Journal of Traumatic Stress
April 2016, *29,* 1–9

ISTSS International Society for Traumatic Stress Studies

PTSD Symptom Trajectories in Disaster Volunteers: The Role of Self-Efficacy, Social Acknowledgement, and Tasks Carried Out

Sigridur B. Thormar,[1] Marit Sijbrandij,[2] Berthold P.R. Gersons,[3] Rens Van de Schoot,[4,5] Barbara Juen,[6] Thorlakur Karlsson,[7] and Miranda Olff[1,3]

[1]Department of Psychiatry, Academic Medical Center, University of Amsterdam, Amsterdam, The Netherlands
[2]Department of Clinical Psychology, VU University Amsterdam and EMGO Institute for Health and Care Research, Amsterdam, The Netherlands
[3]Arq Psychotrauma Expert Group - Diemen, The Netherlands
[4]Department of Methods and Statistics, Utrecht University, Utrecht, The Netherlands
[5]Optentia Research Program, Faculty of Humanities, North-West University, Vanderbijlpark, South Africa
[6]Department of Psychology, University of Innsbruck, Innsbruck, Austria
[7]Department of Psychology, Reykjavík University, Reykjavík, Iceland

Millions of volunteers respond after disasters, with a 24% to 46% risk of developing posttraumatic stress disorder (PTSD). It is unclear which symptom trajectories develop and how they differ between core (volunteering before the disaster) and noncore volunteers (joining after the disaster) and which factors predict trajectories. Symptoms of PTSD were assessed at 6-, 12-, and 18-months postearthquake in 449 volunteers in Indonesia. Demographics, previous mental health service use, self-efficacy, social acknowledgment, and type of tasks were assessed at 6 months. In both core and noncore volunteers, 2 PTSD symptom trajectories emerged: a resilient trajectory (moderate levels of symptoms with a slow decrease over time; 90.9%) and a chronic trajectory (higher levels of symptoms with an increase over time; 9.1%). In both trajectories, core volunteers had fewer symptoms than noncore volunteers. Core volunteers in the chronic trajectory were characterized by having sought prior mental help, reported lower levels of self-efficacy and social acknowledgment, and were more likely to have provided psychosocial support to beneficiaries (Cramér's $V = .17$ to .27, partial $\eta^2 = .02$ to .06). Aid organizations should identify and follow up chronic PTSD trajectories in volunteers, including the noncore, who may be out of sight to the organization after the acute response phase.

Volunteers of the International Federation of Red Cross and Red Crescent Societies (IFRC) reach 30 million victims each year in disasters—taking on various tasks, for example, first aid, evacuation of civilians, removal of the deceased, and psychosocial support (IFRC, 2011). Exposed to multiple deaths or injuries, volunteers often work under unsafe, physically demanding conditions (IFRC, 2013; Thormar et al., 2014). Especially, body recovery (Epstein, Fullerton, & Ursano, 1998) and listening to others' critical experiences (Collins & Long, 2003) may have short- and long-term negative consequences, such as posttraumatic stress disorder (PTSD). PTSD is characterized by a history of exposure to traumatic events and symptoms from each of four symptom clusters: intrusion, avoidance, negative alterations in cognitions and mood, and alterations in arousal and reactivity (American Psychiatric Association, 2013).

The estimated prevalence of PTSD in professional disaster workers varies between 5% and 40% (Galea, Nandi, & Vlahov, 2005) with higher prevalence in Asia (Berger et al., 2012) and in volunteer disaster workers (Haraldsdóttir et al., 2014; Thormar et al., 2010).

Variations in the course of symptoms between populations, events, and community contexts have been documented (Bonanno & Mancini, 2008; Hobfoll et al., 2009; Johansen, Wahl, Eilertsen, & Weisæth, 2007; Norris, Tracy, & Galea, 2009; Wikman, Bhattacharyya, Perkins-Porras, & Steptoe, 2008). Symptoms of PTSD tend to decrease over time (Galea et al., 2005) although some studies have shown a delayed onset of symptoms or increase from subclinical to clinical levels of PTSD (Andrews, Brewin, Philpott, & Stewart, 2007). Researchers have attempted to identify various PTSD symptom trajectories within a specific trauma sample, finding 2–6 trajectories, but mainly the following: recovery—typically high symptoms and fast decline over time, resilient—usually

Correspondence concerning this article should be addressed to Sigridur B. Thormar, Department of Psychiatry, Amsterdam Medical Center, Meibergdreef 5, 1105AZ Amsterdam, The Netherlands. E-mail: s.b.thormar@amc.uva.nl

DOI: 10.1002/jts.22073

low symptoms with little increase over time, chronic—high symptoms with little decrease over time, and delayed onset—low initial symptoms with an increase later in time (Armour, Shevlin, Elklit, & Mroczek, 2011; Bonanno et al., 2012; Dickstein, Suvak, Litz, & Adler, 2010; Galatzer-Levy et al., 2013; Hobfoll et al., 2009; Lowe & Rhodes, 2013; Maercker, Gäbler, O'Neil, Schützwohl, & Müller, 2013; Norris et al., 2009; Orcutt, Erickson, & Wolfe, 2004; Pietrzak et al., 2014; Pietrzak, Van Ness, Fried, Galea, & Norris, 2013; Santiago et al., 2013). One study looked at trajectories of symptoms in disaster volunteers (Pietrzak et al., 2014). Resilience has been proposed as one of the trajectories of PTSD symptoms that may follow exposure to trauma or severe stress (Norris et al., 2009).

