Psychiatry Research 272 (2019) 507–514

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Social support moderates association between posttraumatic growth and trauma-related psychopathologies among victims of the Sewol Ferry Disaster

Kyu-Man Han[a], Ji Young Park[b], Ha Eun Park[c], So Ra An[c], Eun Hee Lee[c], Ho-Kyoung Yoon[d], Young-Hoon Ko[c,d,*]

[a] Department of Psychiatry, Korea University Anam Hospital, Korea University College of Medicine, Seoul, Republic of Korea
[b] Department of Social Welfare, College of Humanities and Social Sciences, Sangji University, Wonju, Republic of Korea
[c] Ansan Mental Health Trauma Center, Ansan, Republic of Korea
[d] Department of Psychiatry, Korea University Ansan Hospital, Korea University College of Medicine, 123 Jeokgeum-ro, Danwon-gu, Ansan 15355, Republic of Korea

ARTICLE INFO

Keywords:
Posttraumatic growth
Perceived social support
Posttraumatic stress disorder
Depression
Sewol Ferry disaster

ABSTRACT

Disasters have numerous harmful effects on the mental health status of trauma-exposed people. We investigated the differences in the association between trauma-related psychopathologies and posttraumatic growth according to the perceived social support level among victims of the Sewol Ferry disaster on April 16, 2014, in South Korea. Data from 241 bereaved family members, survivors, and family members of survivors were used. The Duke-UNC Functional Social Support Questionnaire, Posttraumatic Growth Inventory, PTSD Checklist-5, Posttraumatic Embitterment Disorder Self-Rating Scale, Patient Health Questionnaire-9, and Generalized Anxiety Disorder-7 were used to evaluate perceived social support, posttraumatic growth, and trauma-related psychopathologies. We found that the severity of depression and anxiety showed inverse correlations with posttraumatic growth only in the low-social support group, while they did not demonstrate significant correlations in the high-social support group. The social support level had correlations with posttraumatic growth and the severity of posttraumatic stress disorder and posttraumatic embitterment disorder only in female respondents. Furthermore, there was a mediation pathway from social support level to posttraumatic growth through depressive symptoms. This study explored the complex relationship between social support, posttraumatic growth, trauma-related psychopathologies, and gender among trauma-exposed individuals in the aftermath of the Sewol Ferry disaster.

1. Introduction

Disasters have numerous repercussions on the mental health status of trauma-exposed people, with various types of psychopathologies including posttraumatic stress disorder (PTSD), depression, and anxiety disorders prevalent after disasters (Goldmann and Galea, 2014). Beyond trauma-related psychopathologies, many studies have focused on the other side of psychological consequences—positive changes brought about by the struggle with challenging stressful events. In particular, the concept of posttraumatic growth has been intensively researched in disaster psychiatry (Jin et al., 2014; Leal-Soto et al., 2016; Lowe et al., 2013). A conceptual model of posttraumatic growth includes improvements in five domains including appreciation of life, interpersonal relationships, sense of personal strength, recognition of new possibilities, and spiritual development (Tedeschi and Calhoun, 1996).

Social support is considered one of the most important psychosocial resources for the development of posttraumatic growth following disasters (Du et al., 2018; Dursun et al., 2016). Furthermore, it is known to have a protective effect that is inversely correlated with negative mental health consequences such as PTSD, depressive symptoms, and posttraumatic embitterment disorder (PTED) (Guo et al., 2015; Lai et al., 2018; Lee et al., 2017). In addition to the direct correlations of social support with posttraumatic growth and trauma-related psychopathologies, it has been reported to have a potential moderating effect in the association between trauma exposure and mental health outcomes (Dar et al., 2018). McGuire et al. (2018) reported that perceived social support level significantly moderated the association between exposure to Hurricane Katrina and depressive symptoms, avoidance, and arousal PTSD symptoms. A growing body of evidence suggests a complex relationship between social support, trauma exposure, and trauma-related psychopathologies; however, little is known about the

* Corresponding author.
E-mail address: koyh@korea.ac.kr (Y.-H. Ko).

https://doi.org/10.1016/j.psychres.2018.12.168
Received 7 August 2018; Received in revised form 30 December 2018; Accepted 30 December 2018
Available online 31 December 2018
0165-1781/

potential moderating effect of social support in the association between trauma-related psychopathologies and posttraumatic growth in disaster-exposed people. Previous studies have yielded inconsistent findings on the association between trauma-related psychopathologies and posttraumatic growth —several reported significant correlations and others suggested unclear correlations. There is a possibility that social support affects this mixed result regarding the relationship between posttraumatic growth and psychological distress (Schubert et al., 2016).

Gender might be another factor involved in the relationship between social support, trauma-related psychopathologies, and posttraumatic growth. Significant gender difference has been reported regarding prevalence of PTSD (Carmassi et al., 2014; Wang et al., 2012), depressive symptoms (Sattler et al., 2006), and development of posttraumatic growth (Xu and Wu, 2014) after the disaster. Furthermore, a previous study by Jin et al. (2014) reported that gender was a significant moderating factor in the association between PTSD and posttraumatic growth among survivors after the 2008 Wenchuan earthquake. Evidence has indicated that there is a gender difference in the protective effect of social support on mental health outcomes because women are more sensitive to the positive effects of high social support on posttraumatic mental health status (Ahern et al., 2004; Andrews et al., 2003). However, a more detailed explanation is required.

A South Korean ship, the Sewol Ferry, carrying 476 passengers from Incheon to Jeju Island, sank in the Yellow Sea off the southwest coast of South Korea on April 16, 2014. One hundred and seventy-two people survived the disaster; however, 304 were reported deceased or missing. Of those 304, 250 were high school students on a school excursion from Ansan, South Korea. The disaster caused tremendous shock and overwhelming grief across the country. Generally, it is suggested that human-caused disasters have a more detrimental effect on the mental health of exposed people than natural disasters, and delayed identification of human causes may make emotional distress or anger harder to resolve (Morgan and Bhugra, 2010; Norris et al., 2002). Detailed information about the disaster and its psychological impacts on the community (i.e., Ansan) and South Korea are described in the literature (Han et al., 2017).

A possible relationship between social support, trauma-related pathologies, and post-traumatic growth has been suggested in regard to the Sewol Ferry disaster. A recent study using the data of 48 survivors of the Sewol Ferry disaster reported that perceived social support level was inversely correlated with symptoms of PTED and mediated the influence of PTED symptoms on the meaning in their life (Lee et al., 2017). Another study, of Korean people indirectly exposed to the Sewol Ferry disaster through mass media, reported that individuals with higher levels of PTSD symptoms showed higher posttraumatic growth compared to those with lower levels of PTSD symptoms (Wong et al., 2018). However, there have been few studies exploring the complex relationship between social support, posttraumatic growth, and posttraumatic psychopathologies in the sample of people directly exposed to the disaster (Cao et al., 2018).

