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Article

Loss of loved ones or home due to a disaster: Effects over time on distress in immigrant ethnic minorities

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Abstract

Exposure to mass trauma may bring about increased sensitivity to new or ongoing stressors. It is unclear whether sensitivity to stress associated with ethnic minority/immigrant status may be affected by severe exposure to mass trauma. We examined whether the loss of loved ones or home due to a disaster is associated with more persistent disaster-related distress in ethnic minorities compared with Dutch natives in the Netherlands. In residents affected by a fireworks disaster ($N = 1029$), we assessed disaster-related distress after 3 weeks, 18 months, and 4 years. The effects of loss of loved ones or home and ethnic minority/immigrant status on distress were analyzed using latent growth modeling. After controlling for age, gender, education, employment, and post-disaster stressful life events, the loss of loved ones was associated with more persistent disaster-related distress in ethnic minorities compared with natives at 18 months, and the loss of home was associated with more persistent disaster-related distress in ethnic minorities compared with natives between 18 months and 4 years. Our results suggest that the loss of loved ones may increase sensitivity to stress associated with ethnic minority/immigrant status during the early phase of adaptation

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to a disaster. Loss of home may lead to further resource loss and thereby increase sensitivity to stress associated with ethnic minority/immigrant status in the long term. Efforts to prevent stress-related psychopathology following mass trauma should specifically target ethnic minority groups, notably refugees and asylum seekers, who often experienced multiple losses of loved ones as well as their homes.

Keywords
stress sensitivity, traumatic loss, posttraumatic stress disorder, disasters, ethnic minority status

Exposure to a disaster may be a life-changing experience, and even more so when it leads to the loss of loved ones or of a person's home. Manifestations of psychological distress may include feelings of anxiety and depression, concentration difficulty, anger and hostility, sleep problems, as well as intrusion and avoidance of disaster-related memories (Bonanno, Brewin, Kaniasty, & Greca, 2010). Indeed, in adult survivors of disasters, prevalence rates of posttraumatic stress disorder (PTSD), major depression, complicated grief, anxiety and other disorders are increased compared with non-exposed populations (Neria, Nandi, & Galea, 2008).

A minority of disaster survivors shows persistent or progressive distress and dysfunction, which may in part be predicted by exposure severity (DiGrande, Neria, Brackbill, Pulliam, & Galea, 2011), disaster-related bereavement (Salcioglu, Basoglu, & Livanou, 2007; Suar, Das, & Alat, 2014), post-disaster stressors (Smid, Van der Velden, Lensvelt-Mulders, Knipscheer, Gersons, & Kleber, 2012), and ethnic minority/immigrant status (Drogendijk, van der Velden, & Kleber, 2012). Disaster-affected individuals belonging to ethnic minority groups may receive less material, social, and emotional support than members of ethnic majority groups (Drogendijk, van der Velden, Gersons, & Kleber, 2011). In Western countries, non-Western minority group members are indeed more at risk of developing mental health disturbances such as PTSD after disasters both in the short and long term than Western natives (Drogendijk et al., 2011).

Ethnic minority/immigrant status following migration to a Western society is associated with an increased risk of interpersonal stress and lack of resources. For example, individuals belonging to ethnic minorities may have limited access to work or education, face marginalization or discrimination (Cleveland, Rousseau, & Guzder, 2014), have experienced separation from family, have limited social support (Drogendijk et al., 2011), have been confronted with identity issues and acculturative stress (Drogendijk et al., 2012), use mental health services (MHS) insufficiently (Boscarino, Adams, Stuber, & Galea, 2005), and have language problems.

Globally, migration has increased dramatically during the last decades and is expected to continue to increase. Between 1990 and 2013, the number of

international migrants worldwide rose by over 77 million or by 50 per cent (United Nations, 2013). This leads to a growing number of people belonging to local ethnic minorities, including refugees and asylum seekers who are often faced with multiple losses of loved ones as well as resource loss (Nickerson, Liddell, Maccallum, Steel, Silove, & Bryant, 2014).

To understand vulnerability as well as resiliency of groups and individuals confronted with traumatic stress, loss, and migration, dynamic interactions of culture, history, and social ecology need to be taken into account (De Jong, 2007). Complex interactions among global, local, and individual systems determine how individuals, families, communities, and cultures try to cope. The systemic dynamics of perceptions and actions related to traumatic stress often involve cybernetic looping, i.e. regulatory feedback mechanisms (De Jong, 2007). Indeed, a mechanism whereby past confrontations with overwhelming stressors lead to enhanced sensitivity to new (minor) stressors has been termed stress sensitization, and emerging prospective evidence indicates that stress sensitization may follow trauma exposure. Persistent elevations or increases in levels of psychological distress in response to new stressful life events have been demonstrated in highly exposed adults within the first 18 months following disaster exposure (Smid et al., 2012), in high combat stress exposed soldiers 1 year following return from deployment (Smid, Kleber, Rademaker, Van Zuiden, & Vermetten, 2013), and in highly exposed police responders 1–8 years following exposure to the 9/11 terrorist attacks (Zvolensky et al., 2015).