Studies on disaster volunteers have assumed the sample to be homogeneous (for a review, see Thormar et al., 2010); however, most samples are not. Generally two groups of volunteers responding to a disaster be distinguished. Core volunteers, existing members of an aid agency before the disaster occurred with certain levels of training and experience, and familiarity with the organization's structure and support system, and noncore volunteers, mostly local citizens without training or prior experience joining in response to the disaster; they may comprise half of the volunteers or even more. No studies of which we are aware have examined PTSD symptom trajectories as a function of core versus noncore status.

Various pre-, peri-, and posttrauma predictors for symptoms of PTSD have been identified in emergency professionals such as younger age and single status (Fullerton, Ursano, & Wang, 2004), level of preparation and/or training (Alvarez & Hunt, 2005), self-efficacy (Cicognani, Pietrantoni, Palestini, & Prati, 2009), levels of social support (Reiffels et al., 2013) the personality trait neuroticism (Engelhard, van den Hout, & Kindt, 2003), level of exposure to gruesome things such as performing body recovery (Epstein et al., 1998), and level of supervisor support (Tak, Driscoll, Bernard, & West, 2007). Finally, tragic life events (Epstein et al., 1998) and social acknowledgment (Southwick, Morgan, & Rosenberg, 2000), which is how a person perceives an individual's and/or society's reaction to their difficult experiences (Maercker & Mueller, 2004) have been found to predict symptoms of PTSD. Social acknowledgement differs from social support in that it includes the complete societal context and not only the support from a person´s close environment (Maercker & Mueller, 2004).

In this study, the Indonesian Red Cross—Palang Merah Indonesia (PMI)—volunteers responded to a large earthquake in the area of Yogyakarta in May 2006. The quake caused 5,782 deaths, 36,299 injuries, damage to 135,000 houses, and 1.5 million left homeless (The University Consortium for Evidence Based Approach to the Emergent Issues in Asia, 2014). With latent growth mixture model analysis (LGMM), we examined whether core and noncore disaster volunteers differed on PTSD symptom trajectories and whether trajectory membership was predicted by demographics, history of mental health service use, self-efficacy, social acknowledgment, and certain tasks performed during the rescue work.

Method

Participants and Procedure

Ethical approval initially sought from the Indonesian Institute of Sciences (LIPI) was referred to the board of the Indonesian Red Cross, which approved the study. The study was administered in January and June of 2007 and in January of 2008 at eight branches of the Indonesian Red Cross through a letter of invitation, inviting volunteers to an introduction of the study including their right to decline participation. Informed consent was obtained in writing; no reimbursement was given.

An attempt was made to contact all 877 volunteers who responded to the earthquake: 298 volunteers had moved away or changed their contact information and 63 volunteers were away for work and unable to join the study. Data on starting time were missing for 65 volunteers; therefore, they were not included in the sample. Two participants had no information available on the IES-R measure and were not included. This left 449 as the total sample. Noncore volunteers started in April/May of 2006 when a small eruption started in Mountain Merapi, which was followed by the earthquake in the Yogyakarta area a month later ($n = 220$) and core volunteers had already joined the Red Cross earlier ($n = 229$).

Thus, participants ($N = 449$) at 6 months (T1) represented 51.2% of all volunteers who responded to the earthquake. All 449 volunteers were recontacted twice with a similar survey at 12 months (T2) with return rate of 84% ($n = 377$), and at 18-months (T3) postearthquake with a return rate of 78% ($n = 350$) of the post-6-months sample.

No difference was found between participants ($N = 449$) and those missing data on starting time ($n = 65$) on gender, $t(22) = 0.96$, $p = .346$; education, $t(20) = -1.43$, $p = .168$; having performed body removal, $t(19) = 1.60$, $p = .126$; prior use of mental health services, $t(18) = -0.79$, $p = .440$; age, $t(21) = 0.45$, $p = .659$; social acknowledgement, $t(30) = -0.15$, $p = .881$; and self-efficacy, $t(20) = -0.81$, $p = .428$.

Measures

All instruments were translated to Bahasia Indonesian and back-translated by two bilingual English/Indonesian psychologists. The questionnaire was first piloted in June 2006 with 30 volunteers, who worked on the 2004 Asian tsunami operation, for cultural applicability and to include relevant questions. PTSD symptoms were measured using the 22-item Impact of Event Scale-Revised (IES-R; Weiss, 2007). Each item has a 5-point scale ranging from 0 to 4 (0 = *not at all*; 4 = *extremely*). We used the nonstandard sum score: Total scores range from 0 to 88 and lower scores indicating lower levels of symptoms. The IES-R demonstrated high internal consistency for the total scale (Cronbach's $\alpha = .88$) at 6 months. This is consistent with studies that have found IES-R to have adequate psychometric properties in non-Western cultures (Lim et al., 2009; Weiss, 2007). A cutoff score of ≥ 33 (Creamer, Bell, & Failla, 2003) was selected to indicate probable current PTSD.

Self-efficacy was measured with the Indonesian version of the General Self-Efficacy Scale (Schwarzer et al., 1997), a 10-item scale, with each item ranging from 1 to 4 (1 = *not at all true*; 4 = *exactly true*), designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. Higher scores indicate higher levels of self-efficacy. The scale has been used in various cultures (Luszczynska, Scholz, & Schwarzer, 2005) and demonstrated high internal consistency for the total scale ($\alpha = .86$) in our data.

The Social Acknowledgement Questionnaire (SAQ) (Maercker & Mueller, 2004) measures individuals' perception of recognition as survivor or a victim and the perceived support from the complete societal context. It is a 16-item self-report scale, with each item ranging from 0 to 3 (0 = *not at all*; 3 = *completely*). Higher scores indicate greater feeling of acknowledgement. Adjustments were made in cooperation with the scale's author (A.M) where "victim" was replaced with "volunteer." The SAQ demonstrated moderate internal consistency for the total scale ($\alpha = .60$).