In this study, we created a hypothetical model regarding the complex relationship between perceived social support, trauma-related psychopathologies, posttraumatic growth, and gender assuming that the association between psychopathologies and posttraumatic growth would differ based on social support level and that there would be gender differences in the association between social support level and psychopathologies and between social support and posttraumatic growth. From the evidence of serial correlations between social support level and psychopathologies and between psychopathologies and posttraumatic growth, we also hypothesized that trauma-related psychopathologies would mediate the correlation between social support and posttraumatic growth as shown in Fig. 1. Therefore, we aimed to investigate the moderating role of perceived social support level in the association between trauma-related pathologies and posttraumatic growth among the sample of victims' and survivors' families and survivors of the Sewol Ferry disaster as our main analysis. Second, we also examined the potential moderating role of gender in the associations of social support level with posttraumatic growth and psychopathologies.

2. Methods

2.1. Study sample

The data used in the present study were derived from the Health and Social Welfare Survey on the Victims of the disaster performed by Ansan Mental Health Trauma Center from November 2017 to March 2018. The survey aimed to investigate mental and physical health, living conditions, and welfare demands of bereaved families, survivors' families, and survivors. A total of 346 people who were survivors, bereaved family members, or survivors' family members aged 16 and above participated in the survey and responded to a suite of self-reporting questionnaires regarding socioeconomic status, mental and physical health, health service utilization, health behaviors, quality of family relationships, social activities, and needs for social welfare services with guidance from well-trained interviewers from the center. Bereaved and survivors' family members were limited to parents, brothers, sisters, and children. In the present study, among the 346 people who were survivors or family members of the deceased or survivors and enrolled in the survey, the data of 241 people who completed the all the self-reporting questionnaires on posttraumatic growth, perceived social support, and trauma-related psychopathologies were used in the analysis (as shown in the "2.2. Measurements"). The study protocol was approved by the Institutional Review Board of the Korea University Ansan Hospital (IRB no., 2017AS0018), and in accordance with the Declaration of Helsinki, all participants provided written informed consent prior to participation.

2.2. Measurements

The Duke-UNC Functional Social Support Questionnaire (FSSQ) was used for the assessment of perceived social support (Broadhead et al., 1988). The FSSQ was developed as a 14-item version with a five-point Likert scale to evaluate one's perceptions of the amount and type of individual social support, with each item rated from 1 (*much less than I would like*) to 5 (*as much as I would like*) (Yang et al., 2013). As most previous studies used an eight-item version owing to its validity (Isaacs and Hall, 2011), we used the same, with scores ranging from 8 to 40. The Korean version of the FSSQ was validated in a sample from the outpatient department of family medicine in the university hospital and showed relatively high internal consistency (Cronbach's $\alpha = 0.89$) (Suh et al., 1997). In this study, internal consistency measured by Cronbach's α was 0.959.

Posttraumatic growth was assessed by a 21-item self-reporting questionnaire, the Posttraumatic Growth Inventory (PTGI) developed by Tedeschi and Calhoun (1996). The PTGI measures positive changes after negative events with a six-point Likert scale ranging from 0 (*not at all*) to 5 (*a very great degree*) with regard to interpersonal relationships, new possibilities, personal strength, spiritual change, and appreciation of life (Acquaye, 2017). The possible scores range from 0 to 105, and higher scores are associated with higher degrees of posttraumatic growth. The validated Korean version of the PTGI showed high internal consistency (Cronbach's $\alpha = 0.94$) in a sample of PTSD patients and healthy controls (Song et al., 2009). This study also demonstrated high internal consistency for PTGI (Cronbach's $\alpha = 0.961$).

PTSD symptoms were evaluated using a 20-item version of the PTSD Checklist-5 (PCL-5). The PCL-5 assesses the degree to which individuals have suffered in the past month according to DSM-5 PTSD symptoms related to their most currently distressing event (Wortmann et al., 2016). Each item (five-point Likert scale) is rated from 0 (*not at all*) to 4 (*extremely*) and the summed score ranges from 0 to 80. The Korean version of the PCL-5 was validated in Korean veterans of the Vietnam War and demonstrated excellent internal consistency (Cronbach's

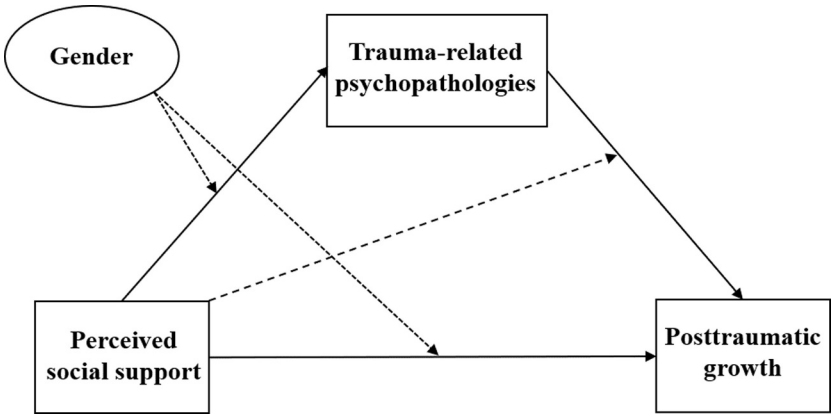

Fig. 1. A hypothetical model of perceived social support, trauma-related psychopathologies, posttraumatic growth, and gender. The perceived social support level moderates the association between trauma-related psychopathologies and posttraumatic growth. Gender moderates the associations between perceived social support and trauma-related psychopathologies and between social support level and posttraumatic growth. The trauma-related psychopathologies mediate the association between perceived social support and posttraumatic growth. The solid line represents correlations between variables and the dotted line represents a moderating effect.

α = 0.972) (Kim et al., 2017). The PCL-5 has the following subscales: intrusions, avoidance, negative alterations in cognition and mood, arousal, and reactivity (Wortmann et al., 2016). Even in this study, the PCL-5 demonstrated high internal consistency (Cronbach's α = 0.967). Recent studies on the PCL-5 suggest that scores of 33 or above can be an efficient cutoff for PTSD diagnosis (Bovin et al., 2016; Wortmann et al., 2016).

A 19-item self-reporting questionnaire, the Posttraumatic Embitterment Disorder Self-Rating Scale (PTED scale), was used for the assessment of PTED symptoms (Linden et al., 2009). The PTED scale, rated on a five-point Likert scale from 0 (*not true at all*) to 4 (*extremely true*), aims to evaluate features of prolonged and disabling embitterment reactions (i.e., experiences of injustice and humiliation) in the aftermath of severe and negative life events experienced over the last years (Shin et al., 2012). A Korean version of the PTED scale was validated and showed very high internal consistency (Cronbach's α = 0.962) in a sample of patients with depressive disorders (Shin et al., 2012). Linden et al. (2009) suggested that a mean total score of 2.5 or above may indicate clinically significant reactive embitterment. The sample in the present study also showed very high internal consistency (Cronbach's α = 0.978).

Depressive symptoms were evaluated by a nine-item version of the Patient Health Questionnaire-9 (PHQ-9) developed for the screening, diagnosis, and severity assessment of depression based on DSM-IV criteria for major depressive episodes (Kroenke et al., 2001). Each item is rated on a four-point Likert scale from 0 (*not at all*) to 3 (*nearly every day*) based on symptom frequency. The PHQ-9 is one of the most widely used questionnaires in primary care settings and is regarded as the most extensively tested psychometric tool for depression (El-Den et al., 2018). The Korean version of the PHQ-9 was validated with high internal consistency (Cronbach's α = 0.978) (Han et al., 2008). A score of 10 or greater is recommended as the cutoff for major depression (Kroenke and Spitzer, 2002). In our sample, internal consistency measured by Cronbach's α was 0.921.

