The Course of Mental Health Disorders After a Disaster: Predictors and Comorbidity

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Current longitudinal disaster studies usually focus only on posttraumatic stress disorder (PTSD), although some studies have shown that increased risks for other disorders and comorbidity is common. To obtain an insight into the course of postdisaster psychopathology, a community sample of survivors of the Enschede fireworks disaster was followed from 2–3 weeks to 4-years postdisaster. Diagnostic interviews (Composite International Diagnostic Interview [CIDI]; World Health Organization, 1997) and childhood stressor interviews were administered at 2-years postdisaster (n = 260); the CIDI was repeated at 4-years postdisaster (n = 201, response rate 77.3%). At 2-years postdisaster many survivors (40.6%) suffered from PTSD (21.8%), specific phobia (21.5%), and/or depression (16.1%). These disorders were highly comorbid. At 4-years postdisaster, prevalence significantly diminished. Instead of full recovery, diagnostic classifications shifted in several survivors over time. This resulted in low rates of PTSD but still elevated rates of depression and specific phobia. The course of the 3 entangled disorders of PTSD, depression, and specific phobia was further studied by constructing 4 groups of survivors based on the diagnostic status at 2- and 4-years postdisaster: healthy, recovered, chronic, and delayed-onset. Initial depressive symptoms, maternal dysfunction, childhood physical abuse, and disaster exposure were found to discriminate between the groups and predict long-term psychopathology.

Disasters are collectively experienced traumatic events with a severe impact, which affect large numbers of people. They are

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characterized by a loss of personal, community, and physical resources for survivors. Following a disaster, survivors may start to suffer from mental health disturbances, such as posttraumatic stress disorder (PTSD) and depressive disorders. Depending on the origin of the disaster, studies have estimated the prevalence of PTSD in the community to be between 4–17% for man-made disasters (e.g., bombing, terrorist attack), 0.4–44.6% for technological disasters (e.g., mining disaster, industrial explosion), and 5–23% for natural disasters (e.g., earthquake, tsunami, flood; Neria, Nandi, & Galea, 2008). Postdisaster prevalence of depression has been assessed to a lesser extent. However, 6-months postdisaster rates appear consistent across populations: 12.4% World Trade Center attacks in New York City (Ahern & Galea, 2006), and 14.8% Mexican flood and mudslides of 1999 (Norris, Murphy, Baker, & Perilla, 2004). In addition to PTSD and depression, the genesis of other mental health disorders such as substance

abuse disorders (e.g., alcoholism; Zucker & Gomberg, 1986) and anxiety disorders (e.g., specific phobia; Onder, Tural, Aker, Kilic, & Erdogan, 2006) is widely recognized. In the latter study, the prevalence of psychopathology at 3 years was similar for PTSD (11.7%), depression (10.5%), and specific phobia (10.0%).

The course of psychopathology postdisaster appears to take four forms (Bonanno, 2004; Wadsworth, Santiago, & Einhorn, 2009). Some individuals are resilient in the face of disaster and do not have clinical levels of mental health symptoms. Another group, termed chronic, meets criteria for clinical psychological problems at multiple assessments. A third group shows symptoms initially but recover over time. The fourth shows delayed onset of symptoms after a period of being symptom free.

In current longitudinal trauma studies, however, it is common to refer to groups of survivors as recovered or delayed-onset when only PTSD is addressed, even though comorbidity between mental health disorders is very common, particularly in PTSD. Population-based samples reported comorbidity rates of PTSD and at least one other mental health disorder of 79% for women and 88% for men (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). High comorbidity seems to logically ensue from the current PTSD classification because it is composed of symptoms that characterize both major depression (e.g., sleeping problems) and anxiety disorders (e.g., avoidance; Brown, Chorpita, & Barlow, 1998; Mineka, Watson, & Clark, 1998).

Recent trends in the field of psychopathology attempt to deal with the overlap in constructs of mental health disorders in the current diagnostic classes of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV;* American Psychiatric Association, 1994). Because the mood and anxiety disorders may be described by an overarching set of three temperamental factors— negative affect, positive affect, and physiological hyperarousal— it is suggested that these disorders should be subsumed together in an overarching class of emotional disorders (Watson, 2005).

