

# Personality, posttraumatic stress and trauma type: factors contributing to posttraumatic growth and its domains in a Turkish community sample

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**Background:** Posttraumatic growth (PTG) is conceptualized as a positive transformation resulting from coping with and processing traumatic life events. This study examined the contributory roles of personality traits, posttraumatic stress (PTS) severity and their interactions on PTG and its domains, as assessed with the Posttraumatic Growth Inventory Turkish form (PTGI-T). The study also examined the differences in PTG domains between survivors of accidents, natural disasters and unexpected loss of a loved one.

**Methods:** The Basic Personality Traits Inventory, Posttraumatic Diagnostic Scale, and PTGI-T were administered to a large stratified cluster community sample of 969 Turkish adults in their home settings.

**Results:** The results showed that conscientiousness, agreeableness, and openness to experience significantly related to the total PTG and most of the domains. The effects of extraversion, neuroticism and openness to experience were moderated by the PTS severity for some domains. PTG in relating to others and appreciation of life domains was lower for the bereaved group.

**Conclusion:** Further research should examine the mediating role of coping between personality and PTG using a longitudinal design.

Keywords: *Domains of posttraumatic growth; personality traits; posttraumatic stress; traumatic event types*

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Although negative aftermaths of traumatic events have been studied extensively, interest in the positive changes following traumatic events, referred to as posttraumatic growth, stress-related growth, or benefit finding, have captured the interest of researchers relatively more recently (Calhoun & Tedeschi, 1999; Helgeson, Reynolds, & Tomich, 2006; Lerner & Blow, 2011; Park & Helgeson, 2006). Posttraumatic growth (PTG) is defined as positive psychological change experienced/reported as a result of an individual's strug-

gle to cope with traumatic events (Calhoun & Tedeschi, 1999; Morris, Shakespeare-Finch, Rieck, & Newbery, 2005; Tedeschi, 1999; Tedeschi & Calhoun, 2004). Research showed that PTG is reported following various types of traumatic life events, such as natural disasters (e.g., Cieslak et al., 2009; Karancı & Acartürk, 2005), accidents (e.g., Nishi, Matsuoka, & Kim, 2010; Shakespeare-Finch & Armstrong, 2010) and loss of a loved one (e.g., Davis, Michael, & Vernberg, 2007; Taku, Calhoun, Cann, & Tedeschi, 2008a).

Tedeschi and Calhoun (2004), in their functional descriptive model, proposed that PTG results from a metaphorically seismic event, shaking the fundamental schemas, beliefs and goals of the individual. This is followed first by automatic ruminations about the event and later with more deliberate ruminations, which leads to schema change and narrative development, and potentially to PTG. The Posttraumatic Growth Scale (PTGI; Tedeschi & Calhoun, 1996) is one of the most frequently used instruments for the assessment of post-traumatic growth. It taps five domains of PTG, namely appreciation of life; relating to others; personal strength; new possibilities; and spiritual growth (Taku, Cann, Calhoun, & Tedeschi, 2008b; Tedeschi & Calhoun, 2004).

Schaefer and Moos (1992), offered a comprehensive model on the determinants of positive changes following traumatic events, which explains positive change with respect to different factor clusters, covering pre-trauma (i.e., individual and environmental) resources, trauma characteristics (i.e., severity of exposure, impact) and post trauma factors (i.e., coping and appraisals). Schaefer and Moos's (1992) model clearly points out that pre-trauma characteristics, such as personality traits will have an effect on how the trauma impacts the individual. Thus, the present study examined the role of personality traits as a pre-trauma variable and the impact of the trauma as manifested in posttraumatic symptomatology, and finally their joint effects in predicting PTG and its domains.

Research focusing on personality as a pre-trauma variable has shown that openness to experience (Linley & Joseph, 2004; Tedeschi & Calhoun, 1996; Zoellner, Rabe, Karl, & Maercker, 2008), agreeableness and conscientiousness (Garnefski, Kraaij, Schroevers, & Somsen, 2008; Linley & Joseph, 2004), extraversion (Garnefski et al., 2008; Sheikh, 2004; Tedeschi & Calhoun, 1996; Val & Linley, 2006), and neuroticism (Evers et al., 2001; Garnefski et al., 2008) are correlated with PTG. Tedeschi and Calhoun (1996) showed that the personality traits of extraversion, openness to experience and optimism are specifically positively related with the dimensions of new possibilities and personal strength. However, there are also some studies failing to find a relationship between personality and PTG, like for optimism (Bostock, Sheikh, & Barton, 2009). Helgeson et al. (2006), in their meta-analysis on benefit finding, failed to find a relationship between neuroticism and PTG. In other studies, however, an inverse significant relationship was found between neuroticism and PTG (Evers et al., 2001; Garnefski et al., 2008). Zoellner et al. (2008), found that for motor vehicle accident survivors with high PTSD higher levels of optimism, and lower levels of openness were related to higher PTG, whereas for those with low levels of PTSD, lower levels of optimism, and higher levels of openness were related to PTG. Thus, in general research seems to support the role of some personality

traits in shaping PTG. However, the contributory roles of different personality traits in domains of PTG and the interaction of personality traits with traumatic stress in contributing to PTG and its domains has not been extensively researched, and this is one of the aims of the present study.

Tedeschi and Calhoun (2004), in their model of PTG proposed that the more seismic the event the more likely it is to experience positive outcomes. This is related to the necessity to process the event and to search for meaning. Several studies, in agreement with the PTG model, have shown that individuals may experience both posttraumatic stress and PTG at the same time (Levine, Laufer, Hamama-Raz, Stein, & Solomon, 2008; Loiselle, Devine, Reed-Knight, & Blount, 2011; Morrill et al., 2008; Tedeschi & Calhoun, 1996). Morris et al. (2005) showed that there are moderate to strong correlations between PTSD symptoms and each domain of PTG. Although the direction of the relationship was positive for most domains, only for the appreciation of life domain they noted a negative relationship between growth and post-traumatic symptomatology.

Thus, it is important to examine the relationship of PTS symptoms and different domains of PTG. In one study with motor vehicle accident survivors, it was found that survivors without PTSD reported higher growth in the perception of personal strength and survivors with PTSD reported higher growth in the perception of appreciation of life and spiritual change (Nishi et al., 2010). Zoellner et al. (2008) found no differences in PTG total score between respondents with different levels of distress (conceptualized with levels of PTSD as measured by Clinician-Administered PTSD Scale). However, for sub-domains of PTG, they reported that those without PTSD had higher scores in perception of personal strength than the PTSD group, whereas those with PTSD scored higher in appreciation of life and spiritual change as compared to the non-PTSD group. Thus, it seems that the level of posttraumatic stress may have an influence on which domain growth is experienced within. Lower posttraumatic distress seems to be related with higher growth in the personal strength domain, whereas higher distress seems to be related with more growth in the appreciation of life and spiritual change domains (Nishi et al., 2010; Zoellner et al., 2008). One of the aims of the present study was to examine how posttraumatic symptomatology relates to the domains of PTG.

