger immune system (9,14). Better knowledge of the relationship between alexithymia and PTG, as well as any mediating effect of reaction style in BC patients, could be very valuable to psychotherapeutic treatment. The development of positive cognitive, emotional, and behavioral changes could constitute a valuable contribution to the prognosis.

METHOD

Ethics committee approval of this study was obtained from the Non-Invasive Clinical Research Ethics Committee of Cukurova University Faculty of Medicine [IRB: 01/11/2019–2019/93]. The participants were informed about the study and provided written consent. In all, 98 female BC patients who presented at the Cukurova University Faculty of Medicine, Department of Oncology between December 2019 and March 2020 were initially reviewed for enrollment in the study. All of the patients had undergone breast surgery. Patients who used psychiatric drugs, were in psychotherapeutic treatment,

were illiterate, or had an intellectual disability or cognitive impairment were excluded. Six patients were ruled out based on the criteria, and 3 patients who completed the data collection tools incorrectly and/or incompletely were excluded from the study. The analysis was conducted using the data of the remaining 89 patients.

Data Collection Tools

Sociodemographic Information Form

The patients were asked to provide data related to age, education level, employment status, marital status, parenthood, family history of BC, and the length of time since diagnosis. The cancer stage of each subject had been determined prior to the study.

Mental Adjustment to Cancer Scale (MAC)

The Mental Adjustment to Cancer scale (MAC) was developed by Watson et al. (22) as a tool to determine the response style of cancer patients and assess the use of these responses. A validity and reliability study of the Turkish scale was conducted by Natan (23). The MAC has 5 subscales: fighting spirit, anxious preoccupation, helplessness-hopelessness, fatalism, and denial-avoidance (2). The instrument consists of 40 items and uses a 4-point, Likert-type scale; each item is scored 1-4. In the present study, the Cronbach alpha reliability coefficient was 0.81 for the fighting spirit subscale, 0.75 for helplessness-hopelessness, 0.74 for anxious preoccupation, 0.73 for fatalism, and 0.75 for the total score. Since the denial-avoidance subscale includes only 1 item, it was not considered in the statistical evaluation of this study.

Toronto Alexithymia Scale (TAS-20)

The TAS-20 was developed by Taylor et al. (24). Gulec et al. (25) conducted a validity and reliability study of a Turkish version of the scale. The instrument consists of 20 items scored 1-5 using a Likert-type scale. A high score indicates more alexithymic features. The tool includes 3 subscales to measure DIF, DDF, and EOT. In this study, the Cronbach alpha coefficient of the scale was 0.80. The DIF subscale coefficient was 0.86, the DDF coefficient was 0.73, and the EOT coefficient was 0.72.

Post-Traumatic Growth Inventory (PTGI)

The PTGI was developed by Tedeschi and Calhoun (8). The instrument consists of 21 items and includes 5 subscales (relating to others, new possibilities, personal strength, spiritual change, and appreciation of life). A Likert-type scale of 0-5 is used to evaluate each item. The maximum score is 105 points. A high score reflects greater growth after trauma. Kagan et al. (26) assessed a Turkish adaptation of the PTGI. Their research found that a 3-factor structure was valid: changes in self-perception (CSP), changes in philosophy of life (CPL), and changes in relationships with others (CRO). Items 5, 10, 11, 12, 13, 15, 16, 17, 18, and 19 are related to CSP; items 1, 2, 3, 4, 7, and 14 are related to CPL; and items 6, 8, 9, 20, and 21 are related to CRO. PTG describes meaningful, constructive changes arising from struggles with major life difficulties (27). It refers to a positive change (spiritual and existential changes) in self-perception, interpersonal relationships and life philosophy. The term "growth" means that these individuals have improved their prior adjustment ability, psychological functioning, or life awareness (7,28). In the present study, the Cronbach alpha coefficient of the scale was 0.92, the CRO coefficient was 0.80, and the CPL coefficient was 0.89.