This study aimed to investigate the prevalence, course, and comorbidity of a comprehensive picture of psychopathology in disaster survivors. Furthermore, we searched for determinants that discriminated between groups of survivors that were mentally healthy, recovered, had a chronic or a delayed-onset of prevalent mood and anxiety disorders postdisaster. We specifically chose to study the course of groups with PTSD, depression, and specific phobia because of their overlap in symptoms. The following variables known to predict PTSD were studied for their influence on the course of psychopathology: sociodemographics, exposure to trauma in childhood, dysfunctional parent–child relationships, magnitude of disaster exposure, and comorbidity of mental health disorders (Brewin, Andrews, & Valentine, 2000; Neria et al., 2008; Onder et al., 2006; Weich, Patterson, Shaw, & Stewart-Brown, 2009).

METHOD

Participants and Procedure

On May 13, 2000, a huge explosion in a central storage facility of a fireworks factory occurred in the city of Enschede, the Netherlands. The facility was situated in the middle of a residential area and severely damaged or destroyed 500 homes. Twenty-three people died and 1,000 people were injured. Approximately 4,500 adult residents were directly affected. The Dutch government declared it a national disaster (van der Velden, Yzermans, Kleber, & Gersons, 2007).

The health of affected residents 18 years and older living in the area at the time of the disaster was monitored in a longitudinal health survey. The study consisted of three waves of self-report questionnaires (T1 = 2- to 3-weeks postdisaster; T2 = 18-months postdisaster; T3 = almost four-years postdisaster). Survivors were recruited by mail and announcements in the media. At T1, T2, and T3, respectively, 1567, 1116, and 995 affected residents participated (estimated response at T1 = 30%, T1–T2 = 71%, and T1–T3 = 65%; van der Velden et al., 2007). Following T2, the present study concerning the prevalence of psychopathology was launched. Of those survivors who participated in T1 and T2 and completed a questionnaires in Dutch (n = 859), a random sample of 602 cases was selected for this additional study. Of these 602 survivors, 507 were recruited by telephone, and 266 (52.5%) completed diagnostic (Composite International Diagnostic Interview [CIDI]; World Health Organization [WHO], 1997) and childhood stressor interviews face-to-face by trained interviewers at 2-years postdisaster. Six survivors were unreliable, leaving 260 survivors. Reasons for nonparticipation were unknown (n = 80; 15.8%), no contact (n = 54; 10.7%), unable/refused (n = 65; 12.8%), wanting to avoid remembering the disaster (n = 21; 4.1%), insufficient mastery of Dutch (n = 12; 2.4%), severely ill (n = 5; 1.0%), deceased (n = 2; .4%), or moved abroad/to another part of the country (n = 2; .4%). The CIDI was repeated at 4 years (n = 201; response rate = 77.3%). For this study, three time points were included: 2–3 weeks, 2 years and 4 years. Between 2 and 4 years, χ^2 test and independent t tests showed no selective dropout either in terms of gender, age, education, or in PTSD, specific phobia, depressive disorder, depressive and PTSD symptom severity, or traumatic exposure (childhood abuse and disaster exposure).

The Medical Ethics Committees of the Academic Medical Center, University of Amsterdam and TNO Zeist (Netherlands Organization for Applied Scientific Research) approved the study protocols. All participants had supplied written informed consent. An incentive of €12 ($17) was given for participation in each phase.

Measures

The computerized Dutch version of the CIDI World Health Organization, 1997) was used to determine mental health

disorders in accordance with *DSM-IV* criteria and demographic data. The following modules were administered: mood, anxiety, substance-related disorder, and somatoform disorder. In the PTSD section, we inquired about PTSD symptoms associated with the fireworks disaster and an additional other event if survivors indicated that the latter was worse. This allowed us to identify all persons with PTSD (Breslau, Peterson, Poisson, Schultz, & Lucia, 2004) and compare the prevalence to the Dutch population. The CIDI has an excellent interrater reliability, good test-retest reliability, and adequate validity (Andrews & Peters, 1998).

