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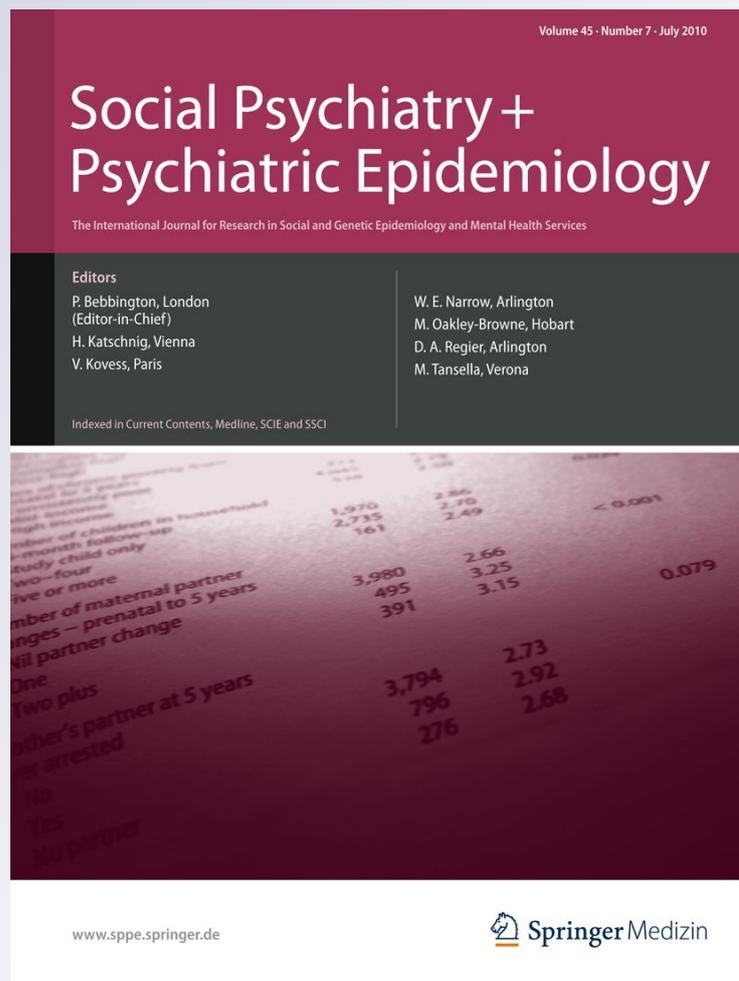
**Social Psychiatry and
Psychiatric Epidemiology**
The International Journal for
Research in Social and Genetic
Epidemiology and Mental
Health Services

ISSN 0933-7954

Volume 46

Number 7

Soc Psychiatry Psychiatr
Epidemiol (2011) 46:615-621
DOI 10.1007/s00127-010-0227-
X



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Mental disorders, psychological symptoms and quality of life 8 years after an earthquake: findings from a community sample in Italy

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Received: 3 August 2009 / Accepted: 13 April 2010 / Published online: 5 May 2010
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Abstract

Background and aims Various studies assessed mental disorders and psychological symptoms following natural disasters, including earthquakes. Yet, samples were often non-representative, and the periods of time between earthquake and assessments were usually short. This study aims to assess the prevalence of mental disorders, level of psychological symptoms and subjective quality of life in a random sample in a rural region in Italy 8 years after an earthquake.

Methods Using a random sampling method, a pool of potential participants of working age who had experienced the earthquake were identified 8 years after the earthquake. They were sequentially approached until the target sample of 200 was reached. Mental disorders were assessed on the MINI, psychological symptoms on the Brief Symptom Inventory (BSI) and the Impact of Event Scale-Revised

(IES-R), and subjective quality of life on the Manchester Short Assessment of Quality of Life (MANSA).

Results 200 people were interviewed, and the response rate of contacted people was 43%. In the MINI, 15 participants (7.5%) had any type of mental disorder; 5 participants had PTSD at any time since the earthquake, and 1 participant at the time of the interview. Symptom levels were low (Global Severity Index of BSI mean = 0.29, SD = 0.30; IES total mean = 0.40, SD = 3.33) and subjective quality of life (MANSA mean = 5.26, SD = 0.59) was in a positive range. The distribution of mental health outcomes made it difficult to explore factors associated with them.

Conclusion There is no evidence that the earthquake had a negative impact on the mental health of the affected population years later. Possible reasons include the relatively weak nature of the earthquake, strong community support that helped overcome mental distress, the long period of time (8 years) between the occurrence of the earthquake and the study, and a capacity of people to maintain or restore mental health after a natural disaster in the long term.