Statistical Analysis

IBM SPSS Statistics for Windows, Version 21.0 software (IBM Corp., Armonk, NY, USA) was used to analyze the study data. The data were assessed for outliers, out-of-range values, missing values, and normality. The presence of a normal distribution was accepted, as the variables of the study showed skewness and kurtosis values between -3 and +3 (29). IBM SPSS AMOS Version 26.0 (IBM Corp., Armonk, NY, USA) was used to perform multiple regression and Pearson correlation analyses, as well as structural equation modeling (SEM) to evaluate the relationships between variables. A statistical significance level of $p<0.05$ was applied in all of the analyses.

RESULTS

The sociodemographic information and disease characteristics of the participants are shown in Table 1. The average age and years of education was 41.22±11.43 years and 10.53±4.52 years, respectively. The length of time since diagnosis was classified as <1 year or ≥1 year. The first year after diagnosis was defined as the acute period, in which patients underwent surgery, intensive chemotherapy, and/or radiotherapy. It was accepted that patients who had been diagnosed ≥1 year prior had completed the acute reactive processes that would occur during the first year of intensive treatment process following diagnosis.

Relationship Between Age and MAC, PTG, and Alexithymia

Relationships between continuous variables were analyzed using Pearson correlation analysis (Table 2).

Table 1: Demographic and disease-related characteristics of the study participants

	n	%
Demographic characteristics		
Marital status		
Married	64	71.9
Single	25	28.1
Parenthood status		
Yes	69	77.5
No	20	22.5
Education status		
Literate	7	7.8
Primary education	17	19.1
High school	28	31.5
University	37	41.6
Employment status		
Working	46	52.9
Not working	41	47.1
Disease characteristics		
Family history of breast cancer		
Yes	28	31.5
No	61	68.5
Length of time since diagnosis		
<1 year	69	77.5
≥1 year	20	22.5
Cancer stage		
Stage 1	18	20.7
Stage 2	28	32.2
Stage 3	26	29.9
Stage 4	17	17.2

The findings indicated that there was a positive correlation between greater age and the cancer reaction style of fatalism (r=0.32; p=0.002). The analysis revealed no relationship between age and the other reaction styles. No significant relationship was found between age and alexithymia scores. There was also a significant negative correlation between age and the PTGI subscales of CPL of life (r=-0.24; p=0.024); no relationship was seen between other PTGI subscales and age (Table 2).

The Relationship Between MAC and PTG

There was no significant relationship observed between the anxious preoccupation reaction style and the PTGI total score or subscale scores. As expected, there was a significant negative relationship between the helplessness-hopelessness reaction style and the fighting spirit reaction style (r=-0.63; p<0.001). There was a positive significant relationship between the fighting spirit reaction style and the PTGI total score (r=0.49; p<0.001) and the subscales (CPL: r=0.46, p<0.001; CRO: r=0.29, p=0.006; and CSP: r=0.45; p<0.001).

A negative significant relationship was also recorded between the helplessness-hopelessness reaction style and the PTGI total score (r=-0.46; p<0.001) and the subscales (CPL: r=-0.45, p<0.001; CRO: r=-0.32, p=0.002; and CSP: r=-0.39, p<0.001).

No significant relationship was seen between the fatalism reaction style and the PTG total score and the subscales (Table 2).

The Relationship Between Alexithymia and PTG

There was a negative correlation between DIF and the PTGI total score (r=-0.34; p=0.001) and the subscales (CPL: r=-0.33, p=0.002; CRO: r=-0.25, p=0.02; and CSP: r=-0.28, p=0.008).

A negative correlation was also observed between DDF and the PTGI total score (r=-0.36; p=0.001) and the subscales (CPL: r=-0.36, p=0.001; CSP: r=-0.34, p=0.001). There was no significant relationship between DDF and CRO (r=-0.15; p=0.159).

There was a significant, negative relationship between EOT and the PTGI total score (r=-0.30; p=0.004) and the subscales (CPL: r=-0.35, p=0.001; CSP: r=-0.23, p=0.032) (Table 2).