Studies on refugees have shown that psychological after effects of displacement depend on the economic, social, and cultural conditions both prior to and following migration. Post-migration stressors associated with PTSD include delays in processing refugee applications, difficulties in dealing with immigration officials, obstacles to employment, and perceived racial discrimination (Laban, Gernaat, Komproe, Schreuders, & De Jong, 2004; Silove, Sinnerbrink, Field, Manicavasagar, & Steel, 1997). Regarding premigration factors, more severe trauma as well as higher education level and higher socioeconomic status determine worse post-migration outcomes, the latter suggesting a crucial role for the loss of intellectual and economic status (Porter & Haslam, 2005). Other contextual dimensions include the reason for migration, language and social support systems, acceptance by the 'majority' culture and the expatriate community, employment, and housing (Bhugra & Becker, 2005). Effects of resource loss on mental distress can be understood within Conservation of Resources theory (Hobfoll, 2001), positing that resource loss is disproportionally more salient than resource gain. Therefore, those who already lack resources are more vulnerable to resource loss and the associated distress (Hobfoll, 2001).

It is unclear whether specific disaster exposure-related factors, such as the loss of loved ones or one's home, and ethnic minority/immigrant status interact in causing persistence of posttraumatic distress. Considering the evidence for stress sensitization, ethnic minority/immigrant status may be hypothesized to act as an ongoing

stressor following disaster exposure, leading to more persistent distress compared to native residents following the loss of loved ones or home. If so, this would have important implications for the secondary prevention of stress-related psychopathology in ethnic minorities exposed to mass trauma.

The present study aimed at investigating whether the loss of loved ones or home due to a disaster is associated with more persistent disaster-related distress in ethnic minorities compared to Dutch native residents using data from a 4-year, three-wave longitudinal study in the Netherlands. Our research question was as follows: does the loss of loved ones or home due to a disaster lead to increased distress in persons belonging to ethnic minorities during the early phase of adaptation and in the long term? We hypothesized that (1) the impact of grief following the loss of loved ones would be manifest as more persistently increased distress in persons belonging to ethnic minorities during the early stages of post-disaster adaptation compared with Dutch native residents, and that (2) the impact of resource depletion following the loss of home would manifest as more persistently increased distress in persons belonging to ethnic minorities compared with Dutch native residents.

Method

Participants and Procedures

On May 13, 2000, at 3:30 pm, a major explosion of a fireworks depot occurred in the city of Enschede (152,000 inhabitants), The Netherlands. The explosion resulted in 23 deaths and about 500 houses were fully destroyed. The Dutch government decided to launch a comprehensive study, aimed at covering both the physical and emotional consequences of the disaster. Participants were recruited through the local media and letters. Additional details about the study have been reported elsewhere (Van der Velden, Yzermans, & Grievink, 2009). The present study used data from affected residents who gave their written informed consent and who provided information regarding the loss of loved ones. At T1 (2–3 weeks after the disaster), $N = 1029$ residents participated. Of these, at T2 (1–20 months post-disaster), $N = 739$ (72%) participated, and at T3 (44–47 months post-disaster), 647 (66%) participated. The study was approved by the Medical Ethics Committee of The Netherlands Organization for Applied Scientific research. Participants at T2 and T3 received a €12 (U.S. $15.00) gift.

Affected residents belonging to an ethnic minority were defined as those who were foreign-born and those who were born in The Netherlands with at least one non-native parent. Countries of origin were: Turkey ($N = 108$, 10.7% of full sample, and 46.2% of ethnic minority/immigrant group), Morocco ($N = 27$, 2.7%, 11.5%), Surinam ($N = 26$, 2.6%, 11.1%), Germany ($N = 18$, 1.8%, 7.7%), Indonesia ($N = 11$, 1.1%, 4.7%), Bosnia-Herzegovina ($N = 8$, 0.8%, 3.4%), and other countries (e.g., Afghanistan, Algeria, Angola, Brazil,

China, Egypt, Eritrea, India, Iran, Iraq, Lebanon, Liberia, Mozambique, Sierra Leone, Syria; N < 5 per country). Dutch natives were defined as those individuals who were born in The Netherlands with neither parent born outside The Netherlands.

Measures

Both questionnaires and the informed consent form were translated and reverse translated in English, German and Turkish. Completed questionnaires were in Dutch ($N = 948$, 92.1%), Turkish ($N = 79$, 7.7%), and German ($N = 2$, 0.2%).

Demographic characteristics, disaster and other stressor exposure

At T1, participants filled in a questionnaire on demographic characteristics (gender, age, education, having a paid job, country of birth, parents' country of birth). The T1 questionnaire also included questions about disaster exposure, including (1) the level of damage to the participants' homes and (2) injury to or death of a family member or friend/colleague due to the disaster. From the responses, we calculated the number of participants who reported (1) total home destruction and (2) the death of a loved one. At T2 and T3, participants were asked whether they experienced the following 18 stressful life events: death of a spouse, father, mother, child, sibling or significant other, serious illness or injury of self or a significant other, divorce or break-up of a relationship, serious threat, physical and sexual violence, burglary, traffic accident, robbery, assault, and war/combat, using an adapted version of a Dutch life-event scale (Smid et al., 2012). Response categories included *not at all, 1–2 years ago, 6 months–1 year ago* and *during past 5 months*. At T2 and T3, participants were instructed to report only stressful life events that did not coincide with the disaster. For the present study, we calculated the total number of different types of stressful life events reported to have occurred within the past 2 years.

Psychological distress

The Symptom Checklist-90-Revised (SCL-90-R) (Derogatis, 1979) is a multidimensional measure of psychological distress during the past 7 days. The Dutch SCL-90-R (Arrindell & Ettema, 2003) yields scores on eight dimensions. Of these, we used the following as indicators of stress-responsive distress: anxiety, cognitive-performance difficulty, depression, hostility, and sleep disturbance. Psychological distress was measured at T1, T2 and T3. Items were rated on a 5-point Likert scale (1 = *not at all* to 5 = *extremely*) to assess the degree of distress over the previous 7 days. The Dutch translation of the SCL-90-R has demonstrated validity and reliability (Arrindell & Ettema, 2003). At all assessments, the internal consistencies of all subscales were excellent ($\alpha \geq .85$).