Anxiety symptoms were assessed using a seven-item version of the Generalized Anxiety Disorder-7 (GAD-7), developed as a screening tool to detect GAD in primary care settings (Spitzer et al., 2006). Each four-point Likert scale item is rated from 0 (*not at all*) to 3 (*nearly every day*) based on the frequency of symptoms (Spitzer et al., 2006). The Korean version of the GAD-7 was validated in a sample of patients with migraine and was reported to have high internal consistency (Cronbach's α = 0.915) (Seo and Park, 2015). GAD-7 scores of 10 and above are consistent with GAD diagnoses based on DSM-IV criteria (Spitzer et al., 2006).

2.3. Covariates

The following socioeconomic and physical health-related characteristics were used as covariates in the analysis: age, gender, educational level (*middle school or below, high school, college degree or above*), marital status (*widowed, divorced, separated, never married, married*), economic activity (*no economic activity or unemployed, economically active)*, having a religion (*yes, no*), trauma experience type (*bereaved families, survivors' families, survivors*), self-rated health (*very good* [coded as 1], *good* [coded as 2], *fair* [coded as 3], *bad* [coded as 4], *very bad* [coded as 5]), alcohol consumption (*four times or more a week, two–three times a week, two–four times a month, less than once a month, past, or never*), and cigarette smoking (*current, past, or never*).

2.4. Data analysis

To examine our hypothetical model, we investigated the potential moderating effect of social support level in the association between trauma-related pathologies and posttraumatic growth and the potential moderating effect of gender in the association between social support and psychopathologies and between social support and posttraumatic growth. We also explored the potential mediation pathway between social support and posttraumatic growth through psychopathologies. First, we performed social support level-stratified multiple regression analyses investigating the correlation between PTGI (dependent variable [DV]) and trauma-related psychopathology scales (IVs [independent variables]) including other socioeconomic and health-related variables as additional IVs to explore the differences in correlation between psychopathologies and posttraumatic growth according to support level. The sample was subdivided into high and low social support groups according to the median FSSQ value because there is no established cutoff value for FSSQ: (high: ≥ median value of FSSQ score; low: < median value of FSSQ score). Second, we performed gender-stratified multiple regression analyses investigating the correlation between FSSQ (IV) and mental health scales (DVs) in a similar manner to the social support level-stratified analyses. Third, we explored the mediation pathway from social support through trauma-related psychopathologies to posttraumatic growth using the method developed by Hayes and Preacher (2014). We adopted a multi-mediator model analysis including FSSQ score as the IV, PTGI score as DV, PCL-5, PTED, PHQ-9, and GAD-7 scores as potential mediators, and socioeconomic and health-related variables as covariates in a single regression model. The mediation analysis was conducted using Hayes' PROCESS macro (ProcessV2.16.3) program (http://www.processmacro.org/download.html). The program can calculate the indirect effect(s) of mediator(s) and direct and total effect of IV to DV in a regression model with non-parametrical bootstrapping processes of resampling. This study adopted 5000 bootstrapping and calculated the 95.0% confidence interval (CI) of the indirect effect of potential mediator(s). In addition, a multiple linear regression model including socioeconomic and health-related variables (including FSSQ) as IVs and posttraumatic growth and trauma-related psychopathology scales as DVs was constructed to determine the predictors of posttraumatic growth and trauma-related

Table 1
Socioeconomic, physical, and mental health-related characteristics of the sample.

Characteristics	$N = 241$	
	N	%
Trauma-experience type		
Bereaved family members	164	68.0
Survivors	49	20.3
Survivors' family members	28	11.6
Gender		
Male	100	41.5
Female	141	58.5
Age (mean ± SD)	39.84 ± 13.84	
16–29 years	80	33.2
30–49 years	89	36.9
50 years or above	72	29.9
Education level		
Middle school graduation or below	17	7.1
High school graduation	179	74.3
College degree or above	45	18.7
Marital status		
Widowed, Divorced/Separated	22	9.1
Never married	81	33.6
Married	138	57.3
Economic activity		
No	142	58.9
Yes	99	41.1
Religion		
No	135	56.0
Yes	106	44.0
FSSQ	22.35 ± 9.95	
Self-rated health (SRH)		
Very good	7	2.9
Good	54	22.4
Fair	114	47.3
Bad	54	22.4
Very bad	12	5.0
Alcohol consumption		
Never	56	23.2
Less than once / month	45	18.7
2–4 / month	69	28.6
2–3 / week	45	18.7
4 or more / week	26	10.8
Cigarette smoking		
Never or past	176	73.0
Current	65	27.0
PTGI	37.30 ± 24.48	
PTG (PTGI ≥ 75%ile = 57)		
No	181	75.1
Yes	60	24.9
PCL-5	33.03 ± 21.59	
PTSD (PCL-5 ≥ 33)		
No	121	50.2
Yes	120	49.8
PTED scale	34.85 ± 21.51	
PTED (PTED scale ≥ 47.5)		
No	162	67.2
Yes	79	32.8
PHQ-9	10.88 ± 7.55	
Depression (PHQ-9 ≥ 10)		
No	118	49.0
Yes	123	51.0
GAD-7	7.28 ± 6.05	
Anxiety (GAD-7 ≥ 10)		
No	163	67.6
Yes	78	32.4

FSSQ, PTGI, PCL-5, PTED scale, PHQ-9, and GAD-7 scores were presented as mean ± standard deviation.
FSSQ, Duke-UNC Functional Social Support Questionnaire; SRH, Self-rated health; PTGI, Posttraumatic Growth Inventory; PCL-5, PTSD Checklist-5; PTED, Posttraumatic Embitterment Self-Rating Scale; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7.

Table 2
Multiple regression analyses investigating predictors of posttraumatic growth and trauma-related psychopathologies in total sample.

DV	IV	Beta	B	SE	*t*	*p*
PTGI	Age	0.399	0.706	0.320	2.209	**0.028**
	Religion (Yes)	0.186	9.158	3.217	2.846	**0.005**
	FSSQ	0.290	0.713	0.171	4.180	**<0.001**
PCL-5	Female	0.220	9.632	2.832	3.401	**0.001**
	Age	0.337	0.526	0.238	2.212	**0.028**
	FSSQ	−0.181	−0.394	0.127	−3.104	**0.002**
	Survivors' family (Ref: Bereaved family)	−0.217	−14.621	3.658	−3.998	**<0.001**
	Self-rated health	0.304	7.503	1.424	5.268	**<0.001**
	Current smoking	0.202	9.786	2.870	3.410	**0.001**
PTED	Female	0.191	8.310	2.663	3.121	**0.002**
	Age	0.358	0.556	0.224	2.488	**0.014**
	FSSQ	−0.218	−0.472	0.119	−3.963	**<0.001**
	Survivors' family (Ref: Bereaved family)	−0.236	−15.820	3.439	−4.600	**<0.001**
	Self-rated health	0.306	7.529	1.339	5.623	**<0.001**
	Current smoking	0.175	8.464	2.698	3.137	**0.002**
PHQ-9	Female	0.147	2.247	1.036	2.168	**0.031**
	Economic activity	−0.170	−2.606	0.894	−2.915	**0.004**
	FSSQ	−0.168	−0.128	0.046	−2.753	**0.006**
	Survivors' family (Ref: Bereaved family)	−0.180	−4.228	1.338	−3.160	**0.002**
	Self-rated health	0.299	2.577	0.521	4.945	**<0.001**
	Current smoking	0.192	3.261	1.050	3.106	**0.002**
GAD-7	FSSQ	−0.157	−0.096	0.038	−2.488	**0.014**
	Survivors' family (Ref: Bereaved family)	−0.192	−3.606	1.109	−3.253	**0.001**
	Self-rated health	0.343	2.372	0.432	5.495	**<0.001**