Although PTG and its domains have been studied extensively with survivors of different kinds of traumatic events, to our knowledge there are very few studies (e.g., Shakespeare-Finch & Armstrong, 2010) examining survivors of different types of traumatic events in the same study. Thus, one aim of the present study is to examine growth in the domains of PTG amongst the survivors of different types of traumatic events (i.e., accidents, natural

disasters and unexpected death of a loved one). Death of a loved one, physical threat and life transition problems seem to lead to higher levels of PTG (Cummings & Swickert, 2010; Ickovics et al., 2006). The only study in which survivors of three types of events were compared in the same study showed that the bereaved group had higher growth in relating to others and appreciation of life domains as compared to survivors of sexual assault.

The purpose of the present study was to examine the contributory roles of personality traits, posttraumatic symptomatology and their interactions in PTG and its domains in a large community sample of adults, from a predominantly Muslim country, Turkey, experiencing diverse traumatic events. A secondary aim was to examine whether the survivors of different types of traumatic events differ in the domains of PTG. For this aim, the most frequently experienced events by the current sample, namely accidents, natural disasters and unexpected death of a loved one were used.

Based on previous research, it was hypothesized that openness (e.g., Linley & Joseph, 2004), agreeableness, conscientiousness (e.g., Garnefski et al., 2008; Linley & Joseph, 2004) and extraversion (e.g., Garnefski et al., 2008; Sheikh, 2004; Tedeschi & Calhoun, 1996) will be positively, whereas neuroticism will be negatively (e.g., Evers et al., 2001) related to PTG total. We also predicted that posttraumatic symptoms will have a positive relationship with the PTG total (e.g., Loisel et al., 2011; Tedeschi & Calhoun, 1996). Since the role of personality traits and PTS severity on sub-domains of PTG have not been extensively studied in the literature, we made no specific predictions for the sub-domains of PTG and also for the impact of the types of traumatic events on the sub-domains of PTG. Thus, we aimed to explore the impact of personality traits, posttraumatic symptoms and their interactions on PTG and its domains. Similarly, we aimed to evaluate differences in domains of PTG between the survivors of accidents, natural disasters, and bereavement.

## Method

### *Participants and procedure*

The present study is part of a large scale study on the prevalence of traumatic events, posttraumatic stress disorder, posttraumatic growth. The participants were 969 adults, from a stratified cluster community sample provided by the Turkish Statistical Institute (TURKSTAT) for Ankara, the capital city, Kocaeli, in the Marmara region devastated by the 1999 earthquakes and Erzincan, with an experience of a devastating earthquake in 1991, in eastern Turkey. TURKSTAT used the data from the address based census information to provide a random sample of households. The calculation of the sample size was based on an expectation of 60%

trauma prevalence and 5% error rate, based on the method suggested by Smblođlu and Smblođlu (1987), 700 households from Ankara, 600 from Kocaeli and 500 from Erzincan, with a total of 1,800 were drawn. Demographic characteristics of the total sample and the three provinces are given in Table 1.

### *Instruments*

The Socio-Demographic Information Form had questions on participants' demographic features (age, sex, years of education, marital status: single/engaged, married, widow/er, divorced, other), work status (employed, unemployed, other), income (rated on a 5-point scale by the participant; 1: very low to 5: very high), previous history of mental illness (Yes/No), if yes then the type of treatment received (psychological treatment; medication; other) and whether they are currently receiving psychiatric treatment (Yes/No).

The Posttraumatic Diagnostic Scale (PDS) is a 49-item self-report instrument, developed by Foa, Cashman, Jaycox, and Perry (1997), to assess posttraumatic stress symptoms, based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition-Text Revision (APA, 2000). The scale assesses the lifetime experience of various traumatic events, the most distressing event for the individual, and the potential PTSD diagnosis. For the present study, the severity of posttraumatic stress symptoms, assessed with 17 items (posttraumatic symptom severity scale-PTS) rated on a 3-point scale (total score ranging between 0 and 51) was used. The psychometric properties of the scale have been reported to be adequate (Foa et al., 1997).

The scale was adapted into Turkish by Isikli (2006), with satisfactory psychometric properties (Duru, 2006; Isikli, 2006). For the present study, the Cronbach's alpha value for the PTS, which was used as an indicator of posttraumatic distress was 0.90. In the present study the type of most distressing traumatic event chosen by the participants was used as "the type of traumatic event", the PTS score (total of 17 items) was used as a measure reflecting the severity of posttraumatic stress symptoms as a potential predictor of PTG and its sub-domains.

The Posttraumatic Growth Inventory (PTGI) is a 21-item scale, designed to measure the positive changes experienced after major life stressors (Tedeschi & Calhoun, 1996). Items are rated on 6-point scales (0 = I did not experience this change, 5 = I experienced this change to a very great degree). The reliability (Cronbach's alpha) coefficients of each factor were reported to be satisfactory.

Dirik and Karanci (2008) provided the Turkish translated version of the scale. For the present study the original five-factor model of PTG was tested with Confirmatory Factor Analysis (CFA) using EQS6.1 (Bentler, 1995; Byrne, 2006). Based on the robust statistics, the

**Table 1.** Demographic characteristics of the sample ( $N=969$ )

	Total sample		Ankara ( $N=302$ )		Erzincan ( $N=248$ )		Kocaeli ( $N=419$ )	
	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)	%	Mean (SD)
Education (years)		8.3 (4.4)		9.8 (4.5)		7.7 (4.2)		7.7 (4.3)
Age		41.8 (15.8)		42.0 (15.9)		40.7 (15.0)		42.3 (16.3)
Sex								
Female	63		62		68		62	
Male	37		38		32		38	
Marital status								
Single/engaged	18.3		18		17.7		19.4	
Married	69.2		68.5		69.8		69.5	
Widow/er	9.3		8.6		11.3		8.6	
Divorced	2.4		3.6		1.2		2.1	
Other	0.8		0.7		0		0	
Work status								
Employed	29.8		34.1		23.4		30.5	
Non-employed	69.5		64.9		76.2		68.7	
Other	0.4		0.3		0.4		0.5	
Income*								
Very low	11.5		10.9		14.5		10.0	
Low	25.3		23.8		29.4		23.9	
Medium	54.0		50.7		51.2		58.0	
Above medium	8.3		13.2		4.0		7.2	
Very high	0.8		1.3		0.8		0.5	
Mental illness								
No	82.1		83.4		80.6		82.1	
Yes	16.8		15.6		19.4		16.2	
Psychological therapy								
Medication	1.2		1.7		1.6		0.7	
Other	12.8		12.3		14.1		12.4	
Other	2.7		1.7		4.0		2.6	
Currently in treatment								
Yes	5.8		5.0		6.9		5.7	
No	10.2		9.6		12.1		9.5	
Types of event								
Accident	11.0		16.6		8.1		8.8	
Natural disaster	28.1		8.9		22.6		45.1	
Death/illness	40.6		49.7		46.4		30.1	