Childhood stressors were indexed by the Structured Trauma Interview (STI; Draijer & Langeland, 1999). Stressors before age 16 include (a) child physical abuse (recurrent and severe parental aggression); (b) child sexual abuse (pressured or forced sexual contact); (c) child witness of domestic violence; (d) early loss, including loss of a natural parent or caretaker by death, divorce, or prolonged separations before age 12; and (e) degree of parental dysfunction for each parent, which were composites of the following seven items: dysfunction resulting from recurrent illness, nervousness, depression, use of sedatives, drugs, alcohol problems, and hospitalizations. The internal consistency of degree of dysfunction was reasonable (Cronbach's α: dysfunction of mother, 0.64; dysfunction of father, 0.65). Concurrent validity of the STI was shown by comparisons with other instruments for the assessment of childhood trauma (Kooiman, Ouwehand, & ter Kuile, 2002) or childhood neglect (Draijer & Langeland, 1999).

Severity of disaster exposure was measured at 2- to 3-weeks postdisaster. Survivors reported sensory exposure by using a list of 21 experiences (0 = *no*, 1 = *yes*) specifying what survivors had seen, felt, heard, or smelled during or immediately after the disaster. Degree of exposure was based on the sum score (range = 0–21; van Kamp et al., 2006).

To determine the severity of PTSD, and depressive symptoms, participants completed three self-report measures at multiple time points.

The Dutch 15-item version of the Impact of Event Scale (IES; van der Ploeg, Mooren, Kleber, van der Velden, & Brom, 2004) was administered to obtain scores for subscales of intrusive (seven items) and avoidance (eight items) symptoms that are rated on a 5-point Likert-type scale (0 = *not at all*, 1 = *seldom*, 3 = *sometimes*, or 5 = *often*), reflecting their occurrence in the past week (range = 0–75). The reliability and structure of the Dutch IES proved to be adequate across various traumatic stressors. It has a robust structure, supporting the composition (Intrusions and Avoidance scale) of the original IES. At all measurement points of the survey, the internal consistency was excellent (Cronbach's α ≥ .94).

As the 15-item IES has no information on the PTSD cluster hyperarousal the Self-Rating Scale for PTSD (SRS-PTSD; Carlier, Lamberts, van Uchelen, & Gersons, 1998) was added after the first wave of data collection to obtain a severity score for PTSD symptoms based on *DSM-IV* criteria. The internal consistency (Cronbach's α = .96) and interrater reliability of this self-report

are found to be satisfactory. Participants were asked specifically to consider the fireworks disaster when completing this measure and the IES.

The Dutch version of the Symptom Check List-90 (SCL-90; Arrindell & Ettema, 2003) was administered to measure the severity of depressive symptoms (16 items). These items are scored on a 5-point Likert scale. At all measurement points of the survey, the internal consistency of the scale was excellent (Cronbach's α ≥ .94).

Data Analysis

Four groups of survivors were constructed based on the course of PTSD, depression, and specific phobia in the past 12 months. The groups consisted of survivors who had the following attributes:

- Healthy: No psychopathology at both 2- and 4-years postdisaster (n = 98)
- Recovered: PTSD, depression, and/or specific phobia at 2-years postdisaster, but no psychopathology at 4-years postdisaster (n = 38)
- Chronic: PTSD, depression, and/or specific phobia at 2- and 4-years postdisaster (n = 27)
- Delayed-onset: No psychopathology at 2-years postdisaster and PTSD, depression, and/or specific phobia at 4-years postdisaster (n = 10)

To ensure that the main psychological problems originated from the disaster, we excluded survivors who had psychological problems preceding the disaster and did not subscribe their current problems to the event (n = 2).

Analysis of variance (ANOVA) with Bonferroni correction was used to examine whether groups differed in numeric variables. Discriminant analysis (DA) was used to build a predictive model of group membership for the course of psychopathology based on differences in characteristics of the groups observed with ANOVA (p < .10). We specifically chose a DA model with equal prior probabilities as this performs better than logistic regression for classifying groups when the outcome variable has more than two groups of unequal size (Hossain, Wright, & Petersen, 2002). All statistical tests were two-tailed, and a p value of less than .05 was considered statistically significant.