Demographics included age, gender, and education (basic education, high school, and university level). Questions regarding 14 tasks, identified by the PMI, were answered on a yes/no basis: "Were you assigned to the task of food distribution?"; "Psychosocial support?"; "Removal of bodies?"; and for the measure on mental health service use, "Had you prior to this event, sought assistance from a mental health professional?"

Data Analysis

After presenting descriptive statistics for the IES-R sum scores, independent *t* tests and χ^2 analyses were used to compare demographics between core and noncore volunteers using listwise deletion to deal with missing data. The variable social acknowledgement had considerable missing data (valid $N = 276$). Because social acknowledgement, however, is one of our key covariates and an important variable for possible interventions, we wanted to retain it with the recognition of issues with generalizability.

Next, to identify the number of trajectories for core and noncore volunteers, latent growth mixture modeling (LGMM) was applied using the software Mplus v7.11 (Muthén & Muthén, 1998–2012). As dependent variables we used the sum score from the IES-R for all three time points. First, LGMM was performed in the full sample. Next, the variable core and noncore volunteer was used as a grouping factor using the KNOWNCLASS option of Mplus. We estimated a series of models with increasing number of latent classes and tested whether the variance around the slope should be estimated. The models were compared using the following indices: Bayesian information criterion (BIC), entropy values, and sample size per latent class. Other indices, such as the Akaike information criterion, Vuong-Lo-Mendell-Rubin test, or the bootstrap likelihood ratio test were also used. Full information maximum likelihood was used to deal with missing data and the robust maximum likelihood estimator was used (multiple linear regression) to deal with the nonnormal distribution of each sum score of the IES-R for the three time points. (All indices and models are available from the corresponding author).

To predict class membership we did not include the covariates in the multigroup LGMM model because these variables would interfere with the mixture solution. A better way would have been to include the covariates as variables in the model using the 3-step procedures developed by Vermunt (2010) so the covariates were kept outside the mixture part of the model. This procedure, however, cannot be combined with the KNOWNCLASS option, but running separate models for core and noncore volunteers resulted in a different mixture solution. Also, due to missing data on combinations of covariates we would have lost more than half of the volunteers for these analyses (valid *N* listwise = 227). Therefore, we decided to save the most likely latent class membership and test covariates separately. We exported most likely class membership information to SPSS version 22 and ran Bonferroni post hoc analyses for each covariate separately using two-tailed tests, $p < .05$. Covariates included were gender, age, self-efficacy, social acknowledgement, and tasks carried out during the mission measured at 6 months.

Results

The PTSD symptoms sum scores were for T1 $M = 26.06$ ($SD = 12.59$; min-max = 0–66), for T2 $M = 24.09$ ($SD = 13.31$; min-max = 0–71), and for T3 $M = 22.84$ ($SD = 13.43$; min-max = 0–59). The correlations between the three time points were moderately high ($r_{T1–T2} = .49$; $r_{T1–T3} = .47$; $r_{T2–T3} = .58$; $ps < .001$).

Independent *t* tests showed that core volunteers were significantly older than noncore volunteers, $t(388.24) = 5.34$, $p < .001$. Chi-square tests showed no difference between core and noncore volunteers with respect to gender ($n = 449$) or mental health service use ($n = 438$) prior to the disaster. After examining the standardized residuals, however, we found that core volunteers were more likely than noncore volunteers to have only basic education, $\chi^2(2, N = 451) = 19.81$, $p < .001$, and to have worked on body recovery, $\chi^2(1, n = 426) = 28.3$, $p < .001$, but no difference was found for provision of psychosocial support ($n = 426$). A *t* test showed no difference between the two groups on levels of self-efficacy or social acknowledgement. Next, we compared the core versus noncore volunteers on the presence of a probable diagnosis of PTSD (i.e., IES-R total score > 33). At T1, fewer core volunteers ($n = 49$, 21.4%) had probable PTSD than noncore volunteers ($n = 79$, 35.9%), $\chi^2(1, N = 128) = 11.59$, $p < .001$. Similar results were found for T2; probable PTSD was less common in core volunteers ($n = 28$, 17.4%) than in noncore volunteers ($n = 48$, 31.4%), $\chi^2(1, N = 76) = 8.36$, $p = .004$. At T3, the number of core volunteers with probable PTSD ($n = 19$, 16.0%) did not differ significantly from the number of noncore volunteers with PTSD ($n = 33$, 25.8%), $\chi^2(1, N = 52) = 3.57$, $p = .059$.

Table 1
Model Comparison of the Linear Model

Number of classes	BIC	Entropy	Sample size of volunteers	
			Noncore	Core
1 class	8500	1	220	229
2 classes	8508	.806	199/21	205/24
2 classes[a]	8497	.810	202/18	206/23
3 classes[b]	8523	.707	107/94/19	113/93/23
3 classes[a]	8516	.832	202/15/3	203/22/4
4 classes[b]	8543	.739	105/92/15/8	111/92/22/4
4 classes[a]	8537	.712	112/82/21/5	119/83/22/5

Note. $N = 449$. BIC = Bayesian information criterion.
[a]Slope variance fixed to zero. [b]Nonpositive definite matrix because of negative slope variance.

LGMM with one to six latent groups in the total sample showed BIC values ranging from 8656 to 8668. Adding a quadratic trend slightly improved the models (BICs ranging from 8676 to 8663; data available from the corresponding author). A 2-group LGMM with known classes was estimated where the core and noncore variable was used as the grouping factor. The number of latent classes in the model was systematically increased. One- to four-class LGMMs (no covariates) were compared, but with separate trajectories for core- and noncore volunteers (and with and without the quadratic trends; contact the corresponding author). We also tested whether to estimate the variance around the slope.

See Table 1 for the final BIC values, the entropy values, the sample size per subgroup, and the error messages. The BIC was lowest for the 2-trajectory solution for the model with no slope variance. Average latent class probabilities for the most likely latent class pattern by latent class pattern are shown for this model in Table 2.