Keywords Earthquake · Post-traumatic stress disorder · Prediction · Natural disaster · Survey · Community sample

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Introduction

Earthquakes are one of the most frequently occurring natural disasters. Throughout the world they affect large numbers of people practically every year. They often strike unexpectedly, threaten lives and lead to large scale destruction. The mental distress associated with experiencing earthquakes poses a challenge to mental health

services. Extensive research has been conducted on mental disorders following natural disasters [7], and several studies assessed samples having experienced earthquakes [2, 3, 6, 8, 16, 18, 19, 21, 23, 24, 27, 28, 30, 35]. Most studies focused on the prevalence of post-traumatic stress disorder (PTSD) and found prevalence rates of PTSD among the survivors of earthquakes ranging from 10.3 [21] to 30% [3]. However, studies used different assessment instruments to measure PTSD symptoms, and the time lag between the actual earthquake and the assessment of PTSD symptoms varied considerably. Although there is evidence that traumatic experiences can lead to increased rates not only of PTSD, but also of other anxiety disorders and major depression, disorders other than PTSD have been less systematically investigated as potential consequences of earthquakes. With respect to other long-term outcomes such as quality of life, there is hardly any research following earthquakes.

In most studies [3, 8, 25], disorders were assessed several months or a few years after the earthquake. Studies investigating long-term outcomes, i.e. more than 5 years after the earthquake are rare [3]. However, evidence on long-term sequelae is essential to establish the need for and evaluate interventions for the prevention and treatment of mental disorders in the aftermath of an earthquake. Furthermore, many of the studies on survivors of earthquakes were conducted in samples that were selective and not representative of the affected population. Research evidence shows that selective groups, usually based on convenience sampling or snowballing methods, tend to have substantially higher rates of PTSD and other mental disorders than representative groups that have been recruited using random sampling methods [13]. Studies on mental disorders following earthquakes should therefore apply a random sampling method, if at all possible, to identify reliable prevalence rates and factors associated with higher or lower rates of disorders.

On 4th September 1997, the region Marche in central Italy was struck by an earthquake with a strength of 4.5 on the Richter scale, which was followed by stronger quakes with a strength of 5.5 and 5.8 on 26th September and a large number of minor quakes during the following 6 months. Camerino is a small town in the Marche region close to the epicentre of the main earthquake, and is located on top of a hill, 630 m above sea level. On 26th September 1997 various buildings in Camerino, including the main church, collapsed and parts of the town were destroyed. Nobody was killed in Camerino itself, although 11 people died in the neighbouring region of Umbria.

The aim of the present study was twofold: (1) to investigate prevalence rates of mental disorders, levels of psychological symptoms and subjective quality of life in a community sample of people of working age 8 years after

the earthquake; and (2) to identify predictors of these outcomes.

Method

Sampling

The target population were residents of working age who had experienced the earthquake in 1997 and had been at least 16 years of age at the time of the earthquake. The latter criterion was chosen to focus on the potential consequences of traumatic experiences in adult people rather than children. Exclusion criteria were absence from Camerino during the earthquake and severe learning difficulties.

The population register of Camerino had 7,039 residents in 2005. Of these, 5,384 were of working age, i.e. between 18 and 65 years. Excluding those with an age of less than 24 years (who were younger than 16 years in 1997) resulted in a total target population of 4,431 residents in Camerino who were born between 1940 and 1981. The list of residents was organised in alphabetical order, and we selected every seventh person, which provided a pool of 633 potential interviewees (326 women and 307 men). The resident list contained the full addresses of all residents. In a next step, we grouped the selected residents according to the district of the town in which they lived. There are five districts, and in each district we randomly defined a ranking of streets. Beginning with the first street on the list of each district, we then wrote to the residents of the selected pool with an address in that street and asked them to participate in the study. This procedure was intended to be similar to a conventional random walk method, but with two distinct advantages. First, the sampling procedure employed in the current study avoids a possible selection of people who are more likely to be at home when the interviewer arrives at the home of the potential interviewees. Second, there was no need to ring door bells without previous warning, which may have been difficult in the cultural context of Camerino. The procedure was to be continued until the planned sample size of 200 interviewees was reached.

Measures

Socio-demographic characteristics (gender, age, school education, living situation, employment status) were recorded on a structured questionnaire. The experience of stressful events before, during and after the earthquake was assessed on a list of 28 potentially stressful events. The list is based on, and similar to, other methods used to assess trauma exposure [33, 34, 42]. It assesses whether or not a participant had experienced any of 28 potentially traumatic

events. For each of the experienced events we asked participants to rate the level of distress at the time. For this we used a five-point Likert type rating scale ranging from 0 (not distressed at all) to 4 (extremely distressed).

