

# The factor structure of the posttraumatic growth inventory in cancer patients in Turkey

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## Abstract

Posttraumatic growth is a positive psychological change that occurs as a result of tackling vital crises. Although cancer is perceived as a fatal disease, the individual's struggle with many negative conditions during diagnosis and treatment can provide positive change and development. The aim of this study was to examine the factor structure of the posttraumatic growth inventory (PTGI) in Turkish cancer patients. This study included 265 cancer patients receiving treatment at the chemotherapy unit of two university hospitals located in northern Turkey. Percentages, frequencies, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to analyse the data, and Cronbach's  $\alpha$  measured internal consistency. EFA yielded a five-factor structure: Spiritual and existential change, change in perception of life and selfness, relating to others, personal strength and new possibilities. Fit indices for CFA were root mean square error of approximation (RMSEA), 0.06; non-normed fit index (NNFI), 0.92; comparative fit index (CFI), 0.90; root mean residuals (RMR), 0.06; and goodness-of-fit index (GFI), 0.90. The overall Cronbach's  $\alpha$  of the scale was 0.93. PTGI was determined as a reliable and valid tool for Turkish cancer patients. PTGI, which has a determined validity and reliability rate, can be used by healthcare professionals working with oncology patients to evaluate the positive psychological growth and changes in cancer patients and determine their adoption rate.

## KEYWORDS

cancer patients, posttraumatic growth, posttraumatic growth inventory, psycho-oncology

## 1 | INTRODUCTION

Diagnosis and treatment of cancer in an individual's life are traumatic events with seismic effects causing deep fear, despair and loss of control (Casellas-Grau, Ochoa, & Ruini, 2017). However, psychological adjustment to a stressful or traumatic event such as cancer is not always negative (Shand, Brooker, Burney, Fletcher, & Ricciardelli, 2018). Cancer experience is a psychosocial transition with the potential for both positive and negative changes that can provide the opportunity for individual adaptation and posttraumatic growth (Crawford, Vallance, Holt, & Courneya, 2015).

Tedeschi and Calhoun (1996) described posttraumatic growth as the positive changes occurring as a result of the struggle with hard vital crises, for which they developed the posttraumatic growth inventory to evaluate the growth following the trauma. Posttraumatic growth (PTG) in cancer patients is affected by many factors such as age, economic status, degree of culture, having children, coping methods, social support systems, level of hope, the meaning of the disease, religion, time after diagnosis, presence of surgical operation, type of treatment and stage of cancer (Casellas-Grau et al., 2017; Crawford et al., 2015; Heidarzadeh et al., 2017; Shand et al., 2018). In earlier studies, it was observed that PTG is quite common in cancer patients

and varies between 47% and 95% (Manne et al., 2004; Jaarsma, Pool, Sanderman, & Ranchor, 2006; Weiss, 2004; Wilson, Morris, & Chambers, 2014).

Posttraumatic growth inventory (PTGI) had been adopted into many different language and culture and its psychometric attributes were examined to yield one-factor (Taku, Cann, Calhoun, & Tedeschi, 2008), three-factor (Powell, Rosner, Butollo, Tedeschi, & Calhoun, 2003; Weiss & Berger, 2006), four-factor (Ho, Chan, & Ho, 2004; Taku et al., 2007) and five-factor structures (Alex Linley, Andrews, & Joseph, 2007; Anderson & Jakesz, 2008; Jaarsma et al., 2006; Morris, Shakespeare-Finch, Rieck, & Newbery, 2005; Teixeira & Pereira, 2013). Studies which focused on evaluating the validity and reliability of the PTGI have generally been conducted on students (Tedeschi & Calhoun, 1996; Tedeschi, Cann, Taku, Senol-Durak, & Calhoun, 2017), immigrants (Weiss & Berger, 2006), non-clinical events (Prati & Pietrantonio, 2014; Taku et al., 2007) and cancer patients, and the factor structure varies based on the study group (Brunet, McDonough, Hadd, Crocker, & Sabiston, 2010; Heidarzadeh et al., 2017). This variety in factor structure shows that the extent of posttraumatic growth can differ based on the culture and nature of the traumatic event (clinical or non-clinical; Heidarzadeh et al., 2017), as the PTGI factor structure for individuals with DSM-IV traumatic events is not clear (Osei-Bonsu, Weaver, Eisen, & Vander Wal, 2011). Therefore, examining the factor structure of PTGI in cancer patients, a major traumatic experience in Turkish culture, will contribute to the national and international literature and help determine the posttraumatic growth and psychological changes experienced by cancer patients.