Although there might have been some support for the 3-class solution, the fourth class only contained three and four cases, which was considered too few for a separate class. Therefore, it was decided that the model with two trajectories for each subgroup best represented the data resulting in four trajectories (see Table 3 for details).

Table 2
Average Latent Class Probabilities for Most Likely Latent Class Pattern by Latent Class Pattern

Actual pattern	Noncore		Core	
	Chronic	Resilient	Chronic	Resilient
Noncore chronic	.77	.23	.00	.00
Noncore resilient	.01	.90	.00	.00
Core chronic	.00	.00	.81	.19
Core resilient	.00	.00	.08	.92

Note. $N = 449$.

For the core volunteers, the first trajectory consisted of 206 volunteers (90%), who showed moderate initial PTSD symptoms (intercept = 22.95; $p < .001$) with a significant (slow) decrease over time ($p < .001$) and was designated the resilient trajectory. The second trajectory consisted of 23 volunteers (10%), who showed moderate to high initial PTSD symptoms (intercept = 27.66, $p < .001$) with a significant increase over time ($p < .001$) and was named the chronic trajectory.

For the noncore volunteers, the first trajectory consisted of 202 volunteers (92%), who showed moderate to high initial PTSD symptoms (intercept = 27.90, $p < .001$) with a significant (slow) decrease over time ($p < .001$). The second trajectory consisted of 18 volunteers (8%), who showed high initial PTSD symptoms (intercept = 31.05; $p < .001$) with a nonsignificant increase over time ($p = .130$; see Figure 1 and 2).

Intercept and slope differences were tested between the two known classes. A significant effect was found between the intercepts of the noncore + resilient versus the core + resilient ($p = .012$). The comparisons between the other intercept revealed p values between .151 and .951. All slopes differed significantly between groups (ps between .033 and < .001) except between the groups noncore + chronic versus the core + chronic ($p = .445$) and between noncore + resilient versus the core + resilient ($p = .889$). The most likely class membership was saved and merged with the original data file.

Next, we compared the four groups (resilient and chronic core volunteers and resilient and chronic noncore volunteers) with respect to gender, age, prior history of mental health service use, self-efficacy, social acknowledgement, and tasks carried out. Chi-square analyses showed that the four groups did not differ with respect to gender ($n = 447$), but were different on education, $\chi^2(6, N = 449) = 25.03$, $p < .001$, Cramér's $V = .17$, where the resilient core volunteers were more likely to have only basic education and resilient noncore volunteers were less likely to have basic education than the other groups. In addition, the four groups differed with respect to prior mental health service use, χ^2 $(3, N = 438) = 11.24$, $p = .010$, Cramér's $V = .16$. Core volunteers within the chronic trajectory were more likely to have sought prior mental health services relative to the other groups. Resilient core volunteers were more likely to have worked on body recovery, whereas resilient noncore volunteers were less likely to have done so, $\chi^2(2, N = 424) = 30.62$, $p < .001$, Cramér's $V = .27$. Finally, chronic core volunteers were relatively more likely to have assisted in psychosocial support than the other groups, $\chi^2(3, N = 424) = 12.12$, $p = .007$, Cramér's $V = .17$.

One-way analysis of variance indicated that the four groups differed with respect to age, $F(3, 431) = 9.43$, $p < .001$, partial $\eta^2 = .06$. Post hoc Bonferroni tests revealed that the resilient core volunteers were significantly older than the resilient noncore volunteers, mean difference = 3.7, 95% confidence interval (CI) [1.79, 5.61], $p < .001$. There was also a significant difference with respect to levels of self-efficacy, $F(3, 442) = 3.46$,

Table 3
Descriptive Statistics for the Four Trajectories

	Resilient			Chronic		
Volunteers	*M*	*SE*	95% CI	*M*	*SE*	95% CI
			Core			
Intercept	22.95	0.96	[21.07, 24.84]	27.66	2.86	[22.06, 33.26]
Slope	−0.51	0.09	[−0.67, −0.34]	1.40	0.34	[0.74, 2.07]
			Noncore			
Intercept	27.90	1.99	[23.99, 31.81]	31.05	9.25	[12.93, 49.18]
Slope	−0.49	0.11	[−0.70, −0.27]	0.96	0.63	[−60.28, 2.20]

Note. $N = 449$. All estimates were significant ($ps < .001$) except the noncore slope. Resilient trajectory consisted of 206 core versus 202 noncore volunteers. Chronic trajectory consisted of 23 core versus 18 noncore volunteers. *SE* = standard error.

$p = .016$, partial $\eta^2 = .02$, with post hoc tests showing that core resilient volunteers reported higher levels of self-efficacy than core chronic volunteers, mean difference = 0.36, 95% CI [0.02, 0.71], $p = .030$. A similar difference was found for levels of social acknowledgment, $F(3, 241) = 4.22$, $p = .006$, partial $\eta^2 = .05$, with post hoc tests showing that core resilient volunteers had higher social acknowledgment scores than core chronic volunteers, mean difference = 4.14, 95% CI [0.41, 7.87], $p = .021$.

Discussion

This was the first study of which we are aware to examine PTSD symptom trajectories in volunteers after a natural disaster. We examined 449 Indonesian Red Cross volunteers working in the aftermath of the 2006 Yogyakarta earthquake, distinguishing between core and noncore volunteers. At 6-months postdisaster, 28.5%, at 12-months postdisaster 24.2%, and at 18-months postdisaster 21.0% of the volunteers had PTSD symptom levels reflecting a probable PTSD (core volunteers 16% vs. noncore 25.8%). In both the core and the noncore group, two PTSD symptom trajectories emerged: a resilient trajectory (moderate levels of PTSD symptoms with slow decrease over time) and a chronic trajectory (higher levels of PTSD symptoms with increase over time). In both trajectories, core volunteers had fewer PTSD symptoms than noncore volunteers.