Significant independent variables are only represented in the table.
DV, Dependent variable; IV, Independent variable; Ref, Reference variable; FSSQ, Duke-UNC Functional Social Support Questionnaire; SRH, Self-rated health; PTGI, Posttraumatic Growth Inventory; PCL-5, PTSD Checklist-5; PTED, Posttraumatic Embitterment Disorder Self-Rating Scale; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7.

psychopathologies in the total sample. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 24.0 (IBM Corporation, Armonk, NY, USA) and statistical significance was considered as $\alpha = 0.05$.

3. Results

3.1. Socioeconomic and physical health-related predictors of mental health

The sample included 164 bereaved family members, 49 survivors, and 28 survivors' family members (Table 1). Detailed information is presented in Tables 1 and S1.

Significant predictors of mental health scores are described in Table 2 and Table S2 (all, $P < 0.05$). In multiple regression analyses, we found that the FSSQ score was inversely correlated with PCL-5, PTED, PHQ-9, and GAD scores, while it was positively correlated with the PTGI score. Survivors' family members were significantly associated with lower PCL-5, PTED, PHQ-9, and GAD-7 scores compared to the bereaved family group. Female gender was significantly associated with higher PCL-5, PTED, and PHQ-9 scores and age had a significant positive correlation with PTGI, PCL-5, and PTED scores. Self-rated health had positive correlations with PCL-5, PTED, PHQ-9, and GAD-7 scores and having religion was associated with higher PTGI scores. Current cigarette smoking was associated with higher PCL-5, PTED, and PHQ-9 scores compared to non-smoking and having no economic activity was associated with higher PHQ-9 scores.

Table 3
Multiple regression analyses investigating correlation between trauma-related psychopathologies and posttraumatic growth according to subgroups determined by perceived social support level.

Subgroups	DV	IV	Beta	B	SE	*t*	*p*
High social support (*n* = 113)	PTGI	PCL-5	0.166	0.211	0.161	1.309	0.194
		PTED	0.181	0.152	0.156	1.188	0.238
		PHQ-9	−0.079	−0.285	0.443	−0.643	0.522
		GAD-7	0.123	0.528	0.479	1.103	0.273
Low social support (*n* = 128)		PCL-5	−0.141	−0.143	0.101	−1.407	0.162
		PTED	−0.106	−0.122	0.116	−1.049	0.296
		PHQ-9	−0.285	−0.797	0.273	−2.917	**0.004**
		GAD-7	−0.264	−0.949	0.355	−2.671	**0.009**

The following variables were also included as independent variables in each multiple linear regression model: gender, age, educational level, marital status, economic activity, religion, trauma-experience type, self-rated health, alcohol consumption, and smoking (detailed information in Table S3).
IV, Independent variable; DV, Dependent variable; PTGI, Posttraumatic Growth Inventory; PCL-5, PTSD Checklist-5; PTED, Posttraumatic Embitterment Disorder Self-Rating Scale; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7.

3.2. Differences in the association of trauma-related psychopathologies with posttraumatic growth according to perceived social support level

The sample was subdivided into high (FSSQ score ≥ 24, n = 113) and low (FSSQ score < 24, n = 128) social support groups according to 50 percentile score of the FSSQ. The perceived social support level moderated the association between PHQ-9 and PTGI and between GAD-7 and PTGI scores (Table 3 and Table S3). PHQ-9 and GAD-7 scores showed significant inverse correlations with PTGI scores only in the low-social support group, while there were no significant correlations in the high-social support group. PCL-5 and PTED scores did not have correlations with PTGI score in either group.

3.3. Gender differences in the association of perceived social support with posttraumatic growth and trauma-related psychopathologies

We found significant gender differences in the association of social support level with posttraumatic growth, PTSD, PTED, and depressive symptoms (Tables 4 and S4). In the multiple regression analysis, FSSQ scores had significant correlations with PTGI, PCL-5, and PTED scores only in female respondents, while they had significant correlations with PHQ-9 scores only in male respondents. The GAD-7 score did not have correlations with FSSQ in either of the subgroups separated by gender.

3.4. Mediation pathway from perceived social support to posttraumatic growth through trauma-related psychopathologies

In a multi-mediator regression model, we included the scores of PCL-5, PTED scale, PHQ-9, and GAD-7 as potential mediators simultaneously; FSSQ score as an independent variable; PTGI score as a dependent variable; and all socioeconomic and health-related variables as covariates.

We found that the PHQ-9 score only had a significant mediating effect in the correlation between FSSQ and PTGI scores (estimated indirect effect = 0.164, bootstrapped 95.0% CI [boot CI] = 0.047–0.374, direct effect = 0.761, Table 5). We confirmed the significance of a mediating effect by observing that the boot CI of indirect effect did not contain zero.

4. Discussion

In the present study, we examined our *a priori* hypothetical model in regard to complex relationships between social support, trauma-related psychopathologies, posttraumatic growth, and gender (Fig. 1) and observed that social support moderated the association of depressive and anxiety symptoms with posttraumatic growth. We also found that gender had a moderating effect in the correlation of social support level with posttraumatic growth, PTSD, PTED, and depressive symptoms. Furthermore, there was a mediation pathway from social support level to posttraumatic growth through the depressive symptoms of the victims.

First, we found a potential moderating effect of perceived social support level in the correlations of depressive and anxiety symptoms with posttraumatic growth. Social support is considered a critical resource regarding positive psychosocial changes in the aftermath of traumatic events and Tedeschi and Calhoun's (2004) revised model included it as an important predictor of posttraumatic growth (Prati and Pietrantoni, 2009). It has been consistently suggested that social support is positively correlated with posttraumatic growth after traumatic events (Benetato, 2011; Lau et al., 2015); while there has been inconsistency regarding the association between trauma-related psychopathologies and posttraumatic growth—positive, negative and null findings according to the different traumatic events (Linley and Joseph, 2004; Schubert et al., 2016; Zoellner and Maercker, 2006). For example, Engelkemeyer and Marwit (2008) reported that 111 bereaved parents who lost their children by accident, homicide, or illness showed inverse correlation between PTGI score and the grief intensity measured by the Revised Grief Experiences Inventory with four subscale on depression, physical distress, tension and guilt, and existential concerns, and the result may be consistent with our findings (Engelkemeyer and Marwit, 2008). Another study on 197 people exposed to the 2011 Oslo bombing attack observed positive correlation between severity of PTSD

Table 4
Gender-stratified multiple regression analyses investigating correlation of perceived social support with posttraumatic growth and trauma-related psychopathologies.

