

Research

Factors associated with psychiatric morbidity, post-traumatic stress disorder and post-traumatic growth in paramedic first responders: the role of core beliefs

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Abstract

Introduction

Paramedics are routinely exposed to traumatic events. This study describes the rates of post-traumatic stress disorder (PTSD), psychiatric morbidity and levels of post-traumatic growth (PTG) in New Zealand first responder paramedics, exploring a mix of demographic, professional, crewing status and exposure risk factors associated with these outcomes and their associations with core belief disruptions.

Methods

A cross-sectional study recruited paramedics (N=579) working in a first responder role. Univariate and multivariate logistic and linear regressions were conducted to identify predictors of PTSD, non-specific psychiatric morbidity and PTG in trauma-exposed participants.

Results

Two-thirds (66.3%) reported significant psychiatric morbidity, with volunteer paramedics being significantly less at risk when compared with professional paramedics (OR=0.52; 95% CI: 0.31-0.87; $p<0.01$). Probable PTSD was reported by 14.6% of participants. Older age reduced the odds of this (OR=0.94; 95% CI: 0.92-0.98; $p<0.01$) while experiencing greater disruptions in core beliefs increased the odds (OR=2.75; 95% CI: 2.00-3.77; $p<0.01$). Being female ($t=4.70$; $p<0.01$) and experiencing greater core belief disruption ($t=7.54$; $p<0.01$) (adjusted $R^2=0.27$) independently contributed to PTG.

Conclusion

Although PTSD rates were typical of first responders generally, psychiatric morbidity rates were high and may be more prevalent in professional staff. Contextual and methodological factors may have influenced these outcomes. Core belief disruptions predict both negative and positive emotional states, suggesting their important role in workplace interventions.

Keywords:

paramedics; trauma effects; core beliefs

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Background

Paramedicine is interested in building evidenced-based practice. Wellbeing is an integral part of this research agenda yet improvements in this area have been marginal at best over recent decades (1). Relevant to this, paramedics have higher rates of post-traumatic stress disorder (PTSD) than other first responders (2,3), although not all studies find this (4). Reasons for possible elevated rates include poorer working conditions, prolonged time spent with service recipients (5,6), higher rates of emergency responding (2,7) and prior history of trauma motivating occupational choices (8). Inconsistencies in rates may also arise from changing diagnostic criteria, use of mixed samples and differences in measurement (9). A more common problem in first responders is non-specific psychiatric morbidity (eg. depression and anxiety symptoms), ranging from 27% (9) to just over 50% (10), although when paramedics are sampled as part of population studies, rates are lower than when paramedics alone are sampled (11). Also, the use of different measures and scoring systems (even on the same measure) can conflate or deflate reported rates.

Several paramedic workplace issues may increase risk for PTSD and psychiatric morbidity. First, it is a workforce heavily reliant on volunteers who may not have full paramedic qualifications (12). In other emergency workers, volunteers have higher rates of PTSD when compared with their professional peers (13). Second, 'single-crewing' is a practice involving deployment of unaccompanied paramedic staff. This is not unique to paramedics but may add to the psychological burden in managing traumatic events and has been raised as a health and safety issue in New Zealand (14). We are unaware of any studies exploring either of these factors in paramedics. The wider population risk factors for PTSD and psychiatric morbidity also apply to paramedics (3-6), including being younger, female and less educated (15,16), although this has not been found consistently (17,18). Assessing trauma exposure is important when considering PTSD risk. Cumulative exposure is widely regarded as increasing risk (19,20) as is the recency of trauma (21).

Positive psychological outcomes

Traumatic events lead some people to report a greater appreciation of life and enriched personal relationships. This is referred to as 'post-traumatic growth' (PTG) (22) where the event acts as a type of psychological 'seismic experience' (23) potentially shifting core beliefs and enhancing relationships with others and reflections on life possibilities/strengths. PTG and PTSD are not simply the opposite ends of a single continuum, they are independent dimensions and can co-occur (24,25). Trauma-exposed people can be supported in recognising positive responses even when they may be highly distressed.

