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**BeSeCu-S - A self-report instrument for emergency survivors**

Journal:	<i>Journal of Risk Research</i>
Manuscript ID:	RJRR-2012-0076.R2
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**Abstract**

Little intercultural research with standardised instruments has been conducted regarding survivors' responses (i.e. their emotions, cognitions and activities) to emergency situations. Based on results from focus groups, with survivors and experts, as well as a pre-test, a standardised psychological instrument was developed: the BeSeCu-S (*Behaviour, Security, and Culture – Survivor*). The BeSeCu-S is a questionnaire for people who have experienced an emergency situation where lives and property were threatened and evacuation from a structure was a valid option. It is subdivided into four main stages of such an event: Beginning, Realisation, Evacuation and Aftermath. A total of 1112 survivors from eight different countries and five different emergency situations took part in the field study. The results indicate that the questionnaire can enable researchers to analyse survivors' responses in relation to pre-, peri- as well as post-event factors (e.g. emergency knowledge, time to begin evacuating, injuries, posttraumatic stress symptoms). Additionally, analyses across different nationalities, event types and stages of an event appear possible.

## Background

In recent years the field of disaster research has received more attention. As with man-made incidents like the bombings in Madrid 2004 and London 2005, the impact of natural disasters has been very severe. Europe has faced incidents like the floods of 2002 and 2010 in the Czech Republic, Germany and Poland, as well as the earthquakes in Italy in 2009 and Turkey in 1999 and 2010. In 2010, natural disasters caused more than 297,000 deaths worldwide and another 217,000,000 people were affected (Guha-sapir, 2010). However, other, smaller-scale emergency events such as building fires, particularly fires in domestic buildings, have also posed significant harm to people and property (Kobes & Groenewegen, 2009).

Different instruments have been developed over the years in order to investigate responses to a traumatic, fearsome event that threatens lives. The Peritraumatic Distress Inventory (PDI; Brunet et al., 2001) has 13 items and focuses on emotional reactions as well as physiological stress reactions during the event. Dissociative reactions during an event like feelings of unreality, being detached from oneself, being confused or a change in sense of time can be assessed with the 10 items of the Peritraumatic Dissociative Experiences Questionnaire (PDEQ; Marmar, Weiss, & Metzler, 1996). A meta-analysis (Ozer, Best, Lipsey, & Weiss, 2003) revealed subjective psychological responses to an event like perceived life threat and peritraumatic emotions as being important predictors of the later occurrence of Posttraumatic Stress Disorder (PTSD). In order to investigate posttraumatic stress following traumatic events, the Impact of Event Scale (IES) was developed (Horowitz, Wilner, & Alvarez, 1979). The self-report instrument was revised by Weiss and Marmar (1997; the IES-R) and comprises the three subscales intrusion, avoidance and hyperarousal. Like the aforementioned peritraumatic measures, the IES-R assesses responses to the event in general, rather than responses to any specific aspects or moments relating to the event.