RESULTS

Sample Characteristics

At 2-years postdisaster, survivors had an average age of 48.1 years (SD = 14.4), and 58.6% were women. The mean number of years of education was 12.6 (SD = 4.0); 78.5% of survivors were married or cohabiting.

Traumatic Exposure and Symptom Severity

Survivors reported an average severity of disaster exposure of 11.0 (SD = 5.1). Childhood physical and sexual abuse was reported by 6.8% and 14.1%, respectively. All symptom severity scores significantly declined over time. Scores for the IES were 36.9 (SD = 16.9) at 2–3 weeks, 24.0 (SD = 19.8) at 2 years, and 16.4 (SD = 17.8) at 4 years, F = 155.32, df = 1.961, $p < .001$. For depressive symptoms they were 29.8 (SD = 12.2) at 2–3 weeks, 24.1 (SD = 10.3) at 2 years, and 23.2 (SD = 9.3) at 4 years, F = 48.61, df = 1.514, $p < .001$. Because SRS-PTSD and IES scores were highly correlated at 2- and 4-years postdisaster (r = .85 and r = .83, respectively), we chose to limit our analyses to the IES, which was also administered at 2–3 weeks.

Prevalence of Psychopathology at 2- and 4-Years Postdisaster

Figure 1 shows the 12-month prevalence of psychopathology in survivors at 2- and 4- years postdisaster. Panic disorder (2 year: n = 3; 4 year: n = 2), obsessive–compulsive disorder (2 year: n = 6; 4 year: n = 6), generalized anxiety disorder (2 year: n = 1; 4 year: n = 2) and agoraphobia (2 year: n = 2; 4 year: n = 0). These are shown as other anxiety disorders. Alcohol (2 year: n = 7; 4 year: n = 5) and drug abuse and dependence (2 years: n = 1; 4 years: n = 0) were also merged. Somatoform disorder consisted of conversion disorder, pain disorder, and somatization disorder.

At 2-years postdisaster PTSD (21.9%), specific phobia (21.5%), and depression (16.2%) were dominant (see Figure 1).

Specific phobia consisted of the following subtypes: nature (n = 34), blood injection (n = 10), animal (n = 3), and situational (n = 21). PTSD was solely disaster-related in 51 out of 57 survivors (89.5%). Although in the total group of survivors with PTSD, depression, and/or specific phobia, eight survivors reported psychological problems preceding the disaster, as many as six out of these eight survivors still attributed their current problems to the disaster.

There were no statistically significant differences in PTSD, depression, and specific phobia prevalence rates for men and women. The percentage of survivors with PTSD, depression, specific phobia, social phobia, and somatoform disorders dropped significantly from 2 to 4 years, and the percentage of survivors without psychopathology in the past 12 months increased from 51.9% to 70.5%.