\*Income was rated on a five point scale by the participants.

hypothesized model fit our data very well ( $S-B\chi^2(179, N=1,253)=829.876, p<0.001, CFI=0.98; RMSEA=0.054; C.I. 0.050, 0.058$ ). The reliability (Cronbach's alpha) coefficients for the present sample were, new possibilities ( $\alpha=0.81$ ), relating to others ( $\alpha=0.84$ ), personal strength ( $\alpha=0.79$ ), spiritual change ( $\alpha=0.63$ ), and appreciation of life ( $\alpha=0.83$ ).

The Basic Personality Traits Inventory (BPTI) was developed by Gençöz and Öncül (in press) after identifying 226 commonly used adjectives in the Turkish culture to define different personality traits obtained from a sample of 100 participants. These adjectives were then administered to 510 participants to rate their own

personalities on a 5-point scale. Factor analysis with varimax rotation yielded five factors in agreement with the literature and a sixth factor reflecting negative valence (e.g., being rude; insincere, having no manners). Forty-five items which had the highest loadings on the factors were chosen to form the BPTI. The 45 items inventory was then administered to a sample of 454 university students to evaluate the factor structure and psychometric properties. The test-retest (3 weeks) coefficients were between 0.74 and 0.84. The correlations of the personality dimensions with self-esteem, coping strategies and social support, STAI-S and STAI-T and PANAS supported its validity. The reliability

(Cronbach's alpha) coefficients for each subscale were found to be adequate.

Since the scale was developed and validated originally in a university student sample, exploratory factor analysis, with varimax rotation was used for the present community sample. As in the original, six factors, accounting for 44.96% of the total variance were obtained. The factors were agreeableness (15.96%); conscientiousness (9.68%), extraversion (6.66%), neuroticism (4.76%), negative valence (4.53%) and openness to experience (3.37%). Cronbach's alpha internal consistency coefficients of agreeableness, conscientiousness extraversion, neuroticism, negative valence, and openness to experience were 0.83, 0.78, 0.78, 0.76, 0.59 and 0.67 respectively for the present sample. Since the Cronbach's alpha for the negative valence dimension was relatively low, and since it is not a dimension researched in the literature, it was not included in the analysis of the present study.

### Procedure

After obtaining approval from the Ethics Committee of Middle East Technical University (METU), fourth year students of the Psychology Departments of METU, Hacettepe and Kocaeli Universities were trained in administering the instruments. Subsequently, participants were visited in their homes based on the addresses provided by the TURKSTAT and were informed about the purposes of the study. They were asked to sign an informed consent form. When the household was contacted, first a list of all individuals above the age of 18 living in the household was obtained. Using the number of adults in a household and the last digit of the survey instrument, the Kish Table (Kish, 1965), providing a method for the random selection of an individual from a household, was used to determine the participant to be included from each household. The inclusion criteria were living in the household for at least 1 year and being 18 or above. Only one adult from each household was included in the sample. When the person chosen was not at home, an appointment was made to visit the household again. If the participant could not be reached in three visits, the procedure was discontinued. A total of 1,800 households were visited in the three provinces over a 6 month period in 2009. We were successful in reaching 1,253 out of 1,800 (69.61%) who accepted to participate. This rate seems to be quite expectable since some could not be contacted after three separate visits and some addresses were not occupied. Out of these 1,253, 1,055 (84.2%) reported to have experienced at least one traumatic event in their lives based on the list of events given in the PDS of Foa et al. (1997), and finally 969 (91.8%) chose one traumatic event that distressed them the most and the present study sample is comprised of these 969 participants. The administration took about

30 min. Participants were informed that they could stop any time and for those who expressed that they were still very distressed due to a traumatic event, we gave a list of mental health facilities that had accepted to give support to study participants.

### Statistical methods

After inspection of the data and data cleaning procedures, correlation analysis and hierarchical multiple regression analysis were conducted using the SPSS 15.0 program (SPSS Inc., 2006). Six separate hierarchical multiple regression analyses were conducted to evaluate how well personality traits, posttraumatic stress (PTS) severity and their interaction terms predicted the total PTG score and its sub-domains while statistically controlling for the socio-demographic variables. The criterion variables were the total PTG score and the scores of the five sub-domains. The socio demographic variables (age, sex, and years of education) were taken as control variables in order to control for their possible confounding effects on the predictors and were entered into the equation with enter method in the first block. Personality traits (extraversion, conscientiousness, agreeableness, neuroticism, and openness) were entered into the second block, with the stepwise method. In the third block, posttraumatic stress (PTS) severity was entered into the regression model. It was hypothesized that personality traits would moderate the relationship between PTS severity and PTG scores. Therefore, the five two-way interaction terms (personality traits  $\times$  PTS) were entered as a set in the final step. If there would be a coefficient not equal to zero at 0.05 then the reduced model was conducted. Finally, a simple slope analysis was conducted for significant interaction terms (Aiken & West, 1991; Jose, 2008).

To evaluate the differences in PTG domains between survivors of three different kinds of traumatic events (i.e., accidents, natural disasters and bereavement) a one-way multivariate analysis of variance (MANOVA) was conducted.

## Results

### Predictors of PTG and its domains: regression analyses

The Pearson product-moment correlations among the major predictors and criterion measures are presented in Table 2. As can be seen from the table, among the personality traits conscientiousness and agreeableness had significant correlations with all the domains and the total PTG. PTS severity had significant positive correlations with the total PTG score and most of its sub-domains.