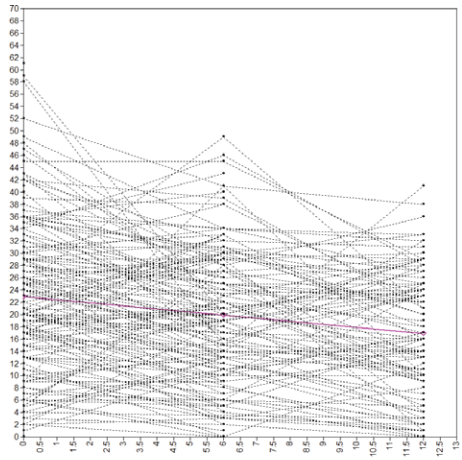
We found two trajectories that have been found (not identical) in other trauma samples (Armour et al., 2012; Orcutt et al., 2004). In their study among volunteers of the World Trade Center attack, Pietrzak et al. (2014) found six trajectories, but their large sample may have allowed them to identify more trajectories. Most volunteers were assigned to a resistant/resilient trajectory (58%) as in our study.

Why we did not find a recovery trajectory may be explained by the fact that 70% of the volunteers were either directly affected (37%) or indirectly affected (33%). This, in combination with ongoing aftershocks, high unemployment, and low social economic status in the area all render recovery less likely within the timeframe of 18 months. The attack on the World Trade Center (Pietrzak et al., 2014) did not cause system breakdown or massive resource loss to the volunteers themselves and the 8-year prospective follow-up might have allowed for identification of late-onset trajectories.

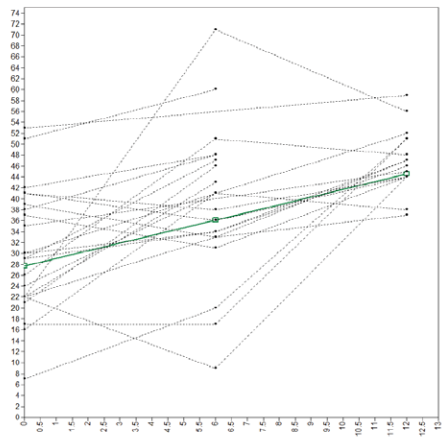
Gender was a nonsignificant predictor of PTSD symptoms, although being a woman is a known risk factor for PTSD in community samples (Olff, Langeland, Draijer, & Gersons, 2007). Our findings are in line with studies on police and military samples (Engelhard, van den Hout, Weerts, & van Doornen, 2009), so possibly female volunteers share resilient characteristics with these groups. Age was significantly higher in the resilient core group, in line with a study showing higher symptoms of PTSD in younger emergency workers (Witteveen et al., 2007). Resilient core volunteers had possibly been with the PMI the longest and thus had more training and experience. Studies have shown a protective effect of preparedness in mitigating risk for PTSD (Johnson et al., 2005).

Core volunteers in the chronic trajectory were more likely to have used mental health services prior to the disaster, which has previously predicted PTSD symptoms (Norris et al., 2002). This may reflect the cumulative effect of volunteering in disasters and rendering this subgroup less resilient in the face of new disaster work. As expected, and in line with a prior study of emergency workers after a disaster (Cicognani et al., 2009), self-efficacy was higher in the resilient core volunteers than in the chronic core volunteers. This may reflect the characteristic of resiliency in those choosing to continuously volunteer in adverse conditions; when faced with stressors, these volunteers believe they have the resources to cope with adversity (Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2014).

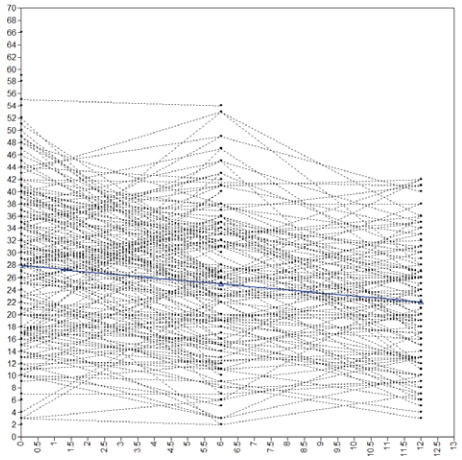
Core volunteers in the chronic trajectory were more likely to have provided psychosocial support to the affected group than to the other groups. Some were personally affected by the disaster, thus listening to tragic narratives may have resulted in them reliving their own experiences. This study was the first to document that volunteers providing psychosocial support may need specific attention themselves. This may be due to secondary traumatization (Collins & Long, 2003), lack of training to carry out the task (Cyr & Dowrick, 1991), or



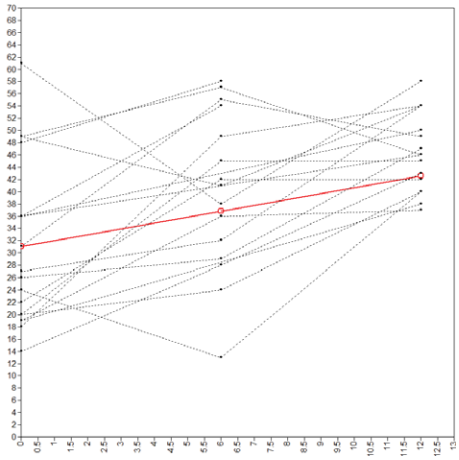
Core-resilient volunteers (n = 206)



Core-chronic volunteers (n = 23)



Noncore-Resilient volunteers (n = 202)



Noncore-chronic volunteers (n = 18)

Figure 1. Estimated mean trajectories and observed individual trajectories.

lack of support for themselves (Bonanno, Galea, Bucciarelli, & Vlahov, 2007). This finding is of interest because the development of psychosocial support programs puts increased emphasis on training volunteers as providers of support after major disasters.