Comorbidity Rates at 2-Years Postdisaster

At 2 years, 62 out of 260 survivors (23.8%) suffered from one single 12-month mental disorder, whereas 31 (11.9%) had two, 22 (8.4%) had three, and 10 survivors (3.8%) had multiple coexisting disorders. Many survivors (40.6%) suffered from PTSD, depression, and/or specific phobia. Comorbidity between two disorders was highest in PTSD with depression (n = 25, 43.8%) and in PTSD with specific phobia (n = 30, 52.6%). After taking all Axis I disorders into account, 63.2% of survivors with PTSD had one or more co-existing disorders, and 73.8% and 76.8% survivors with depression and specific phobia, respectively, had at least one other mental health disorder.
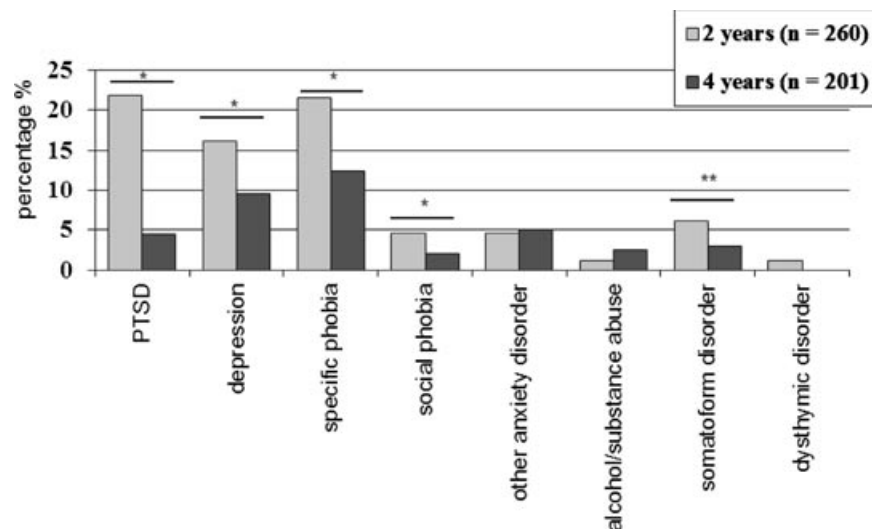
Figure 1. Twelve-month prevalence of psychopathology 2- and 4-years postdisaster.
$^*p < .05$, $^{**}p < .001$.

Shift in Psychopathology From 2- to 4-Years Postdisaster

An in-depth look at 12-month psychopathology in survivors who were healthy or suffered from PTSD, depression, and/or specific phobia was performed to gain insight into the course of psychopathology from 2 to 4 years ($n = 201$). Survivors without PTSD, specific phobia, or depression who suffered from other psychopathology were excluded from the analysis ($n = 28$). When survivors were healthy at 2-years postdisaster, this was usually sustained over time (90.7%). In total, 58.2% of survivors with PTSD, specific phobia, and/or depression at 2 years no longer met full diagnostic criteria for any mental health disorder at 4-years postdisaster. Nonetheless, although most survivors recovered from depression and specific phobia, approximately half as many developed a new onset of these disorders. Delayed-onset of one disorder was preceded in 18 out of 28 (64.3%) by another disorder. This regularly resulted in a shift in diagnostic classification. Over 10% of survivors with PTSD or specific phobia went on to be diagnosed with a delayed-onset of depression, whereas survivors with depression at 2 years were hardly ever diagnosed with delayed-onset PTSD or specific phobia. Delayed-onset of PTSD without any mental health disorder in the participant's history was unusual. Of all psychopathology, specific phobia often appeared to be a chronic disorder.

Four Groups Based on the Course of Psychopathology

Table 1 displays the four groups based on the course of PTSD, depression, and specific phobia ($n = 173$). Post hoc analyses demonstrated that on all time points the IES and depressive symptom severity of healthy survivors were significantly lower than those in groups of recovered and chronic survivors. At 2–3 weeks postdisaster and at 4-years postdisaster, healthy survivors also had lower IES scores than survivors in the delayed-onset group. Less-severe depressive symptoms in the healthy versus the delayed-onset group was only seen at 4 years. Healthy survivors reported the least disaster exposure in comparison to recovered and chronic survivor groups. In contrast to the chronic group, healthy survivors had lower maternal dysfunction scores. Survivors in the chronic group had more comorbid disorders, were more prone to have experienced childhood physical abuse, had higher IES scores at 2 years, and higher depression scores at 2 and 4 years than recovered survivors.

Prediction of the Course of Psychopathology

Discriminant analysis showed that a model including the following variables was able to significantly discriminate the groups: severity of exposure to the disaster, childhood sexual and physical abuse, maternal dysfunction, as well as intrusive, avoidant, and depressive symptoms at 2–3 weeks ($\lambda = .64$, $\chi^2 = 64.65$, $p < .001$). We specifically used symptom severity measures at 2–3 weeks postdisaster in the model instead of later measures because these are more interesting in forecasting later functioning. The standardized function coefficients of depressive symptoms, maternal dysfunction, childhood physical abuse, and severity of exposure contributed most to distinguishing among the groups (.77, .39, .38, and .34, respectively). Childhood sexual abuse contributed to the discriminant function to a lesser extent (.13). Although intrusions and avoidance at 2–3 weeks ($-.11$) did not contribute to the model, they were highly correlated with the overall discriminant function ($r = .56$). The classification results showed that the model correctly predicted 64.4% of healthy survivors, 36.1% of survivors who recover, 54.5% of survivors in the chronic group, and 50% of survivors with a delayed-onset, whereas by chance only 25% of survivors would be correctly appointed to each of the four groups.