Intrusion and avoidance

The Impact of Event Scale (IES) measures "(...) the current degree of subjective impact experienced as a result of a specific event" (Horowitz, Wilner, & Alvarez, 1979, p. 209) by assessing intrusion and avoidance of event-specific memories during the past 7 days. The Dutch version of the IES (Van Der Ploeg, Mooren, Kleber, Van der Velden, & Brom, 2004) was used at T1, T2 and T3. Questions were specifically directed to intrusion and avoidance related to the disaster. Respondents were asked to rate the items on a 4-point scale according to how often each had occurred in the previous 7 days. The 4 points on the scale were 0 (*not at all*), 1 (*rarely*), 3 (*sometimes*), and 5 (*often*). At all assessments, the internal consistencies were excellent ($\alpha \geq 0.94$).

Analyses

We performed dropout analyses by comparing the sample completing the T2 and T3 assessments with T2 and T3 dropouts using chi-square tests for categorical, and t-tests for continuous variables. Latent growth and path analyses were performed using SPSS/Amos software versions 20.0 and 17.0, respectively. Missing data were handled using the full information maximum likelihood (FIML) procedure. Data screening revealed severe non-normality in both stressor exposure variables and distress variables (except intrusion and avoidance). This non-normality was expected because low scores on stressful life events and distress variables were the most common, and higher scores increasingly rare.

We used Bayesian statistics to estimate parameters and 95% credibility intervals from our models. The rationale for applying Bayesian estimation was twofold. First, Bayesian estimation is not based on normality assumptions (Bolstad, 2004) and therefore Bayesian estimates are unaffected by non-normality. Second, the Bayesian credible interval is intuitively interpretable because it allows direct probability statements about the parameters, i.e. the probability of a parameter being within the stated interval, unlike the confidence statements in frequentist statistics. This is therefore a compelling reason for using Bayesian statistics (Bolstad, 2004). Estimates may be considered statistically significant at $p < .05$, i.e. leading to rejection of the null hypothesis, if the 95% credible interval does not include zero (Bolstad, 2004). Bayesian estimation of the model parameters does not otherwise affect their interpretation.

We used the default settings in Amos (Arbuckle, 2009), using an uninformative flat prior. The Markov Chain Monte Carlo (MCMC) sampling for the Bayesian estimation was continued until subsequent runs were sufficiently uncorrelated, i.e. when the value of the Gelman–Carlin–Stern–Rubin convergence statistic was below the conservative default value of 1.002. Bayesian model fit indices, including the posterior predictive p-value (PPP), deviance information criterion (DIC), and effective number of parameters were calculated besides maximum likelihood fit indices, including the discrepancy (χ^2), comparative fit index (CFI), non-normed
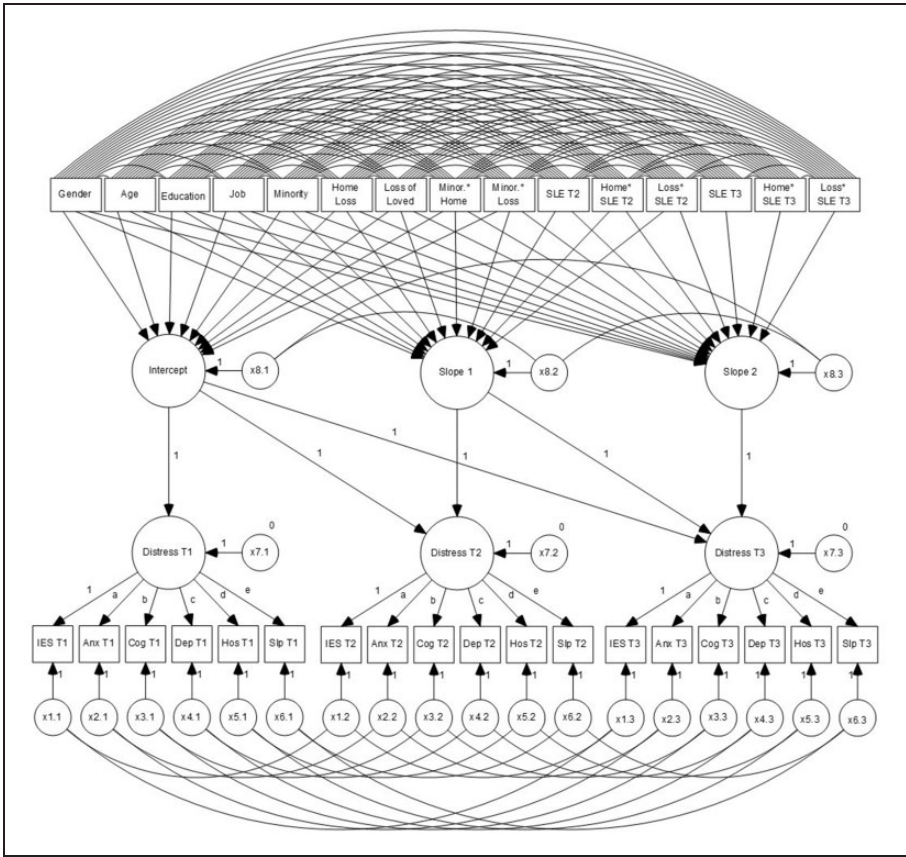
Figure 1. Piecewise Growth Curve of Factors Model with Predictors
Factors are shown as circles, predictor variables and indicators as squares, paths as arrows, and covariances as curved lines. Circles named x1 to x8 represent residual error variances. Numbers and letters (0, 1, a, b, ...) indicate fixed parameters.

fit (Tucker-Lewis) index (NNFI/TLI), root-mean-square error of approximation (RMSEA), and Akaike information criterion (AIC). Models that fit well are indicated by CFIs and NNFIs ≥.90 and RMSEAs ≤ .08 (Hu & Bentler, 1999). Figure 1 shows a path diagram representation of the model.