In this study, the fighting spirit response style was predicted to be a positive coping style. Multiple regression analyses were performed to assess both fighting spirit and PTGI scores to reveal any significant sociodemographic and disease-related associations. First, categorical variables were dummy-coded to be included in the analyses (marital status: single=0, married=1; parenthood status: No=0, Yes=1; employment status: No=0, Yes=1; family history of BC: No=0, Yes=1; and length of time since diagnosis: <1 year=0, ≥1 year=1). The results revealed that none of those variables were significantly associated with fighting spirit ($F[6, 82]=0.22$; $p=0.97$; $R^2=0.02$) or CRO ($F[6, 82]=0.45$; $p=0.84$; $R^2=0.03$). Only the education variable (total years) ($\beta=1.13$; $t[82]=2.31$; $p=0.02$) was significantly associated with the PTGI score ($F[6, 82]=1.47$; $p=0.2$; $R^2=0.10$). Education ($\beta=0.59$; $t[82]=3.28$; $p=0.002$) and the length of time since diagnosis ($\beta=3.91$; $t[82]=2.37$; $p=0.02$) were associated with CPL ($F[6, 82]=3.61$; $p=0.003$; $R^2=0.21$). Of the variables examined, only education ($\beta=0.54$; $t[82]=2.21$; $p=0.03$) was significantly associated with CSP ($F[6, 82]=1.18$; $p=0.33$; $R^2=0.08$) (Table 3).

Table 2: Pearson correlation analysis of age, mental adjustment to cancer, post-traumatic growth, and alexithymic features

	Age	AP	FS	HH	FA	DIF	DDF	EOT	ALX	CSP	CRO	CPL
AP	-0.03											
FS	-0.01	-0.18										
HH	0.21	0.36***	-0.63***									
FA	0.32**	0.17	-0.16	0.42***								
DIF	-0.04	0.36***	-0.48***	0.62***	0.33**							
DDF	0.17	0.31**	-0.33**	0.52***	0.21	0.62***						
EOT	0.09	0.07	-0.22*	0.33**	0.29**	0.26*	0.43***					
ALX	0.07	0.33**	-0.46***	0.63***	0.38***	0.85***	0.83***	0.67***				
CSP	-0.14	-0.02	0.45***	-0.39***	0.02	-0.28**	-0.34***	-0.23*	-0.43***			
CRO	-0.02	-0.01	0.29**	-0.32**	-0.03	-0.25*	-0.15	-0.17	-0.25*	0.47***		
CPL	-0.24*	0.09	0.46***	-0.45***	-0.18	-0.33**	-0.36***	-0.35***	-0.35**	0.69***	0.46***	
PTGI	-0.17	0.02	0.49***	-0.46***	-0.07	-0.34**	-0.36**	-0.30**	-0.42***	0.87***	0.70***	0.91***

*p<0.05, **p<0.01, ***p<0.001. ALX: Alexithymia (total), AP: Anxious preoccupation, CPL: Changes in philosophy of life, CRO: Changes in relationships with others, CSP: Changes in self-perception, DDF: Difficulty describing feelings, DIF: Difficulty identifying feelings, EOT: Externally-oriented thinking, FA: Fatalism, FS: Fighting spirit, HH: Helplessness-hopelessness, PTGI: Posttraumatic Growth Inventory (total)

Mediating Role of Mental Adjustment Style to Cancer in the Relationship Between Alexithymia and Post-Traumatic Growth

The SEM analysis indicated that the predictive power of alexithymia on PTG was significant (χ^2[8, n=89]=7.38, p=0.5; χ^2/df=0.92; root mean square error of approximation [RMSEA]=0.00; comparative fit index [CFI]=1.00; incremental fit index [IFI]=1.00; normed fit index [NFI]=0.95). Alexithymia predicted PTG (β=-0.49; p<0.001; standard error [SE]=0.12; 95% bias-corrected confidence interval [CI]=-0.75, -0.24). A fighting spirit attitude also predicted PTG (β=0.55; p<0.001; SE=0.08, 95% bias-corrected CI=0.36, 0.69) with good model indices (χ^2[2, n=89]=0.06, p=0.97; χ^2/df=0.92; RMSEA=0.00; CFI=1.00; IFI=1.02; NFI=0.1). Fighting spirit was then added as a mediator in the relationship between alexithymia and PTG, and it was seen to decrease the probability level of the relationship (β=-0.32, p=0.0; SE=0.15; 95% bias-corrected CI=-0.66, -0.03). The indices revealed a good fit (χ^2[12, n=89]=14.24, p=0.29; χ^2/df=1.19; RMSEA=0.05; CFI=0.99; IFI=0.99; NFI=0.93). Fighting spirit had a positive influence on the association between alexithymia and PTG (Fig. 1).