Challenges to core beliefs are considered essential for PTG to occur (23) and are associated with PTSD (25-27). Core

beliefs are described as fundamental assumptions about the world including 'how we believe people will behave, how events should unfold, and our ability to influence events' (28). Thus, even if well managed, traumatic events can shake or disrupt a person's fundamental assumptions about fairness, having control, and why people behave as they do (28). For example, exposure to fatal road accident scenes may lead paramedics to seriously examine beliefs about the meaning of life or their belief that things that happen to people are controllable. A single study (29) has explored core beliefs in paramedics with regard to life event and trauma exposure, although not in regard to PTG or PTSD.

There are mixed results regarding relationships between PTG and demographic characteristics, although a trend is evident for women to experience more PTG (30-32). There is more consistent evidence of cross-national differences. Research outside of the United States usually shows lower levels of PTG, noting that aspects of the US cultural 'narrative' strongly promote benefit-finding (31) even if this is misplaced or harmful (32). For this reason, studies in the New Zealand context are important.

The aims of this study are to first estimate the rates of PTSD, psychiatric morbidity and level of PTG in New Zealand first responder paramedics who have been directly exposed to at least one traumatic event. Second, in an effort to build knowledge about the role of work setting variables in this population, we explore a mix of demographic, professional, crewing status and trauma exposure risk factors associated with each of these outcomes. Finally, we investigate if PTSD and PTG are associated with core belief disruptions as theoretically predicted and found in selected other studies although not yet explored in paramedics.

Methods

Sampling and procedure

In New Zealand, one paramedicine agency provides front-line medical/ambulance responses throughout most of the country. Staff (including volunteers) were eligible if they were active first responders (thus excluding administrative/program staff). No other recruitment exclusion criteria applied. Internet-based data collection (33) was a practical solution for a national study, and one commonly used in trauma research (34,35). After questionnaire pilot-testing, study information was placed in internal newsletters/communications, with prompts emailed to all potential participants after several weeks. At recruitment, participants accessed the ethics-approved information and consent text before electing to proceed to the study questions. Participants were advised that information given, including participation, was anonymous and confidential. After collation, the resulting full dataset was accessible only to the researchers with normal research data storage protection strategies applying.

Data collection went 'live' on the day of a major disaster (earthquake) which the host organisation responded to on a national basis (14 November 2016). Unrelated industrial disputes within the host organisation immediately followed. Recruitment was suspended and relaunched in February 2017 for the originally planned two-month participation period.

In total, 579 responses were received (representing 27% of all eligible participants). Two validity questions ('I only sleep 1-2 hours per night': true/false; 'Please leave this next question blank, for office use') were embedded checking for item reading. Less than 3% of participants endorsed the former and all skipped the latter, indicating thorough reading.

Ethics approval

In accordance with ethical standards of the Declaration of Helsinki, ethical approval was obtained from the research institution's ethics committee (reference number 16/046). Locality approval was granted from the host organisation. All participants gave informed consent.

Measures

Trauma exposure and trauma symptoms

The Life Events Checklist (LEC-5) extended version (36) assessed lifetime exposure to 16 life events (or nomination of an event not listed) which may result in PTSD or psychiatric morbidity. For each endorsed event, participants specify their involvement (happened to me; witnessed it; learned about it; part of job; not sure). Following others (8), lifetime exposure to different event types was calculated as a total score, with identification of the worst event and recency of this. To be consistent with definitions of direct exposure in comparative research (8,37) we took a conservative approach by including only those who had directly experienced a traumatic event – defined as happening to them or directly witnessing it.

PTSD symptoms were measured using the 20-item PTSD checklist modified for DSM-5 (PCL-5) (38). Items are scored 0 to 4, with total scores from 0 to 80. The original recommended cut-off score of 33 or more for probable PTSD was used for comparison with other trauma-exposed populations (39,40). Participants answered the PCL-5 in regard to their self-defined LEC-5 worst event. In the current study internal consistency was high ($\alpha=.96$).