Construction of a measurement model of stress-responsive distress

Since our research question concerned distress related to a disaster, a first step in the analysis was to model distress. We modeled distress as a latent variable with feelings of anxiety and depression, concentration difficulty, hostility and rage, sleep problems (SCL-90), and intrusion and avoidance (IES) as its indicators.

We applied this measurement model to assess distress at three points in time following the disaster. Factor loadings were constrained to be equal across occasions, and indicators' residual variances were autocorrelated (Smid et al., 2012).

Construction of a piecewise growth curve of factors model

As a second step, it was necessary to model change in stress-responsive distress over time. This can be done flexibly using latent growth models. Interest of the present analysis centered on changes during two distinct time periods, specifically early adaptation (from T1 to T2) and long-term adaptation (from T2 to T3). We therefore specified a latent growth model comprising three factors: (1) immediate post-disaster distress level (Intercept); (2) change in stress-responsive distress during early adaptation (Slope 1); and (3) change in stress-responsive distress during long-term adaptation (Slope 2). The Intercept factor loaded on all three distress indicators (T1 to T3) with factor loadings set to 1 (see Figure 1). The Slope 1 factor loaded on the distress indicators at T2 and T3 with factor loadings set to 1 to capture the change during the early adaptation period. The Slope 2 factor loaded on the distress at T3 indicator only, again with a factor loading set to 1 to capture the change during the long-term adaptation period.

Adding predictors

As a third step, our research question required modelling of the effects of loss of loved ones or home on distress in Dutch natives as well as ethnic minority/ immigrant groups. To investigate associations between stressor exposure and distress we added predictor variables (i.e., total home destruction, loss of loved one, and number of stressful life events at T2 and at T3) as causal indicators to the model, including interaction variables, to estimate their independent effects. To compare the scores between native Dutch and the ethnic minority/immigrant group it was first necessary to estimate their effects adjusted for potential confounders. Thus, we added sociodemographic variables (i.e., age, female sex, years of education after primary school, having a paid job as well as belonging to an ethnic minority) as predictors to estimate their independent effects as well as to correct for possible bias from dropout. To estimate differential effects of loss of loved ones or home in natives versus ethnic minorities/immigrants we included interaction effects of ethnic minority/immigrant status with total home destruction (Minority*Home destruction) and loss of loved ones (Minority*Loss of loved one).

Probing interaction effects

Using slope difference tests and macros provided by Dawson (Dawson, 2014) two-way interactions were probed. Variances and covariances of estimates needed to calculate slope difference tests were estimated using FIML in Amos.

Results

Descriptive Analyses and Attrition

Descriptive analyses are presented in Table 1. Significant differences between the ethnic minority/immigrant and native Dutch groups were found in education years, distress indicators at all times, having a paid job, total home destruction, loss of loved ones, and stressful life events at T3. As expected, distress indicators showed a decline across assessments, except anxiety, cognitive-performance difficulty, depression, hostility, and sleep problems in the ethnic minority/immigrant group between T2 and T3. At T1, the sample comprised $N = 234$ (23.2%) participants with ethnic minority/immigrant status; at T2, this was $N = 108$ (14.9%); and at T3, this was $N = 122$ (18.4%).

   We compared the sample completing the T2 survey ($N = 739$) with the nonresponders sample at T2 ($N = 290$), and those completing the T3 survey ($N = 674$) with T3 nonresponders ($N = 355$). Completing the T2 survey was more likely in female residents (55.9% vs. 46.7%, $p = .008$), older residents (40.7 vs. 37.0 years, $p < .001$), and those with higher educational level (6.9 vs. 6.1 years after primary school, $p = .004$), and less likely in residents belonging to ethnic minority groups (14.9% vs. 44.1%, $p < .001$). Having a paid job, the loss of loved ones, and total home destruction did not differ between study completers at T2 and dropouts. Mean levels of anxiety (18.2 vs. 20.5, $p < .001$), cognitive-performance difficulty (17.8 vs. 19.8, $p = .001$), depression (29.0 vs. 32.1, $p = .001$), and hostility (9.2 vs. 10.3, $p < .001$) at T1 were lower in those completing the T2 survey than dropouts, however, intrusion and avoidance and sleep problems at T1 did not differ between those completing the T2 survey and dropouts. Completing the T3 survey was more likely in female residents (56.7% vs. 46.9%, $p = .003$), those having a paid job (66.0 vs. 58.4%, $p = .018$), and those with higher educational level (6.9 vs. 6.3 years after primary school, $p = .013$), and less likely in residents belonging to ethnic minority groups (18.4% vs. 32.4%, $p < .001$) and those with total home destruction (9.5% vs. 13.5%, $p = .049$). Mean age, the loss of loved ones, and the number of stressful life events reported at T2 did not differ between study completers at T3 and dropouts. Mean levels of anxiety (18.4 vs. 19.8, $p = .028$) and depression (29.3 vs. 31.0, $p = .046$) at T1 were lower in those completing the T3 survey than dropouts, however, intrusion and avoidance, cognitive-performance difficulty, hostility, and sleep problems at T1 did not differ between those completing the T3 survey and dropouts. Given the high correlations between the distress indicators, we concluded that there were no indications of meaningful nonresponse bias for the current analyses.