Six separate hierarchical multiple regression analyses were conducted to evaluate how well personality traits,

**Table 2.** Correlation matrix and descriptive data of the variables used in hierarchical regression analysis

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. PTG	–	0.83*	0.84*	0.78*	0.79*	0.82*	0.05	0.19*	0.21*	0.08*	0.19*	0.19*
2. New possibilities		–	0.70*	0.52*	0.57*	0.65*	0.05	0.13*	0.20*	0.11*	0.20*	0.20*
3. Personal strength			–	0.55*	0.59*	0.63*	0.08*	0.20*	0.18*	0.05	0.23*	0.19*
4. Spiritual change				–	0.47*	0.57*	–0.04	0.15*	0.15*	0.11*	0.02	0.24*
5. Appreciation of life					–	0.54*	0.09*	0.15*	0.16*	0.02	0.18*	0.06
6. Relating to other						–	0.05	0.14*	0.18*	0.02	0.15*	0.10*
7. Extraversion							–	0.21*	0.20*	–0.21*	0.38*	–0.16*
8. Conscientiousness								–	0.45*	–0.02	0.38*	0.02
9. Agreeableness									–	0.04	0.40*	0.13*
10. Neuroticism										–	–0.08*	0.37*
11. Openness to experience											–	–0.05
12. PTS severity												–
M	2.24	1.49	2.4	2.9	2.4	1.9	3.7	4.1	4.3	2.7	3.7	11.1
SD	1.2	1.3	1.5	1.7	1.7	1.3	0.8	0.6	0.5	0.8	0.7	10.3
N	962	962	962	962	962	962	969	969	969	969	969	924

\* $p < 0.05$ , one-tailed.

Note: PTG, total score of posttraumatic growth; PTS, total score of posttraumatic stress.

posttraumatic stress severity and their interaction terms predicted the total PTG score and its sub-domains while statistically controlling for the socio-demographic variables (see statistical methods section for details).

### Total PTG

The variables in the final model (Table 3) accounted for 14% of the total variance in the total PTG,  $R^2 = 0.14$ ,  $F_{(14,901)} = 10.4$ ,  $p < 0.001$ . Thus, in the overall model, personality traits, PTS severity, and their interactions accounted for a significant portion of the variance in the total PTG score, after controlling for the socio-demographic variables.

Conscientiousness, agreeableness, openness to experience, posttraumatic stress symptom severity appeared significantly related to the total PTG score. Of the five two-way interaction terms entered at block four of the hierarchical regression, only PTS  $\times$  extraversion interaction was significant, indicating that the regression of PTS severity on total PTG score varies as levels of extraversion vary. The slopes of the high and low levels of extraversion (Fig. 1) were found to be significant (simple slope = 0.03,  $t = 5.7$ ,  $p < 0.001$ ; simple slope = 0.011,  $t = 2.2$ ,  $p < 0.05$ , respectively).

### New possibilities

The variables in the final model (Table 3) accounted for 18% of the total variance in the score of new possibilities,  $R^2 = 0.18$ ,  $F_{(14,901)} = 12.5$ ,  $p < 0.001$ . Thus, in the overall model, personality traits, PTS severity, and their interactions accounted for a significant portion of the variance in the score of new possibilities while

controlling for the socio-demographic variables. Agreeableness, openness to experience and PTS severity appeared significantly related to new possibilities. Of the five two-way interaction terms entered at block four of the hierarchical regression, only PTS  $\times$  extraversion interaction was significant, indicating that the regression of PTS severity on the score of new possibilities varies as levels of extraversion vary.

The slopes of high and low levels of extraversion (Fig. 2) were found to be significant (simple slope = 0.03,  $t = 5.9$ ,  $p < 0.001$ ; simple slope = 0.01,  $t = 2.8$ ,  $p < 0.01$ , respectively).

### Spiritual change

The variables in the final model (Table 3) accounted for 13% of the total variance in the score of spiritual change,  $R^2 = 0.13$ ,  $F_{(14,901)} = 9.3$ ,  $p < 0.001$ . Thus, in the overall model, personality traits, PTS severity, and their interactions together accounted for a significant portion of the variance in the score of spiritual change while controlling for the socio-demographic variables.

Conscientiousness, agreeableness, and posttraumatic stress symptom severity appeared significantly related to the score of spiritual change. Of the five two-way interaction terms, only PTS  $\times$  extraversion and PTS  $\times$  neuroticism interactions were significant, indicating that regression of PTS severity on the score of spiritual change varies as levels of extraversion and neuroticism vary.

The slopes of high and low level of extraversion (Fig. 3) were found to be significant (simple slope = 0.05,  $t = 6.3$ ,  $p < 0.001$ ; simple slope = 0.02,  $t = 2.7$ ,  $p < 0.01$ , respectively).

**Table 3.** Summary of hierarchical regression of personality traits, PTS severity and their interaction terms on PTG total score and PTG sub-domains, while statistically controlling for the socio-demographic variables<sup>a</sup>

Step	Variables	PTG total score		New possibilities		Spiritual change		Relating to others		Personal strength		Appreciation of life	
		R <sup>2</sup> change	β	R <sup>2</sup> change	β	R <sup>2</sup> change	β	R <sup>2</sup> change	β	R <sup>2</sup> change	β	R <sup>2</sup> change	β
1	The socio-demographic variables	0.03*											
2	Personality traits	0.07*		0.06*		0.04*		0.01*		0.02*		0.01*	
	Extraversion		0.01		-0.02		-0.05		-0.01		0.03		0.10
	Conscientiousness		0.18*		0.13		0.25*		0.08		0.24*		0.20*
	Agreeableness		0.33*		0.33*		0.38*		0.42*		0.17		0.37*
	Neuroticism		0.01		0.05		0.01		-0.05		-0.02		0.02
3	Openness to experience		0.18*		0.28*		-0.09		0.16*		0.36*		0.16
	Posttraumatic stress (PTS) severity	0.03*	0.02*	0.03*	0.02*	0.03*	0.04*	0.01*	0.02*	0.02*	0.03*	0.001	0.01
4	Interaction terms	0.01*		0.01		0.02*		0.02*		0.01		0.01*	
	PTS × extraversion		0.09*		0.10*		0.12*		0.09*		0.11*		0.01
	PTS × conscientiousness		-0.03		-0.02		0.01		-0.09*		-0.03		-0.02
	PTS × agreeableness		0.02		-0.01		0.03		0.07		0.01		-0.01
	PTS × neuroticism		-0.04		0.04		-0.11*		-0.09*		-0.01		-0.03
	PTS × openness to experience		0.05		0.03		0.07		0.001		0.03		0.12*

<sup>a</sup>Age, sex, and years of education were used as control variables.

\*p < 0.05.

