

Original

Resilience, post-traumatic growth, and work engagement among health care professionals after the Great East Japan Earthquake: A 4-year prospective follow-up study

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Abstract: Objectives: Although attention has been paid to post-traumatic stress disorder (PTSD) among health care professionals after disasters, the impact of traumatic events on their work has not been elucidated. The aim of this study was to examine whether disaster-related distress, resilience, and post-traumatic growth (PTG) affect work engagement among health care professionals who had been deployed to the areas affected by the Great East Japan Earthquake that occurred on March 11, 2011. **Methods:** We recruited disaster medical assistance team members who were engaged in rescue activities after the earthquake. The short version of the Resilience Scale (RS-14) and Peritraumatic Distress Inventory (PDI) were administered one month after the earthquake, and the short form of Posttraumatic Growth Inventory (SF-PTGI) and Utrecht Work Engagement Scale (UWES) were administered four years after the earthquake. Work engagement is composed of vigor, dedication, and absorption. Regression analyses were used to examine the relationship of UWES with RS-14, PDI, and SF-PTGI. **Results:** We obtained baseline data of 254 participants in April 2011, and 191 (75.2%) completed the follow-up assessment between December 2014 and March 2015. The results showed that RS-14 predicted vigor, dedication, and absorption; in addition, SF-PTGI was positively related with these three parameters ($p < 0.01$ for all). **Conclusions:** Resilience at baseline and PTG after rescue activities may increase work engagement among health care professionals after dis-

asters. These findings could be useful for establishing a support system after rescue activities during a large-scale disaster and for managing work-related stress among health care professionals.

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Introduction

Mental health among health care professionals after disasters is a significant issue. Previous studies reported that mid-teen percentage rescue workers can develop post-traumatic stress disorder (PTSD) after an airline crash and a terrorist attack^{1,2}. However, positive mental health among rescue workers after disasters has not been fully examined so far.

Notable concepts of positive mental health include work engagement, resilience, and post-traumatic growth (PTG). Work engagement is defined as “a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption”³. Work engagement is closely related to job resources, which include the physical, psychological, social, and organizational aspects of the job⁴.

Resilience has various definitions; however, most of them include two common factors, namely, the experience of adversity and achievement of positive outcomes⁵. Resilience has often been viewed as a stress-coping ability in the face of adversity, in other words, psychological resource. Thus, resilience would predict work engagement, but a relationship between work engagement and

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resilience among health care professionals has not been fully examined.

PTG is another concept drawing attention, defined as “the experience of positive change that occurs as a result of the struggle with highly challenging life crises”⁶⁾. It comprises of five factors, namely, “relating to others,” “new possibilities,” “personal strength,” “spiritual change,” and “appreciation of life.” Tedeschi and Calhoun suggested that individuals who are resilient may be the least likely to experience PTG⁷⁾ because traumatic experiences may be less challenging to them. Therefore, they are less likely to engage in extensive cognitive processing that is associated with PTG⁸⁾. However, at the same time, it would be reasonable for some subscales of PTG, namely, “personal strength” and “relating to others” to enhance work engagement because they can be regarded at least partly as psychological and social resources. This means that even health care professionals who are not resilient may be able to enhance work engagement after severely stressful events through PTG.

The Great East Japan Earthquake occurred on March 11, 2011. The earthquake and a massive tsunami hit the coast of Tohoku region, Japan, and the number of killed or missing persons reached about 18,500. After the earthquake, many health care professionals were dispatched to the disaster area for rescue activities. Some of them must have experienced stressful events severe enough to generate PTG. The aim of this study was to examine whether disaster-related distress, resilience, and PTG affect work engagement among health care professionals who were deployed four years earlier to the area affected by the Great East Japan Earthquake.

Subjects and Methods

Participants and Procedures

This study is a follow-up and extension of an earlier study entitled “Attenuating posttraumatic distress with omega-3 polyunsaturated fatty acids among disaster medical assistance team members after the Great East Japan Earthquake: the APOP randomized controlled trial”⁹⁾. Both the studies were conducted in accordance with the Declaration of Helsinki as revised in 2004 and the ethical principles laid out by the Ministry of Health, Labour and Welfare of Japan. The original study was approved by the Ethics Committee of the National Disaster Medical Center on April 1, 2011, and this follow-up investigation was approved on September 18, 2014.