Modeling Stress-Responsive Distress

First, we constructed cross-sectional factor models for T1, T2, and T3 representing a single factor (Distress) with six indicators (intrusion and avoidance, anxiety, cognitive-performance difficulty, depression, hostility, and sleep problems). All factor loadings were high (>0.60). These three models fit the data well at all

Table 1. Descriptive Analyses

	Natives (N = 795)		Ethnic minority/ Immigrant (N = 234)		Total (N = 1029)			
	M	(SD)	M	(SD)	M	(SD)	F	Scale
Age	40.06	(14.18)	38.12	(13.59)	39.62	(14.06)	3.42	
Education after primary school (yrs)	7.30	(3.69)	4.91	(4.24)	6.75	(3.95)	69.52***	
Intrusion and Avoidance								0–75
T1	33.35	(16.93)	43.01	(17.46)	35.56	(17.52)	55.85***	
T2	18.36	(17.62)	27.54	(21.32)	19.62	(18.42)	20.51***	
T3	11.96	(16.26)	29.14	(20.99)	14.79	(18.27)	86.63***	
Anxiety								10–50
T1	17.33	(7.92)	23.69	(11.01)	18.78	(9.12)	92.13***	
T2	14.39	(6.15)	20.52	(10.09)	15.27	(7.18)	69.29***	
T3	13.37	(5.22)	21.19	(10.22)	14.73	(7.02)	139.60***	
Cognitive-Performance Difficulty								9–45
T1	17.02	(7.71)	22.46	(9.56)	18.26	(8.48)	77.06***	
T2	14.27	(6.44)	19.91	(8.95)	15.09	(7.13)	58.89***	
T3	13.57	(5.60)	21.21	(9.92)	14.91	(7.17)	126.41***	
Depression								16–80
T1	27.48	(11.12)	37.32	(16.24)	29.75	(13.15)	107.11***	
T2	23.64	(9.87)	33.67	(16.34)	25.09	(11.58)	71.40***	
T3	22.31	(8.29)	35.68	(17.40)	24.63	(11.60)	150.46***	
Hostility								6–30
T1	8.86	(3.46)	11.75	(5.42)	9.52	(4.17)	91.17***	
T2	7.55	(2.55)	11.57	(6.31)	8.13	(3.65)	126.19	
T3	7.38	(2.54)	11.94	(6.27)	8.18	(3.89)	158.11***	
Sleep Problems								3–15
T1	6.62	(3.65)	8.37	(4.05)	7.02	(3.81)	38.41***	
T2	5.24	(2.86)	7.51	(3.67)	5.57	(3.09)	51.01***	
T3	4.99	(2.76)	7.89	(3.98)	5.49	(3.20)	86.58***	

	N	%	N	%	N	%	χ^2	P
Gender								
Male	364	(47.0)	107	(45.7)	471	(46.7)	0.11	
Female	411	(53.0)	127	(54.3)	538	(53.3)		
Having a paid job	531	(69.2)	95	(43.8)	626	(63.6)	47.34***	

(continued)

Table 1. Continued

	N	%	N	%	N	%	χ^2	P
Total home destruction	64	(8.2)	47	(20.1)	111	(11.0)	25.76***	
Loss of loved one	61	(7.9)	31	(13.2)	92	(9.1)	6.30*	
Stressful Life Events T2								
No SLE	256	(42.2)	42	(40.8)	298	(42.0)	0.41	
I SLE	203	(33.5)	33	(32.0)	236	(33.3)		
2 or more SLE	147	(24.3)	28	(27.2)	175	(24.7)		
Stressful Life Events T3								
No SLE	220	(40.8)	67	(56.3)	287	(43.6)	10.81**	
I SLE	159	(29.5)	21	(17.6)	180	(27.4)		
2 or more SLE	160	(29.7)	31	(26.1)	191	(29.0)		

Note. T1: 2–3 weeks, T2: 18–20 months, and T3: almost 4 years after the disaster. Ns may not add up to the maximum at each assessment due to missing responses
*$p < .05$, **$p < .01$, ***$p < .001$

three times. Model fit indices were for the Distress T1 model: $\chi^2(9) = 56.77$, $p < .001$, RMSEA $= .072$, CFI $= .99$, NNFI $= .98$, AIC $= 92.77$; for the Distress T2 model: $\chi^2(9) = 35.11$, $p < .001$, RMSEA $= .053$, CFI $= .99$, NNFI $= .98$, AIC $= 71.11$; and for the Distress T3 model: $\chi^2(9) = 51.25$, $p < .001$, RMSEA $= .068$, CFI $= .99$, NNFI $= .97$, AIC $= 87.25$. We then constructed a latent growth model incorporating the three distress models. This model showed adequate fit to the data: $\chi^2(139) = 1115.87$, $p < .001$, RMSEA $= .083$, CFI $= .94$, NNFI $= .92$, AIC $= 1215.87$. Given the fit of the models to the data in all subsequent stages of the model construction, the resulting model provided an adequate basis for answering our research questions.