Current mental disorders and life time PTSD (since the earthquake) were assessed using the Mini International Neuropsychiatric Interview (MINI) [39], which is a structured diagnostic interview assessing the symptom criteria used in the Diagnostic and Statistical Manual of Mental Disorders IV [1]. The MINI was validated by a cross-national study involving more than 600 subjects [39], and it has been found to be valid and reliable overall when measured against the much longer Composite International Diagnostic Interview (CIDI) [22] and the Structured Clinical Interview for DSM-III-R Patients (SCID-P) [38]. The reliability of the interview has been demonstrated in Italy [37] as well as other cultures [17, 31].

For a self-rating of general symptoms of mental distress we used the Brief Symptom Inventory [10], which is a 53-item scale measuring psychological symptoms comprising of nine subscales. In this study, we used the Global Severity Index (GSI) of the BSI, which is a measure of overall psychological distress level. It corresponds to the sum of the 53 items divided by the number of items of the scale.

Symptoms of post-traumatic stress were self-rated on the Impact of Event Scale-Revised (IES-R) [41] a 22-item scale measuring three core phenomena of PTSD, i.e., re-experiencing of traumatic events, defensive avoidance and denial of trauma related memories and emotions, and hyperarousal. In this study, the total score of the scale was used.

Subjective quality of life (SQOL) was assessed on the Manchester Short Assessment of Quality of Life (MANSA) [36] and defined as the mean score of 12 satisfaction ratings with different life domains and life in general. Each item is rated on a Likert type scale ranging from 1 (lowest satisfaction) to 7 (highest satisfaction) with 4 as a neutral middle point. The method is similar to the Quality of Life Interview and the Lancashire Quality of Life Profile [29]. It has been previously applied in studies on various clinical and non-clinical populations, including samples with post-traumatic stress [9].

Procedure

Potential interviewees were sent a letter explaining the study and asking for consent to be interviewed. This was followed up by attempts to contact the person 1 week after the letter was sent. Up to three attempts were made at different times of the day to contact the person, and interviews were arranged at a convenient place for the interviewee. Chosen places included the home of the

interviewee, their place of work, the academic institution at Camerino and a bar.

The interviewers (F.M. and L.B.) were qualified psychologists who are trained in administering the instruments of the study. The supervision of the researchers and quality control procedures were linked to a larger study on mental disorders in refugees [33, 34] and organised by the Italian centre of the study at the Department of Psychiatry at the University of Modena and Reggio Emilia.

The interviews were conducted between April 2005 and December 2006.

The study was approved by the Ethics Committee of the University of Camerino.

Analysis

Descriptive statistics were used to analyse the distribution of the assessed variables. Then, univariate and multivariate regression analyses were carried out in order to identify potential predictors of current mental disorder (as assessed by the MINI), levels of psychological symptoms (as measured by the BSI and IES-R), and subjective quality of life (as assessed by the MANSA). The predictors entered into the regression were gender; age, years of school education, total monthly income, marital status, employment status, and stressful events.

Results

Recruitment and sample

Out of the pool of 633 potential interviewees, 600 were approached to reach the target sample size of 200. Eleven people did not fulfil the inclusion criteria, 120 could not be contacted, and 269 did not consent to participate. Assuming that all of the 120 potential participants who could not be contacted also met the inclusion criteria, the response rate was 34%. Considering only those people who were contacted and met the inclusion criteria, the response rate was 43%.

Table 1 summarises the socio-demographic characteristics of the sample.

There were more men than women in the sample, and the majority of participants lived with a partner and were in paid employment. All participants reported direct experience of the earthquake. During and in the immediate aftermath of the earthquake, 113 interviewees (56.5%) had provided assistance to other people (helping them escape from buildings, providing first aid and immediate support, or pulling them out from rubble). The distress linked to this experience was described as low by 7 (6.2% of those who had the

Table 1 Characteristics of the sample

Variable	Earthquake (<i>N</i> = 200)			
	<i>N</i>	%	<i>M</i>	<i>SD</i>
<i>Age</i>				
Total			45.68	10.7
≤30	19	9.5		
31–40	51	25.5		
41–50	52	26		
51–60	60	30		
61–65	18	9		
<i>Gender</i>				
Female	83	41.5		
Male	117	58.5		
<i>Marital status</i>				
Single	42	21		
Married	151	75.5		
Divorced	3	1.5		
Cohabitation	4	2		
Widowed	0	0		
<i>Number of children</i>				
Total			1.1	0.9
<i>People who they live with</i>				
Alone	15	7.5		
Partner	154	77		
Parents	39	19.5		
Other	19	9.5		
Children under 18	72	36		
Children over 18	60	30		
<i>Years of school</i>				
≤10	38	19	13.84	3.88
11–15	89	44.5		
≥16	73	36.5		
<i>Employment status</i>				
Employed	165	82.5		
Student	7	3.5		
Retired	19	9.5		
Unemployed	4	2.0		
Other	5	2.5		
<i>Accommodation</i>				
Own house/flat	158	79		
Rented house/flat	13	6.5		
At parents	25	12.5		
Council house	1	0.5		
Other	2	1		