Post-traumatic growth

The Post-traumatic Growth Inventory Short Form (PTGI-SF) (28) is a 10-item (0 to 5 Likert scale) inventory assessing the degree to which people experience positive changes from a distressing incident (in this case, worst traumatic event). Consistent with other first responder studies (41), we used the PTGI-SF as a single scale, computing the item means. Internal consistency in the current study was high ($\alpha=.90$).

General psychological health

The 12-item short form of the General Health Questionnaire (GHQ-12) (42) assessed common psychological/psychiatric symptoms. The original unidimensional Likert scale scoring method (0011 coding) using a single global score was used as it is less contaminated by response bias (43,44). The original cut-off score of 6 or more marked the presence of non-specific psychiatric morbidity, with acceptable internal consistency in this study ($\alpha=.75$).

Core beliefs

The Core Beliefs Inventory (CBI) (28) assessed the degree to which participants reported that their 'worst ever' life event had disrupted their core beliefs. Each of the nine items is scored on a six-point (0 to 5) Likert scale, with mean ratings on the items used. In the current study, internal consistency was high ($\alpha=.91$).

Statistical analysis

Data were analysed using SPSS (version 25). Missing value analyses (Little's MCAR test) were all non-significant indicating that missing values were random. Where there was less than 20% of missing items on psychometric measures, values were replaced (GHQ-12, $n=8$; PCL-5, $n=17$; CBI, $n=8$; PTGI-SF, $n=4$) with the arithmetic mean for each value. Descriptive and univariate analyses assessed relationships between the dependent variables (GHQ-12; PCL-5; PTGI-SF) and the independent variables (demographic variables; work characteristics; LEC-5; CBI). In multivariate analyses (forward stepwise logistic and linear regression), independent variables with significance at $p<0.10$ were entered in up to four blocks according to their likely chronological order. Block one included demographic variables (age, gender, education, geographical region); block two included work characteristics (professional/volunteer role, years working for the host organisation, single crewing); block three included number of types of trauma exposure (LEC-5) and time since the nominated 'worst event'. Block four included core beliefs (CBI).

Results

Characteristics of the sample

Study participants exposed to at least one trauma ($n=471$) were evenly split by gender (51.80% male), aged 18–75 years ($M=42.28$; $SD=12.50$) and mostly of New Zealand European ethnicity (86.10%), with smaller numbers of Māori (5.30%) and other or mixed ethnicities (8.60%). Because of the predominance of a single ethnic group, ethnicity was not included in subsequent analyses. In other respects, the sample was broadly representative of all first responders employed by the host organisation in New Zealand. Roles included paramedics (37.90%), intensive care paramedics (29.20%), emergency medical technicians (13.80%), clinical hub nurses (10.40%) and call dispatcher handlers (6.50%). All other roles were less than 2%. On average, participants had worked with

the host organisation for a decade ($M=10.90$ years, $SD=8.90$).

Trauma exposure characteristics

The rate of direct traumatic exposure (81%) was consistent with similar studies (8), as were the most commonly reported (LEC-5) trauma types (transport accident, 73.10%; physical assault, 65.30%; natural disaster, 62.60%; life-threatening illness or injury, 59.30%; fire or explosion, 53.50%; serious accident, 52.00%). All other events were less than 50%. Participants reported a large number of trauma types ($M=6.83$; $SD=3.68$) with the self-defined 'worst event' occurring some years ago ($M=7.22$; $SD=8.23$).

Rates and predictors of psychiatric morbidity and post-traumatic growth

Table 1 summarises the final regression model for psychiatric morbidity and PTG for participants exposed to a traumatic event (LEC-5 >0). Overall, 66.3% reported experiencing significant non-specific psychiatric morbidity (GHQ-12 ≥ 6). Univariate predictors of this included in the multivariate analyses were: professional status single-crewing and years as a host organisation worker. Only the former remained a significant factor (95% CI: 0.31-0.87; $p=0.01$), with professional staff more at risk for generic psychiatric symptoms than volunteers. Probable PTSD was reported by 14.6% of participants. Univariate predictors of PTSD included in the multivariate analysis included: age, LEC-5 number of types of traumatic events and CBI. Significant variables remaining included being older (OR=0.94; 95% CI: 0.915-0.975; $p<0.01$) which reduced the odds of PTSD and experiencing greater disruptions in core beliefs (OR=2.75; 95% CI: 2.00-3.77; $p<0.01$), which increased the odds.