The same procedure was run for the helplessness-hopelessness response style, and it was observed that this reaction to cancer was a negative predictor of PTG (β=-0.47, p<0.001; SE=0.11; 95% bias-corrected CI=-0.66, -0.23) with good model indices (χ^2[2, n=89]=0.9, p=0.64; χ^2/df=0.45; RMSEA=0.00; CFI=1.00; IFI=1.01; NFI=0.99). Adding helplessness-hopelessness to the relationship between alexithymia and PTG reduced the coefficient (β=-0.37, p=0.03; SE=0.22; 95% bias-corrected CI=-0.75, -0.02), however, the addition of helplessness-hopelessness no longer predicted PTG (β=-0.23, p=0.14; SE=0.21, 95% bias-corrected CI=-0.53, 0.17). Although the model indicated a good fit (χ^2[12, n=89]=11.8, p=0.46; χ^2/df=0.98; RMSEA=0.00; CFI=1.00; IFI=1.00; NFI=0.94), the hypothesized mediating role of helplessness-hopelessness in the relationship between alexithymia and PTG was not confirmed (Fig. 2).

DISCUSSION

A review of the literature yields evidence supporting a relationship between age and PTG (30). In this study, a weak relationship was found showing negative development in the life philosophies of BC patients as age increased, but in general, no relationship was determined between PTG and age. Changes in life philosophy in PTG include expressions such as "taking life easy" and "enjoying life more." Those who experience growth in this area redefine their understanding of the value of life and their priorities. In this sense, it could be expected that individuals who are in the advanced stages of life and closer to the reality of death might experience less growth when confronted with a diagnosis of BC. Our observation of a positive relationship between age and the fatalism reaction style was consistent and suggests that fatalism may become more prominent in individuals with age. Mystakidou et

Table 3: Results of multiple regression analyses assessing demographic and disease-related variables on FS, PTGI total score, and PTGI subscales

	F	t	df	β	R^2	p
FS	0.22		6, 82		0.02	0.97
Marital status		-0.16	82	-0.34		0.87
Parenthood status		0.71	82	1.63		0.48
Education		-0.21	82	-0.04		0.84
Employment status		0.75	82	1.19		0.45
Family history of breast cancer		0.13	82	0.19		0.90
Length of time since diagnosis		0.05	82	0.67		0.69
PTG	1.47		6, 82		0.10	0.20
Marital status		-0.08	82	-0.44		0.94
Parenthood status		0.69	82	4.27		0.49
Education		2.31	82	1.13		0.02*
Employment status		-0.11	82	-0.47		0.91
Family history of breast cancer		0.85	82	3.50		0.40
Length of time since diagnosis		1.10	82	4.89		0.28
CPL	3.61		6, 82		0.21	0.003**
Marital status		-0.67	82	-1.40		0.51
Parenthood status		0.98	82	2.25		0.33
Education		3.28	82	0.59		0.002**
Employment status		-0.15	82	-0.24		0.88
Family history of breast cancer		1.00	82	1.53		0.32
Length of time since diagnosis		2.37	82	3.91		0.02*
CRO	0.45		6, 82		0.03	0.84
Marital status		-1.04	82	-1.74		0.30
Parenthood status		1.19	82	2.18		0.24
Education		-0.09	82	-0.01		0.93
Employment status		0.91	82	1.15		0.37
Family history of breast cancer		0.22	82	0.27		0.83
Length of time since diagnosis		0.69	82	0.92		0.49
CSP	1.18		6, 82		0.08	0.33
Marital status		0.95	82	2.70		0.34
Parenthood status		-0.05	82	-0.16		0.96
Education		2.21	82	0.54		0.03*
Employment status		-0.65	82	-1.39		0.52
Family history of breast cancer		0.82	82	1.70		0.42
Length of time since diagnosis		0.03	82	0.06		0.98

