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Behavioural, emotional, and cognitive responses in European disasters: Results of survivor interviews

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Running head: Interviews with survivors of disasters

Abstract

In the European multi-centre study BeSeCu, interviews in seven countries were conducted in order to explore emotional, behavioural and cognitive responses during disasters as experienced by survivors. Interviews (either in groups or one-to-one) were run by type of event: terror attack, fire, collapse of a building, earthquake and flood. While the environmental cues and ability to recognise what was happening varied in different disasters, survivor responses tended to be more universal across events, and were most often adaptive and non-selfish. Several peritraumatic factors related to current levels of posttraumatic stress were identified, while memory quantity did not differ as a function of event type or posttraumatic stress. Time since event had a small effect on what was recalled. Based on the findings, suggestions for emergency training are made.

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Introduction

In the past decade (2000–09), 899 natural and technological disasters have occurred in Europe, claiming the lives of 89,317 people and affecting 9,196,702 people.² Among the most common events in Europe are natural disasters,³ with more notable recent cases including the floods in the Czech Republic and Germany in 2002 and the floods in Poland in 2010, as well as the Marmara earthquake in Turkey in 1999 and the L’Aquila earthquake in Italy in 2009. In addition, Europe has seen some high profile man-made disasters, such as the bombings in Madrid, Spain, in 2004 and in London, United Kingdom, in 2005. Since these terror attacks and those in the United States on 11 September 2001, public awareness of man-made disasters has increased in Europe (Grimm, Schmidt and Hulse, 2009). Coupled with the incidence rates, this suggests a mounting need for disaster research/emergency psychology in Europe. This is especially true given that studies are revealing several misconceptions about the types of responses that emergencies evoke in people. For example, a number of widely-held beliefs among the public and the media have been shown to be incorrect, such as that looting, mass panic, and selfish behaviour are common in disasters, and should be abandoned in favour of realistic, proactive emergency knowledge (Alexander, 2007; Prati, Catufi, and Pietrantonio, 2012). By understanding better what actions people actually take and their thought processes as an emergency unfolds, members of the public and emergency personnel will be better equipped to deal with a disaster, and the economic, physical, and psychological consequences of such events can be mitigated. Pinpointing and comprehending emotional responses relevant to counterproductive behaviour during disasters and the development of subsequent psychological distress will also aid the public and professionals, both during and after an incident.

² See <http://www.emdat.be>.

³ See <http://www.emdat.be>.

One fruitful approach to identifying actual human behaviour, as well as emotional and cognitive processing, in disasters is to examine the retrospective narratives of survivors. Sotgiu and Galati (2007) asked survivors about their experience during the flood in Italy in 2000 and found that participants remembered well the emergency phase and reported a variety of emotions, such as fear, sadness, and surprise. Prati, Catufi, and Pietrantonio (2012) noted similar emotional responses by survivors of earthquakes in Italy, and highlighted the main coping responses during the earthquake: flight; freeze; seek shelter; no reaction, because the individual did not realise what was happening; look for relatives and try to protect them; seek additional information from the social environment; and completion of previous activities. Pro-social behaviours were common and looting did not occur. These studies suggest that the most frequently experienced emotions and behaviours in disasters may be adaptive (for instance, to fear life-threatening stimuli and to look for ways to avoid or limit the negative consequences) and non-selfish. They suggest, too, that responses may depend on a person's ability and/or need to recognise and make sense of cues to the life-threatening stimuli. The current study sought to complement this field of research by widening the focus to include survivors' accounts from a variety of European natural and man-made disasters, assessing the behaviours, emotions, and cognitions described therein.

When including survivors' descriptions of events, one must consider functions of memory. There is reason to believe that many details of disasters will be recalled to good effect by the people who experienced them firsthand, even when a number of years have passed. Studies in forensic and cognitive psychology, gauging the accuracy and consistency of eyewitness reports of emotional events, have shown that arousal enhances remembering of situations (Christianson, 1992; van Giezen et al., 2005; Hulse et al., 2007). In the case of natural disasters, emotional involvement and exposure to an earthquake has been associated with improved recall of the event itself (Neisser, 1996), in comparison only to seeing the event on television (Er, 2000). Furthermore, disaster-related interviews about Hurricane Hugo

(1989) and Hurricane Andrew (1992) have revealed remarkable memory stability over time (Norris and Kaniasty, 1992; Bahrack et al., 1998; Fivush et al., 2004). However, while exposure to and greater involvement in emergency events that produce heightened emotional states may help to enhance memory, such experiences may also contribute to the development of post-traumatic stress symptoms in some individuals (Bernat et al., 1998). Post-traumatic stress, conversely, is linked to impaired memory functions. For example, post-traumatic stress disorder (PTSD) sufferers may find that certain aspects of the traumatic event come to mind easily and vividly while other details are difficult to recollect intentionally in sequence or at all (Halligan et al., 2003). In addition, there is evidence that the memories of persons who suffer PTSD about the traumatic events are disjointed from autobiographical memory and feature different characteristics, such as sensory components or the feeling that the memory is not in the past but is happening 'here and now' (Kleim, Wallott, and Ehlers, 2008). Consequently, it is important to take into account the presence of post-traumatic stress symptoms in survivors when examining how they recall their disaster experience.