This study aimed to investigate the factor structure of the posttraumatic growth inventory, used frequently with cancer patients to determine their positive psychological changes when coping with cancer in a severe or critical state of their illness.

## 2 | METHODS

### 2.1 | Design and setting

This was a cross-sectional study conducted between August 2018 and January 2019 at the Karadeniz Technical University, Farabi Hospital, Medical Oncology Chemotherapy Unit and Trabzon Kanuni Training and Research Hospital, Medical Oncology Chemotherapy Unit in Turkey.

### 2.2 | Participants

Participants were prospectively enrolled from among patients receiving chemotherapy treatment at Karadeniz Technical University Farabi Hospital and Trabzon Kanuni Training and Research Hospital. Criteria for inclusion in the research were: able to speak Turkish, between the age of 18–70, having stage 1, 2 or 3 cancers regardless of the type of cancer, receiving treatment and not having a

**TABLE 1** Introductory characteristics of participants (n = 265)

Introductory characteristics	n	%
Age		
18–50 years old	79	29.8
51–60 years old	92	34.7
61–70 years old	94	35.5
Average ± SD=54.82 ± 12.52		
Sex		
Female	130	49.1
Male	135	50.9
Education status		
Primary school	203	76.6
High school	30	11.3
Bachelor	32	12.1
Income perception		
Low	40	15.1
Median	178	67.2
High	47	17.8
Social security		
Yes	241	91.0
No	24	9.0
Marital status		
Married	227	85.7
Single	38	14.3
Cancer type		
Breast	80	30.2
Lung	45	17.0
Colon	33	12.5
Stomach	21	7.9
Prostate	18	6.8
Endometrium	15	5.7
Over	13	4.9
Brain	10	3.8
Pancreas	8	3.0
Bladder	7	2.6
Bone	5	1.9
Liver	3	1.1
Testis	3	1.1
Skin	2	0.8
Lymphoma	2	0.8
Surgical operation		
Yes	160	60.4
No	105	39.6
Metastasis		
Yes	240	90.6
No	25	9.4

psychiatric disorder. In studies conducted to evaluate the validity and reliability of a scale, a sample with 5–10 times the number of items in the scale is necessary to conduct factor analysis

(Tabachnick & Fidell, 2015). Since the number of items in the PTGI is 25, a sample of 250 people was planned, but to guard against extreme values or lost data, it was decided to include 265 cancer patients in the sample.

### 2.3 | Language validity

The language validity of PTGI was attained through the usage of the revised version of the scale, for which a Turkish culture adaptation has been created (Tedeschi et al., 2017). Permission to use the scale was obtained from Emre Şenol Durak, who had applied the Turkish culture PTGI to students (Tedeschi et al., 2017). A test for language validity was not needed for the scale, and thus no expert opinion was sought regarding language validity.

### 2.4 | Data collection

Data were collected in face-to-face interviews by the researcher. All patients were informed about the questionnaire and then they read and checked their answers on the papers. The data for this study were collected via an individual description questionnaire and the PTGI.

#### 2.4.1 | Individual description questionnaire

This questionnaire was prepared by the researchers based on the literature (Muliira, Salas, & O'Brien, 2017; Prati & Pietrantonio, 2014; Teixeira & Pereira, 2013). The questionnaire includes the patients' socio-demographic characteristics and information about their medical histories (Table 1).