experience), moderate by 27 (23.9%), severe by 56 (49.6%) and extreme by 23 (20.4%) participants. Also, 56 interviewees (28%) had to leave their home and were temporarily housed elsewhere. The resulting distress was described as

Table 2 Frequencies of mental health disorder, as measured by the MINI

Mini-current diagnosis (<i>N</i> = 200)	Frequency	%
Major depressive episode	9	4.5
Dysthymia	3	1.5
Suicidality	0	0.0
Manic episode	1	0.5
Panic disorder	1	0.5
Agoraphobia	1	0.5
Social phobia	1	0.5
Obsessive-compulsive disorder	1	0.5
PTSD (current)	1	0.5
PTSD (past)	5	2.5
Alcohol dependence	0	0.0
Substance dependence	0	0.0
Psychotic disorder	0	0.0
Generalised anxiety disorder	10	5.0
Anti-social personality disorder	2	1.0
Somatisation disorder	1	0.5

low or moderate by 8 (14.3% of those who had the experience), severe by 27 (48.2%) and extreme by 21 (37.5%).

Mental disorders

The mental disorders at the time of the interview, as assessed on the MINI, are shown in Table 2.

Of 200 interviewees, only 1 met the criteria for current PTSD on the MINI, yielding a prevalence rate of 0.5%. The 95% confidence interval for the prevalence of current PTSD was 0–4.99%. Five interviewees met the criteria for past PTSD (2.5%). Ten interviewees were diagnosed as having a generalised anxiety disorder (5.0%) and 9 a major depressive episode (4.5%). All other current diagnoses had a frequency of 3 or lower. Considering co-morbidity 15 (7.5%) participants had one mental disorder, five (2.5%) participants had two disorders, and one participant each had three and four disorders.

Symptoms and subjective quality of life

The mean scores on the GSI of the BSI were 0.29 (SD = 0.30) and 0.40 (SD = 3.33) on the IES-R, which reflect low symptom levels. The mean score on the MANSAs was 5.26 (SD = 0.59).

Factors associated with mental disorders, symptoms and subjective quality of life

Because of the low prevalence of the disorders, we did not attempt a statistical analysis of factors associated with any

specific current disorder and took the existence of any current disorder as dependent variable. Nevertheless, all dependent variables other than MANSA were strongly skewed, because of the low prevalence of disorders and the low symptom levels. In multivariate regression analyses, none of the tested predictors statistically contributed to the existence of a current mental disorder, the BSI score or the IES-R score.

Unlike the other dependent variables, the MANSA score showed an almost normal distribution. Out of all tested factors, only gender statistically contributed to the MANSA score in the multivariate analysis, whereby being men significantly contributed to higher SQOL. The number of stressful experiences during the earthquake was not a significant predictor of any of the outcomes, when the influence of other factors was controlled for, as in the multivariate regression analysis.

Discussion

Main findings

The study assessed mental disorders, psychological symptoms and SQOL in a community sample 8 years after an earthquake, applying a random sampling method. The findings are clear: the prevalence of mental disorders and levels of symptoms are low, and the mean SQOL is positive as compared to other samples in the literature [14, 15]. We found not only a very low prevalence of PTSD as a disorder, but also hardly any PTSD symptoms related to the experience of the earthquake.

The overall prevalence rate of mental disorders in the current study is slightly higher than the point prevalence rates in two surveys of psychiatric disorders in Italy [11, 12]. One of them used different methods to assess mental disorders [11]. The other one used the same instrument, i.e. the MINI, to assess mental disorders, but was conducted in an urban area [12]. However, the differences between the rates found in this study and other existing surveys in Italy are very small, and the rates can be considered as similar. In another study assessing PTSD symptoms 10 years after exposure to an earthquake in Italy [3], 30% of respondents reported such symptoms. The earthquake had been more devastating than the one in Camerino and the assessment of PTSD symptoms was based on a positive answer to only one of two rather broad questions on troubled thoughts and bad dreams about the event. This resulted in the relatively high prevalence of PTSD symptoms, whilst PTSD as a diagnostic category was not assessed.