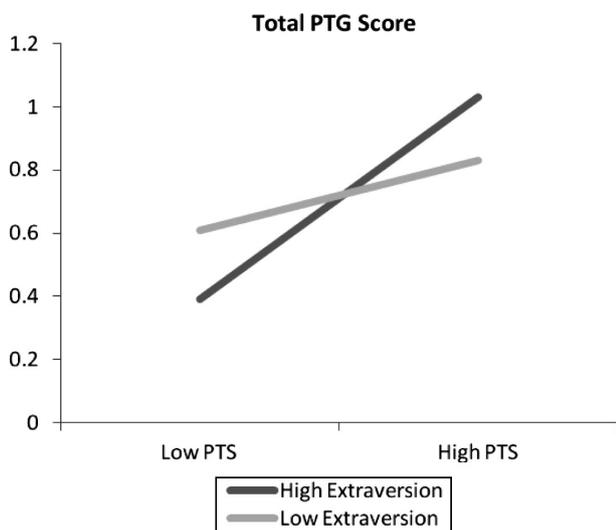


Fig. 1. The interaction of PTS severity and extraversion on the total PTG score.

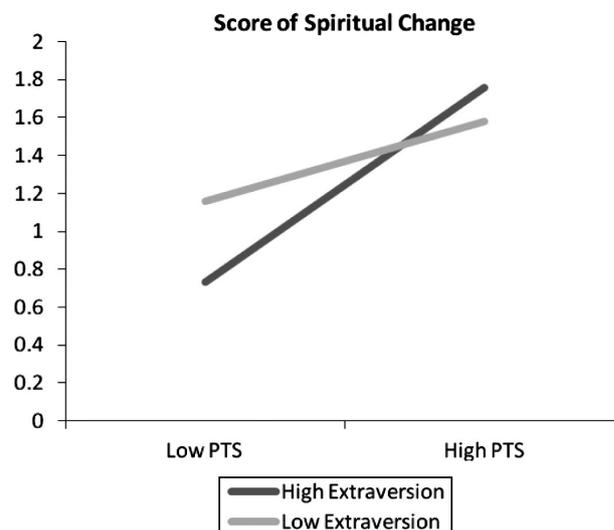


Fig. 3. The interaction of PTS severity and extraversion on the score of spiritual change.

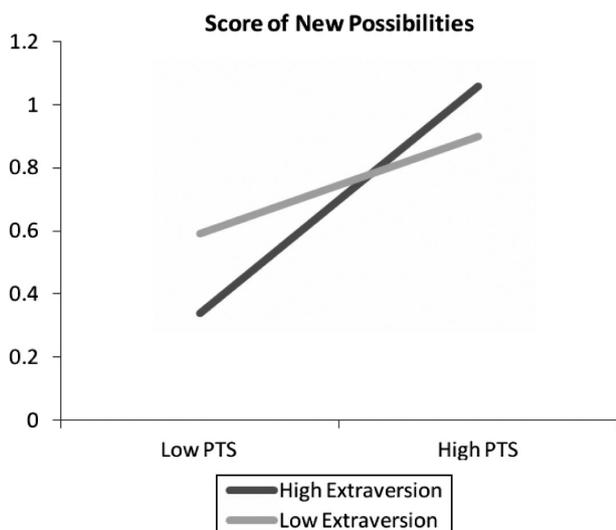


Fig. 2. The interaction of PTS severity and extraversion on the score of new possibilities.

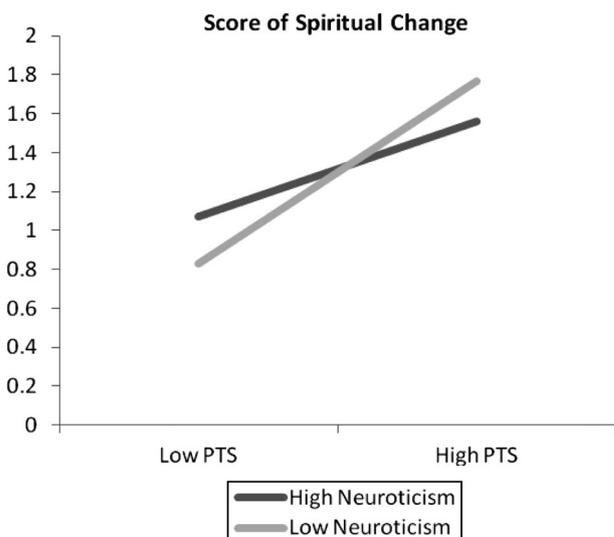


Fig. 4. The interaction of PTS severity and neuroticism on the score of spiritual change.

The slopes of high and low level of neuroticism (Fig. 4) were also found to be significant (simple slope = 0.02,  $t = 3.6$ ,  $p < 0.001$ ; simple slope = 0.05,  $t = 5.3$ ,  $p < 0.01$ , respectively).

### Relating to others

The variables in the final model (Table 4) accounted for 9% of the total variance of score of relating to others,  $R^2 = 0.09$ ,  $F_{(14,901)} = 5.9$ ,  $p < 0.001$ . Thus, in the overall model, personality traits, PTS severity, and their interactions together accounted for a significant portion of the variance in the score of relating to others while controlling for the socio-demographic variables.

Agreeableness, openness to experience and posttraumatic stress symptom severity appeared significantly

related to the score of relating to others. Of the five two-way interaction terms entered at block four of the hierarchical regression,  $PTS \times extraversion$ ,  $PTS \times conscientiousness$  and  $PTS \times neuroticism$  interactions were significant, indicating that regression of PTS severity on the score of relating to others varies as levels of extraversion, conscientiousness and neuroticism varies.

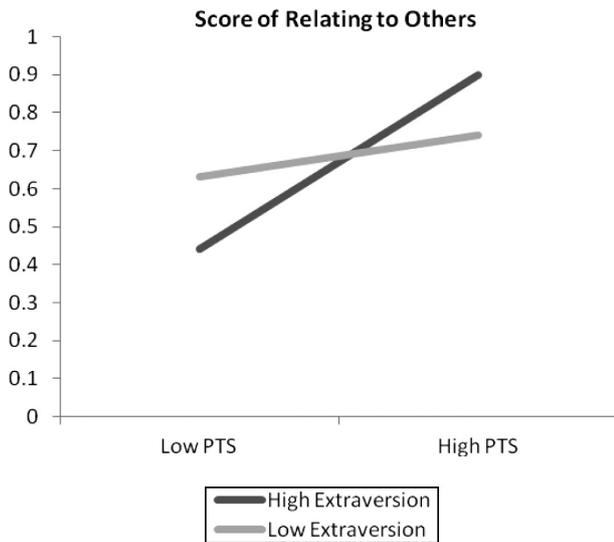
The slope of high level of extraversion (Fig. 5) was found to be significant (simple slope = 0.02,  $t = 3.3$ ,  $p < 0.001$ ). However, the slope of low level of extraversion was not significant (simple slope = 0.01,  $t = 0.89$ ,  $p > 0.05$ ).