Disaster medical assistance teams (DMATs) are specialized mobile medical teams that provide medical aid during the acute phase of a large-scale disaster. DMATs consist of physicians, nurses, and operational coordination staff including pharmacists, social workers, psychologists, and office workers. The Japanese Ministry of Health, Labour and Welfare has set up a national network

of DMATs, and in response to the 2011 Great East Japan Earthquake, 1,816 rescue workers in DMATs were deployed to the disaster area. We recruited DMAT members who participated in the disaster response activities. Here we applied the same inclusion criteria as in our previous study^{9,10)}: (a) aged ≥ 18 years, (b) native Japanese speaker or non-native speaker with Japanese conversational abilities and (c) physically and psychologically capable of understanding and providing consent for study participation.

Among the 1,816 DMAT workers deployed, 172 participated in the initial APOP clinical trial, 254 were enrolled in this longitudinal observational study, and 1,390 did not respond. We obtained baseline data from the 254 longitudinal study participants one month after the earthquake from April 2 to 22, 2011. Among the 254 participants, 191 (75.2%) completed a follow-up assessment four years after the earthquake between December 11, 2014, and March 31, 2015.

Measures

At baseline, we administered a short version of the Resilience Scale (RS-14) and Peritraumatic Distress Inventory (PDI). RS-14 is a 14-item self-report questionnaire intended to assess resilience¹¹⁾. The response is measured using a 7-point Likert scale, yielding a score ranging from 14 to 98. PDI is a 13-item self-report questionnaire intended to assess distress during and immediately after a traumatic event. The response is measured using a 5-point Likert scale, yielding a score ranging from 0 to 52¹²⁾.

At follow-up, we administered the short form of the Posttraumatic Growth Inventory (SF-PTGI), 9-item Utrecht Work Engagement Scale (UWES-9), and Impact of Event Scale-Revised (IES-R). SF-PTGI is a 10-item self-report questionnaire intended to assess PTG as the degree of change experienced after a traumatic event¹³⁾. Each of the five subscales consists of two items, which were rated on a 6-point Likert scale, yielding a total score ranging from 0 to 50. UWES-9 is a 9-item self-report questionnaire intended to assess work engagement, yielding a score ranging from 0 to 54¹⁴⁾. It consists of three subscales: vigor, dedication, and absorption. Each subscale consists of three items, which were rated on a 7-point Likert scale. IES-R is a 22-item self-report questionnaire intended to assess PTSD symptoms during the previous week, yielding a score ranging from 0 to 88¹⁵⁾. It consists of two subscales: working excessively and working compulsively. Each subscale consists of five items, which were rated on a 4-point Likert scale. The reliability and validity of the Japanese versions of RS-14¹⁶⁾, PDI^{17,18)}, PTGI¹⁹⁾, UWES²⁰⁾, and IES-R²¹⁾ have been verified.

Statistical analysis

The means and standard deviations of the measures and their subscales were calculated. Spearman's correlation coefficients among continuous variables were also calcu-