#### 2.4.2 | Posttraumatic growth inventory

This inventory was developed by Tedeschi and Calhoun in 1996 and it comprises 21 items. The scale was revised in 2017 with the addition of four items to evaluate the PTG of non-pious but spiritual and existentialist individuals. The revised version of the scale consists of 25 items and five factors. The factors are spiritual and existential change (5, 18, 22, 23, 24, 25), appreciation of life (1, 2, 13), personal strength (4, 10, 12, 19), new possibilities (3, 7, 11, 14, 17) and relating to others (6, 8, 9, 15, 16, 20, 21), and the items are scored on a 6-point Likert-type ranging from 0 = *never experienced* to 5 = *experienced to a very great degree* for a total score of 0–125, where higher scores indicate greater post-traumatic growth (Tedeschi et al., 2017). Fit indices for the scale are very high and the value of Cronbach's  $\alpha$  is 0.96. The revised version of the scale in 2017 was tested in American, Japanese and Turkish students who had experienced a traumatic event, and it was adapted to Turkish by Senol-Durak (Tedeschi et al., 2017).

### 2.5 | Data analysis

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to evaluate its construct validity. EFA was conducted to reduce the number of variables, determine the correlations among the variables and estimate whether the theoretical structure measures what it actually aims to measure (Tabachnick & Fidell, 2015). Bartlett's test and the Kaiser-Meyer-Olkin (KMO) test were used to test the suitability of the data set for factor analysis. Bartlett's test determines the probability of a high correlation between at least some of the variables in the correlation matrix, in which case the null hypothesis must be rejected ( $p < .05$ ). If so, this means that there is a high correlation between the variables and the data set shows a multivariate normal distribution. The KMO test determines whether the sample size is sufficient for factor analysis. KMO value should be above 0.60 (Tabachnick & Fidell, 2015). CFA is conducted to evaluate the suitability of the scale for new cultures or samples and can also be used to confirm whether the newly discovered factor structure of the scale is verified or not. In this study, the factors of the PTGI were determined by conducting EFA and the factor structure was assessed using CFA. In EFA, we applied five-factor, four-factor, three-factor and two-factor structures, and as a five-factor model was found to have the best concordance with CFA, it was thus adopted.

Cronbach's  $\alpha$  of the scale and the subscales was reviewed to check the reliability of the scale and determine its internal consistency (Çokluk, Şekercioğlu, & Büyüköztürk, 2012). The other way to determine reliability is the standard error measurement (SEM) and minimal detectable change (MDC). The SEM is expressed as the units of the scale for the original test scores and allows the computation of a confidence interval around an individual value and makes it easier to interpret the precision of a score. To calculate the standard value of errors in measurement, the standard error of the measurement is calculated based on the reliability and standard deviation of the test scores (Lopes et al., 2008). The SEM measures the sensitivity of individual measurements and gives an indication of absolute reliability. And, the SEM are used to calculate MDC. MDC's formula is as follows:  $MDC = SEM \times 1.96 \times \sqrt{2}$  (Mokkink et al., 2010). The MDC shows the minimal amount change that can be interpreted as a real change in properties measured by the measuring tool for an individual; a smaller MDC indicates a more sensitive measure (Ries, Echternach, Nof, & Gagnon Blodgett, 2009).

### 2.6 | Ethical consideration

The permission of the scale owners Tedeschi and Calhoun was obtained via electronic mail. Permission to use the Turkish version of the scale was obtained via electronic mail from Şenol Durak for language validity purposes. Ethical committee approval was obtained from the Akdeniz University Faculty of Medicine, Clinical Trials Ethical Board for the research. Once the aim of the study was explained to individuals recruited for the research sample, written

permission was obtained through an informed consent form from those who agreed to participate in the research voluntarily.