Predicting Stress-Responsive Distress

A path diagram of the final model with predictors added is represented in Figure 1. This model fit the data well: $\chi^2(373) = 2084.53$, $p < .001$, RMSEA $= .054$, CFI $= .94$, NNFI $= .91$, AIC $= 2526.53$, PP$P = .50$, DIC $= 82471.02$. The model parameters are shown in Table 2. The intercept (baseline level) of stress-responsive distress was significantly higher in female participants and those belonging to ethnic minorities, as well as in those reporting loss of loved ones or home, while participants having a paid job had significantly lower initial distress levels. Stress-responsive distress during the early adaptation period (1 to 18 months post-disaster) showed significantly larger decreases in female participants, those with a paid job and those reporting loss of home. However, significantly more persistent or increasing distress was observed in participants belonging to ethnic minorities who had lost a loved one, and in participants who reported stressful life events as well as loss of home (SLE T2*home destruction). Finally, stress-responsive

Table 2. Disaster Exposure and Ongoing or New Stressors Predicting Changes in Disaster-Related Distress

	Intercept			Slope 1			Slope 2		
	Coeff.	(95% CI)	Std. Coeff.	Coeff.	(95% CI)	Std. Coeff.	Coeff.	(95% CI)	Std. Coeff.
Age	−0.02	(−0.08–0.04)	−0.02	−0.04	(−0.09–0.02)	−0.06	0.02	(−0.03–0.07)	0.04
Female sex	**5.36**	**(3.81–6.91)**	**0.20**	**−4.19**	**(−5.63––2.75)**	**−0.22**	−0.64	(−1.88–0.63)	−0.04
Education after primary school (yrs)	**−0.28**	**(−0.50––0.05)**	**−0.08**	0.05	(−0.15–0.26)	0.02	−0.13	(−0.31–0.05)	−0.07
Having a paid job	**−3.32**	**(−5.46––1.03)**	**−0.10**	**−1.85**	**(−3.63––0.05)**	**−0.10**	−0.04	(−1.44–1.41)	0.00
Belonging to ethnic minority	**6.58**	**(4.35–8.96)**	**0.21**	−0.30	(−2.64–1.99)	−0.01	1.41	(−0.81–3.65)	0.08
Total home destruction	**7.06**	**(4.01–10.24)**	**0.17**	**−6.72**	**(−9.91––3.54)**	**−0.22**	−2.58	(−5.89–0.69)	−0.11
Loss of loved one	**4.21**	**(1.00–7.56)**	**0.09**	−2.57	(−5.76–0.52)	−0.08	0.81	(−2.30–3.87)	0.03
Minority*Home destruction	3.60	(−1.50–8.45)	0.06	0.36	(−4.53–5.50)	0.01	6.56	**(1.76–11.52)**	**0.19**
Minority*Loss of loved one	1.89	(−3.69–7.49)	0.02	**7.12**	**(1.45–12.78)**	**0.13**	−4.55	(−9.89–0.98)	−0.11
Stressful Life Events T2				0.50	(−0.11–1.12)	0.06	−0.31	(−0.95–0.34)	−0.05
SLE T2*Home destruction				**3.54**	**(1.67–5.41)**	**0.17**	−0.46	(−2.41–1.47)	−0.03
SLE T2*Loss of loved one				0.06	(−1.64–1.78)	0.00	−0.77	(−2.66–1.13)	−0.05
Stressful Life Events T3							0.17	(−0.39–0.70)	0.03
SLE T3*Home destruction							−0.20	(−1.97–1.61)	−0.01
SLE T3*Loss of loved one							0.32	(−1.22–1.84)	0.02
	Mean	(95% CI)		Mean	(95% CI)		Mean	(95% CI)	
Adjusted estimate	30.55	(26.14–34.82)		0.03	(−4.00–3.87)		−0.63	(−4.12–22.75)	

Note. Coeff: coefficient, std.: standardized; CI: credible interval. Distress represents a factor with six indicators: feelings of anxiety and depression, concentration difficulty, hostility and rage, sleep problems, and intrusion and avoidance, and is expressed in Impact of Event Scale units. Values in **bold** are statistically significant at $p < .05$. For the model: $\chi^2(373) = 1696.11$, $p < .001$, RMSEA = .059, CFI = .94, NNFI = .90, AIC = 2138.11, PPP = .50, DIC = 53191.44, effective number of parameters = 215.40, convergence = 1.0017, samples = (500 + 77501)*8.

distress during the long-term adaptation period (18 months to 4 years post-disaster) was significantly more persistent or increasing in participants belonging to ethnic minorities who had lost their homes, but not in those who lost loved ones.

Probing Interaction Effects

We probed the significant interaction effects of belonging to ethnic minorities and loss of loved ones or home by estimating their unadjusted effects and performing post hoc slope difference tests. The results of the unadjusted analyses are presented in Table 3. The unadjusted effects (Table 3) were similar to the adjusted effects (Table 2).

Post hoc slope difference tests revealed significant differences in effects of minority status on change in stress-responsive distress within the groups that had experienced loss of loved ones ($t = 3.20$, $p = .001$) or home ($t = 4.08$, $p < .001$). In disaster survivors who did not report the loss of loved ones or home, no effects of minority status on change in stress-responsive distress were observed. Figure 2 shows the trajectories of stress-responsive distress over time across Dutch natives and ethnic minority groups that did or did not report the loss of loved ones (upper panel) or home (lower panel).

Discussion

The results of this study show that the loss of loved ones due to a disaster is associated with more persistent disaster-related distress in ethnic minorities compared with Dutch natives during the first 18 months, controlling for age, gender, education, employment, and post-disaster stressful life events. As expected, grief reactions were found to have their strongest impact in bereaved survivors in the early phase of post-disaster adaptation. These may include a sense of mistrust, anger, detachment, or identity disruption and other manifestations of persistent grief (Prigerson et al., 2009). We also showed that the loss of home due to a disaster is associated with more persistent disaster-related distress in ethnic minorities compared with natives between 18 months and 4 years, again controlling for age, gender, education, employment, and post-disaster stressful life events. Material loss may bring about increased vulnerability to further resource loss and thereby amplify distress, consistent with stress sensitization following extreme loss of resources. As reported earlier (Smid et al., 2012), we found that residents whose house was completely destroyed by the disaster responded more strongly to stressful life events reported 18–20 months following the disaster than residents who reported less extreme disaster exposure. The persistence of sensitizing effects of home loss in ethnic minorities was expected because lack of resources may have long-term effects, particularly in populations that were already resource depleted before the occurrence of the traumatic event (Hobfoll, 2001).