The majority (66.40%) reported at least some degree of positive change (PTGI-SF total score >10). Univariate predictors of PTG included in the multivariate analyses included: gender, LEC-5 number of types of traumatic events; years since the worst event; CBI. Significant variables remaining, which increased PTG, were being female ($t=4.70$; $p<0.01$) and experiencing greater core belief disruption ($t=7.54$; $p<0.01$) (adjusted $R^2=0.27$). Disruptions in core beliefs were reported in the mild-to-moderate range ($M=2.89$; $SD=1.25$ on a 6-point scale).

Discussion

This study found a high rate of non-specific psychiatric morbidity in trauma-exposed New Zealand paramedics. This is at the upper end of those previously reported in health professional groups, yet consistent with studies where this is assessed as part of wider enquiries about wellbeing and recovery from critical events (10,45). These symptoms are not benign, with their known association with burnout and job stress. Several contextual and methodological factors may have elevated these rates including the natural disaster delaying

recruitment and other unanticipated 'framing effects' (eg. burgeoning industrial disruption) which can amplify expressions of distress. A third issue is that we concurrently asked about traumatic events, which may have activated non-specific psychiatric symptoms or memories of them (although we used a high cut-off score to reduce the risk of false positives).

If the reported rate of psychiatric morbidity is accurate, this has implications for bolstering staff welfare services, especially for professional paramedics who will be exposed to accumulating events over their career. Symptoms may build over time for many reasons, including the eroding of empathy, which may come with repeated exposure. Paramedic workplace wellbeing initiatives may need particular outreach towards professional and long-serving staff who possibly view psychological supports and personal wellbeing initiatives as more relevant for less experienced or volunteer staff.

The rate of probable PTSD found was low compared with some reports of first responder workforces (46), although entirely consistent with a recent meta-analysis of paramedics when studied in isolation (9) and in earlier studies (2). The decision to only include trauma-exposed participants may have added greater alignment with diagnostic requirements for PTSD which may not have been present in all studies reporting higher rates. Although concerning that just over one in 10 had probable PTSD, only the one novel workplace characteristic explored (volunteers/professional staff) was predictive despite emphasis sometimes being given to single crewing as harmful to wellbeing. Older age appears to be a protective factor; age may bring greater robustness and life experience to psychologically accommodate traumatic events. However, older paramedics with PTSD may have self-selected out of the profession.

The level of core belief disruption was consistent with other studies (28) and independently predicted higher PTSD and PTG. This builds on literature highlighting the centrality of core beliefs in multiple psychological outcomes. Shared cognitive variables may explain this. For example, disruptions may activate intrusive rumination in regard to PTSD but deliberate rumination (looking for benefits) in regard to PTG (47). Further research may disentangle the harmful and helpful types of disruptions to improve workplace interventions, including those promoting positive outcomes.

The finding that trauma-exposed women report more PTG is not found in all populations (48). The 'caring' roles performed by paramedics may promote more awareness of benefit-finding in women. If true differences exist, male paramedics may benefit from interventions promoting greater social connections or stimulating cognitive adaptations focussed on the appreciation of life.