### 3 | FINDINGS

The average age of the participants was  $54.82 \pm 12.52$ , approximately half of whom were male (49.1%) and the majority of whom were primary school graduates (76.6%), married (85.7%) and of medium-level income (67.2%). A majority of the participants were suffering from breast, lung and colon cancers (30.2%, 17% and 12.5% respectively); an overwhelming majority of them had experienced metastasis (90.6%), and more than half of them (60.4%) had undergone a surgical operation (Table 1).

To obtain evidence of the structural validity of this study based on the scores collected through PTGI, EFA was first conducted. KMO test had been applied prior to EFA to determine the suitability of the sample size for factorisation, yielding a value for the base data set of 0.91, from which it was determined that the Chi-square value relating to Bartlett's test of sphericity ( $\chi^2(253) = 3,604.624$ ;  $p = .000$ ) was meaningful at an advanced level. Multicollinearity between items and missing value problem were not found. It was determined that the data were thus suitable for factor analysis. After exclusion of items, the analysis was repeated for the five-factor structure. The factors contributing to the total variance were spiritual and existential change (17.76%), change in perception of life and selfness (15.25%), relating to others (12.79%), personal strength (11.08%) and new possibilities (9.80%). The total contribution of the five factors to the variance was 66.70% (Table 2).

Exploratory factor analysis, which was conducted to determine the PTGI factor pattern, yielded a level of acceptance for factor load values of 0.45. When the items in the analysis of the five-factor structure were evaluated regarding whether the factor load values remained within the limits of the level of acceptance and loading under more than one factor, two of the items (items 5 and 19) were found to be inappropriate in terms of factor naming. Factor load values on the subscales were between 0.56 and 0.77 for spiritual and existential change, 0.46 and 0.67 for change in perception of life and selfness, 0.5 and 0.79 for relating to others, 0.62 and 0.76 for personal strength and 0.57 and 0.66 for new possibilities. When the

**TABLE 2** Described total variance table of posttraumatic growth inventory

Factors	Rotated article load values		
	Total	Variance (%)	Cumulative (%)
Spiritual and existential change	4.086	17.765	17.765
Change in perception of life and selfness	3.508	15.253	33.018
Relating to others	2.482	12.790	45.808
Personal strength	2.255	11.086	56.894
New possibilities	1.151	9.806	66.70

common factor variances of the 23 items of PTGI were examined, the values were found to fluctuate between 0.45 and 0.79 (Table 3).

Fit indices calculated with CFA without any modification are  $\chi^2(98) = 169.22$ ,  $p = .001$ ,  $\chi^2/df = 2.45$ , RMSEA = 0.06, NFI = 0.92, CFI = 0.90, RMR = 0.06 and GFI = 0.90 (Table 4).

Descriptive statistics and Cronbach's  $\alpha$  for each domain of the PTGI are presented in Table 5. Internal consistency analysis (Cronbach's  $\alpha$ ) and item analysis were examined to assess the reliability of the PTGI. The overall  $\alpha$  of the PTGI was 0.93, while for the subscales, the value of  $\alpha$  was 0.86 for spiritual and existential change, 0.80 for change in perception of life and selfness, 0.89 for relating to others, 0.82 for personal strength and 0.60 for new possibilities. The overall SEM was 0.06 point for PTGI and PTGI's subscales changed between 0.06 and 0.12. The MDC relating to the total PTGI score was 0.16 points (95% CI; Table 5).

### 4 | DISCUSSION

The increase in cancer incidence throughout the world and increases in life expectancy for cancer patients, thanks to technological advancements, have focused the attention of researchers on adaptation to the negative effects of cancer and on psychological growth (Brunet et al., 2010). The PTGI is one of the most important measurement tools for examining positive psychological changes throughout the diagnosis and treatment of a fatal disease (Heidarzadeh et al., 2017). Therefore, it is very important to examine the validity and factor structure of the PTGI in cancer patients, which was the aim of this study.