Apart from memory function, post-traumatic stress after a disaster experience is closely related to survivors' peri-traumatic responses. Studies have shown that post-traumatic stress symptoms are best predicted by peri-traumatic factors, such as emotions and cognitions displayed by survivors during the event (Ozer et al., 2003), including negative feelings and perceived threats (Brunet et al., 2001), dissociation (Marmar et al., 1994), and physiological factors related to a panic attack (Fikretoglu et al., 2006). However, while the influence of peri-traumatic emotional and cognitive processing on post-traumatic outcome is well-established, to our knowledge no studies have investigated the relationship between peri-traumatic behavioural responses and post-traumatic stress. The Cognitive Model of PTSD of Ehlers and Clark (2000) suggests that PTSD sufferers are likely to apply dysfunctional cognitive strategies after experiencing the traumatic event. Following this approach, one can assume that counterproductive behaviour during the traumatic situation will be more likely to lead to

the development and maintenance of PTSD symptoms, as PTSD sufferers generalise the behaviour displayed in the traumatic situation to their general behaviour in their everyday lives. We believe, therefore, that there is reason to investigate the relationship between peri-traumatic behaviour and the development of post-traumatic distress.

The following exploratory study aimed to collect accounts from survivors of a wide range of European natural and man-made disasters using a standardised interview procedure, as well as to identify which kinds of behavioural, emotional, and cognitive responses were displayed. An evaluation was performed to investigate whether these responses were related to (i) the type of disaster and (ii) levels of post-traumatic stress, while (iii) taking memory functions into account.

As studies of a single natural hazard (that is, an earthquake or a flood) have reported similar, adaptive responses (Sotgiu and Galati, 2007; Prati, Catufi, and Pietrantonio, 2012), the current study examined if survivor responses displayed in different types of natural and man-made disasters would be similar or if they would be specific to the incidents. Accounts were grouped according to the type of disaster experienced. It was expected that survivor responses, while featuring some differences across different disasters according to the incident-related cues of specific situations, would nevertheless be adaptive.

The influence of current level of post-traumatic stress was assessed and accounts from participants with lower post-traumatic stress were compared to accounts from participants with higher post-traumatic stress. Retrospective assessments of the intensities of peri-traumatic emotions and cognitions have revealed differences related to the level of trauma (Brunet et al., 2001; Basoglu, Salcioglu, and Livanou, 2002; Ozer et al., 2003; Basoglu et al., 2004), hence we expected not just emotional and cognitive responses to differ but also peri-traumatic behaviour, including the way of reacting (for example, instinctive, rational, resigned) or discrete actions such as actively rescuing oneself or others, to differ as a function of post-traumatic stress.

Finally, possible confounds had to be considered in the analysis: differences in the accounts between groups with high and low levels of post-traumatic stress might also arise from memory functions. Thus, the quantity of information recalled by both groups was compared. To consider further the effects influencing the reliability of the analysis, memory retrieval as a function of time passed since the event was investigated. Although autobiographical memory for emotionally arousing events is meant to be relatively stable owing to characteristics such as distinctiveness, sudden occurrence, or repeated reporting of the incident (because of public interest) (Pohl, 2007), we decided nevertheless to assess the time factor in our sample. Also of interest was whether the interview would generate similar levels of detail for all types of disasters and hence differences in memory quantity/reporting units were compared across events. It was believed that no differences in memory/reporting quantity would be a positive outcome vis-à-vis the reliability and validity of the analysis.

Methods

The study described in this paper is part of a larger cross-cultural multi-centre research project called BeSeCu (Behaviour, Security, Culture), with participating centres in: Barcelona, Spain; Greifswald and Hamburg, Germany; Izmir, Turkey; London, UK; Prague, Czech Republic; Stockholm, Sweden; and Warsaw, Poland. It was approved by all national institutional ethics committees.

Events

Of interest were emergency events with the following characteristics: (a) they occurred within approximately 10 years of the interview, concentrated in a particular time and space; (b) they concerned an identifiable hazard that posed a physical threat but of a non-infectious kind (that is, excluding emergencies such as epidemics); (c) a threat was posed to lives and/or property (with the lives and/or property being many, such as a large number of people in a

single structure or smaller groups of people located across a number of nearby structures); (d) the emergency services attended the scene; and (e) a full or partial evacuation of the affected structure(s) was attempted, either by the victims or by official agents. Numerous events in the countries of the participating centres met the above criteria, notably: the discotheque fire in Gothenburg, Sweden, in 1998 and a fire in a hospital in Hamburg, Germany, in 2007; the earthquake in Marmara, Turkey, in 1999; the floods in the Czech Republic in 2002; the 7 July bombings in London, UK, in 2005; and the collapse of the roof of the Katowice Trade Hall in Poland and of a multi-storey residential building in Spain in 2006. The bombings in Mumbai, India, in 2008 also were of interest as several German tourists were caught up in them.

Participants

Individual recruitment occurred in each centre, using word-of-mouth and advertising campaigns conducted via the emergency services, the media, and self-help groups. Adult survivors were invited to contact the researchers if they wished to take part in an interview. Participation was restricted to persons who had experienced directly the emergency event—bystanders and relatives of victims were excluded. Also excluded were persons who had survived incidents that turned out not to match all of the aforementioned event characteristics. From a total of 134 persons who voluntarily participated in the study, 125 were included in the analysis, with approximately equal numbers of females (52.8 per cent) and males (47.2 per cent). Nine per cent of participants had a migrant background, but no significant differences were found between migrants and natives with regard to age, education, gender, and type of event. Thus, migrant status is not discussed further in this paper. The socio-demographic, incident-related characteristics, and Impact of Event Scale-Revised (IES-R) total mean (M) scores of participants are reported in Table 1.