Future research could explore if associations between core beliefs, PTG and PTSD are influenced by the type of trauma

Table 1. Demographic, work and psychological measure characteristics of sample (sample sizes in univariate analyses)

Variable	Total sample	GHQ-12 <6	GHQ-12 ≥6	T or Chi	p-value	No PTSD (PCL-5 <33)	PTSD (PCL-5 ≥33)	T or Chi	p-value	PTG (t or r)	p-value
Demographic characteristics											
Age (M/SD) (n=377)	42.28 (12.50)	42.47 (12.83)	43.56 (12.09)	0.78	0.46	43.88 (12.56)	37.36 (10.57)	3.36	0.01	0.04	0.43
Gender (% male) (n=382)	53.40	57.44	55.10	1.04	0.34	53.30	55.10	0.05	0.88	5.28	0.01
Education level (% tertiary) (n=360)	78.87	77.89	79.40	0.09	0.77	80.03	69.56	2.70	0.12	0.67	0.50
Work characteristics											
Professional or volunteer status (n=325) (%)	70.46	60.55	75.23	7.45	0.01	69.96	75.00	0.50	0.61	0.65	0.52
Years as St John worker (M/SD) (n=358)	10.90 (8.85)	9.33 (9.06)	11.67 (8.25)	2.24	0.03	11.38 (9.03)	9.90 (7.67)	1.06	0.29	-0.06	0.29
Single or double-crewed role (% single) (n=382)	55.80	45.87	59.15	5.13	0.03	52.63	63.26	1.91	0.21	-0.15	0.88
Trauma characteristics											
Number of traumatic event types (LEC-5) (M/SD) (n=358)	6.83 (3.68)	6.63 (3.60)	7.11 (3.76)	-1.02	0.31	6.69 (3.64)	8.33 (3.75)	-2.90	0.00	0.13	0.02
Years since worst event (LEC-5) (M/SD) (n=320)	7.22 (8.23)	7.13 (8.47)	7.31 (8.08)	-0.18	0.86	7.29 (8.17)	6.94 (8.61)	0.27	0.79	0.16	0.01
Core beliefs (CBI) (M/SD) (n=329)	2.89 (1.25)					2.67 (1.16)	4.07 (1.02)	-7.80	0.00	0.43	0.00

exposure. Some traumas, such as natural disasters, with their widespread community awareness, may be more amenable to 'incredible story' narratives and socially connecting activities which in turn may reinforce positive world assumptions. In other types involving private and potentially shaming aftermaths (eg. sexual assaults, physical violence), it may be harder to engender benefit-finding. Gender/age interactions may also play a part (49), especially in regard to these latter categories. Further exploration of these subtleties is warranted in both paramedics and other trauma-exposed populations.

Table 2. Final regression model for each psychological outcome

Predictor variable	Psychological measure				
	B	SE	OR	95% CI for OR	p-value
Psychiatric morbidity (GHQ-12) (n=298)					
Professional status	-0.66	0.26	0.52	0.31-0.87	0.01
PTSD (PCL-5) (n=298)					
Age	-0.06	0.02	0.94	0.92-0.98	0.00
Disruption of core beliefs	1.01	0.16	2.75	2.00-3.77	0.00
Post-traumatic growth (PTGI-SF) (n=284)					
t					
Gender	-0.54	0.16	-4.70		0.00
Disruption of core beliefs	0.36	0.05	7.54		0.00

Limitations

Cross-sectional methodologies have limitations and risk 'time of measurement' effects due to unexpected events, as they did in this study. This affected recruitment, although a relatively large sample size was collected, able to detect medium effects, and with good demographic and workforce variability broadly representative of these first responders. Another possible wellbeing participation bias occurred because of the nature of the topic even though this bias may have applied in different directions. That is, a study on psychological wellbeing may have had low interest in those with no psychological symptoms, while being highly distressed may have acted as barrier for engagement. This common concern in trauma research has not been supported, since answering questions about trauma not being found to prompt distress (50). Recruitment may also have been influenced by stigma about mental health. A further limitation could have been the missing values, although checks revealed these to be random.

Conclusion

In New Zealand, the paramedic workforce has rates of PTSD commensurate with other first responders but elevated levels

of non-specific psychiatric morbidity. Yet positive psychological outcomes following trauma exposure are also reported. Disruptions in core beliefs are associated with these outcomes, thereby highlighting opportunities for refining workplace interventions, especially among older and experienced paramedics.