Result of the simple slope analysis (Fig. 6) revealed a significant slope of low level of conscientiousness (simple slope = 0.02,  $t = 3.4$ ,  $p < 0.01$ ) but not for high

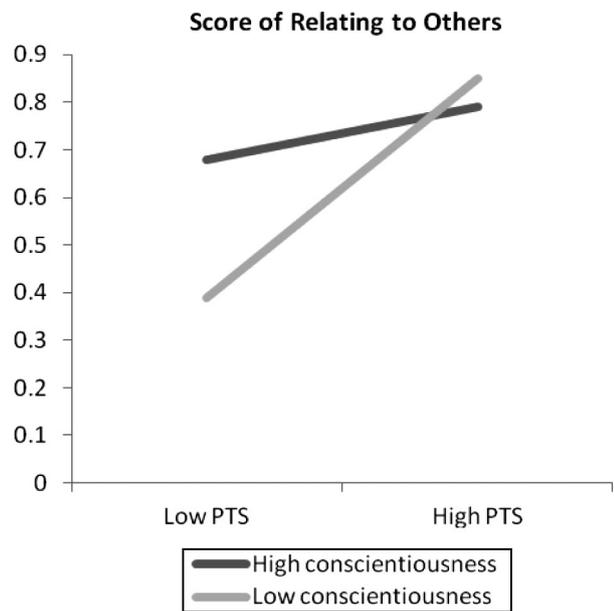
**Table 4.** Means and standard deviations on the dependent variables for the three groups

Type of event	Relating to others		Personal strength		Appreciation of life		Spiritual change		New possibilities	
	M	SD	M	SD	M	SD	M	SD	M	SD
A	1.6	1.3	2.3	1.5	2.7	1.6	2.2	1.5	1.5	1.4
ND	2.0	1.4	2.4	1.4	2.7	1.5	2.7	1.4	1.4	1.3
DLO	1.7	1.3	2.4	1.4	2.1	1.6	2.5	1.5	1.4	1.3

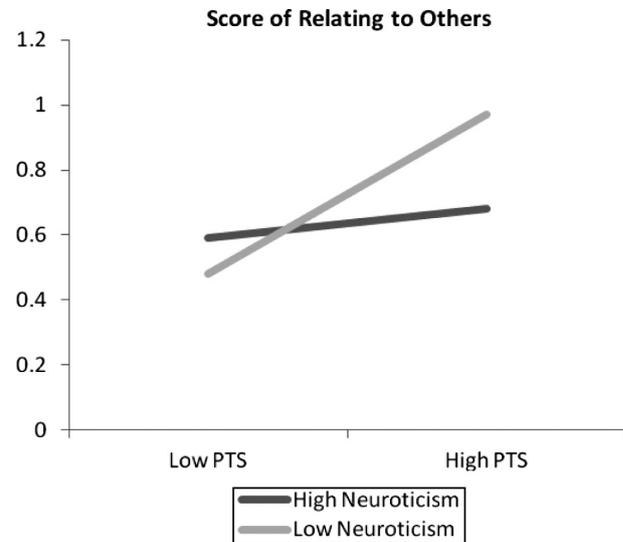
Note: A, accident; ND, natural disaster; DLO, death of loved one.



**Fig. 5.** The interaction of PTS severity and extraversion on the score of relating to others.



**Fig. 6.** The interaction of PTS severity and conscientiousness on the score of relating to others.



**Fig. 7.** The interaction of PTS severity and neuroticism on the score of relating to others.

level of conscientiousness (simple slope = 0.01,  $t = 0.83$ ,  $p > 0.05$ ).

The slope of low level of neuroticism (Fig. 7) was found to be significant (simple slope = 0.02,  $t = 4.2$ ,  $p < 0.001$ ). However, the slope of high level of neuroticism was not found to be significant (simple slope = 0.004,  $t = 0.63$ ,  $p > 0.05$ ).

**Personal strength**

The final model (Table 3) accounted for 13% of the total variance of the score of personal strength,  $R^2 = 0.13$ ,  $F_{(14,901)} = 9.1$ ,  $p < 0.001$ . Conscientiousness, openness to experience and posttraumatic stress symptom severity were related to personal strength. Only the  $PTS \times$  extraversion interaction was significant, indicating that regression of PTS severity on the score of personal strength varies as levels of extraversion vary.

The slopes of high and low level of extraversion (Fig. 8) were found to be significant (simple slope = 0.04,  $t = 5.8$ ,  $p < 0.001$ ; simple slope = 0.02,  $t = 2.7$ ,  $p < 0.01$ , respectively).

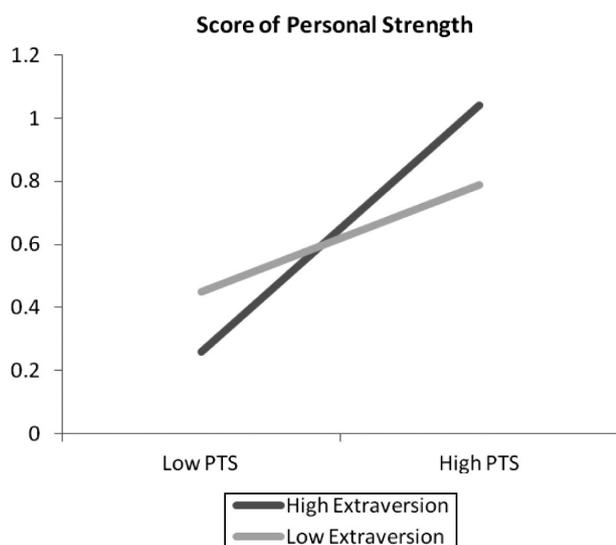


Fig. 8. The interaction of PTS severity and extraversion on the score of personal strength.

### Appreciation of life

The variables in the final model (Table 3) accounted for 7% of the total variance of score of appreciation of life,  $R^2 = 0.07$ ,  $F_{(14,901)} = 5.1$ ,  $p < 0.001$ . Thus, in the overall model, personality traits, PTS severity, and their interaction together accounted for a significant portion of the variance in the score of appreciation of life while controlling for the socio-demographic variables.

Conscientiousness and agreeableness appeared significantly related to the score of appreciation of life. Of the five two-way interaction terms only  $PTS \times openness$  was significant, indicating that regression of PTS severity on the score of appreciation of life varies as levels of openness to experience vary.