Resilient core volunteers were more likely to work on body recovery than the other three groups, and the resilient noncore volunteers were less likely to have done so. Resilient core volunteers may possibly have felt better equipped for removal of dead bodies and thus offered to volunteer for this task.

In line with previous research (Southwick et al., 2000), perceived social acknowledgement was lower in the chronic trajectory than in the resilient trajectory. This may have been particularly important to core volunteers who may have felt more a part of the organization and expected more from it then noncore volunteers.

The high number of participants and low attrition over time was a strength of this study. The ability to distinguish between core and noncore volunteers offered new insight into the mental consequences for this understudied community resource. For LGMM analysis, however, a larger sample might have provided more power to find more trajectories and a longer timeframe might have allowed for more to develop. The first assessment taking place 6-months postdisaster was a limitation and deprived us of the opportunity to study acute reactions.

Trajectories of PTSD symptoms in both core and noncore volunteers included a resilient and a chronic PTSD symptom trajectory; one fourth of the volunteers reported high PTSD symptom levels. About 9% of the volunteers were assigned to the chronic trajectory 18-months postdisaster. In both trajectories, core volunteers had fewer symptoms of PTSD than noncore

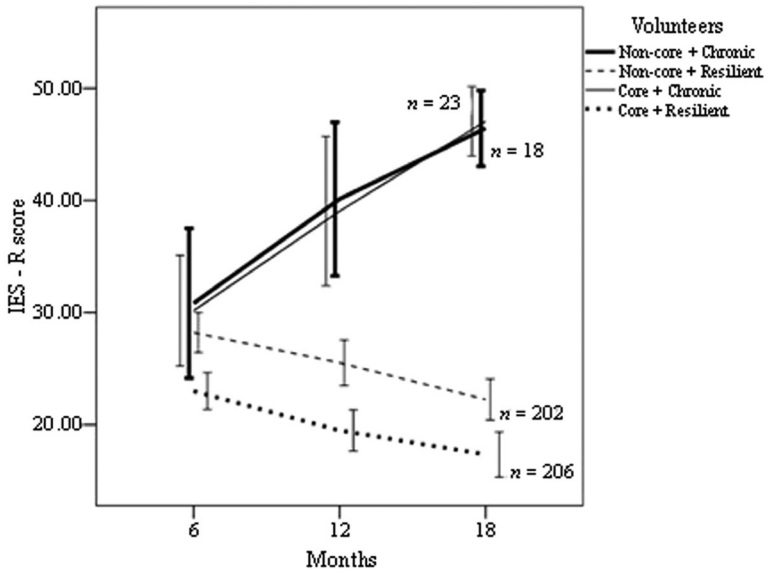


Figure 2. Overview of symptom trajectories of posttraumatic stress disorders in core and noncore volunteers working in the aftermath of the earthquake (the error bars represent the 95% confidence interval).

volunteers. Core volunteers in the chronic trajectory were characterized by having sought prior mental health help, reported lower levels of self-efficacy and social acknowledgment, and were more likely to have provided psychosocial support. The results pointed to the importance of screening and assessment for PTSD in both core and noncore disaster volunteers and providing adequate support, especially to noncore volunteers involved in disaster recovery operations and those providing psychosocial support.

References

Alvarez, J., & Hunt, M. (2005). Risk and resilience in canine search and rescue handlers after 9/11. *Journal of Traumatic Stress*, *18*, 497–505. doi:10.1002/jts.20058

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

Andrews, B., Brewin, C. R., Philpott, R., & Stewart, L. (2007). Delayed-onset posttraumatic stress disorder: A systematic review of the evidence. *American Journal of Psychiatry*, *164*, 1319–1326. doi:10.1176/appi.ajp.2007.06091491

Armour, C., Shevlin, M., Elklit, A., & Mroczek, D. (2011). A latent growth mixture modeling approach to PTSD symptoms in rape victims. *Traumatology*, *18*, 20–28. doi:10.1177/1534765610395627

Berger, W., Coutinho, E. S. F., Figueira, I., Marques-Portella, C., Luz, M. P., Neylan, T. C., . . . Mendlowicz, M. V. (2012). Rescuers at risk: A systematic review and meta-regression analysis of the worldwide current prevalence and correlates of PTSD in rescue workers. *Social Psychiatry and Psychiatric Epidemiology*, *47*, 1001–1011. doi:10.1007/s00127-011-0408-2

Bonanno, G. A., Galea, S., Bucciarelli, A., & Vlahov, D. (2007). What predicts psychological resilience after disaster? The role of demographics, resources and life stress. *Journal of Counseling and Clinical Psychology*, *75*, 671–682. doi:10.1037/0022-006X.75.5.671

Bonanno, G. A., & Mancini, A. D. (2008). The human capacity to thrive in the face of potential trauma. *Pediatrics*, *121*, 369–375. doi:10.1542/peds.2007-1648

Bonanno, G. A., Mancini, A. D., Horton, J. L., Powell, T. M., Leardmann, C. A., Boyko, E. J., . . . Smith, T. C. (2012). Trajectories of trauma symptoms and resilience in deployed US military service members: Prospective cohort study. *British Journal of Psychiatry*, *4*, 317–323. doi:10.1192/bjp.bp.111.096552

Cicognani, E., Pietrantoni, L., Palestini, L., & Prati, G. (2009). Emergency workers quality of life: The protective role of sense of community, efficacy beliefs, and coping strategies. *Social Indicators Research*, *94*, 449–463. doi:10.1007/s11205-009-9441-x

Collins, S., & Long, A. (2003). Too tired to care? The psychological effects of working with trauma. *Journal of Psychiatric and Mental Health Nursing*, *10*, 17–27. doi:10.1046/j.1365-2850.2003.00526.x

Creamer, M., Bell, R., & Failla, S. (2003). Psychometric properties of the Impact of Event Scale-Revised. *Behaviour Research and Therapy*, *41*, 1489–1496. doi:10.1016/j.brat.2003.07.010

Cyr, C., & Dowrick, P. W. (1991). Burnout in crisis line volunteers. *Administration and Policy in Mental Health and Mental Health Services Research*, *18*, 343–354.