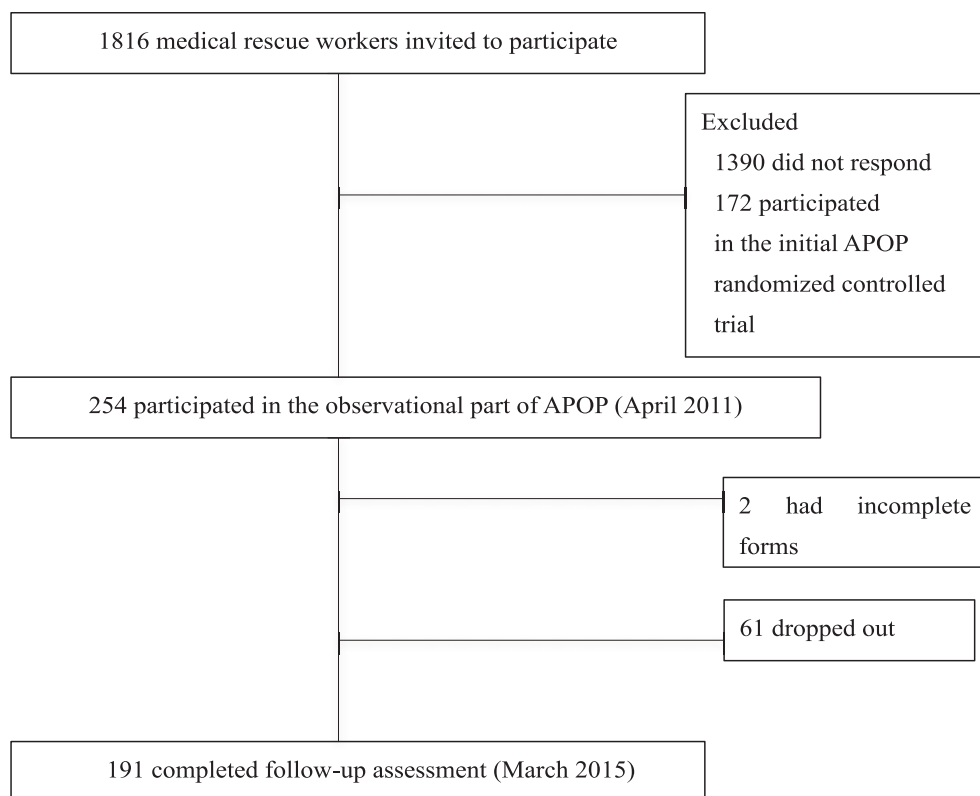


Fig. 1. Participant flow diagram

lated. We selected RS-14, SF-PTGI, and PDI as independent variables to establish a model for work engagement and its subscales, namely, vigor, dedication, and absorption. Multivariate regression analysis was used to examine if independent variables predicted UWES-9 and its subscales after adjusting for age and sex. PTG could be partly regarded as an individual trait after a traumatic experience because it is “the change that occurs as a result of the struggle.” On the other hand, we viewed work engagement as a modifiable state. Thus, we assumed it was reasonable to treat SF-PTGI as an independent variable and UWES-9 as a dependent variable, although both SF-PTGI and UWES-9 were measured at the 4-year follow-up. All data analyses were performed using the statistical software package SPSS, version 21.0J for Windows (SPSS Japan Inc., Tokyo, Japan).

Results

Participant flow is shown in Fig. 1, and demographic characteristics of 191 completers are shown in Table 1. Completers did not differ from those who dropped out of the follow-up in terms of age, gender, and RS-14 score at baseline.

Table 2 shows Spearman’s correlation coefficients among continuous variables.

Of note, PTGI was predicted both by RS-14 and PDI

and positively related both with work engagement and PTSD symptoms. Of the five subscales, only personal strength was predicted by resilience and not by peritraumatic distress, and its association with work engagement seemed to be stronger than that with PTSD symptoms. However, the other four subscales were predicted by peritraumatic distress and not by resilience. Particularly, the associations of appreciation of life and spiritual change with PTSD symptoms seemed to be stronger than those with work engagement.

Table 3 shows the results of multivariate regression analyses. Resilience at baseline predicted the total scores of UWES-9, vigor, dedication, and absorption even after being adjusted for age and sex. In addition, SF-PTGI at follow-up was positively related with the total scores of UWES-9 and these three parameters R-squared value of each model was significant. For reference, variance inflation factors were below 1.263.

Discussion

To the best of our knowledge, this is the first work to suggest that resilience at baseline and PTG after rescue activities may increase work engagement, which is characterized by vigor, dedication, and absorption, among health care professionals.