Increased levels of distress in ethnic minorities could not be attributed to insufficient use of mental health services (MHS). Previous research in the same sample

Table 3. Probing Interaction Effects

	Intercept			Slope 1			Slope 2		
	Coeff.	(95% CI)	Std. Coeff.	Coeff.	(95% CI)	Std. Coeff.	Coeff.	(95% CI)	Std. Coeff.
Model 1¹: Loss of Loved One									
Belonging to ethnic minority	**9.97**	**(7.87–12.06)**	**0.32**	−0.07	(−1.98–1.97)	0.00	**2.62**	**(0.72–4.54)**	**0.16**
Loss of loved one	**5.26**	**(1.93–8.49)**	**0.11**	**−2.89**	**(−5.74−−0.10)**	**−0.09**	0.34	(−1.89–2.60)	0.01
Minority*Loss of loved one	−0.71	(−6.51–5.08)	−0.01	**7.77**	**(1.66–13.47)**	**0.14**	−4.81	(−10.14–0.49)	−0.12
	Mean	(95% CI)		Mean	(95% CI)		Mean	(95% CI)	
Adjusted estimate	28.79	(27.65–29.93)		−4.41	(−5.18−−3.63)		−1.51	(−2.19−−0.81)	
Model 2²: Loss of Home									
Belonging to ethnic minority	**8.65**	**(6.59–10.72)**	**0.27**	0.68	(−1.45–2.87)	0.03	1.03	(−0.98–3.09)	0.06
Total home destruction	**8.50**	**(5.42–11.65)**	**0.20**	**−4.06**	**(−6.79−−1.28)**	**−0.13**	**−2.90**	**(−5.42−−0.36)**	**−0.13**
Minority*Home destruction	2.43	(−2.74–7.60)	0.04	2.51	(−2.58–7.31)	0.06	**6.33**	**(1.72–10.89)**	**0.19**
	Mean	(95% CI)		Mean	(95% CI)		Mean	(95% CI)	
Adjusted estimate	28.56	(27.42–29.69)		−4.31	(−5.11−−3.52)		−1.31	(−1.96−−0.64)	

Note. Coeff: coefficient, std.: standardized; CI: credible interval. Distress represents a factor with six indicators: feelings of anxiety and depression, concentration difficulty, hostility and rage, sleep problems, and intrusion and avoidance, and is expressed in Impact of Event Scale units. Values in **bold** are statistically significant at $p < .05$.
[1]For the model: $\chi^2(184) = 1217.57$, $p < .001$, RMSEA = .074, CFI = .94, NNFI = .92, AIC = 1353.57, PPP = .50, DIC = 52296.70, effective number of parameters = 68.72, convergence = 1.0018, samples = (500 + 70501)*2.
[2]For the model: $\chi^2(184) = 1228.24$, $p < .001$, RMSEA = .074, CFI = .94, NNFI = .92, AIC = 1364.24, PPP = .50, DIC = 52617.44, effective number of parameters = 67.58, convergence = 1.0016, samples = (500 + 70501)*2.
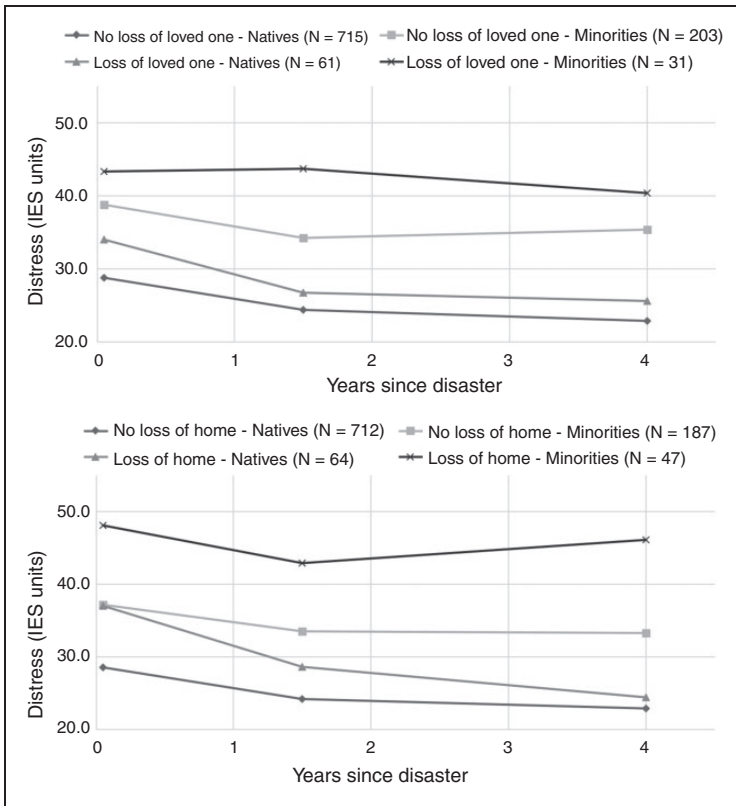
Figure 2. Trajectories of Stress-Responsive Distress

showed that among symptomatic minority group members, MHS use was higher compared with the Dutch natives 4 years after the disaster (Van der Velden, Yzermans, Kleber, & Gersons, 2007). Part of the mental health program after the disaster consisted of special campaigns aimed at immigrants, and this may have contributed to their increased use.