Subgroups	IV	DV	Beta	B	SE	*t*	*p*
Female (*n* = 141)	FSSQ	PTGI	0.349	0.864	0.209	4.131	**<0.001**
		PCL-5	−0.198	−0.408	0.162	−2.512	**0.013**
		PTED	−0.215	−0.459	0.151	−3.035	**0.003**
		PHQ-9	−0.097	−0.072	0.060	−1.186	0.238
		GAD-7	−0.111	−0.067	0.052	−1.293	0.199
Male (*n* = 100)		PTGI	0.181	0.448	0.301	1.489	0.140
		PCL-5	−0.059	−0.138	0.210	−0.656	0.514
		PTED	−0.153	−0.346	0.202	−1.715	0.090
		PHQ-9	−0.208	−0.167	0.077	−2.169	**0.033**
		GAD-7	−0.126	−0.080	0.059	−1.349	0.181

The following variables were also included as independent variables in each multiple linear regression model: age, educational level, marital status, economic activity, religion, trauma experience type, self-rated health, alcohol consumption, and smoking (detailed information in Table S4).
DV, Dependent variable; IV, Independent variable; FSSQ, Duke-UNC Functional Social Support Questionnaire; PTGI, Posttraumatic Growth Inventory; PCL-5 - PTSD Checklist-5; PTED, Posttraumatic Embitterment Disorder Self-Rating Scale; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7.

Table 5
Mediation pathway between perceived social support and posttraumatic growth through trauma-related psychopathologies.

			IV on M		M on DV		IV on DV		Mediating effect of M			
IV	**M**	**DV**	Effect of IV on M	*p*	Effect of M on DV	*p*	Direct effect of IV on DV	*p*	Indirect effect	Boot SE	Boot LLCI	Boot ULCI
FSSQ	PCL-5	PTGI	−0.396	0.002	0.156	0.444	0.761	< 0.0001	−0.062	0.079	−0.251	0.067
	PTED		−0.473	0.0001	0.224	0.219			−0.106	0.101	−0.353	0.053
	PHQ-9*		−0.125	0.006	−1.314	0.001			0.164	0.079	0.047	0.374
	GAD-7		−0.095	0.012	0.056	0.906			−0.005	0.047	−0.106	0.091

All estimated effect values, *p*-values, standard errors, and confidence intervals were obtained from the mediation analysis by Hayes and Preacher (2014). A significant mediating effect is represented in bold with an asterisk ($p < 0.05$)
DV, Dependent variable; M, Mediator; IV, Independent variable; Boot SE, Bootstrapped standard error; Boot LLCI/ULCI, Lower level (LL) or upper level (UL) confidence interval (CI) for bootstrapped effect value in the mediation analysis based on 5000 bootstrap samples. FSSQ, Duke-UNC Functional Social Support Questionnaire; PTGI, Posttraumatic Growth Inventory; PCL-5, PTSD Checklist-5; PTED, Posttraumatic Embitterment Disorder Self-Rating Scale; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalized Anxiety Disorder-7.

symptoms and posttraumatic growth (Blix et al., 2013). Furthermore, it has been suggested that various psychosocial factors including cognitive processing (e.g., rumination), coping strategies, religiosity, personality constructs (e.g., extraversion, optimism, or openness), and social support contribute to posttraumatic growth development among traumatized people (Schubert et al., 2016; Tedeschi and Calhoun, 2004); therefore, we postulate that social support may influence the more complex relationship between trauma-related psychopathologies and posttraumatic growth. For the moderating effect of social support in the correlation between trauma-related psychopathologies and posttraumatic growth, a recent study by Cao et al. (2018) found that higher perceived social support was associated with the pattern of mild PTSD symptoms with high posttraumatic growth versus the patterns of high PTSD symptoms with high posttraumatic growth or mild PTSD symptoms with mild posttraumatic growth in an epidemiological sample of 1063 Chinese earthquake survivors (Cao et al., 2018). A recent study by Dong et al. (2015) provides an indirect clue about our findings by reporting that self-disclosure—talking about traumatic events and their consequences—had a significant moderating effect in the association between posttraumatic growth and intrusive rumination, which is highly correlated with depressive and anxiety symptoms (Iqbal and Dar, 2015). They found that self-disclosure, which is strongly associated with social support level, buffered the detrimental effect of intrusive rumination on posttraumatic growth among people injured by accidental trauma (Dong et al., 2015). We could explain our results by hypothesizing that higher social support levels might facilitate self-disclosure, in turn, ameliorating unproductive thoughts (i.e., rumination), which are highly comorbid with depression and anxiety, and eventually lead to posttraumatic growth in traumatized individuals. Particularly, rumination has been reported to be associated with both posttraumatic growth and social sharing of emotion based on social support (Garcia et al., 2016). However, as we did not assess self-disclosure or rumination symptoms, this explanation remains hypothetical.

In gender-stratified analyses, the FSSQ score was correlated with PTGI, PCL-5, and PTED scores only in females, while it was correlated with PHQ-9 only in males after adjusting for potential confounding factors. Gender differences in the association between social support and mental health status have been consistently suggested. Most studies have reported that females are more sensitive to the pathogenic effects of low social support than males (Kendler and Gardner, 2014; Kendler et al., 2005) because females are more likely to use social support as a resource to deal with stressful life events (Assari and Lankarani, 2016). Ahern et al. (2004) found that social support had a greater protective effect in females than males in the context of PTSD symptoms among those exposed to the Kosovo War in 1999, and Andrews et al. (2003) observed that the effects of social support on PTSD symptoms were significantly greater for female than male victims of violent crime. In addition, we observed a result contradictory to previous studies—a significant correlation with depressive symptoms in only male respondents—and we postulate that the moderating effect of gender may differ according to the characteristics of victims and traumatic disaster itself. While the aforementioned studies investigated survivors of traumatic events, most of the trauma-exposed people in our sample were bereaved family members (68.0%); this might have affected the gender differences in the impacts of social support on depressive symptoms. To our knowledge, no study has examined gender difference in the correlation of social support with trauma-related psychopathologies and posttraumatic growth among those exposed to disasters. Further studies are required to investigate the potential moderating role of gender in the relationship between social support and mental health status after a disaster.

Furthermore, PHQ-9 score mediated the correlation between FSSQ and PTGI scores in victims of the disaster. This indicates that social support influences depressive symptomatology, in turn, affecting the degree of posttraumatic growth independently to direct effect of social support on posttraumatic growth. Along with the correlation between social support and depression in victims of disaster (McGuire et al., 2018; Ren et al., 2015), the significant inverse correlation between depressive symptoms and posttraumatic growth was also reported for sexual assault victims (Frazier et al., 2001), traumatized refugees (Teodorescu et al., 2012), or adolescents exposed to earthquakes (Lau et al., 2015). Our observation may provide a clinical implication that providing sufficient social support to people traumatized by disaster may be a favorable condition for achieving posttraumatic growth both through its direct and indirect effects through relieving depressive symptoms.