Resilience is thought to be a primary personal resource

Table 1. Demographic and Exposure Characteristics of Rescue Workers Who Participated in the Follow-up Study ($n=191$)

Variables	<i>n</i>	%	Mean	SD
Age (years)			42.4	7.8
Men	117	61.3		
Occupation				
Medical Doctor	45	23.6		
Nurse	83	43.5		
Operational coordination staff	63	33.0		
Period of deployment (days)			3.6	1.2
Stress prior to deployment, yes	53	27.7		
Saved a child during deployment, yes	8	4.2		
Contact with corpses during deployment, yes	14	7.3		
Concern over radiation exposure, yes	14	7.3		
RS-14 at baseline			68.1	12.2
PDI at baseline			12.3	7.1
SF-PTGI at follow-up			17.8	10.6
Relating to others			4.2	2.6
New possibilities			3.8	2.7
Personal strength			3.0	2.4
Spiritual change			2.0	2.2
Appreciation of life			4.9	2.6
UWES at follow-up			25.5	10.8
Vigor			7.9	3.8
Dedication			9.6	3.7
absorption			7.9	3.9
IES-R at follow-up			5.4	6.7

SD, standard deviation.

RS-14, a short version of resilience scale; SF-PTGI, a short form of posttraumatic growth inventory; UWES, Utrecht Work Engagement Scale; IES-R, the Impact of Event Scale-Revised

in individuals. Therefore, not surprisingly, resilience at baseline predicted work engagement. However, it is noteworthy that PTG was positively related to work engagement. The findings suggested that people whose assumptive worlds were shaken as well as people who were strong enough and not influenced by stressful events could enrich psychological and social resources and eventually increase work engagement.

In addition to rescue activities after large-scale disasters, health care professionals may also face potentially traumatic events. According to the American Psychiatric Association, medical incidents, such as waking during surgery and anaphylactic shock, and observing serious injury and unnatural death are qualified as traumatic events²²). Thus, health care professionals can feel peritraumatic distress in their work. Highly stressful events should be prevented whenever possible, but they are sometimes unavoidable. Previous studies have shown that some factors such as deliberate rumination and social sup-

port may lead to PTG²³). Therefore, providing a work environment where health care professionals can honestly express emotions and feel supported may lead them to make the most out of unfortunate events.

Caution should be taken on a positive relationship between PTG and PDI as well as PTG and PTSD symptoms. Previously, compared with others, spiritual change and appreciation of life were shown to have a positive association with PTSD¹⁹), and we reported that spiritual change and appreciation of life can be viewed as coping efforts in the face of distress²⁴). It would be important to see what their PTG really stands for, and the effort to seek out meaning should not be forced.

This study has several limitations. First, the external validity of the present findings may have been affected by the nonresponse of many DMAT members who were invited to participate in this study. These DMAT members may not have had enough time to participate immediately after returning from deployment, choosing instead to fo-

Table 2. Correlations between the continuous variables (N=191)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age													
2. RS-14	0.14												
3. PDI	-0.09	-0.20 [#]											
4. PTGI total score	-0.03	0.15*	0.31 [#]										
5. Relating to others (PTGI)	-0.02	0.10	0.28 [#]	0.84*									
6. New possibilities (PTGI)	-0.07	0.11	0.25 [#]	0.91*	0.72 [#]								
7. Personal strength (PTGI)	0.04	0.29 [#]	0.14	0.82 [#]	0.64 [#]	0.70 [#]							
8. Spiritual change (PTGI)	0.08	0.07	0.31 [#]	0.77 [#]	0.65*	0.65 [#]	0.55 [#]						
9. Appreciation of life (PTGI)	-0.05	0.06	0.35 [#]	0.82 [#]	0.56 [#]	0.75 [#]	0.55 [#]	0.53 [#]					
10. UWES total score	0.19*	0.43 [#]	-0.03	0.28 [#]	0.30 [#]	0.22 [#]	0.36 [#]	0.17*	0.12				
11. Vigor (UWES)	0.16*	0.42 [#]	0.01	0.30 [#]	0.29 [#]	0.27 [#]	0.37 [#]	0.19 [#]	0.15*	0.92 [#]			
12. Dedication (UWES)	0.15*	0.48 [#]	-0.01	0.29 [#]	0.32 [#]	0.23 [#]	0.37 [#]	0.16*	0.13	0.92 [#]	0.82 [#]		
13. Absorption (UWES)	0.20 [#]	0.30 [#]	-0.04	0.24 [#]	0.27 [#]	0.18*	0.29 [#]	0.16*	0.10	0.91 [#]	0.76 [#]	0.76 [#]	
14. PTSD symptoms at follow-up	-0.02	-0.17*	0.47 [#]	0.34 [#]	0.26 [#]	0.32 [#]	0.14*	0.31 [#]	0.34 [#]	-0.10	-0.10	-0.14	-0.05