Instruments

Interview. A semi-structured interview was designed by an intercultural and interdisciplinary team of experts, including emergency physicians, fire-fighters and fire-safety engineers, psychotherapists specialised in trauma, and scientists. The interview involved techniques from a cognitive interview (Fisher and Geiselman, 1992), such as asking participants mentally to reinstate the context and to start with an uninterrupted free narrative. Cognitive interview techniques have been shown to enhance the recall of event details (Köhnken et al., 1999). The narrative was followed by probing questions that focused on four main themes: Eight questions were asked about the ‘initial context’ (such as the setting and recognition/realisation that an emergency was occurring); thirteen questions were asked about the ‘emergency phase’ (when survivors and others began to respond to the emergency—details about evacuation, emergency services’ interventions, and reactions); three questions were asked about emotional processing; and four questions were asked about cognitive appraisal (such as risk perception, self-efficacy) during the disaster.

Questionnaires. Two questionnaires were administered. The first asked participants for socio-demographic information (such as age and gender) and incident details (such as date and duration). The second was a validated national version of the IES-R (Weiss and Marmar, 1997; Maercker and Schützwohl, 1998; Baguena et al., 2001; Preiss et al., 2004; Corapcioglu et al., 2006; Juczyński and Ogińska-Bulik, 2009; Sveen et al., 2010). The IES-R is a commonly used self-report measure that assesses post-traumatic stress symptomatology in the past seven days and possesses satisfactory psychometric properties (Joseph, 2000; Sundin and Horowitz, 2003). Although the IES-R usually is applied to more recent events than those studied here, it was administered because to the best of our knowledge there is no comparable, cross-culturally validated instrument that can be applied to any specific life-event (such as different types of disasters).

Procedure

Participants were first asked to complete the two questionnaires pertaining to the disaster that they would go on to describe. Then they were interviewed. Interviews were conducted either in groups (such as dyads or triads, mini-groups, or in groupings by kind of event) or on a one-to-one basis. One-to-one interviews generally were chosen when the event was particularly traumatic or sensitive. Overall, 29 group interviews and 12 one-to-one interviews were held across the centres. All of the interviews were led by experienced psychologists and recorded on audiotape or videotape with the participants' consent. The average duration of an interview was 90 minutes. Interviewers were vigilant to signs of upset and participants were informed from the outset that they could take a break or withdraw from the study altogether if they so wished.

Data analysis

Content analysis. Interviews were transcribed verbatim according to transcribing guidelines. At an international workshop, a theoretical framework based on statements from each country and each event was designed in order to conduct a content analysis. Statements were assessed per interview. Content analyses were performed in each country separately with two independent coders. The quantity of categories was assessed across all interviews at the final data-checking stage by the coordinating centre. Statements given by participants were classified into course of event (initial context and emergency phase) and emotional and cognitive processing of the event. Analysis revealed the following dimensions: recognition/realisation, interpretation, reaction, evacuation decision, evacuation process, emotion, self-efficacy, risk perception, worst moment, and improvement (see Table 2). As the information given was very rich, dimensions had to be divided into domains and then into categories. Considering the scope of this paper, only an overview of the most common dimensions, domains, and categories for the initial context and emergency phase of the

disaster and the emotional and cognitive processing of the event are presented in the results section below.

Inter-coder reliability. For the assessment of inter-coder reliability, an international team of three centres was established (Lauf, 2001). The coding process was evaluated in one step from identifying relevant talk in the full transcript until final choice of categories according to the theoretical framework. Reliability of data was calculated with Krippendorff's alpha (Krippendorff, 2004). The advantages of using Krippendorff's alpha are the ability to deal with small sample sizes and multiple coders as well as its accommodation of and comparability to all common scales of measurement. One should note that inter-coder reliability was higher when conducting it in national centres, 0.91, yet still sufficient in bi-national ratings, 0.79 and 0.80. Inter-coder reliability for dimensions varied across transcripts (see Table 3). The dimensions interpretation, evacuation process, and worst moment were especially high. Other dimensions varied across transcripts with sufficient ratings. Only in the dimension evacuation decision was inter-coder reliability not sufficiently high, so the validity of data for this dimension cannot be assumed.

Statistical analysis. The content analysis produced dichotomous nominal data. To assess the influence of post-traumatic stress and type of event on survivor accounts, Chi-squared tests were conducted. In addition, the effect sizes Cramer's V and Cramer's Phi were calculated for type of event and post-traumatic stress, respectively. There were no missing cases for the condition type of event. Missing cases on the IES-R (four single items) were imputed using a regression model (conditional mean imputation) (Schafer and Graham, 2002). The IES-R was used to group participants with high and low post-traumatic stress by a cut-off of the total IES-R score of 33, as suggested by Creamer, Bell, and Faila (2003). Group interviews were ranked in the high-stress condition if the mean scores of all participants were above the cut-

off score, and vice versa for the low-stress group. Since not all of the focus groups could be grouped clearly, analyses involving post-traumatic stress include 15 of the 29 group interviews and all of the one-to-one interviews. The influence of post-traumatic stress, time elapsed since the event, and type of event on memory retrieval/reporting units was evaluated with T-tests, correlations, and analysis of variance (ANOVA) tests, respectively. The partial eta squared and Cohen's *d* of the effect sizes were calculated for type of event and post-traumatic stress, respectively. All statistical data analyses were conducted with PASW Statistics 18.0.