CFA analysis indicated that a five-factor structure comprising spiritual and existential change, change in perception of life and selfness, relating to others, personal strength and new possibilities was optimal. Spiritual and existential change refers to the belief in a spiritual being that may increase after trauma, contributing to finding meaning as a coping mechanism in the cognitive process. Change in perception of life and selfness refers to the individual understanding the value and meaning of life and finding a new direction in life. Relating to others expresses the change in the relationship of an individual with other individuals after a traumatic event, as explaining the traumatic experience of the individual to others increases interpersonal feelings and strengthens interpersonal bonds. Personal strength refers to the perception of individual strength—the recognition of improved capabilities to deal with future challenges and to change situations that need to be changed. New possibilities refer to the situation after a traumatic event where the individual realises new opportunities and develops new areas of interest to create a new meaning and perception of life. This study yielded a factor structure similar to but different from that of Tedeschi et al. (2017); the factor called 'appreciation of life' was changed to 'change in perception of life and selfness'. It is thought that the most important reason for this difference in factor structure is that the two studies were conducted in different cultures, so that people's perception of the disease and the meaning attributed to the disease were different.

**TABLE 3** Factor pattern of the posttraumatic growth inventory (main components analysis)

PTGI items	Factor 1 <sup>a</sup>	Factor 2 <sup>b</sup>	Factor 3 <sup>c</sup>	Factor 4 <sup>d</sup>	Factor 5 <sup>e</sup>	Common factor variance
13- Better appreciate each day	0.62					0.69
18- Stronger religious faith	0.77					0.71
22- Greater sense of harmony with world	0.71					0.77
23- More connected with existence	0.66					0.76
24- Better able to face questions about life/death	0.56					0.66
1- Changed my priorities		0.67				0.52
2- Greater appreciation for value of own life		0.59				0.61
4- Greater self-reliance		0.54				0.55
6- Can count on people		0.67				0.55
7- New path for life		0.56				0.58
25- Greater clarity about life's meaning		0.46				0.56
8- Greater sense of closeness with others			0.55			0.72
9- More willing to express my emotions			0.57			0.72
15- More compassion for others			0.79			0.80
16- More effort into my relationships			0.79			0.82
20- Learned how wonderful people are			0.55			0.56
21- Better accept needing others			0.57			0.70
10- I can handle difficulties				0.76		0.77
11- Do better things with my life				0.72		0.72
12- Better able to accept				0.62		0.62
3- Developed new interests					0.66	0.60
14- New opportunities					0.57	0.59
17- Try to change things					0.55	0.69

<sup>a</sup>Spiritual and existential change.

<sup>b</sup>Change in perception of life and selfness.

<sup>c</sup>Relating to others.

<sup>d</sup>Personal strength.

<sup>e</sup>New possibilities.

Although the results of this study differ from the original five-factor structure of PTGI, its five-factor structure is similar, and we note that literature reviews have revealed some difficulties and inconsistencies in the PTGI factor structure (Heidarzadeh et al., 2017; Ho et al., 2013). Only some studies have confirmed the five-factor structure of the PTGI (Brunet et al., 2010; Heidarzadeh et al., 2017; Jaarsma et al., 2006; Liu et al., 2015; Ramos, Leal, Marôco, & Tedeschi, 2016). For example, Brunet et al. (2010) examined the factor structure of the PTGI in breast cancer patients and found a five-factor structure consisting of relating to others, new possibilities, personal strength, spiritual change

and appreciation of life. In a study of the factor structure of the PTGI in cancer patients by Heidarzadeh et al. (2017), the original factor structure was supported. Similarly, Jaarsma et al. (2006) support the factor structure of the original scale. In a Chinese study that examined the psychometric attributes of the PTGI in 1,227 breast cancer patients, a five-factor structure was found consisting of relating to others, new possibilities, personal strength, spiritual change and appreciation of life (Liu et al., 2015).