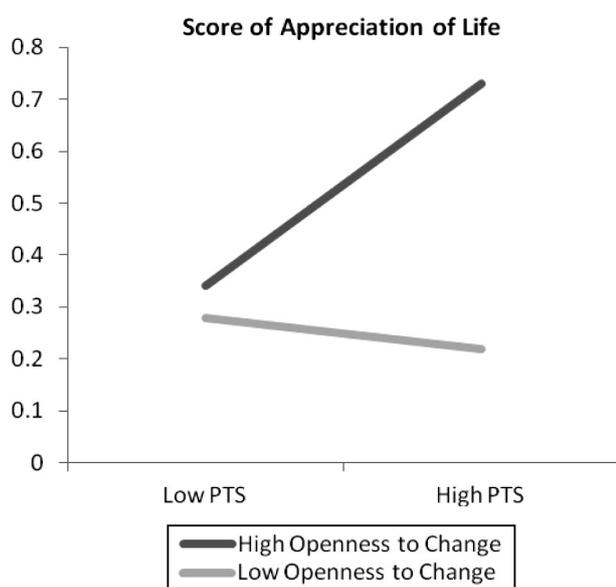


Fig. 9. The interaction of PTS severity and openness to change on the score of appreciation of life.

The slope of the high level of openness to change (Fig. 9) was found to be significant (simple slope = 0.02,  $t = 2.3$ ,  $p < 0.01$ ). However, the slope of the low level of openness to experience was not found to be significant (simple slope = -0.002,  $t = 0.45$ ,  $p > 0.05$ ).

### Effects of the type of event experienced

The three most frequently experienced traumatic events by our sample were, accidents (11%;  $N = 107$ ), natural disasters (28.1%;  $N = 272$ ) and unexpected death of a loved one (40.6%;  $N = 393$ ). A one-way multivariate analysis of variance (MANOVA) was conducted to determine the effect of being a survivor of these three types of traumatic events on the five domains of the PTG. Significant differences were found among the three types of events on the dependent measures, Wilks'  $\Lambda = 0.89$ ,  $F_{(10,1518)} = 8.8$ ,  $p < 0.001$ . The multivariate  $\eta^2$  based on Wilks'  $\Lambda$  was not found to be strong, 0.06. Table 4 contains the means and the standard deviations of the dependent variables for the three groups.

Analysis of variances (ANOVA) on each dependent variable was conducted as follow-up test to the MANOVA. Using the Bonferroni method, each ANOVA was tested at the 0.01 level. The ANOVA on relating to others and appreciation of life score were significant,  $F_{(2,763)} = 6.1$ ,  $p < 0.01$ ,  $\eta^2 = 0.02$ ;  $F_{(2,763)} = 16.5$ ,  $p < 0.01$ ,  $\eta^2 = 0.04$ , respectively. On the other hand the ANOVA on personal strength, spiritual change and new possibilities were not significant.

Post hoc analysis to the univariate ANOVA for relating to others and appreciation of life scores consisted of conducting pairwise comparisons to find significant differences between types of events in terms of the score of two sub-domains of PTG. Each pairwise comparison was tested at the 0.01 divided by 3 or 0.003 level. There were significant differences between group of natural disaster and group of death of loved one in terms of relating to other score (Table 4). Additionally, the group of accident and the group of natural disaster had significantly higher scores on appreciation of life than the group of death of loved one.

### Discussion

The primary goal of the current study was to explore the contributory roles of personality traits, posttraumatic stress severity (PTS) and their interactions on PTG and especially its domains in a large community sample from Turkey exposed to various types of traumatic events. A secondary aim was to examine the differences in PTG domains in individuals exposed to three different kinds of traumatic events. The results revealed that some personality traits do have a facilitative role on PTG total and its domains. PTS severity also had a contributory role in PTG total and all the domains except for the appreciation of life. Furthermore, an important contribution of the

present study was to show that some personality traits have a contributory role on the total PTG and its domains depending on PTS severity.

Personality traits are posited to be important in shaping ones' responses to traumatic events (Morris et al., 2005; Tedeschi & Calhoun, 1996). Our findings indeed supported this view by showing that conscientiousness, agreeableness and openness are robust predictors of the total PTG and almost all of the domains. When we examine the relationship of specific personality traits with specific domains of PTG, extraversion seems to exert an influence on all domains except the appreciation of life domain moderated by the PTS severity. For all the domains, participants with high extraversion experience more growth when they also experience high PTS severity. This may be related to the coping strategies of individuals with extraversion, using more support-seeking, problem-solving and cognitive restructuring (Connor-Smith & Flachsbart, 2007). Thus, under high PTS severity, extraversion may help individuals to cope with the traumatic aftermaths of an event by using more functional coping strategies and thus lead to higher growth in almost all domains. However, when the PTS severity is low, extraversion seems to have a suppressing effect on PTG. Under low PTS severity, individuals with high extraversion may not feel the need to activate their coping resources and thus not achieve much growth because they do not feel the need to engage in problem-solving or seeking-social support. It is important to note that the beneficial effect of having high extraversion under high PTS severity or having the trait of extraversion is not related to the appreciation of life domain, which may imply that this domain is related to some other personality traits.

Conscientiousness appeared significant for the spiritual change, personal strength and appreciation of life domains. Furthermore, for the relating to others domain, conscientiousness interacted with PTS severity, showing that high conscientiousness is facilitative of growth in relating to others domain irrespective of PTS severity, whereas for low conscientiousness high PTS severity is needed for growth in this domain. Conscientiousness involves high levels of self-regulation, persistence, impulse control, achievement orientation, and self-discipline (McCrae & John, 1992). This trait has been found to be related to problem-solving and cognitive restructuring coping styles (Connor-Smith & Flachsbart, 2007). Thus, it is understandable that conscientiousness will facilitate the processing of the traumatic event and directly coping with the event, rather than avoiding and thus relate to growth perceptions in the relating to others domain irrespective of level of PTS severity. However, individuals who are low on this trait seem to need a high traumatic impact to try to deal with the event and thus report PTG only when they experience high distress.

Agreeableness was related to all domains of PTG, except the personal strength domain. Agreeableness involves trust, altruism, compliance, and tendermindedness (McCrae & John, 1992). It has been shown to be related with high levels of both perceived and received social support (Bowling, Beehr & Swader, 2005; Tong et al., 2004). Thus, it seems that, except for the personal strength domain, this trait likely facilitates PTG by making the individual accept the traumatic event and seek social support in order to deal with its aftermath.