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Conflict of interest

The authors declare they have no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

References

- Bentley MA, Levine R. A national assessment of the health and safety of emergency medical services professionals. *Prehosp Disaster Med* 2016;31:S96-104. doi: 10.1017/S1049023X16001102.
- Berger W, Coutinho ES, Figueira I, et al. Rescuers at risk: a systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Soc Psychiatry Psychiatr Epidemiol* 2012;47:1001-11. doi: 10.1007/s00127-011-0408-2.
- Rybojad B, Aftyka A, Baran M, Rzońca P. Risk factors for posttraumatic stress disorder in Polish aramedics: a pilot study. *J Emerg Med* 2016;50:270-6. doi: 10.1016/j.jemermed.2015.06.030.
- Berger W, Figueira I, Maurat AM, et al. Partial and full PTSD in Brazilian ambulance workers: prevalence and impact on health and on quality of life. *J Trauma Stress* 2007;20:637-42. doi: 0.1002/jts.20242.
- McFarlane AC, Bookless C. The effect of PTSD on interpersonal relationships: issues for emergency service workers. *Sex Relation Ther* 2010;16:261-7. doi: 10.1080/14681990124457.
- Pietrzak RH, Goldstein RB, Southwick SM, Grant BF. Prevalence and Axis I comorbidity of full and partial posttraumatic stress disorder in the United States: results from Wave 2 of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Anxiety Disord* 2011;25:456-65. doi: 10.1016/j.janxdis.2010.11.010.
- Luftman K, Aydelotte J, Rix K, et al. PTSD in those who care for the injured. *Injury* 2017;48:293-6. doi: 10.1016/j.injury.2016.11.001.
- Fjeldheim CB, Nöthling J, Pretorius K, et al. Trauma exposure, posttraumatic stress disorder and the effect of explanatory variables in paramedic trainees. *BMC Emerg Med* 2014;14:11. doi: 10.1186/1471-227X-14-11.

References (continued)