However, some researchers have argued that the PTGI five-factor structure has not been validated in different countries and therefore

it might need to be restructured. When the factor structures of the PTGI in England (Alex Linley et al., 2007), Iran (Heidarzadeh et al., 2017), France (Cadell, Suarez, & Hemsworth, 2015), China (Ho et al., 2004), Canada (Brunet et al., 2010) and Spain (Weiss & Berger, 2006) were examined, one-, two-, three-, four- and five-factor structures were found. For instance, despite the reliability of the Chinese version of the PTGI in 188 cancer patients, the results differ from those for the original version to some extent, for the Chinese version has a four-factor structure: self, interpersonal, spiritual and life orientation (Ho et al., 2004). Ho et al. (2004) summarised the reasons for the variety in PTGI factor structures under four headings. First, the items of the PTGI may not be well suited to other cultures because they are generally prepared on the basis of studies conducted in America (Brennan, 2001); second, tests of the validity of the PTGI in students can yield variable results due to the phenomenon of positive psychological conditions, and therefore the scale can differ for cancer patients (Cohen, Cimboric, Armeli, & Hettler, 1998); third, the items on the PTGI pertain to a wide range of stressful events and some items may not be related to cancer; and finally, it is normal to discover different factors in different languages and cultures.

CFA is a method that analyses whether the information obtained from the data gathered during the standardisation process is in concordance with the theoretical structure (Tabachnick & Fidell, 2015). In this study, the most commonly used goodness-of-fit indices in the literature were used. When the CFA fit indices of the PTGI were examined, it was found that  $\chi^2/df = 2.45$  ( $\leq 5$ ), GFI = 0.90 ( $\geq 0.90$  = good fit), NFI = 0.92 ( $\geq 0.90$  = good fit), CFI = 0.90 ( $\geq 0.90$  = good fit) and RMR and

RMSEA = 0.06 ( $\leq 0.05$  and  $\leq 0.08$  = acceptable fit) (Tabachnick & Fidell, 2015). CFA of the original scale yielded  $\chi^2/df = 3.91$  ( $\leq 5$ ), CFI = 0.96 ( $\geq 0.95$  = perfect fit), NFI = 0.94 ( $\geq 0.95$  = perfect fit), incremental fit index (IFI) = 0.93 ( $\geq 0.95$  = perfect fit) and RMSEA = 0.05 ( $\leq 0.08$  = acceptable fit), as in this study (Tedeschi & Calhoun, 1996). The CFA fit indices were well in the revised version of PTGI (Tedeschi et al., 2017). Ho's et al. (2004) study found good CFA fit indices (GFI: 0.92, adjusted goodness of fit index (AGFI): 0.89, CFI: 0.96, turker-lewis index (TLI): 0.94 and RMSEA: 0.047) (Ho et al., 2004). The factor structure of the study conducted by Ho et al. in, 2013 in Taiwan is the same as in their study in 2004, and it had similar CFA conformity indices. ( $\chi^2 = 3.96$ , CFI = 0.88, normed fit index (NFI) = 0.81, RMSEA = 0.07).

Cronbach's  $\alpha$  is a measure of the internal consistency (homogeneity) of the items in the scale. The higher the value of  $\alpha$ , the more consistent the items in the scale, indicating that they measure the same property (Çokluk et al., 2012). It is stated that the reliability level predicted for the measurement instruments that can be used in research is 0.70 or greater (Tabachnick & Fidell, 2015). In this study, it was found that the general  $\alpha$  of the scale was 0.93, and the values of  $\alpha$  for the subscales vary between 0.60 and 0.89. Only one subscale, new possibilities, has a low  $\alpha$  value (0.60), which may be due to the small number of items (three) (Tabachnick & Fidell, 2015). In the study by Tedeschi and Calhoun (1996), the PTGI demonstrated good internal reliability (overall PTGI: 0.90, relating to others: 0.93, new possibilities; 0.85, personal strength: 0.73, appreciation of life: 0.65 and spiritual change: 0.60). In these studies,  $\alpha$  for the overall scale was generally 0.90 and above but was lower for the subscales with few items (Heidarzadeh et al., 2017; Jaarsma et al., 2006; Liu et al., 2015; Ramos et al., 2016). In the study of Brunet et al. (2010), overall  $\alpha$  for the PTGI was 0.90 and  $\alpha$  ranged between 0.67 and 0.85 for the subscales. In Ho et al. (2004), overall  $\alpha$  was 0.82, and for the subscales  $\alpha$  ranged between 0.42 and 0.89.