Results

Behavioural, emotional, and cognitive responses

Participants' responses are illustrated in Tables 4 and 5. As can be seen, the most commonly reported behavioural response to a disaster was a supportive one. Many participants reported people helping each other through the incident. Actions taken to save other people's lives were also common. After these altruistic acts, the next most commonly reported behaviours were preparing for evacuation and seeking information.

With regard to how participants felt during the disaster, fear and panic were the two most commonly reported emotions, with nervousness coming third. Next, participants reported experiencing physiological reactions, such as palpitations, and feelings of derealisation or dissociation. Their thoughts appeared to centre largely on the threat posed, with the most commonly reported cognition being the perception of high risk. However, participants also reported what went through their mind when they were initially presented with cues to the emergency, whether these were from the environment or from other people. Cognitions in this phase focused most frequently on their understanding of what was happening and whether they estimated the seriousness of the situation appropriately.

Also of interest was the way of reacting. Three methods were reported. First, participants reporting instinctive reactions described automatic responses. They said that they just reacted during the event; they did not think about what to do next, nor did they reflect on emotional or cognitive states or plan their behaviour. Second, participants reporting a rational way of reacting stayed calm, and anticipated possible actions in the given situation and their consequences. Moreover, they were proactive for the most part in trying to manage an evacuation/rescue. In all, there was little difference between whether participants reported reacting in an instinctive or in a rational way. Third, participants reporting resignation were convinced that they were at the mercy of the situation and were not able to influence the outcome; hence they did not react. Only a small percentage of survivors reported resignation.

Type of event and responses

As one might expect, how participants came to recognise the situation they faced differed across disasters. Smoke/flames/fire were reported in fires and terror attacks ($\text{Chi}^2(4,41)=23,01, p<0.001; V=0.37$) and an explosion in terror attacks and the collapse of a building ($\text{Chi}^2(4,41)=15,72, p<0.01; V=0.31$). Water was only mentioned as a cue in the flood condition ($\text{Chi}^2(4,41)=33,21, p<0.001; V=0.45$). The realisation of something unusual happening due to people shouting and noise was not related to any specific disaster ($\text{Chi}^2(4,41)=6,82, p=0.15; V=0.20$). Neither were participants more significantly informed by others in any specific incident ($\text{Chi}^2(4,41)=9,36, p=0.06; V=0.24$). Participants reported significantly more often their ability to recognise/realise their situation being impaired, mainly through being asleep, during the initial phase of the collapse of buildings ($\text{Chi}^2(4,41)=12,01, p<0.05; V=0.27$). The correct interpretation of the disaster usually was made in fires and earthquakes ($\text{Chi}^2(4,41)=14,49, p<0.01; V=0.30$). Underestimation of seriousness was primarily reported in floods ($\text{Chi}^2(4,41)=14,29, p<0.01; V=0.29$).

In relation to reactions, neither instinctive nor rational reactions were related to specific incidents with $\text{Chi}^2(4,41)=4,32, p=0.36; V=0.16$ and $\text{Chi}^2(4,41)=7,12, p=0.13; V=0.21$, respectively. In addition, resignation was not related to any specific incident ($\text{Chi}^2(4,41)=3,81, p=0.43; V=0.15$). Supportive behaviour was reported in all cases except for fires ($\text{Chi}^2(4,41)=16,28, p<0.01; V=0.31$). Saving family and friends was reported more often in domestic or professional settings, such as in a collapse of a building, an earthquake, a fire, and a flood than in public places such as during terror attacks ($\text{Chi}^2(4,41)=10,06, p<0.05; V=0.25$). Preparation for evacuation was not related to any event ($\text{Chi}^2(4,41)=7,04, p=0.13; V=0.21$), and seeking information was independent of the disaster participants were experiencing ($\text{Chi}^2(4,41)=3,50, p=0.48; V=0.15$).

With regard to emotional and cognitive processing, fear, nervousness, panic, dissociation/ derealisation and physiological reactions were not related to specific incidents with $\text{Chi}^2(4,41)=3,24, p=0.52; V=0.14$, $\text{Chi}^2(4,41)=4,57, p=0.33; V=0.17$, $\text{Chi}^2(4,41)=3,24, p=0.52; V=0.14$, $\text{Chi}^2(4,41)=8,51, p=0.07; V=0.23$, and $\text{Chi}^2(4,41)=8,45, p=0.08; V=0.23$, respectively. Although a high level of perceived risk was not related to any incident ($\text{Chi}^2(4,41)=4,87, p=0.30; V=0.17$), a low level of perceived risk was reported significantly more in fires ($\text{Chi}^2(4,41)=10,93, p<0.05; V=0.26$).

The effect sizes of significant results ranged from $V=0.25$ to $V=0.45$ and for insignificant results from $V=0.14$ to $V=0.24$.

Post-traumatic stress and responses

Experiencing an explosion and being impaired at the initial stage of the disaster was reported significantly more often by the high post-traumatic stress group than by the low post-traumatic stress group (see Table 4). The only behavioural responses that differed according to current levels of post-traumatic stress were preparing for evacuation and seeking information: participants in the low post-traumatic stress group reported these behaviours

significantly more often than those in the high post-traumatic stress group. Regarding emotional and cognitive responses, the high post-traumatic stress group reported significantly more experience of derealisation/dissociation and physiological reactions than did the low post-traumatic stress group. The low post-traumatic stress group in turn reported significantly more often low perceived risk (see Table 5). No other significant differences were found as a function of post-traumatic stress. Effect sizes of significant results ranged from $\Phi=0.37$ to $\Phi=0.47$; effect sizes for insignificant results ranged from $\Phi=0.02$ to $\Phi=0.37$.