DISCUSSION

This longitudinal study investigated the prevalence, course, and comorbidity of psychopathology in a community sample of survivors after a devastating fireworks disaster in their residential area.

Prevalence of Mental Disorders

At 2-years postdisaster nearly half (48.3%) of survivors in our sample fulfilled the criteria for a mental health disorder in the past 12 months. The most common disorders, PTSD (21.8%), specific phobia (21.5%), and depression (16.1%), were apparent in 40% of survivors. High 12-month comorbidity rates between these three disorders were found, and more than half of these survivors suffered from two or more coexisting disorders. Except for two cases, PTSD was disaster-related. Interviewers orally reported that specific phobia consisted largely of a fear of thunderstorms, with an obvious sensory association to the fireworks explosions. In accord with previous findings (North, Kawasaki, Spitznagel, & Hong, 2004) substance abuse had not developed in response to the disaster or as part of coping with its aftermath. At 4-years postdisaster, psychological problems significantly diminished, and 12-month prevalence rates had dropped to 4.5 % PTSD, 9.5% depression, and 12.4% specific phobia. In comparison to the Dutch population, PTSD was no longer elevated at 4 years, 3.3%, 95% CI [2.2, 4.5], according to de Vriesand and Olff (2009). Rates for depression and specific phobia were still increased: depression, 5.7%, 95% CI [4.8, 6.5] (Bijl, De, Ravelli, Smit, & Vollebergh, 2002); and specific phobia, 6.9%, 95% CI [6.0, 7.8]. Although PTSD is most commonly studied in the aftermath of disasters, our study shows that it is not the central psychopathology after such events, at least in the long-term.

More than half of survivors with PTSD, depression, and specific phobia at 2-years postdisaster no longer met full diagnostic

Table 1. ANOVA of Sociodemographics, Symptom Severity, and Traumatic Exposure in Groups of Survivors based on the Course of Psychopathology (PTSD, Depression, and Specific Phobia) from 2- to 4-Years Postdisaster

Variable	Healthy (n = 98)		Recovered (n = 38)		Chronic (n = 27)		Delayed-onset (n = 10)		df	F (t or χ²)
	M	SD	M	SD	M	SD	M	SD		
Females N (%)	58	59.2%	18	47.4%	16	59.3%	4	40.0%		2.70[a]
Males N (%)	40	40.8%	20	52.6%	11	40.7%	6	60.0%		
Age	49.21	14.86	45.08	12.24	48.80	11.82	48.10	18.16	3, 172	.81
Education (years)	12.96	3.56	13.08	3.23	11.89	4.93	10.70	4.81	3, 172	1.60
Number of disorders at 2 years (%)										
1	—		16	42.1%	14	51.9%	—			11.37[a]**
2	—		19	50.0%	4	14.8%	—			
3	—		2	5.3%	5	18.5%	—			
4	—		1	2.6%	4	14.8%	—			
Symptom severity scores										
2–3 weeks										
Intrusions and avoidance[b]	31.05	16.21	40.24	14.19	45.76	16.58	49.33	14.31	3, 164	9.32***
Depressive symptoms[c]	24.78	7.94	32.14	11.64	38.80	16.37	31.38	9.60	3, 162	13.34***
2 years										
Intrusions and avoidance[d]	15.61	15.53	30.42	17.49	41.45	17.51	28.80	20.33	3, 152	17.87***
Depressive symptoms[e]	19.50	4.69	27.41	9.48	33.91	16.77	27.00	10.25	3, 154	19.30***
4 years										
Intrusions and avoidance[f]	8.88	12.83	20.47	19.10	31.16	17.64	30.55	22.98	3, 159	17.22***
Depressive symptoms[g]	19.25	4.57	23.65	6.81	30.69	12.98	27.61	10.40	3, 161	18.37***
Traumatic exposure										
Disaster exposure severity[h]	9.97	4.93	12.52	4.23	13.56	4.38	12.10	6.10	3, 171	5.44**
Childhood physical abuse n (%)[i]	4	4.2%	1	2.6%	7	25.9%	0	0%		12.42[a]**
Childhood sexual abuse n (%)[i]	11	11.3%	9	23.7%	7	25.9%	2	20.0%		5.71[a]
Childhood adversities										
Early parental loss n (%)	13	13.4%	7	18.4%	5	18.5%	1	11.1%		1.19[a]
Witness domestic violence n (%)	8	8.4%	3	7.9%	6	22.2%	1	11.1%		4.45[a]
Maternal dysfunction[j]	.55	1.08	.74	1.18	1.42	1.50	1.10	2.08	3, 166	3.59*
Paternal dysfunction	.34	.68	.47	1.08	.76	.97	.30	.48	3, 162	1.84