9. Petrie K, Milligan-Saville J, Gayed A, et al. Prevalence of PTSD and common mental disorders amongst ambulance personnel: a systematic review and meta-analysis. *Soc Psychiatry Psychiatr Epidemiol* 2018;53:897-909. doi: 10.1007/s00127-018-1539-5.
10. Gouweloos-Trines J, Tyler MP, Giummarra MJ, et al. Perceived support at work after critical incidents and its relation to psychological distress: a survey among prehospital providers. *Emerg Med J* 2017;34:816-22. doi: 10.1136/emered-2017-206584.
11. Goodwin L, Ben-Zion I, Fear NT, et al. Are reports of psychological stress higher in occupational studies? A systematic review across occupational and population based studies. *PLoS One* 2013;8:e78693. doi: 10.1371/journal.pone.0078693.
12. Boyle MJ, Williams B, Bibby C, et al. The first seven years of the metropolitan fire brigade emergency responder programme - an overview of incidents attended. *Open Access Emerg Med* 2010;2:77-82.
13. Haraldsdóttir HA, Gudmundsdóttir D, Romano E, et al. Volunteers and professional rescue workers: traumatization and adaptation after an avalanche disaster. *J Emerg Manag* 2014;12:457-66. doi: 10.5055/jem.2014.0209.
14. Mather M. Extra funding for single-crew ambulances announced. Available at: www.stuff.co.nz/national/92544652/extra-funding-for-singlecrew-ambulances-set-to-be-announced [Accessed 14 May 2017].
15. Koenen KC, Ratanatharathorn A, Ng L, et al. Posttraumatic stress disorder in the world mental health surveys. *Psychol Med* 2017;47:2260-74. doi: 10.1017/S0033291717000708.
16. McLean CP, Asnaani A, Litz BT, Hofmann SG. Gender differences in anxiety disorders: prevalence, course of illness, comorbidity and burden of illness. *J Psychiatr Res* 2011;45:1027-35. doi: 10.1016/j.jpsychires.2011.03.006.
17. Donnelly EA, Bradford P, Davis M, Hedges C, Klingel M. Predictors of posttraumatic stress and preferred sources of social support among Canadian paramedics. *CJEM* 2016;18:205-12. doi: 10.1017/cem.2015.92.
18. Tolin DF, Foa EB. Sex differences in trauma and posttraumatic stress disorder: a quantitative review of 25 years of research. *Psychol Bull* 2006;132:959-92. doi: 10.1037/0033-2909.132.6.959.
19. Geronazzo-Alman L, Eisenberg R, Shen S, et al. Cumulative exposure to work-related traumatic events and current post-traumatic stress disorder in New York City's first responders. *Compr Psychiatry* 2017;74:134-43. doi: 10.1016/j.comppsy.2016.12.003.
20. Yehuda R, Hoge CW, McFarlane AC, et al. Post-traumatic stress disorder. *Nat Rev Dis Primers* 2015;1:15057. doi: 10.1038/nrdp.2015.57.
21. Corneil W, Beaton R, Murphy S, Johnson C, Pike K. Exposure to traumatic incidents and prevalence of posttraumatic stress symptomatology in urban firefighters in two countries. *J Occup Health Psychol* 1999;4:131-41.
22. Tedeschi RG, Calhoun LG. The Posttraumatic Growth Inventory: measuring the positive legacy of trauma. *J Trauma Stress* 1996;9:455-71.
23. Taku K, Cann A, Tedeschi RG, Calhoun LG. Core beliefs shaken by an earthquake correlate with posttraumatic growth. *Psychol Trauma* 2015;7:563-9. doi: 10.1037/tra0000054.
24. Liu AN, Wang LL, Li HP, Gong J, Liu XH. Correlation between posttraumatic growth and posttraumatic stress disorder symptoms based on Pearson correlation coefficient: a meta-analysis. *J Nerv Ment Dis* 2017;205:380-9. doi: 10.1097/Nmd.0000000000000605.
25. Zhou X, Wu X, Fu F, An Y. Core belief challenge and rumination as predictors of PTSD and PTG among adolescent survivors of the Wenchuan earthquake. *Psychol Trauma* 2015;7:391-7. doi: 10.1037/tra0000031.
26. Connerty TJ, Knott V. Promoting positive change in the face of adversity: experiences of cancer and post-traumatic growth. *Eur J Cancer Care (Engl)* 2013;22:334-44. doi: 10.1111/ecc.12036.
27. Lilly MM, Pierce H. PTSD and depressive symptoms in 911 telecommunicators: the role of peritraumatic distress and world assumptions in predicting risk. *Psychol Trauma* 2013;5:135-41. doi: 10.1037/a0026850.
28. Cann A, Calhoun LG, Tedeschi RG, et al. The Core Beliefs Inventory: a brief measure of disruption in the assumptive world. *Anxiety Stress Coping* 2010;23:19-34. doi: 10.1080/10615800802573013.
29. Galloucis M, Silverman MS, Francek HM. The impact of trauma exposure on the cognitive schemas of a sample of paramedics. *Int J Emerg Ment Health* 2000;2:5-18.
30. Jin YC, Xu JP, Liu DY. The relationship between post traumatic stress disorder and post traumatic growth: gender differences in PTG and PTSD subgroups. *Soc Psychiatry Psychiatr Epidemiol* 2014;49:1903-10. doi: 10.1007/s00127-014-0865-5.
31. Calhoun LG, Cann A, Tedeschi RG. The posttraumatic growth model: Sociocultural considerations, in posttraumatic growth and culturally competent practice: Lessons learned from around the globe. In: Weiss T & Berger R, editors. *Posttraumatic growth and culturally competent practice: Lessons learned*. Hoboken, NJ: Wiley, 2010, John Wiley & Sons Inc: Hoboken, NJ, US. p.1-14.
32. Aspinwall LG, Tedeschi RG. The value of positive psychology for health psychology: progress and pitfalls in examining the relation of positive phenomena to health. *Ann Behav Med* 2010;39:4-15. doi: 10.1007/s12160-009-9153-0.
33. SurveyMonkey Inc. San Mateo, California, USA. Available at: www.surveymonkey.com.
34. Surgenor LJ, Snell DL, Dorahy MJ. Posttraumatic stress symptoms in police staff 12-18 months after the Canterbury earthquakes. *J Traum Stress* 2015;28:162-6.
35. Schlenger WE, Caddell JM, Ebert L, et al. Psychological reactions to terrorist attacks: findings from the National Study of Americans' Reactions to September 11. *JAMA* 2002;288:581-8. doi: 10.1001/jama.288.5.581.