Dickstein, B. D., Suvak, M., Litz, B. T., & Adler, A. B. (2010). Heterogeneity in the course of posttraumatic stress disorder: Trajectories of symptomatology. *Journal of Traumatic Stress*, *23*, 331–330. doi:10.1002/jts.20523

Engelhard, I. M., van den Hout, M. A., & Kindt, M. (2003). The relationship between neuroticism, pre-traumatic stress and post-traumatic stress: A prospective study. *Personality and Individual Differences*, *35*, 381–388. doi:10.1016/s0191-8869(02)00200-3

Engelhard, I. M., van den Hout, M. A., Weerts, J., Hox, J. J., & van Doornen, L. J. P. (2009). A prospective study of the relation between posttraumatic stress and physical health symptoms. *International Journal of Clinical and Health Psychology*, *9*, 365–372.

Epstein, R. S., Fullerton, C. S., & Ursano, R. J. (1998). Posttraumatic stress disorder following an air disaster: A prospective study. *American Journal of Psychiatry*, *155*, 934–938. doi:10.1176/ajp.155.7.934

Fullerton, C. S., Ursano, R. J., & Wang, L. (2004). Acute stress disorder, posttraumatic stress disorder and depression in disaster or rescue workers. *American Journal of Psychiatry*, *161*, 1370–1376. doi:10.1176/appi.ajp.161.8.1370

Galatzer-Levy, I. R., Ankri, Y., Freedman, S., Israeli-Shalev, Y., Roitman, P., Gilad, M., & Shalev, A. Y. (2013). Early PTSD symptom trajectories: Persistence, recovery, and response to treatment: Results from the Jerusalem trauma outreach and prevention study (J-TOPS). *PLoS One*, *8*(8), 1–9. doi:10.1371/annotation/0af0b6c6-ac23-4fe9-a692-f5c30a3a30b3

Galea, S., Nandi, A., & Vlahov, D. (2005). The epidemiology of post-traumatic stress after disasters. *Epidemiology Reviews*, *27*, 78–91. doi:10.1093/epirev/mxi003

Haraldsdóttir, H. A., Gudmundsdóttir, D., Romano, E., Þórdardóttir, E. B., Gudmundsdóttir, B., & Elklit, A. (2014). Volunteers and professional rescue workers: Traumatization and adaptation after an avalanche disaster. *Journal of Emergency Management*, *12*, 457–466. doi:10.5055/jem.2014.0209

Hobfoll, S. E., Palmieri, P. A., Johnson, R. J., Canetti-Nisim, D., Hall, B. J., & Galea, S. (2009). Trajectories of resilience, resistance, and distress during ongoing terrorism: The case of Jews and Arabs in Israel. *Journal of Consulting and Clinical Psychology*, *77*, 138–148. doi:10.1037/a0014360

International Federation of Red Cross and Red Crescent Societies (IFRC). (2011). Value of volunteers report. Retrieved from http://www.ifrc.org/Global/Publications/volunteers/IFRC-Value-of-volunteers-report-EN.pdf

International Federation of Red Cross and Red Crescent Societies (IFRC). (2013). Volunteering in emergencies. Retrieved from http://www.ifrc.org/en/what-we-do/volunteers/volunteering-in-emergencies/

Johansen, V. A., Wahl, A. K., Eilertsen, D. E., & Weisæth, L. (2007). Prevalence and predictors of post-traumatic stress disorder (PTSD) in physically injured victims of non-domestic violence: A longitudinal study. *Social Psychiatry and Psychiatric Epidemiology*, *42*, 583–593. doi:10.1007/s00127-007-0205-0

Johnson, S. B., Langlieb, A. M., Teret, S. P., Gross, R., Schwab, M., Massa, J., . . . Geyh, A. S. (2005). Rethinking first response: Effects of the cleanup and recovery effort on workers at World Trade Center disaster site. *Journal of Occupational and Environmental Medicine*, *47*, 386–391. doi:10.1097/01.jom.0000158722.57980.4a

Lim, H. K., Woo, J. M., Kim, T. S., Kim, T. H., Choi, K. S., Chung, S. K., & Chee, I. S. (2009). Reliability and validity of the Korean version of the Impact of Event Scale-Revised. *Comprehensive Psychiatry*, *50*, 385–390. doi:10.1016/j.comppsych.2008.09.011

Lowe, S. R., & Rhodes, J. E. (2013). Trajectories of psychological distress among low-income, female survivors of Hurricane Katrina. *American Journal of Orthopsychiatry*, *83*(2 Pt3), 398–412. doi:10.1111/ajop.12019

Luszczynska, A., Scholz, U., & Schwarzer, R. (2005). The General Self-Efficacy Scale: Multicultural validation studies. *The Journal of Psychology*, *139*, 439–457. doi:10.3200/jrlp.139.5.439-457

Maercker, A., Gäbler, I., O'Neil, J., Schützwohl, M., & Müller, M. (2013). Long-term trajectories of PTSD or resilience in former East German political prisoners. *Torture*, *23*, 15–27.