Note. N = 173; survivors without PTSD, phobia, or depression who had another disorder were excluded from the analysis. ANOVA = Analysis of variance; PTSD = posttraumatic stress disorder. Post hoc analyses used Bonferroni correction.

[a]Fisher exact test. [b]Healthy vs recovered*; healthy vs chronic***; healthy vs late-onset**. [c]Healthy vs recovered**; healthy vs chronic***; recovered vs chronic*. [d]Healthy vs recovered**; healthy vs chronic***; recovered vs chronic*. [e]Healthy vs recovered**; healthy vs chronic***; healthy vs late-onset***; healthy vs chronic***; healthy vs late-onset**; recovered vs chronic**. [f]Healthy vs recovered*; healthy vs chronic***; recovered vs chronic**. [g]Healthy vs chronic*. [h]Healthy vs recovered**; healthy vs chronic**; recovered vs chronic**. [j]Healthy vs chronic*.

* p < .05, one-tailed. ** p < .01, one-tailed. *** p < .001, two-tailed.

criteria of any disorder at 4 years. Others also recovered of one of these disorders, but went on to develop a new onset. Thus, in line with the literature (Rosen, Spitzer, & McHugh, 2008), PTSD, depression, and specific phobia appeared to be highly intertwined: Not only were these disorders the three most prevalent and highly comorbid, survivors also shifted between these disorders over the course of time. These findings add additional merit to the overarching class of emotional disorders proposed by Watson (2005) in which anxiety and mood disorders are incorporated.

Course of Psychopathology

To follow the course over time of these three entangled disorders (PTSD, depression, and specific phobia) in survivors whose main psychological problems originated from the fireworks disaster, we constructed four groups to enable comparison between healthy survivors to groups who recovered, had chronic, or a delayed-onset of disorders. Our healthy group appeared to be resilient individuals (see Bonanno, 2004). Although psychopathology was absent, survivors did experience transient disturbance in normal functioning across time.

We found that severe depressive symptoms in the early aftermath were more relevant in our model for predicting an unfavorable course of mental health between 2- and 4-years postdisaster than severity of PTSD symptoms. It appears that intrusions, avoidance, and hyperarousal symptoms usually show a natural recovery, which is suppressed by having additional depressive symptoms. This result was previously found in a cross-sectional study (Onder et al., 2006). Findings showed a better recovery rate of PTSD in those survivors of the Marmara earthquake with a single diagnosis in comparison to survivors with comorbid PTSD and depression. Furthermore, several treatment studies showed that comorbid depression to PTSD predicted a greater resistance to treatment (Brady, Killeen, Brewerton, & Lucerini, 2000). In our study, survivors who recovered had fewer comorbid disorders than those with a chronic course. Findings suggest that screening for trauma survivors at risk for long-term mental health problems appears more effective by using depressive instead of PTSD symptom severity measures.