*p<0.05, **p<0.01. CPL: Changes in philosophy of life, CRO: Changes in relationships with others, CSP: Changes in self-perception, FS: Fighting spirit, PTGI: Posttraumatic Growth Inventory (total)

al. (31) noted in their study of 100 BC patients that age was an important predictor of new possibilities and appreciation of life. They found that young women had the highest level of PTG. Manne et al.(32) evaluated 162 women with BC and found that PTG was higher among younger patients. Boyle et al. (33) also found that the cancer experience was perceived more negatively in elderly women while younger women had a more positive outlook on the future and greater PTG. Similarly, younger people showed more PTG in the study conducted by Paredes and Pereira (13). Although there was no correlation between PTG and age in terms

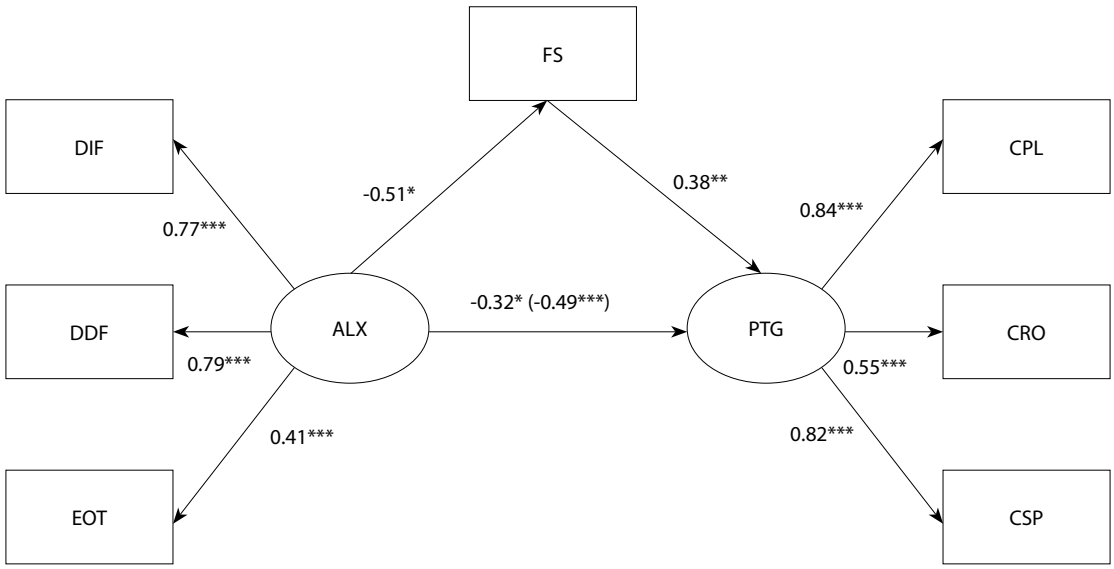

Figure 1. Results of structural equation modeling examining the mediating effect of a fighting spirit response style to cancer on the relationship between alexithymia and post-traumatic growth. The value in parentheses represents the total effect.
*p<0.05; **p<0.01; ***p<0.001. ALX: Alexithymia, CPL: Changes in philosophy of life, CRO: Changes in relationships with others, CSP: Changes in self-perception, DDF: Difficulty describing feelings, DIF: Difficulty identifying feelings, EOT: Externally-oriented thinking, HH: Helplessness/hopelessness, PTG: Post-traumatic growth.