Effects on memory quantity

On average, 31.51 (SD=6.64) statements were given per interview. Considering different stages of the disaster per interview, about the initial context of the event a mean of 5.76 (SD = 1.73) statements were given. About the emergency phase of the disaster, more than twice as many statements were given (M=13.49, SD= 3.23). A mean of 2.73 (SD=1.25) statements were given about emotions and 5.76 (SD = 2.59) about cognitions (self-efficacy and risk perception).

One-way ANOVAs indicated no significant main effect of the type of disaster for the memory quantity measured in the amount of overall statements ($F(4,40)=1.08, p=0.38; \eta^2=0.15$), but also not for the different stages of the event, such as the initial context ($F(4,40)=0.74, p=0.57; \eta^2=0.09$), emergency phase ($F(4,40)=1.55, p=0.21; \eta^2=0.21$), emotional ($F(4,40)=0.47, p=0.76; \eta^2=0.07$), or cognitive processing ($F(4,40)=2.09, p=0.10; \eta^2=0.16$). Nor did post-traumatic stress have any significant effect on the amount of statements reported overall ($T=-0.49, p=0.63; d=0.19$) and on the initial context ($T=1.69, p=0.10; d=0.72$), emergency phase ($T=-1.08, p=0.29; d=0.26$), emotional ($T=1.58, p=0.13; d=0.59$), or cognitive processing ($T=-0.49, p=0.62; d=0.10$). Finally, no significant relationship was found between the time since the event and the amount reported in the interviews overall ($r=0.03, p=0.86$) and with respect to the about emergency phase ($r=0.03, p=0.87$), emotional

($r=0.06$, $p=0.71$), or cognitive processing ($r=0.21$, $p=0.19$). A significant negative correlation was found only for the time passed since the incident and the statements given by participants about the initial context ($r=-0.22$, $p<0.05$).

Discussion

This is the first explorative study to investigate behavioural, emotional, and cognitive responses during disasters using interviews with a wide sample of European disaster survivors. It was possible to assess the impacts of natural catastrophes (earthquakes and floods), man-made terror attacks, as well as fires and the collapse of buildings in one study with the same set of instruments. It was also possible to obtain detailed recollections despite the disasters occurring several years ago.

The main findings of this study confirm somewhat the indications from previous interviews with disaster survivors (Sotgiu and Galati, 2007; Prati, Catufi, and Pietrantonio, 2012): that the responses displayed by survivors during the event most often are adaptive, to an extent, and non-selfish. The most frequently reported emotions and cognitions were fear and the perception of high risk, while the most frequently reported behaviours were extending support to others and attempting to save lives. This shows that survivors had recognised the danger present, yet acted in ways that did not benefit their own survival. Of course, aiding others could be described as *maladaptive* behaviour—the consequences could be a delay to one's own evacuation and an increase in personal risk. However, one should bear in mind that, in some of the disasters sampled, such as the bombings in London in 2005, evacuation was not always a viable immediate option. Some survivors were trapped for an hour or more. Hence, the altruistic behaviour displayed did not necessarily jeopardise the survivors' personal well-being. Moreover, taking steps during the event to be with people and to aid their well-being conceivably could help reduce survivors' trauma both at the time (cf. social attachment model; Mawson, 2005) and in the long term (for example, minimise survivor

guilt). Therefore, a more detailed analysis of altruistic responses in disasters is relevant: are there specific circumstances when altruistic behaviour is displayed? Will altruistic behaviour stop at saving the core family or extend to saving strangers if they are also present? How do altruistic persons rate their own peri-traumatic risk? As there is obviously a need in humans not only to save their own lives but also to help others, the results of further investigations could be integrated into emergency training so that counterproductive attempts to rescue others are avoided and disaster victims apply the right strategies.

This study also supported the idea that survivors' responses may depend on one's ability/need to recognise and to make sense of cues to life-threatening stimuli. The detailed analysis of the content revealed that, despite the different disasters being highlighted by clear characteristics such as explosions, fire, flames, smoke, and water, in less than one-half of all interviews did participants report making the right interpretation of the cues. Furthermore, in about one-third of all interviews, participants were underestimating the seriousness of the event—compare this with the study of Prati, Catufi and Pietrantonio (2012) of the Umbria–Marche earthquake of 1997, when 10 per cent of survivors did not recognise or understand what was happening. The correct interpretation was more often made in the current study in relation to earthquakes and fires, which might be because of emergency trials and thus public knowledge about these situations or past experience of these disasters (Alexander, 1990). Underestimation of seriousness was reported by participants who had experienced a flood. The reason for this might be the long onset of the disaster, which in turn could lead to a delay in self-evacuation and increase the need for the emergency services to direct resources to rescue operations.

Based on these results, public security training should be tailored to specific disasters, instructing people in the unique characteristics of different events, thereby helping them to recognise the cues and the dangers attached to them more quickly, and boosting their understanding of how to react appropriately. The results also imply that further research needs

to be conducted with representative samples in a quantitative research setting, gathering survivor accounts of different types of disasters in order to generalise event-related cues across different events.

The reports of impairments (such as consumption of alcohol and sleeping through the initial cues) in this study, although few in comparison, suggest that there is also still room for improvement in warning systems and devices to facilitate swifter awareness of what is happening. A very challenging task in this field will be to improve rescue aids or evacuation strategies for people impaired owing to alcohol or drugs. The importance of a further investigation of states of impairment is underlined by the finding that this situation was identified more often in the group with higher levels of post-traumatic stress (cf. Ehlers and Clark, 2000). For medical and psychological support after disasters, it should be clarified if alcohol/drug consumption during the event could be classified as vulnerability criteria for the development of later psychological distress.