With regard to the potential predictors of posttraumatic growth and trauma-related psychopathologies, religion was associated with posttraumatic growth, self-rated health was correlated with all trauma-related psychopathologies, and women were more likely to have higher PTSD, PTED, and depressive symptoms. Religious commitment or positive religious coping were positively correlated with posttraumatic growth in those exposed to disasters (Chan and Rhodes, 2013) and a conceptual posttraumatic growth model also included spiritual growth (Tedeschi and Calhoun, 2004). For self-rated health, its associations with depression and PTSD were widely reported among disaster-exposed people (Heid et al., 2016; Ruggiero et al., 2009).

The Ansan Mental Health Trauma Center, which conducted this survey, aimed to investigate the mental health status of victims of the Sewol Ferry disaster; that is, family members of the deceased, family members of the survivors, and survivors themselves. Most of studies on the Sewol Ferry disaster focused on PTSD symptoms or posttraumatic growth in bereaved family members (Huh et al., 2017; Lee et al., 2018; Tae et al., 2018; Yun et al., 2018) and there has been no study investigating psychological distress in the sample, including victims with different types of trauma experience after the disaster or explored difference in trauma-related psychopathologies or posttraumatic growth according to the trauma experience types. Therefore, our study aimed to investigate the psychological distress and posttraumatic growth in

the sample, including those with all types of trauma experience and further explored potential distinct patterns of mental health status. We observed significant differences in levels of trauma-related psychopathologies among subgroups determined by trauma-experience types. In particular, the bereaved families showed significantly higher prevalence of PTSD (59.1%), PTED (40.2%), depression (58.5%), and anxiety symptoms (39.1%) compared to the survivor's families (26.5%, 20.4%, 32.7%, and 20.4%, respectively) or the survivors (35.7%, 10.7%, 39.3%, and 14.3%, respectively) (Table S1). This finding could be supported by previous studies reporting that bereaved survivors showed significantly higher prevalence of PTSD and depression than non-bereaved survivors of the 2008 Sichuan earthquake (Chan et al., 2012; Cheng et al., 2015). We postulate that the loss of a child might lead to higher prevalence of PTSD and depression mediated by prolonged and complicated grief and disruption of daily life in the aftermath of a disaster (Chan et al., 2012).

Finally, several studies have reported that the relationship between posttraumatic growth and psychological adjustment is unclear or controversial (Linley and Joseph, 2004; Zoellner and Maercker, 2006). Furthermore, the elapsed time since trauma may be a critical factor in regard to the association between posttraumatic growth and trauma-related psychopathologies (Blix et al., 2013). For example, one study reported that perceived posttraumatic growth immediately after the trauma may be seen as a cognitive coping strategy. However, in the medium and long term after the trauma, actual posttraumatic growth might develop and this may affect the relationship between posttraumatic growth and trauma-related psychopathologies (Helgeson et al., 2006). In the present study, posttraumatic growth and psychological distress were investigated three years and six months after the disaster and we believe that this might be a sufficient time to develop posttraumatic growth.

There are several limitations to consider. First, this study had a cross-sectional design; therefore, we could not elucidate the causal relationships between perceived social support, trauma-related psychopathologies, and posttraumatic growth. Second, trauma-related psychopathology assessments were self-reported, reducing the accuracy of trauma-related symptomatology evaluation. Second, the sample size was smaller compared to recent studies on natural disasters (Chan et al., 2012; Xu and Wei, 2013). However, considering that sample sizes of studies on a ferry disaster might naturally be limited (Arnberg et al., 2011), ours might be enough to examine our *a priori* hypothesis. Third, participants of the survey were recruited through the Ansan Mental Health Trauma Center; therefore the participants were more likely to use mental health or social welfare services compared to victims of the disaster who were not included in the survey. This might have potentially biased the sample. Finally, previous studies have suggested that an individual's perception regarding the severity of the traumatic event or level of trauma exposure may affect the degree of related psychopathologies or development of posttraumatic growth (Blix et al., 2013; Boals and Schuettler, 2009; Garcia et al., 2016). However, this study did not assess individual perceptions of the severity of the traumatic event, and this might affect our results.

In conclusion, this study found that perceived social support level has a significant moderating role in the association between posttraumatic growth and trauma-related psychopathologies such as depression and anxiety among trauma-exposed individuals after the disaster. We also observed that gender has a moderating effect on the correlation of social support level with posttraumatic growth and psychological distress. From a practical perspective, our findings indicate that mental health professionals and policymakers must pay more attention to providing social support or related social welfare services to trauma-exposed people to facilitate posttraumatic growth and recovery. We hope future studies elucidate the psychosocial mechanism underlying social support level-related differences in the correlation between posttraumatic growth and psychological distress.

Conflict of interest

The authors have no potential or actual conflict of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgment

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2018.12.168.

References

Acquaye, H.E., 2017. PTSD, optimism, religious commitment, and growth as post-trauma trajectories: a structural equation modeling of former refugees. Prof. Counselor 7 (4), 330–348.
Ahern, J., Galea, S., Fernandez, W.G., Koci, B., Waldman, R., Vlahov, D., 2004. Gender, social support, and posttraumatic stress in postwar Kosovo. J. Nerv. Ment. Dis. 192 (11), 762–770.
Andrews, B., Brewin, C.R., Rose, S., 2003. Gender, social support, and PTSD in victims of violent crime. J. Trauma Stress 16 (4), 421–427.
Arnberg, F.K., Eriksson, N.G., Hultman, C.M., Lundin, T., 2011. Traumatic bereavement, acute dissociation, and posttraumatic stress: 14 years after the MS Estonia disaster. J. Trauma Stress 24 (2), 183–190.
Assari, S., Lankarani, M.M., 2016. Stressful life events and risk of depression 25 years later: race and gender differences. Front. Public Health 4, 49.
Benetato, B.B., 2011. Posttraumatic growth among operation enduring freedom and operation Iraqi freedom amputees. J. Nurs. Scholarsh. 43 (4), 412–420.
Blix, I., Hansen, M.B., Birkeland, M.S., Nissen, A., Heir, T., 2013. Posttraumatic growth, posttraumatic stress and psychological adjustment in the aftermath of the 2011 Oslo bombing attack. Health Qual. Life Outcomes 11, 160.
Boals, A., Schuettler, D., 2009. PTSD symptoms in response to traumatic and non-traumatic events: the role of respondent perception and A2 criterion. J. Anxiety Disord. 23 (4), 458–462.
Bovin, M.J., Marx, B.P., Weathers, F.W., Gallagher, M.W., Rodriguez, P., Schnurr, P.P., et al., 2016. . Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in veterans. Psychol. Assess. 28 (11), 1379–1391.
Broadhead, W.E., Gehlbach, S.H., de Gruy, F.V., Kaplan, B.H., 1988. The Duke-UNC Functional Social Support Questionnaire. Measurement of social support in family medicine patients. Med. Care 26 (7), 709–723.
Cao, C., Wang, L., Wu, J., Li, G., Fang, R., Cao, X., et al., 2018. . Patterns of posttraumatic stress disorder symptoms and posttraumatic growth in an epidemiological sample of Chinese earthquake survivors: a latent profile analysis. Front. Psychol. 9, 1549.
Carmassi, C., Akiskal, H.S., Bessonov, D., Massimetti, G., Calderani, E., Stratta, P., et al., 2014. . Gender differences in DSM-5 versus DSM-IV-TR PTSD prevalence and criteria comparison among 512 survivors to the L'Aquila earthquake. J. Affect. Disord. 160, 55–61.
Chan, C.L., Wang, C.W., Ho, A.H., Qu, Z.Y., Wang, X.Y., Ran, M.S., et al., 2012. . Symptoms of posttraumatic stress disorder and depression among bereaved and non-bereaved survivors following the 2008 Sichuan earthquake. J. Anxiety Disord. 26 (6), 673–679.
Chan, C.S., Rhodes, J.E., 2013. Religious coping, posttraumatic stress, psychological distress, and posttraumatic growth among female survivors four years after Hurricane Katrina. J. Trauma Stress 26 (2), 257–265.
Cheng, Z., Ma, N., Yang, L., Agho, K., Stevens, G., Raphael, B., et al., 2015. Depression and posttraumatic stress disorder in temporary settlement residents 1 year after the Sichuan earthquake. Asia Pac. J. Public Health 27 (2), Np1962–Np1972.
Dar, K.A., Iqbal, N., Prakash, A., Paul, M.A., 2018. PTSD and depression in adult survivors of flood fury in Kashmir: the payoffs of social support. Psychiatry Res. 261, 449–455.
Dong, C., Gong, S., Jiang, L., Deng, G., Liu, X., 2015. Posttraumatic growth within the first three months after accidental injury in China: the role of self-disclosure, cognitive processing, and psychosocial resources. Psychol. Health Med. 20 (2), 154–164.
Du, B., Ma, X., Ou, X., Jin, Y., Ren, P., Li, J., 2018. The prevalence of posttraumatic stress in adolescents eight years after the Wenchuan earthquake. Psychiatry Res. 262, 262–269.
Dursun, P., Steger, M.F., Bentele, C., Schulenberg, S.E., 2016. Meaning and posttraumatic growth among survivors of the September 2013 Colorado floods. J. Clin. Psychol. 72 (12), 1247–1263.
El-Den, S., Chen, T.F., Gan, Y.L., Wong, E., O'Reilly, C.L., 2018. The psychometric properties of depression screening tools in primary healthcare settings: a systematic review. J. Affect. Disord. 225, 503–522.
Engelkemeyer, S.M., Marwit, S.J., 2008. Posttraumatic growth in bereaved parents. J.