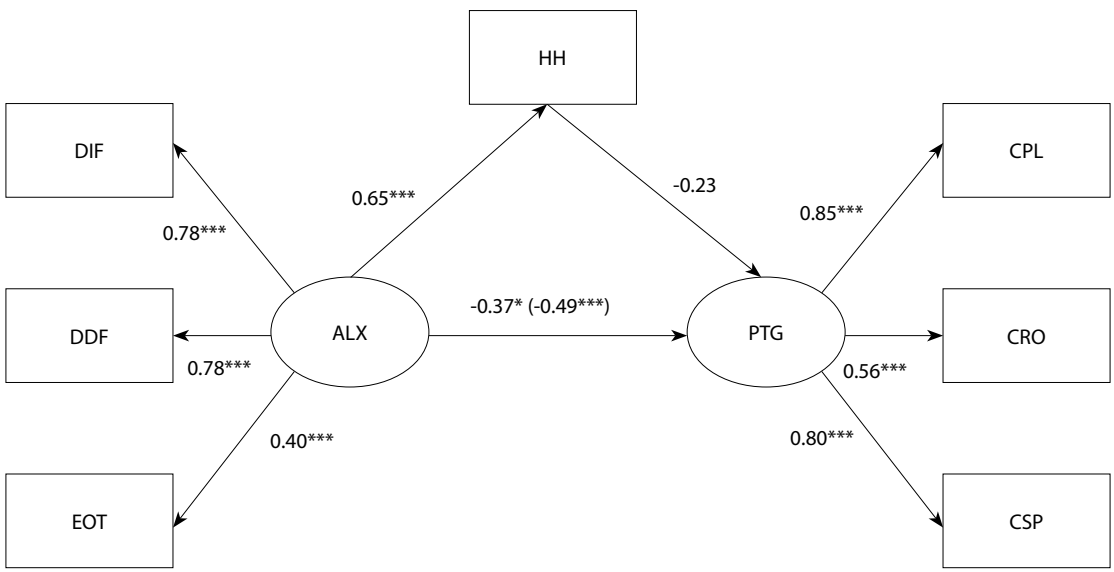

Figure 2. Results of structural equation modeling examining the mediating effect of a helplessness/hopelessness response style to cancer on the relationship between alexithymia and post-traumatic growth. The value in parentheses represents the total effect.
*p<0.05; ***p<0.001. ALX: Alexithymia, CPL: Changes in philosophy of life, CRO: Changes in relationships with others, CSP: Changes in self-perception, DDF: Difficulty describing feelings, DIF: Difficulty identifying feelings, EOT: Externally-oriented thinking, HH: Helplessness-hopelessness, PTG: Post-traumatic growth.

of overall scores in our study, the fact that changes in life philosophy were associated with age suggests that younger women diagnosed with BC are more open to change than those who are older.

In our study, the results of the PTGI and its subscales were negatively correlated with the helplessness-hopelessness response style. This finding coincides with the results reported by Ho et al. (34), who found that

poor coping had a negative correlation with PTG. Romeo et al. (10) reported that patients with a BC diagnosis who demonstrated a helplessness-hopelessness response at the time of diagnosis developed PTG in the later stages if the initial depressive symptoms were subsequently alleviated. Our study group comprised patients who had already undergone the initial diagnosis process and received surgical treatment.

Our results revealed a positive correlation between the fighting spirit reaction style and the PTGI subscales. Ho et al. (34) also found that a positive attitude was positively associated with PTG. Similarly, another study of 41 cancer patients found that problem-focused coping was associated with PTG (35). Furthermore, in a study of 80 BC patients aged 20-70, a proactive coping style was found to be associated with PTG (36). Morris et al. (37) found that a high level of adaptive coping was associated with greater PTG. They reported that teaching patients adaptive (problem-focused) coping techniques can have a psychological benefit. It seems clear that an attitude of confidence, willingness, and power to fight the disease has a positive influence on PTG.

People sometimes find it difficult to recognize or describe their emotions. Although it has not been fully understood that to what extent the human being's ability to identify and express their emotions is beneficial, our findings indicate that the low level of such an ability may lead to negative biopsychosocial consequences. We observed a negative correlation between CSP and life philosophy, subscales of the PTGI, and alexithymia and its subscales. Our review of the literature revealed only limited research of the relationship between PTG and alexithymia. Alexithymia has generally been studied in patients with PTSD. A significant relationship between the severity of PTSD symptoms and alexithymia scores has been reported (38). In a study of the predictive potential of alexithymia on PTG, 250 university students who had recently experienced a stressful event, alexithymia was found to be a negative predictor for PTG and a positive predictor for PTSD (19). It appears that difficulty recognizing emotions may be a barrier to PTG. The previous research and our results seem to indicate that being aware of and expressing emotions contributes to positive change.

The results of our study are valuable in terms of further illustrating the relationship between alexithymia and PTG. We found that evidence of alexithymia and its subgroups had a negative relationship with PTG. Moreover, the partial mediating role of a fighting spirit response style would seem to confirm that the reaction to a cancer diagnosis is clinically important.