Leach (2004) divided human responses to disasters roughly into three groups, appearing in 10–15, 75, and 10–15 per cent of the population respectively: calm; reflexive, almost automatic; and counterproductive behaviour, adding to the victim's danger. In the current study there were almost an equal number of reports of instinctive and rational reactions, with no significant impact vis-à-vis type of disaster or level of post-traumatic stress. Similarly, reports of reacting with resignation did not occur according to type of disaster or level of post-traumatic stress. It is perhaps too early to conclude whether people react automatically/instinctively as opposed to with more controlled, conscious processing, or whether they are likely to just give up, depending more on the characteristics of the individual, independent of the situation, and later on emotional and cognitive states.

Future research with a larger sample to investigate ways of reacting in disasters would likely enhance understanding of the influence of peri-traumatic states on post-traumatic outcome. According to the Cognitive Model of PTSD (Ehlers and Clark, 2000), in particular,

PTSD sufferers tend to generalise from having no control during the disaster to having no control over their lives. Moreover, the influence of past experience of disasters and security training should be considered. Training in survival procedures is recommended in order to allow people to create memory schemas of actions in disasters and thus ease the appropriate response during disasters (see Leach, 2004). Furthermore, a classification of human responses during disasters might help emergency services to interact with survivors in relevant situations.

Despite some reports of resignation, among the most frequently reported behaviours were to prepare for evacuation and to seek information on the rescue, suggesting that many participants were optimistic of escaping the situation. Preparation for evacuation might indicate a delay in flight, especially in domestic settings if people cannot override the usual actions they might take before leaving their home (getting dressed and collecting one's keys and wallet, for instance) and therefore pose a threat to survival. However, survivors also reported interactions with rescue services and being told to prepare to leave their home while waiting for fire-fighters, in order to be guided out of the building using masks. In comparable situations immediate flight without professional assistance could have lethal consequences. It is interesting that both responses were reported more by participants with lower current post-traumatic stress. One might assume that actively planning for/assisting in the rescue gave survivors a feeling of control over the situation, which might have a positive effect on the development of post-traumatic stress symptoms. Indeed, there is research that has established a link between peri-traumatic helplessness and post-traumatic stress (Joseph et al., 1994) and so it should follow that a sense of not feeling helpless during the event would reduce the likelihood of developing post-traumatic stress.

While fear was a dominant emotion in the current study, reported across all types of disaster, 'panic' was reported just as frequently; much more than in other similar research (for instance, only eight per cent of participants reported panic in the Prati, Catufi and Pietrantonì

(2012) study of the Umbria–Marche earthquake). A clarification must be made, though: the participants in this study tended to use ‘panic’ in a colloquial way, meaning a negative form of excitement and an amplification of ‘fear’, rather than mass panic (see Dombrowsky and Pajonk, 2005), or psychological definitions of panic attacks in themselves or in others. From an analysis of the transcripts, the occurrence of a mass panic with fatalities can only be assumed on one occasion.

As well as reporting feelings, participants often referred to physiological reactions associated with heightened emotional states and the sense of dissociation. These phenomena were reported significantly more often by participants in the high post-traumatic stress group rather than in the low one. This would appear to complement results from a meta-analysis conducted by Ozer et al. (2003), which revealed that peri-traumatic variables were better predictors of PTSD than pre- or post-traumatic variables, and that peri-traumatic dissociation was the strongest predictor. Furthermore, Fikretoglu et al. (2006) found physiological symptoms of a panic attack during the traumatic event to be a good predictor of later post-traumatic distress. A relationship with post-traumatic stress would also be expected based on other research on this topic, concerning perceived life threat and fear (Basoglu, Salcioglu, and Livanou, 2002; Simeon et al., 2003; Basoglu et al., 2004). However, there is reason for caution: owing to the fact that only the occurrence and not the intensity of peri-traumatic states was collected, definitive relationships between fear/risk perception and post-traumatic stress cannot be derived from the above research. Findings involving retrospective ratings of the intensity of peri-traumatic emotional stress and risk perception and their influence on current PTSD symptoms in this sample are given elsewhere (see Grimm, Hulse, Preiss, and Schmidt, under revision); in brief, those findings demonstrated that the relationship between peri-traumatic and post-traumatic states is not necessarily straightforward.

Factors such as one’s ability to detect cues being initially impaired and exposure to certain types of cue were reported more often in groups with higher post-traumatic stress

symptomatology, but so too were the behavioural responses that occurred prior to evacuation. This study, then, established an initial link between peri-traumatic behaviour and post-traumatic stress. However, owing to the characteristics of the sample, such as its size, it is believed that further investigations of this topic with larger, representative samples will prove useful to understand better peri-traumatic behaviour, its interaction with peri-traumatic emotional and cognitive states across different types of disasters, and post-traumatic stress symptoms. Further investigation of the different components of both the situation and the individual responses to it will be beneficial for understanding of the development of post-traumatic stress following disasters. As disaster victims do not only suffer material losses or physical injuries, but also psychological distress after disasters (acute stress disorder, anxiety symptoms, depression, or PTSD), which cause a lot of damage to victims, families, and society, broad knowledge of disaster responses and vulnerability factors will lead to more effective post-disaster medical and psychological interventions.