Maercker, A., & Mueller, J. (2004). Social acknowledgment as a victim or survivor: A scale to measure a recovery factor of PTSD. *Journal of Traumatic Stress*, *17*, 345–351. doi:10.1023/b:jots.0000038484.15488.3d

Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Author.

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*, 207–239. doi:10.1521/psyc.65.3.207.20173

Norris, F. H., Tracy, M., & Galea, S. (2009). Looking for resilience: Understanding the longitudinal trajectories of responses to stress. *Social Science and Medicine*, *68*, 2190–2198. doi:10.1016/j.socscimed.2009.03.043

Olff, M., Langeland, W., Draijer, N., & Gersons, B. P. (2007). Gender differences in posttraumatic stress disorder. *Psychological Bulletin*, *133*, 183–204. doi:10.1037/0033-2909.133.2.183

Orcutt, H. K., Erickson, D. J., & Wolfe, J. (2004). The course of PTSD symptoms among Gulf war veterans: A growth mixture modeling approach. *Journal of Traumatic Stress*, *17*, 195–202. doi:10.1023/b:jots.0000029262.42865.c2

Pietrzak, R. H., Feder, A., Singh, R., Schechter, C. B., Bromet, E. J., Katz, C. L., . . . Southwick, S. M. (2014). Trajectories of PTSD risk and resilience in World Trade Center responders: An 8-year prospective cohort study. *Psychological Medicine*, *44*, 205–219. doi:10.1017/S0033291713000597

Pietrzak, R. H., Van Ness, P. H., Fried, T. R., Galea, S., & Norris, F. H. (2013). Trajectories of posttraumatic stress symptomatology in older persons affected by a large-magnitude disaster. *Journal of Psychiatric Research*, *47*, 520–526. doi:10.1016/j.jpsychires.2012.12.005

Reiffels, L., Pietrantoni, L., Prati, G., Kim, Y., Kilpatrick, D., Dyb, G., . . . O'Donnell, M. (2013). Lessons learned about psychosocial responses to disaster and mass trauma: An international perspective. *European Journal of Psychotraumatology*, *4*, 1–9. doi:10.3402/ejpt.v4i0.22897

Santiago, P. N., Ursano, R. J., Gray, C. L., Pynoos, R. S., Spiegel, D., Lewis-Fernandez, R., . . . Fullerton, C. S. (2013). A systematic review of PTSD prevalence and trajectories in *DSM-5* defined trauma exposed populations: Intentional and non-intentional traumatic events. *PLoS One*, *8*(4), e59236. doi:10.1371/journal.pone.0059236

Schwarzer, R., Born, A., Iwawaki, S., Lee, Y.-M., Saito, E., & Yue, X. (1997). The assessment of optimistic self-beliefs: Comparison of the Chinese, Indonesian, Japanese and Korean versions of the General Self-Efficacy Scale. *Psychologia: An International Journal of Psychology in the Orient*, *40*, 1–13.

Southwick, S., Bonanno, G., Masten, A., Panter-Brick, C., & Yehuda, R. (2014). Resilience definitions, theory, and challenges: Interdisciplinary perspectives. *European Journal of Psychotraumatology*, *5*. doi:10.3402/ejpt.v5.25338

Southwick, S. M., Morgan, C. A., & Rosenberg, R. (2000). Social sharing of Gulf war experiences: Association with trauma-related psychological symptoms. *Journal of Nervous and Mental Disease*, *188*, 695–700. doi:10.1097/00005053-200010000-00008

Tak, S., Driscoll, R., Bernard, B., & West, C. (2007). Depressive symptoms among firefighters and related factors after the response to Hurricane Katrina. *Journal of Urban Health*, *84*, 153–161. doi:10.1007/s11524-006-9155-1

The University Consortium for Evidence Based Approach to the Emergent Issues in Asia. (2014). Evidence based approach to the emergent issues in Asia, fieldwork at Yogyakarta. Retrieved from http://www.eba-consortium.asia/?p=1027

Thormar, S. B., Gersons, B. P. R., Juen, B., Karlsson, T., Djakababa, M. N., & Olff, M. (2014). The impact of disaster work on community volunteers: The role of peri-traumatic distress, level of personal affectedness, sleep quality and resource loss, on post-traumatic stress disorder symptoms and subjective health. *Journal of Anxiety Disorders*, *2*, 971–977. doi:10.1016/j.janxdis.2014.10.006

Thormar, S. B., Gersons, B. P. R., Juen, B., Marschang, A., Djakababa, M. N., & Olff, M. (2010). The mental health impact of volunteering in a disaster

setting: A review. *Journal of Nervous and Mental Disease*, *198*, 529–538. doi:10.1097/NMD.0b013e3181ea1fa9

Vermunt, J. K. (2010). Latent class modeling with covariates: Two improved three-step approaches. *Political Analysis*, *18*, 450–469. doi:10.1093/pan/mpq025

Weiss, D. (2007). The Impact of Event Scale-Revised. In J. P. Wilson & C. S. Tang (Eds.), *Cross-cultural assessment of psychological trauma and PTSD* (pp. 219–238). New York, NY: Springer. doi:10.1007/978-0-387-70990-1_10

Wikman, A., Bhattacharyya, M., Perkins-Porras, L., & Steptoe, A. (2008). Persistence of posttraumatic stress symptoms 12 and 36 months after acute coronary syndrome. *Psychosomatic Medicine*, *70*, 764–772. doi:10.1097/psy.0b013e3181835c07

Witteveen, A. B., Bramsen, I., Twisk, J. W. R., Huizink, A. C., Slottje, P., Smid, T., & Van Der Ploeg, H. M. (2007). Psychological distress of rescue workers eight and one-half years after professional involvement in the Amsterdam air disaster. *Journal of Nervous and Mental Disease*, *195*, 31–40. doi:10.1097/01.nmd.0000252010.19753.19