Neuroticism, which involves negative emotionality, self-consciousness, physiological reactivity to stress, and behavioral inhibition (McCrae & John, 1992) appeared significant for the spiritual change and relating to others domains moderated by PTS severity. Connor-Smith and Flachsbart (2007), in their meta-analysis reported that neuroticism predicted wishful thinking, withdrawal and emotion focused coping. All these strategies point to the fact that individuals high on neuroticism may use avoidance coping that may hinder the processing of the event which is essential for growth. For both the spiritual change and the relating to others domains low neuroticism facilitated growth under high PTS severity. For the relating to others domain individuals high in neuroticism showed the same PTG irrespective of PTS severity levels. However, those with low neuroticism had a higher PTG under high PTS severity. Thus, low neuroticism seems to facilitate coping and processing under high PTS severity for relating to others. However, interestingly for the spiritual change domain, both high and low neuroticism related to higher PTG under high PTS severity. Although future research needs to focus on the coping strategies of individuals with low and high neuroticism, our findings seem to point out that this trait has a negative impact on growth in the spiritual and the relating to others domains as distinct from other domains of growth.

Openness related to new possibilities, relating to others, personal strength domains. Furthermore, those with high openness showed higher levels of growth in the appreciation of life domain under high PTS severity. Openness entails being interested in new situations, new experiences and ideas. Individuals who are high on openness are intellectually curious, imaginative and emotionally responsive (Costa & McCrae, 1985). Since cognitive processing is essential for PTG (Tedeschi & Calhoun, 2004), it can be expected that individuals showing openness are more likely to be ready to cognitively process the traumatic event and its meaning and thus show more growth in all domains. For the appreciation of life, openness seems to facilitate growth only when PTS severity is high, indicating that this trait helps individuals to process the event related struggles when there is a higher traumatic impact. However, when the PTS severity is low, high openness does not seem to have a facilitative effect on the appreciation of life.

Taken together the findings relating personality traits to domains of growth seem to point out that rather than having very distinct effects on specific domains, conscientiousness, agreeableness and openness are facilitators of growth in almost all domains of PTG. Therefore, in future research it will be valuable to examine how these personality traits relate to PTG by examining cognitive processing and coping strategies unique to these traits. However, the effects of extraversion and neuroticism seems to depend on PTS severity. High extraversion is facilitative for growth in all domains, except for appreciation of life under high PTS severity. Similarly, neuroticism has a role on two domains of PTG, namely spiritual change and the relating to others, and this effect depends on the level of PTS severity. High neuroticism seems to be unfavourable under both high and low PTS severity, whereas when PTS severity is high low neuroticism fosters growth in these two domains. These findings modify previous findings of a negative relationship between neuroticism and PTG (Evers et al., 2001; Garnefski et al., 2008) by showing that this negative relationship is more pronounced only under high PTS severity conditions and only for some domains of growth.

PTS severity appeared significant for the total PTG and all the domains, except the appreciation of life. This finding supports the model of PTG, positing a role for the seismicity of the event to create room for processing and thus positive transformations (Tedeschi & Calhoun, 2004) and is in line with previous research findings (Levine et al., 2008; Morrill et al., 2008; Tedeschi & Calhoun, 1996). PTS severity was not significant only for the appreciation of life domain. Morris et al. (2005) reported a negative relationship between PTS severity and the appreciation of life domain, whereas the relationship was positive for all the other domains. In the present study, although PTS severity did not directly relate to this domain, openness to experience interacted with PTS severity only for this domain, showing that under high PTS severity individuals who are high in openness report more growth. Thus, it seems that growth in appreciation of life occurs when high PTS severity is experienced by individuals who are more open to process their experiences.

In the current sample we compared growth in the five domains of PTG among individuals who experienced three distinct types of events, namely accidents, natural disasters and unexpected death of a loved one. Previous research on the impact of different kinds of events on the domains of PTG is quite rare (e.g., Shakespeare-Finch & Armstrong, 2010) and thus it was difficult to make specific predictions. The only study comparing survivors of different types of events in the same study, showed that the bereaved group had higher growth than survivors of sexual assault in relating to others and appreciation of life domains (Shakespeare-Finch & Armstrong, 2010).

Our results also showed that the type of event had a significant impact on only two domains, namely the relating to others and the appreciation of life domains. Natural disaster survivors had significantly higher growth in relating to others as compared to those who lost a loved one. Also, natural disaster and accident survivors had higher scores in the appreciation domain as compared to the bereaved group. Since in our sample reporting of sexual assault or other types of physical assault were very low we ended up comparing events which are relatively less benign as compared to assault victimization. Therefore, within our three groups, it is understandable that the bereaved group showed less growth in the relating to others and the appreciation of life domains. It seems less likely to endorse growth in the appreciation of life after experiencing the sudden loss of a loved one, since the bereaved may be struggling with feelings of guilt, knowing that the loved one can no longer enjoy life. On the other hand, the 1999 Marmara earthquake was followed by extensive media coverage of devastation and help from volunteers (Dogan, 2011; Sumer, Karanci, Berument & Gunes, 2005), and thus it is understandable that those who survived a natural disaster report more growth in the appreciation of life and relating to others domains. Similarly, survivors of accidents experience a threat to life and thus may feel that life is a gift and thus show more growth in the appreciation of life.

Since the types of events were not purposefully selected in the present study to yield differences in PTG domains, and the types of events most frequently endorsed by a community sample were analyzed the results do not seem to provide a clear distinction between the survivors of these three types of events.

### Study limitations

The present study has some shortcomings that should be acknowledged. Firstly, due to the cross-sectional design no causal inferences can be drawn from the results. The study utilized a self-report instrument administered face to face with trained interviewers. This face to face reporting may have increased the report of some more benign events like accidents and natural disasters and may have suppressed the reporting of certain other types of events like violence and sexual abuse which are more difficult to report to interviewers who are complete strangers to the respondent. Another limitation was the use of a personality measure specifically developed to be used in Turkey. Although our results on personality traits were in line with previous research findings, the use of a newly developed personality scale can be considered a limitation. Lastly, although we have used the Kish method to ensure a random sampling from households, our sample had an overrepresentation of women and the unemployed. This may be related to fact that males and

the employed were more reluctant to accept participation due to time constraints.

## Conclusions

The current study involved a large community sample, representing adults from different walks of life and thus provides valuable insights into the positive transformations in the aftermath of diverse traumatic events and the effects of personality and posttraumatic stress severity on domains of growth. As a whole, our findings supported the importance of some personality traits, like openness, agreeableness and conscientiousness in facilitating PTG and some of its domains. Furthermore, the results showed that the impacts of extraversion, neuroticism and openness on growth depends on the survivor's PTS severity. Thus, the results show that some personality traits are unique predictors of some domains, and that some personality traits are only helpful under high or low PTS severity conditions. In order to understand how personality relates to PTG and its sub-domains the possible mediating roles of coping strategies and types of traumatic events using longitudinal designs are recommended. An understanding of coping processes can provide useful guidelines for clinicians for facilitating PTG in survivors of traumatic events.

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## Conflict of interest and funding

There is no conflict of interest in the present study for any of the authors.

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