A significant link between post-traumatic stress and the amount of information recalled was not found in this sample, either for the different phases of the disaster or for the overall reports. It would be premature to conclude from this that post-traumatic stress has no effect on memory of disaster experiences, as current experimental studies suggest that the traumatic memories of PTSD sufferers are disjointed from their autobiographical memories (Kleim, Wallott, and Ehlers, 2008). One must consider that the societal interest in disasters (such as sharing experiences with other victims, family members, friends, local authorities and/or the media) might enhance the consistency of reports. Indeed, disaster survivors have been found to show higher consistency of retrospective reports of peri-traumatic states in comparison to victims of physical abuse/assault (Ouimette, Read, and Brown, 2005). Owing to our recruitment strategy, it is possible that a self-selection bias might have hindered persons with disorganised or incomplete memories due to traumatic stress from taking part in the study. However, there was a significant difference in the amount recalled for the different

phases independent of level of post-traumatic stress. The initial context was less well remembered than the emergency phase, with more than twice as many statements being reported about the latter. This could simply be because of the fact that more probing questions were asked about the emergency phase in the interview than about the initial context. Nonetheless, this finding is consistent with that of Sotgiu and Galati (2007) and Bahrack et al. (1998) in their assessments of the memories of adult and child natural disaster survivors, respectively, suggesting that people do tend to recall best the most critical phase of an emergency event. That fewer statements were made comparatively speaking about emotional processing and cognitive appraisal likely reflects the fact that fewer questions were asked about these aspects than about the phases of the event, as well as that participants' emotions and thoughts of risk did not vary much as the event unfolded. To our knowledge, there is no other study that, to date, has compared the recall of the disaster phases with the recall of emotional processing and cognitive appraisal in a free narrative or prompted interview. Further research in this area is welcome to clarify the relationship between memory for these different aspects of a disaster experience.

No relationship between time since event and amount of information recalled was found, except for the amount recalled about the initial context. Here, more statements were given when the time between the event and the interview was shorter. Jones, Harvey, and Brewin (2007) found that trauma narratives, independent of the level of traumatic stress, became more coherent but also shorter over time. The finding of this study suggests that the information omitted over time may belong to a specific phase in the event (information about the setting, for example) rather than details scattered across the event, and further supports the idea that the more critical part of an emergency event is remembered best.

Finally, a few limitations of the qualitative and exploratory approach of this study have to be taken into account. Although the discussions were rich and illustrative, participants may have influenced each other. In addition, differences between one-to-one and group

interviews must be considered. However, to control group influence, numbers of statements were assessed per group and not per participant. The influence of the interviewer on the interview, regardless of whether it was a group interview or a one-to-one interview, was controlled as much as possible, as participating centres were instructed by a manual as well as via an international workshop before the endeavour. The study was designed to give first insights into narratives from a wider sample of survivors of different types of disasters; the different sample sizes per disaster were affected somewhat by the different incidence rates of each disaster type. This study does not claim that the responses of the participants are representative of all populations who experience these types of disasters. Nevertheless the behavioural, cognitive, and emotional responses identified here might assist in deriving research hypotheses for a broader quantitative setting.

In summary, the current study offers an overview of the most common responses to different natural and man-made disasters occurring in domestic and public settings in a wider European sample. Although participants reported that the environmental cues and the ability to recognise what was happening varied in the different disasters, behavioural, emotional, and cognitive responses tended to be more universal across events, and most often were adaptive and non-selfish. Several peri-traumatic factors related to current levels of post-traumatic stress were identified, while memory quantity was similar across event types and post-traumatic stress levels. Time since event had a small effect on what was recalled.

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Table 1. Socio-demographic and incident-related characteristics of participants

Characteristics	Number	Percentage
Participant		
Native	113	90.4
Migrant	12	9.6
Age (M, [SD])	48.01	[14.15]
Sex		
Male	59	47.2
Female	66	52.8
Education		
Primary	23	18.4
Secondary	44	35.2
Tertiary	35	28.0
Other	8	6.4
Total [missing]	110 [15]	88.0 [12.0]
Country		
Czech Republic	42	33.6
Turkey	19	15.2
Poland	16	12.6
Spain	15	12.8
Germany	14	11.2
UK	10	8.0
Sweden	9	7.2
Type of event		
Fire	52	41.6

Flood	35	28.0
Collapse of a building	16	12.8
Terrorist attack	12	9.6
Earthquake	10	8.0
Injuries to participants	32	25.6
Fatal casualties during the disaster	51	40.8
Damage to property of survivors	91	72.8
Time since event (M, [SD] in years)	4.06	[2.95]
Duration of event (M, [SD] in hours)	23.46	[52.51]
Impact of Event Scale-Revised (M, [SD])	32.19	[21.16]

Note: M= mean; SD = standard deviation.