Our results also supported theories about the relationship between cancer response style and the ability to express feelings. The fighting spirit response style was negatively associated with difficulty recognizing and defining emotions, and negative response styles (helplessness-hopelessness, anxious waiting, fatalism) were found to be positively related to difficulty with recognizing and identifying emotions. We found no studies investigating this relationship in patients with BC. However, there is previous research that demonstrates a relationship between negative responses to stress and alexithymic characteristics in the general population (39,40).

It would appear evident that coping strategies are related to recognition of emotions, and that those who have the ability to define and articulate post-traumatic emotions can more easily develop a more positive reaction style.

We found a positive correlation between education level and PTG and the fighting spirit response style in patients with BC. Several studies have determined a positive relationship between education level and PTG in the general population and in patients with chronic diseases other than cancer (41,42). However, the results of studies conducted with cancer patients are contradictory. In a study with 72 BC patients, a negative relationship was found between education level and PTG (43). Belizzi and Blank (44) suggested that BC patients with a low level of education level developed more PTG. It was also reported in another study of 161 women with early stage BC that there was a negative relationship between education level and PTG (45). However, in studies with cancer patients who underwent a bone marrow transplant (46) and early stage BC patients (47), a positive relationship was found between education level and PTG. We found that education was an important factor in the development of PTG. This is consistent with some of the literature that has indicated that there may be a positive relationship between education level and PTG; other sociodemographic and disease-related characteristics were not related to PTG development.

The present study also investigated relationships between the time since diagnosis and PTG. Only the relationship between the length of time since diagnosis and CPL of life was significant. It may be postulated that if individuals develop the ability to overcome the initial stress of the diagnosis, they may successfully manage and comply with the treatment and develop PTG. Tedeschi and Calhoun (7) reported a similar conclusion. The authors found that suffering, appropriately managed, can

lead to significant personal growth. Other research has returned different results. For example, in a study of individuals who had experienced a terrorist attack, the stress was not associated with PTG (48). It is important to consider that the stress of traumatic events varies; it may be of short duration or continuous. Furthermore, trauma may be unconsciously suppressed and positive coping mechanisms may be rendered dysfunctional. Therefore, the type and severity of the trauma may contribute to differences in the study results. This topic merits further examination in future studies.

Our study has a few limitations. First, the number of participants in our study is relatively small, due to a lacking number of admissions to the single-center within the designated time frame. Although our results are significant, a larger sample would yield more generalizable results. Another limitation is that the patients' disease characteristics were not evenly distributed; the treatments applied and the stage of the disease were not uniform. In subsequent studies, it may be desirable to assess PTG in more limited groups, for example, only patients receiving chemotherapy or patients with a stage 4 diagnosis.

Since research into PTG in Turkey is limited, the findings of this study are very valuable. According to our findings, when women receiving treatment for BC were taught active coping strategies and were encouraged to identify and define their emotions, the traumatic experience could lead to positive change in their lives.

Our study emphasized that emotions have an important role in human life. Patients should be encouraged to talk about their feelings, and this should be taught to all those who come into close contact with patients. The evidence suggests that patients who can recognize and describe their emotions after a traumatic experience can more easily achieve more positive changes.

Our results indicated that alexithymia was a negative predictor of PTG, however, we also found that a fighting spirit response style had a partially mediating effect. Alexithymia should not be ignored in cancer patients. Although some studies have stated that alexithymia may be a factor that increases susceptibility to cancer, difficulties in recognizing and expressing emotions may also develop after cancer diagnosis in some patients and hamper PTG. Therapeutic interventions designed to improve the ability to recognize and express emotions and develop positive response patterns, such as fighting spirit, could make a substantial contribution to the course of PTG and the disease.

Contribution Categories		Author Initials
Category 1	Concept/Design	S.C., M.C., U.K.A.
	Data acquisition	M.C., U.K.A.
	Data analysis/Interpretation	S.C., U.K.A.
Category 2	Drafting manuscript	S.C., M.C.,
	Critical revision of manuscript	S.C., U.K.A.
Category 3	Final approval and accountability	S.C., M.C., U.K.A.
Other	Technical or material support	S.C., M.C., U.K.A.
	Supervision	S.C., U.K.A.

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