In this study, the experience of stressful events was not significantly linked with any of the outcomes tested in

multivariate analyses. We therefore did not provide evidence that the earthquake at Camerino led to increased levels of mental disorders or psychological distress 8 years later. In particular, we did not find an increased prevalence of PTSD or raised levels of post-traumatic stress symptoms.

Strengths and limitations

The study was conducted in a small Italian town, which reduces the potential variance due to urban–rural differences or geographical spreads that many other surveys encounter. All participants had experienced the same earthquake at the same place, and the recruitment 8 years later used a random sampling method. Mental disorders and other outcomes were assessed on established and validated instruments, and all participants were interviewed face to face by qualified psychologists.

Despite these methodological strengths, the study also has shortcomings. (1) The random sampling method was rigorously applied, but we achieved a response rate of only 43% of all people who were contacted and met the inclusion criteria. Considering those who we failed to contact, the response rate was only 34%. Non-respondents might have reported higher [20] or even lower rates [13] of mental disorders and levels of distress, which remains unknown for this study. (2) The prevalence of mental disorders and the level of current symptoms were low, so that it was difficult to explore factors associated with mental disorders and symptoms in the statistical analysis. The results of these analyses should therefore be interpreted with caution. Whilst the overall sample size of 200 may be seen as sufficient for an estimate of prevalence rates, much larger samples would have been required to identify predictors of so infrequent disorders. (3) As in all studies of this type, memory bias might influence findings on a possible association between traumatic events in the past and current mental disorders, and recalling stressful events that happened 8 years before the interview with accuracy may be particularly difficult. Yet, such memory bias has usually been found to overestimate the association between stress in the past and current distress [26, 40]. Since we did not find any evidence for such an association in this study, memory bias might be less relevant for the interpretation of this study.

Explanations

There are at least three possible explanations for the absence of evidence regarding negative long-term mental health consequences of the earthquake, and these are not mutually exclusive.

1. The earthquake in Camerino may have been too weak to have a long-term impact on mental health. Although buildings collapsed and some people were killed in neighbouring areas, nobody died in Camerino itself, and it is possible that only stronger earthquakes might affect individuals' mental health in the long term. One can argue that there may be a threshold below which earthquakes do not have a long-term effect on mental health and the earthquake in Camerino did not reach that threshold. However, according to the definition of traumatic events that may lead to PTSD, the person has to experience a threat to the physical integrity involving fear or horror [1]. When one has to escape from a collapsing building, these criteria may be fulfilled no matter what happens to other people in the same area and at the same time. Also, more than 50% of the sample reported specific potentially traumatic experiences (e.g. assisting other people to escape), which was described as extremely distressful by about 20% of those who had the experience. It is therefore difficult to conclude that the earthquake in Camerino simply was not strong enough. Yet, events of a really traumatic nature in Camerino may have affected too small a number of people so that larger studies would be required to identify the consequences on a population level [5].
2. The strong social cohesion of a rural community in Italy might have prevented mental disorders [32] or helped overcome them within the long period of 8 years since the event. A study screening for PTSD 6 months after an earthquake in a neighbouring region in central Italy estimated a PTSD prevalence of 14.3% [35], which is also lower than rates found in studies elsewhere [3, 4]. Thus, there may be specific factors in the community strengthening resilience and fostering effective coping. The high levels of SQOL of the participants in this study may be a sign of positive potentials and resources of people living in such a community.
3. There is some evidence suggesting that natural disasters have less impact on mental health than man-made ones. Earthquakes are natural disasters. Their precise occurrence can be difficult to anticipate and they can have devastating effects. Yet, the quakes and their consequences might be perceived as an inevitable part of human life, particularly in regions like central Italy, where they have frequently happened in the past. The region of Camerino is a high-risk area for earthquakes and, thus, it is likely that people are better prepared to deal with these events as compared to non-risk areas, which in turn might reduce the potential traumatic effect of the earthquake.

Implications

Earthquakes are disasters requiring humanitarian and practical help for the affected populations. Such help may include psychological support, particularly for more vulnerable people. However, the findings of this study do not support the case for intervention policies that focus on the prevention of negative long-term effects on people's mental health, at least not after less devastating earthquakes and in communities with a high level of cohesion and mutual support.

The challenges for research are to replicate these findings following stronger earthquakes and in different social contexts, and to explore the factors within individuals and communities that help maintain or restore people's mental health over long periods of time following natural disasters.

Acknowledgments We thank Dr Iolanda Grappasonni and Dr Fabio Petrelli from the University of Camerino (Italy) and Dr Massimo Mari from the Department of Mental Health at Jesi (Italy) for their support of the study.

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