Trauma Stress 21 (3), 344–346.
Frazier, P., Conlon, A., Glaser, T., 2001. Positive and negative life changes following sexual assault. J. Consult. Clin. Psychol. 69 (6), 1048–1055.
Garcia, F.E., Cova, F., Rincon, P., Vazquez, C., Paez, D., 2016. Coping, rumination and posttraumatic growth in people affected by an earthquake. Psicothema 28 (1), 59–65.
Goldmann, E., Galea, S., 2014. Mental health consequences of disasters. Annu. Rev. Public Health 35, 169–183.
Guo, S., Tian, D., Wang, X., Xiao, Y., He, H., Qu, Z., et al., 2015. Protective effects of social support content and support source on depression and its prevalence 6 months after Wenchuan Earthquake. Stress Health 31 (5), 382–392.
Han, C., Jo, S.A., Kwak, J.H., Pae, C.U., Steffens, D., Jo, I., et al., 2008. Validation of the Patient Health Questionnaire-9 Korean version in the elderly population: the Ansan Geriatric study. Compr. Psychiatry 49 (2), 218–223.
Han, K.M., Kim, K.H., Lee, M., Lee, S.M., Ko, Y.H., Paik, J.W., 2017. Increase in the prescription rate of antidepressants after the Sewol Ferry disaster in Ansan, South Korea. J. Affect. Disord. 219, 31–36.
Hayes, A.F., Preacher, K.J., 2014. Statistical mediation analysis with a multicategorical independent variable. Br. J. Math. Stat. Psychol. 67 (3), 451–470.
Heid, A.R., Christman, Z., Pruchno, R., Cartwright, F.P., Wilson-Genderson, M., 2016. Vulnerable, but why? Post-traumatic stress symptoms in older adults exposed to Hurricane Sandy. Disaster Med. Public Health Prep. 10 (3), 362–370.
Helgeson, V.S., Reynolds, K.A., Tomich, P.L., 2006. A meta-analytic review of benefit finding and growth. J. Consult. Clin. Psychol. 74 (5), 797–816.
Huh, H.J., Kim, K.H., Lee, H.K., Chae, J.H., 2017. Attachment styles, grief responses, and the moderating role of coping strategies in parents bereaved by the Sewol ferry accident. Eur. J. Psychotraumatol. 8 (suppl 6), 1424446.
Iqbal, N., Dar, K.A., 2015. Negative affectivity, depression, and anxiety: does rumination mediate the links? J. Affect. Disord. 181, 18–23.
Isaacs, K.B., Hall, L.A., 2011. A psychometric analysis of the functional social support questionnaire in low-income pregnant women. Issues Ment. Health Nurs. 32 (12), 766–773.
Jin, Y., Xu, J., Liu, D., 2014. The relationship between post traumatic stress disorder and post traumatic growth: gender differences in PTG and PTSD subgroups. Soc. Psychiatry Psychiatr. Epidemiol. 49 (12), 1903–1910.
Kendler, K.S., Gardner, C.O., 2014. Sex differences in the pathways to major depression: a study of opposite-sex twin pairs. Am. J. Psychiatry 171 (4), 426–435.
Kendler, K.S., Myers, J., Prescott, C.A., 2005. Sex differences in the relationship between social support and risk for major depression: a longitudinal study of opposite-sex twin pairs. Am. J. Psychiatry 162 (2), 250–256.
Kim, J.W., Chung, H.G., Choi, J.H., So, H.S., Kang, S.H., Kim, D.S., et al., 2017. . Psychometric properties of the Korean version of the PTSD Checklist-5 in elderly Korean veterans of the Vietnam War. Anxiety Mood 13 (2), 123–131.
Kroenke, K., Spitzer, R.L., 2002. The PHQ-9: a new depression diagnostic and severity measure. Psychiatr. Ann. 32 (9), 509–515.
Kroenke, K., Spitzer, R.L., Williams, J.B., 2001. The PHQ-9: validity of a brief depression severity measure. J. Gen. Intern. Med. 16 (9), 606–613.
Lai, B.S., Osborne, M.C., Piscitello, J., Self-Brown, S., Kelley, M.L., 2018. The relationship between social support and posttraumatic stress symptoms among youth exposed to a natural disaster. Eur. J. Psychotraumatol. 9 (Suppl 2), 1450042.
Lau, J.T., Yeung, N.C., Yu, X., Zhang, J., Mak, W.W., Lui, W.W., et al., 2015. Psychometric properties of the Chinese version of the Revised Posttraumatic Growth Inventory for Children (PTGI-C-R). Asia Pac. J. Public Health 27 (2), Np1310–Np1320.
Leal-Soto, F., Carmona-Halty, M., Ferrer-Urbina, R., 2016. Rumination in posttraumatic stress and growth after a natural disaster: a model from northern Chile 2014 earthquakes. Eur. J. Psychotraumatol. 7, 31638.
Lee, S.H., Nam, H.S., Kim, H.B., Kim, E.J., Won, S.D., Chae, J.H., 2017. Social support as a mediator of posttraumatic embitterment and perceptions of meaning in life among Danwon survivors of the Sewol Ferry Disaster. Yonsei Med. J. 58 (6), 1211–1215.
Lee, S.M., Han, H., Jang, K.I., Huh, S., Huh, H.J., Joo, J.Y., et al., 2018. Heart rate variability associated with posttraumatic stress disorder in victims' families of Sewol Ferry disaster. Psychiatry Res. 259, 277–282.
Linden, M., Baumann, K., Lieberei, B., Rotter, M., 2009. The Post-Traumatic Embitterment Disorder Self-Rating Scale (PTED Scale). Clin. Psychol. Psychother. 16 (2), 139–147.
Linley, P.A., Joseph, S., 2004. Positive change following trauma and adversity: a review. J. Trauma Stress 17 (1), 11–21.
Lowe, S.R., Manove, E.E., Rhodes, J.E., 2013. Posttraumatic stress and posttraumatic growth among low-income mothers who survived Hurricane Katrina. J. Consult. Clin. Psychol. 81 (5), 877–889.