Table 2. Theoretical framework resulting from content analysis with number of statements describing the different dimensions/domains

Dimension	Total number of statements
Course of the event (initial context and emergency phase)	
Recognition/realisation	137
Environmental cues: direct and indirect cues	82
Information	46
Impairment	9
Interpretation	65
Reaction	228
Way of reacting	44
Type of reaction	184
Evacuation decision	82
Evacuation process	207
Evacuation route	45
Way finding	41
Obstacles and challenges	61
Interactions	60
Improvement	91
Emotional and cognitive processing of the event	
Emotion	120
Fear and other fearful emotions	40
Detachment	13

Panic	40
Relief	11
Other	16
Self-efficacy	133
Locus of control	44
Emotion regulation	28
Expected outcome	43
Post-crisis impact	18
Risk perception	90
Level of risk perception	60
Nature of risk perception	30
Worst moment	64
During the situation	44
After the situation	20

Table 3. Inter-coder reliability of bi-national and national ratings of transcripts

Dimension	Group interview (bi-national)		Interview (bi-national)		Interview (national)	
	α	[95% CI]	α	[95% CI]	α	[95% CI]
Recognition/realisation	0.25	[-0.50; 1.0]	1.0	[0.00; 1.0]	1.0	[0.00; 1.0]
Interpretation	1.0	[0.00; 1.0]	1.0	[0.00; 1.0]	1.0	[0.00; 1.0]
Reaction	1.0	[1.0; 1.0]	0.42	[-0.16; 0.80]	0.81	[0.42; 1.0]
Evacuation decision	0.59	[-0.22; 1.0]	0.06	[-0.57; 0.69]	1.0	[0.00; 1.0]
Evacuation process	1.0	[1.0; 1.0]	1.0	[1.0; 1.0]	1.0	[0.00; 1.0]
Improvement	0.75	[0.00; 1.0]	0.55	[-0.13; 1.0]	1.0	[0.00; 1.0]
Recall of emotion	0.46	[-0.35; 1.0]	0.74	[0.20; 1.0]	1.0	[0.00; 1.0]
Self-efficacy	1.0	[1.0; 1.0]	1.0	[1.0; 1.0]	0.64	[1.0; 1.0]
Risk perception	0.50	[-0.25; 1.0]	1.0	[1.0; 1.0]	1.0	[0.00; 1.0]
Worst moment	1.0	[0.00; 1.0]	1.0	[0.00; 1.0]	1.0	[0.00; 1.0]

All	0.80	[0.65; 0.93]	0.79	[0.64; 0.91]	0.91	[0.78; 1.0]
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Note: CI = confidence interval.

Table 4. Descriptions of the initial context and emergency phase resulting from content analysis divided into categories with examples of statements from transcripts

Dimension/category	Citation from interview	N	High stress (12)	Low stress (15)	Chi ²	P	Phi
Realisation/recognition							
Explosion	‘When it exploded. It was a big bang and the lights went out . . .’.	22	10	7	3.80	<0.05	0.37
Smoke/flames/fire	‘I saw the smoke and the flames rising’.	23	8	8	0.49	0.48	0.13
Water	‘The water went over the road’.	5	0	4	3.75	0.06	0.37
Noise/shouting	‘They were shouting’.	13	5	5	0.19	0.66	0.08
Informed by others	‘. . . fire-fighters came and told me I have to evacuate, because there is a fire in the building’.	19	9	6	3.31	.07	.35
Impaired	‘We didn’t hear anything, nothing, we were sleeping’.	8	4	0	5.87	<0.05	0.47
Interpretation							
Correct interpretation	‘When I woke up I immediately realised that there was a fire’.	17	6	4	1.56	0.21	0.24
Underestimation of seriousness	‘My friend pulled me inside [. . .] because I wasn’t taking this	14	2	7	2.70	0.10	0.32

	seriously, just being in my own little world’.						
Reaction							
<i>Way of reacting</i>							
Instinctive	‘I turned back and hesitated	23	9	7	2.22	0.13	0.29
Automatic	where to hide myself, it was such an unconditioned reaction, save yourself, man!’.						
Rational/calm	‘At that time I acted wisely’.	21	4	7	0.49	0.48	0.13
Resignation	‘I understood straight away— I’m not getting out—it’s all over, so I have to inhale enough smoke to be able to, well, pass out’.	7	2	3	0.05	0.82	0.17
<i>Type of reaction</i>							
Supportive behaviour	‘Everyone helped each other.’	32	9	13	0.60	0.43	0.15
Save people (family, friends, strangers)	‘I turned back and started running, to wake my sister up who was sleeping.’	25	7	9	0.01	0.93	0.02
Prepare for evacuation	I said to my wife: ‘get dressed, but properly. Where are the papers? Firstly, the wallet, packed all the other stuff and then we were thinking about	20	2	9	5.18	<0.05	0.44

	what to do next’.							
Seek information	‘We were walking to and fro all the time [. . .], tried to call someone to get some information’.	18	2	8	3.84	<0.05	0.38	

Table 5. Descriptions of emotional and cognitive processing resulting from content analysis divided into categories with examples of statements from transcripts

Dimension/category	Citation from interview	N	High stress	Low stress	Chi ²	P	Phi
		(41)	(12)	(15)			
Emotion							
Fear	‘Fear. Overriding fear. Absolute fear’.	25	8	10	0.01	0.99	0.02
Nervousness	‘But it was simply, we were all terribly nervous’.	15	2	7	2.70	0.10	0.32
Derealisation/ dissociation	‘And for a couple of seconds you lose the sense of everything, you don’t know where you are, if you’re dreaming, if it’s real’.	12	7	3	4.20	<0.05	0.39
Panic	‘Then I understood: “Hell, now are people dying!”’. And then I got panic and kept on running’.	25	9	7	2.22	0.14	0.29
Physiological reaction	‘I have had a lot of palpitation. I was obsessed about the death and fear of loss [. . .]. I wasn’t able to control my palpitation and wasn’t able to walk’.	14	6	2	4.29	<0.05	0.40
Risk perception							
High level	‘I realised straight away that it was lethal danger’.	22	8	5	2.97	0.08	0.33

Low level	'I would have said that the risk	9	0	4	3.76	0.37
	something happens to us was zero'.					0.05