RS-14, Resilience Scale short version; PDI, Peritraumatic Distress Inventory; PTGI, Posttraumatic Growth Inventory (short form); UWES, Utrecht Work Engagement Scale; *<0.05. [#]<0.01.

Table 3. The results of multivariate regression analysis: the relationship of work engagement with resilience, peritraumatic distress and posttraumatic growth (n=191)

Variable	UWES total score	UWES vigor	UWES dedication	UWES absorption
Resilience assessed by RS-14	0.35 [#] (0.24, 0.46)	0.13 [#] (0.09, 0.17)	0.13 [#] (0.09, 0.17)	0.09 [#] (0.05, 0.13)
Peritraumatic distress assessed by PDI	0.05 (-0.16, 0.25)	0.03 (-0.04, 0.10)	0.02 (-0.05, 0.10)	-0.01 (-0.09, 0.08)
Posttraumatic growth assessed by SF-PTGI	0.28 [#] (0.15, 0.42)	0.10 [#] (0.05, 0.14)	0.09 [#] (0.04, 0.13)	0.10 [#] (0.05, 0.15)
Age	0.21* (0.04, 0.39)	0.07* (0.01, 0.13)	0.05 (-0.01, 0.11)	0.09 [#] (0.03, 0.16)
Sex, women	-0.26 (-3.06, 2.55)	-0.21 (-1.19, 0.78)	-0.03 (-1.00, 0.95)	-0.03 (-1.12, 1.07)
R squared	0.31 [#]	0.31 [#]	0.31 [#]	0.22 [#]

*<0.05. [#]<0.01.

CI, confidence interval; RS-14, a short version of resilience scale; PDI, Peritraumatic Distress Inventory; SF-PTGI, a short form of posttraumatic growth inventory; UWES, Utrecht Work Engagement Scale

cus on working at their usual hospitals. Second, the study population may be biased. In general, motivated health care professionals tend to register as DMAT members; thus, generalizing our findings to other health care professionals warrants further study. Third, the attrition rate in this study was relatively high, although completers did not differ from dropouts in terms of age, sex, and RS-14. Fourth, we did not completely assess job resources that could enhance work engagement because this was a secondary analysis of the APOP follow-up study. Confounders may exist in the model, given the likelihood that work engagement is also influenced by other factors such as workload, support from their bosses, colleagues, and

families. Finally, the timing of assessment was decided practically, rather than theoretically based.

To conclude, resilience and PTG after rescue activities may increase work engagement among health care professionals after the Great East Japan Earthquake. These findings could be useful for establishing a system after rescue activities at large-scale disasters and for managing work-related stress among health care professionals.

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Conflict of Interest: Dr. Nishi has received research grants from the Japan Society for the Promotion of Science, the National Center of Neurology and Psychiatry Japan, and Japan Agency for Medical Research and Development and lecture fees from NTT DoCoMo, Inc., and Otsuka Pharmaceutical Co., Ltd. Drs. Kawashima, Noguchi, Usuki, Yamashita, and Koido declare that they have no conflict of interest. Dr. Matsuoka has received research grants from National Center of Neurology and Psychiatry, Japan, and Pfizer Health Research Foundation. He has been a paid speaker for Ono Pharmaceutical Co., Ltd., Mochida Pharmaceutical Co., Ltd., Takeda Pharmaceutical Co., Ltd., Suntory Wellness Ltd.. None of the funding sources had a role in the design and conduct of the study, data collection, data management, analysis, interpretation of the data, review or approval of the manuscript, or decision to submit the manuscript for publication.

Statement of human rights: All procedures performed in this study were in accordance with the ethical standards of the institutional and national research committee and the Helsinki declaration and its later amendments or comparable ethical standards.

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