McGuire, A.P., Gauthier, J.M., Anderson, L.M., Hollingsworth, D.W., Tracy, M., Galea, S., et al., 2018. Social support moderates effects of natural disaster exposure on depression and posttraumatic stress disorder symptoms: effects for displaced and nondisplaced residents. J. Trauma Stress 31 (2), 223–233.
Morgan, C., Bhugra, D., 2010. Principles of Social Psychiatry. John Wiley & Sons, New York.
Norris, F.H., Friedman, M.J., Watson, P.J., Byrne, C.M., Diaz, E., Kaniasty, K., 2002. 60,000 disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. Psychiatry 65 (3), 207–239.
Prati, G., Pietrantoni, L., 2009. Optimism, social support, and coping strategies as factors contributing to posttraumatic growth: a meta-analysis. J. Loss Trauma 14 (5), 364–388.
Ren, J., Jiang, X., Yao, J., Li, X., Liu, X., Pang, M., et al., 2015. Depression, Social Support, and Coping Styles among Pregnant Women after the Lushan Earthquake in Ya'an, China. PLoS One 10 (8), e0135809.
Ruggiero, K.J., Amstadter, A.B., Acierno, R., Kilpatrick, D.G., Resnick, H.S., Tracy, M., et al., 2009. Social and psychological resources associated with health status in a representative sample of adults affected by the 2004 Florida hurricanes. Psychiatry 72 (2), 195–210.
Sattler, D.N., de Alvarado, A.M., de Castro, N.B., Male, R.V., Zetino, A.M., Vega, R., 2006. El Salvador earthquakes: relationships among acute stress disorder symptoms, depression, traumatic event exposure, and resource loss. J. Trauma Stress 19 (6), 879–893.
Schubert, C.F., Schmidt, U., Rosner, R., 2016. Posttraumatic growth in populations with posttraumatic stress disorder-a systematic review on growth-related psychological constructs and biological variables. Clin. Psychol. Psychother. 23 (6), 469–486.
Seo, J.G., Park, S.P., 2015. Validation of the Generalized Anxiety Disorder-7 (GAD-7) and GAD-2 in patients with migraine. J. Headache Pain 16, 97.
Shin, C., Han, C., Linden, M., Chae, J.H., Ko, Y.H., Kim, Y.K., et al., 2012. Standardization of the Korean version of the posttraumatic embitterment disorder self-rating scale. Psychiatry Investig 9 (4), 368–372.
Song, S., Lee, H., Park, J., Kim, K., 2009. Validity and reliability of the Korean version of the posttraumatic growth inventory. Korean J. Health Psychol. 14 (1), 193–214.
Spitzer, R.L., Kroenke, K., Williams, J.B., Lowe, B., 2006. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch. Intern. Med. 166 (10), 1092–1097.
Suh, S.Y., Im, Y.S., Lee, S.H., Park, M.S., Yoo, T., 1997. A study for the development of Korean version of the Duke-UNC functional social support questionnaire. J. Korean Acad. Fam. Med. 18 (3), 250–260.
Tae, H., Huh, H.J., Hwang, J., Chae, J.H., 2018. Relationship between serum lipid concentrations and posttraumatic stress symptoms in the bereaved after the Sewol ferry disaster: a prospective cohort study. Psychiatry Res. 266, 132–137.
Tedeschi, R.G., Calhoun, L.G., 1996. The Posttraumatic Growth Inventory: measuring the positive legacy of trauma. J. Trauma Stress 9 (3), 455–471.
Tedeschi, R.G., Calhoun, L.G., 2004. Posttraumatic growth: Conceptual foundations and empirical evidence. Psychol. Inq. 15 (1), 1–18.
Teodorescu, D.S., Siqveland, J., Heir, T., Hauff, E., Wentzel-Larsen, T., Lien, L., 2012. Posttraumatic growth, depressive symptoms, posttraumatic stress symptoms, post-migration stressors and quality of life in multi-traumatized psychiatric outpatients with a refugee background in Norway. Health Qual. Life Outcomes 10, 84.
Wang, W., Fu, W., Wu, J., Ma, X.C., Sun, X.L., Huang, Y., et al., 2012. Prevalence of PTSD and depression among junior middle school students in a rural town far from the epicenter of the Wenchuan earthquake in China. PLoS One 7 (7), e41665.
Wong, A., Lee, H.S., Lee, H.P., Choi, Y.K., Lee, J.H., 2018. Posttraumatic stress disorder symptoms and posttraumatic growth following indirect trauma from the Sewol Ferry Disaster, 2014. Psychiatry Investig 15 (6), 613–619.
Wortmann, J.H., Jordan, A.H., Weathers, F.W., Resick, P.A., Dondanville, K.A., Hall-Clark, B., et al., 2016. Psychometric analysis of the PTSD Checklist-5 (PCL-5) among treatment-seeking military service members. Psychol. Assess. 28 (11), 1392–1403.
Xu, J., Wei, Y., 2013. Social support as a moderator of the relationship between anxiety and depression: an empirical study with adult survivors of Wenchuan earthquake. PLoS One 8 (10), e79045.
Xu, J., Wu, W., 2014. Work satisfaction and posttraumatic growth 1 year after the 2008 Wenchuan earthquake: the perceived stress as a moderating factor. Arch. Psychiatr. Nurs. 28 (3), 206–211.
Yang, H.K., Shin, D.W., Park, J.H., Kim, S.Y., Eom, C.S., Kam, S., et al., 2013. The association between perceived social support and continued smoking in cancer survivors. Jpn. J. Clin. Oncol. 43 (1), 45–54.
Yun, J.A., Huh, H.J., Han, H.S., Huh, S., Chae, J.H., 2018. Bereaved families are still embittered after the Sewol ferry accident in Korea: a follow-up study 18 and 30months after the disaster. Compr. Psychiatry 82, 61–67.
Zoellner, T., Maercker, A., 2006. Posttraumatic growth in clinical psychology - a critical review and introduction of a two component model. Clin. Psychol. Rev. 26 (5), 626–653.