Survivors with delayed onset of psychopathology had only slightly higher symptom severity scores at 4-years postdisaster than at 2-years postdisaster. Although delayed-onset of PTSD, depression, and/or specific phobia could refer to none or only few initial symptoms that lead to the disorder, our findings indicate prodromal symptoms prior to developing a full-blown mental health disorder. These findings are in-line with a recent meta-analysis (Smid, Mooren, van der Mast, Gersons, & Kleber, 2009) which reported that survivors with initial subthreshold PTSD were at risk of developing delayed PTSD. Mental illness thus appears more a continuous instead of a dichotomous process.

Trauma Exposure and Course of Mental Disorders

Both the magnitude of traumatic exposure and absence of maternal care during childhood were predictive for the course of psychopathology. Healthy survivors reported the least traumatic exposure and maternal dysfunction. Although one out of four survivors in the chronic group reported childhood physical abuse, it was rarely reported in the other groups. Hence, dose-response characterized the relationship between severity of trauma exposure and the degree of disruption in normal functioning. Findings are in-line with earlier reports showing an association between childhood abuse and dysfunctional mother–child relationship on the one hand and a higher incidence of psychopathology in adulthood on the other (e.g., Langeland, Draijer, & van den Brink, 2004). A meta-analysis (Brewin et al., 2000) showed that the severity of the focal trauma conveyed the strongest risk for PTSD. The current study demonstrated that the course of a combination of anxious-depressive disorders is also well predicted by the exposure severity of the focal trauma; however, maternal dysfunction was a slightly better predictor. Interestingly, maternal dysfunction contributed more to an unfavorable course of disorders than childhood sexual abuse. The effects of trauma on children can be mitigated by the presence of a supportive caregiver, even if that caregiver is unable to alter the outcome of events (Luthar & Zigler, 1991). Van der Kolk and Fisler (1994) stated that only when caregivers adequately tune in to their infants can they help infants change their psychological state from distressed to contented. One of the key problems of dysfunction of the primary caregiver is that a child might not learn how to regulate the intensity of feelings and impulses.

Demographics and Course of Psychopathology

None of the studied demographics including gender, age, and years of education conveyed risk factors for the course of psychopathology. Within the scientific trauma literature it is debated whether gender and specific age groups foster a higher risk for trauma in itself instead of PTSD (e.g., Olff, Langeland, Draijer, & Gersons, 2007). Women, for instance, are at higher risk for sexual assault or rape and are more often traumatized at a younger age; both are associated with higher risks for developing PTSD. Therefore, in our sample in which survivors all experienced the same trauma and we only included adult patients, we may not have found demographic risk factors.

Strengths and Limitations

The strengths of the current study were the longitudinal design and the face-to-face administered structured clinical interviews. Nevertheless, there are several limitations. Although we could not find selective dropout in survivors between waves of data collection,

we are hesitant to state that our community sample is representative for the affected community. Furthermore, because data on childhood experiences are collected retrospectively, we are uncertain whether there are actual increases in childhood traumatic exposure and adversities, or a recollection bias. There is reassuring evidence, however, that some types of psychopathology (such as depression) do not typically bias reports of childhood experience (Brewin, Andrews, & Gotlib, 1993); furthermore, our findings are supported by a recent systematic review (Weich et al., 2009) that demonstrated prospective evidence of associations between poor parent–child relationships and common psychiatric disorders in later life.

This study illustrated the course of psychopathology in a community of disaster survivors. It showed that the most prevalent disorders of PTSD, specific phobia, and depression are highly intertwined: They frequently co-occurred, and a shift in diagnostic classification over time was common. Our findings question whether the *DSM-IV* adequately classifies PTSD, depression, and specific phobia as separate disorders. Future studies should focus on possible clusters of anxious-depressive symptoms for more comprehensive descriptions of the whole spectrum of trauma-induced psychopathology. Because patients are often appointed to treatment programs based on a specific diagnosis, clinicians need to be aware of comorbidity and a possible shift in disorders over time and subsequently switch to more comprehensive treatment approaches. Child abuse and neglect form extra risk factors for long-term psychopathology in adulthood. We may profit from the predictive value of depressive symptom severity within a few weeks postdisaster, as this offers opportunities for early screening of trauma survivors at risk for long-term mental health problems.

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