Increased and persistent stress-responsive distress among persons of different cultural backgrounds is likely to result from interplay of psychological, social and biological factors (Bhugra & Becker, 2005). A contextual stress sensitization model specifies processes contributing to enhanced stress sensitivity in three different dimensions: cognitive, interpersonal, and neurobiological. The *cognitive* dimension includes enhanced responses to trauma-related memories, enhanced perception of threat, and reinforced negative interpretations of events. The *interpersonal* dimension includes increased distrust, irritability, detachment or estrangement, and identity disruption. The *neurobiological* dimension includes different neurobiological systems that may show increased responses due to previous excessive stress

reactions (Smid et al., 2015). The impairments that result from stress-responsive distress may cause loss of resources through contextual mechanisms (for example, job loss after a conflict at work in a trauma survivor with increased irritability), leading to persistence or increases in distress over time.

Migration and the inherent transitions in cultural identity may impact on cognitive, interpersonal, and neurobiological stress sensitivity. Components of cultural identity, including language, dietary habits, and leisure activities change with migration and acculturation (Bhugra & Becker, 2005). Disruptions in cultural identity lead to *cultural bereavement* (Bhugra & Becker, 2005; Eisenbruch, 1991), reflected in preoccupation with memories of family in homeland, continuing experiences from the past, visitations from ghosts or spirits in dreams, guilt feelings, the structuring of the past to the homeland, personal experience of death, funerals and graves, and anxiety and anger in response to separation from the homeland (Eisenbruch, 1991). Likewise, immigrant ethnic minorities may experience *cultural incongruity* in case of dissimilarity between beliefs and expectations in the culture of origin and the culture of settlement (Bhugra & Becker, 2005), leading to alienation and thereby contributing to detachment, estrangement, and distrust. In addition to these interpersonal processes, the experience of *discrimination* may increase susceptibility to stress through different neurobiological systems, including the central nervous system, hypothalamic-pituitary-adrenal axis, and autonomic nervous system (Berger & Sarnyai, 2014).

Study Strengths and Limitations

Strengths of the current study include the large sample, the long-term follow-up, and the longitudinal design. There are also some limitations to this study.

First, attrition in our study represents a potential limitation. Given frequently high rates of attrition in disaster research (Scott, Sonis, Creamer, & Dennis, 2006), our completion rates are acceptable. More attrition occurred among ethnic minority/immigrant group members than Dutch natives, especially at the T2 assessment. This occurs frequently in longitudinal research involving minority groups (Yancey, Ortega, & Kumanyika, 2006) and partially successful efforts were made to reduce the attrition among this group at the T3 assessment. Nonetheless, selective attrition may have led to an underestimation of the true effects. Participants reporting total home destruction were more likely not to complete the T3 assessment. Since this did not apply to the T2 assessment and since the other disaster-related exposure variable (i.e., loss of loved ones) did not predict study attrition, this is unlikely to have exerted large effects on our overall findings.

Second, in our study, we did not assess individual differences in stress reactivity and stressor exposure existing before the index trauma. Given the short time interval between the disaster and the first assessment (2–3 weeks), a detailed exploration of these pre-disaster aspects was considered too burdensome. Future studies employing assessments prior to disaster exposure are needed to further explore these individual differences.

Third, our findings with regard to stressful life events may be limited because the assessment time frame of this variable did not exactly match the timing of our study assessments. Our assessment time frames were chosen to maximize the likelihood of including relevant occurrences (of SLE), while at the same time minimizing the risk of inaccurate responses due to remoteness and memory bias. We verified that exposure to stressful life events was not correlated with any of the disaster exposure variables (loss of loved ones or home). Prospective studies with more frequent assessments than those employed here would be necessary to ascertain occurrence of stress sensitization within more precise time frames.

Fourth, we did not take proximity of loved ones into account. If increased stress sensitivity is related to the proximity of the lost person, the reported effect sizes may be conservative.

Implications for Research and Practice

To our knowledge, this study is the first to provide evidence that stress sensitization may occur following the loss of loved ones or home. These findings have important implications for understanding the longitudinal course of psychopathology following the traumatic loss of loved ones.

Bereaved persons belonging to ethnic minority groups merit special attention. Promoting social connectedness within and integration across majority and minority ethnic groups is likely to lessen the distressing impact of the loss of loved ones on psychological functioning. In treatment-seeking bereaved persons, the active involvement of significant others may help to restore social connectedness and reduce interpersonal sensitivity, and exploring cultural meaning may enhance the treatment effect. The concept of cultural bereavement emphasizes the need for a restoration of cultural meaning following the loss of loved ones or home in line with religious and cultural traditions. Clinicians may consider adding specific, culturally sensitive grief-focused interventions besides trauma-focused interventions.

Providing practical assistance in the aftermath of mass trauma may help prevent further resource losses. On a community level, foreseeable stressors and resource losses may be an effective target for secondary prevention of stress-related psychopathology. These implications are specifically relevant for refugees and asylum seekers, who are often faced with multiple losses of loved ones as well as resource loss. Thus, agencies involved in the reception of refugees and asylum seekers may contribute to preventing adverse mental health outcomes by counteracting or preventing further stressors and resource losses. This should include providing safety, fulfillment of basic needs, access to medical as well as mental health care, as well as fair, quick, and humane immigration decisions.

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