References (continued)

36. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP. Life Events Checklist for DSM-5 (LEC-5) 2013. Available at: www.ptsd.va.gov
37. May CL, Wisco BE. Defining trauma: how level of exposure and proximity affect risk for posttraumatic stress disorder. *Psychol Trauma* 2016;8:233-40. doi: 10.1037/tra0000077.
38. Blevins CA, Weathers FW, Davis MT, Witte TK, Domino JL. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): development and initial psychometric evaluation. *J Trauma Stress* 2015;28:489-98. doi: 10.1002/jts.22059.
39. Bovin MJ, Marx BP, Weathers FW, et al. Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in veterans. *Psychol Assess* 2016;28:1379-91. doi: 10.1037/pas0000254.
40. Wortmann JH, Jordan AH, Weathers FW, et al. Psychometric analysis of the PTSD Checklist-5 (PCL-5) among treatment-seeking military service members. *ibid.* 2016;28:1392-403. doi: 10.1037/pas0000260.
41. Kehl D, Knuth D, Hulse L, Schmidt S; BeSeCu-Group. Predictors of postevent distress and growth among firefighters after work-related emergencies: a cross-national study. *Psychol Trauma* 2015;7:203-11. doi: 10.1037/a0037954.
42. Goldberg D. Use of the general health questionnaire in clinical work. *BMJ (Clin Res Ed)* 1986;293:1188-9.
43. Hankins M. The factor structure of the twelve item General Health Questionnaire (GHQ-12): the result of negative phrasing? *Clin Pract Epidemiol Ment Health* 2008;4:10. doi: 10.1186/1745-0179-4-10.
44. Rey JJ, Abad FJ, Barrada JR, Garrido LE, Ponsoda V. The impact of ambiguous response categories on the factor structure of the GHQ-12. *Psychol Assess* 2014;26:1021-30. doi: 10.1037/a0036468.
45. Mattei A, Fiasca F, Mazzei M, Abbossida V, Bianchini V. Burnout among healthcare workers at L'Aquila: its prevalence and associated factors. *Psychol Health Med* 2017;22:1262-70. doi: 10.1080/13548506.2017.1327667.
46. Stanley IH, Hom MA, Spencer-Thomas S, Joiner TE. Examining anxiety sensitivity as a mediator of the association between PTSD symptoms and suicide risk among women firefighters. *J Anxiety Disord* 2017;50:94-102. doi: 10.1016/j.janxdis.2017.06.003.
47. Lancaster SL, Klein KR, Nadia C, Szabo L, Mogerman B. An integrated model of posttraumatic stress and growth. *J Trauma Dissociation* 2015;16:399-418. doi: 10.1080/15299732.2015.1009225.
48. Stutts LA, Stanaland AW. Posttraumatic growth in individuals with amputations. *Disabil Health J* 2016;9:167-71. doi: 10.1016/j.dhjo.2015.07.005.
49. Kilic C, Magruder KM, Koryurek MM. Does trauma type relate to posttraumatic growth after war? A pilot study of young Iraqi war survivors living in Turkey. *Transcult Psychiatry* 2016;53:110-23. doi: 10.1177/1363461515612963.
50. Jaffe AE, DiLillo D, Hoffman L, Haikalis M, Dykstra RE. Does it hurt to ask? A meta-analysis of participant reactions to trauma research. *Clin Psychol Rev* 2015;40:40-56. doi: 10.1016/j.cpr.2015.05.004.