This was the first study to use the MDC and SEM as reliability measurements in order to analyse the psychometric properties of the PTGI. The overall SEM was 0.06 point for PTGI and PTGI's subscales changed between 0.06 and 0.12. The MDC relating to the total PTGI score was 0.16 points (95% CI) and MDC of subscales changed between 0.16 and 0.33. These scores show that the level of agreement to the Turkish version of PTGI in cancer patients was considered excellent, representing <5% of the total score of the PTGI (0–100) (Wageck et al., 2013).

**TABLE 4** Confirmatory factor analysis fit index of the posttraumatic growth inventory

Fit indices	Fit	Acceptable range
$\chi^2$ (98)	169.92 ( $p = .001$ )	–
$\chi^2/SD$	2.45	$\leq 2$ ile $\leq 5$ arası
RMSEA	0.06	$\leq 0.05$ ile $\leq 0.08$ arası
NFI	0.92	$\geq 0.90$ ile 1 arası
CFI	0.90	$\geq 0.90$ ile 1 arası
RMR	0.06	$\leq 0.05$ ile $\leq 0.08$ arası
GFI	0.90	$\geq 0.90$ ile 1 arası

Subscale	M	SD	SEM	MDC <sub>(95)</sub>	Cronbach's $\alpha$
Spiritual and existential change	4.06	1.03	0.06	0.16	0.86
Change in perception of life and selfness	3.93	1.04	0.06	0.16	0.80
Relating to others	3.62	1.27	0.07	0.19	0.89
Personal strength	4.03	2.07	0.12	0.33	0.82
New possibilities	3.40	1.34	0.08	0.16	0.60
Overall	3.82	0.98	0.06	0.16	0.93

Note: Score ranges for the means are 0–5.

Abbreviations: PTGI, posttraumatic growth inventory.

**TABLE 5** Descriptive statistics and internal consistency of each of the PTGI ( $n = 265$ )



## 4.1 | Limitations of the study

Confirmatory factor analysis should be performed on a new sample group other than the sample group on which EFA was performed. In this study, CFA was performed on the same sample group as EFA was performed.

## 4.2 | Clinical implications

The findings suggest that PTGI is suitable for evaluating Turkish cancer patients' posttraumatic growth. Application of this scale in the Turkish language would help healthcare professionals (oncologists, psycho-oncologists and psychiatry and oncology nurses) to understand the psychosocial situation of patients following diagnosis and treatment and indicate whether a patient has undergone growth in terms of psychology, perception of selfness, interpersonal relations and philosophy of life.

## 5 | CONCLUSION

It has been determined that in Turkish culture, the PTGI is a valid and reliable measurement tool for cancer patients. The PTGI is of great importance by providing a standard tool to evaluate the psychological status of cancer patients. International standards should be observed to ensure that any such adapted tools will be of high quality. The psychometric examination of any scale based on international standards will contribute to the development and use of international methodology. Additionally, the application of an internationally accepted methodology to other studies will enable researchers to perform comparative analyses of the results of studies conducted in different societies and cultures.

### CONFLICT OF INTEREST

The author(s) declared no potential conflict of interest with respect to the research, authorship and/or publication of this article.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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