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3 Another similarity is that its items focus mainly on emotional, physiological, and cognitive  
4 responses to the event, albeit ones occurring at a later point in time.  
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8 In events like terrorist attacks, floods, earthquakes and building fires there is another  
9 type of peri-event response that is important: victims' activities. What individuals do when  
10 faced with a threat and in the moments afterwards can directly influence their chances of  
11 escaping danger and reaching a place of safety. Studies of behavioural responses during a  
12 disaster or smaller-scale emergency that threatens lives and property, and especially during a  
13 building evacuation, have usually been investigated in a single type of event (Kasapoglu &  
14 Mehmet, 2004; McConnell, Boyce, Shields, Galea, Day, & Hulse, 2010; Proulx & Reid,  
15 2006; Zhao, Lo, Zhang, & Liu, 2008). Previous investigations have often focused on initial  
16 activities like searching for more information or ignoring threat cues and continuing with  
17 one's current task (e.g. Samochine, Boyce, & Shields, 2005) as well as evacuation  
18 preparations such as collecting belongings (e.g. McConnell et al., 2010). Activities  
19 undertaken during this "response phase" (Galea, 2009) can not only delay the start of an  
20 individual's evacuation from a structure (Zhao et al., 2009) but also affect their risk of  
21 incurring physical injury (Glenshaw, Vernick, Frattaroli, Brown, & Mallonee, 2008) and have  
22 been found to be influenced by factors like emotional distress (Zhao et al., 2009), perceived  
23 cues to the threat (Zhao et al., 2009) and prior emergency knowledge (Glenshaw et al., 2008;  
24 Zhao et al., 2009). Perceived control and urgency may possibly even be involved (Glenshaw  
25 et al., 2008; Zhao et al., 2009). However, such studies have highlighted a temporal factor,  
26 with victims' responses changing at different moments during the event (Glenshaw et al.,  
27 2008; McConnell et al., 2010; Zhao et al., 2009).  
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52 It would seem then that in order to better understand the effects of peri-event  
53 responses on well-being following a disaster or similarly threatening emergency situation,  
54 victims' emotions (i.e. feelings and physiological states), cognitions plus their activities  
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3 would need to be investigated. Responses would also need to be investigated with respect to  
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5 the different stages of the event. Such knowledge could be of use to professionals in various  
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7 health and safety fields and help develop preventive and protective interventions. However,  
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9 investigations of relationships between a fuller range of peri-event responses and post-event  
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11 outcomes are very rare, as are investigations of relationships between the range of peri-event  
12  
13 responses, and existing measures like the PDI and PDEQ would not be adequate for this task.  
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15 One study (Kaysen, Morris, Rizvi, & Resick, 2005) that did look at peri-event emotions,  
16  
17 cognitions and activities – albeit for emergencies involving only a single victim (i.e. females  
18  
19 who had been robbed, sexually or physically assaulted) – not only found that certain activities  
20  
21 and emotions were associated with perceived threat, but also that peri-event responses could  
22  
23 differ according to the type of event experienced. Although Kaysen et al. (2005) did not  
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25 examine responses at specific moments during the events, they nevertheless noted a temporal  
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27 factor (event duration) as being important. Such findings support the notion that a more  
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29 comprehensive examination of responses to threatening events is needed.  
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35 There is one further point to consider. The rise of globalisation and multicultural  
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37 nations, and the fact that future large-scale threatening events are likely to be multinational  
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39 events (Lahad & Crimando, 2010), prompt the question of whether culture will impact  
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41 psychological and behavioural responses during disasters and other emergency situations.  
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43 Most studies addressing this issue have been carried out in the UK, the USA, Canada or  
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45 Australia (Briere & Elliott, 2000; Brown, 2003; Kobes, Helsloot, Vries, & Post, 2010; Lindell  
46  
47 & Perry, 2011); cultures that might be very similar. However some study results indicate that  
48  
49 culture might have a possible influence on the behavioural response to a threatening event  
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51 (Fothergill, Maestas, & Darlington, 1999; Rodríguez, Quarantelli, & Dynes, 2006) and thus  
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53 requires proper attention. Yet a comparison between cultures, different types of events, as  
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55 well as relationships between peri-event responses, is not possible since no standardised  
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3 instruments have been used and research usually focuses on one particular event, therefore  
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5 one can only make assumptions regarding this specific incident (Briere & Elliott, 2000).  
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8 In order to investigate relationships between different peri-event responses and post-  
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10 event outcomes, across different stages of an event and different event types, and also  
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12 between different nationalities, the BeSeCu-S (*Behaviour, Security, and Culture – Survivor*)  
13  
14 questionnaire was developed. This was as part of the wider EU-funded BeSeCu Project, with  
15  
16 research conducted by partners in eight different countries in Europe. The BeSeCu-S  
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18 questionnaire was designed for survivors of any event that threatened lives and property and  
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20 meant evacuation of a structure was a valid option. Topics and questions were presented  
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22 chronologically (i.e. relevant to pre-event, peri-event, then post-event factors) and collect  
23  
24 data on a variety of variables related to the individual, to the event in question and to  
25  
26 threatening events in general. It allows not only investigations of acute trauma-related  
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28 constructs like emotional distress, panic attack symptoms, perceived threat and posttraumatic  
29  
30 stress but also enables an investigation between these constructs and activities undertaken by  
31  
32 individuals during the event. BeSeCu-S displays the result of cooperation between  
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34 practitioners and researchers, as demanded by different disaster researchers, in order to  
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36 compare experiences and include future needs (Fischer, 2008; Kasapoglu & Mehmet, 2004).  
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41 The BeSeCu-S was tested with over a thousand survivors from Germany, United  
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43 Kingdom, Spain, Italy, Sweden, Poland, Czech Republic and Turkey. It was hypothesised  
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45 that analyses would reveal the following outcomes: (1) The BeSeCu-S would be suitable for  
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47 international use; (2) the BeSeCu-S would be suitable for capturing the experiences of  
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49 survivors across different event types and across different stages of an event; (3) survivors'  
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51 peri-event responses (at least some emotional and cognitive responses) would be significantly  
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53 associated with post-event stress; (4) peri-event responses (at least some activities) would be  
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55 significantly associated with time to begin evacuating and injuries incurred; and (5) prior  
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3 emergency knowledge as well as emotional and cognitive peri-event responses would be  
4 significantly associated with at least some peri-event activities.  
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## 9 **Method**

### 10 *Questionnaire development*

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12 The questionnaire was developed in consecutive steps including qualitative and quantitative  
13 data approaches. In addition to the interdisciplinary BeSeCu team of researchers and end-  
14 users, national and international experts from different fields of security research as well as  
15 emergency evacuation and national accident investigation boards supported the process of  
16 item generation. A literature review revealed the main topics and preliminary structure for the  
17 focus groups and interviews with survivors and first responders. These sessions were carried  
18 out with 132 participants in all project-partner countries (i.e. Germany, United Kingdom,  
19 Spain, Italy, Sweden, Poland, Czech Republic and Turkey) and the most frequently reported  
20 answers were used in order to formulate a first set of items in relation to the aforementioned  
21 and newly formulated categories (Freitag, Grimm, & Schmidt, 2011; Grimm, Hulse, Preiss,  
22 & Schmidt, n.d.). A pre-test with a convenience sample of 336 participants as well as 11  
23 cognitive debriefing task participants (see Collins, 2003; Eremenco, Cella, & Arnold, 2005)  
24 was drawn in order to test feasibility, practicability and difficulty of items (Grimm, Hulse, &  
25 Schmidt, 2012). As a result of these steps, a final questionnaire draft was developed in  
26 English; therefore a translation into all corresponding languages of all partner countries (i.e.  
27 German, Spanish, Italian, Swedish, Polish, Czech, and Turkish) was necessary using a  
28 forward-backward-forward translation technique (Hilton & Skrutkowski, 2002; Petersen,  
29 Schmidt, Power, & Bullinger, 2005). The questionnaires were identical with respect to layout  
30 and design and available online and as a paper-pencil version. Regarding recruitment, each  
31 project partner was responsible for recruiting a nationwide sample in their own country and  
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3 therefore applying the appropriate recruitment strategies (Knuth, Kehl, Stegemann, &  
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5 Schmidt, in press).  
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### 9 10 *Participants*

11 Participants were eligible for the study if they gave informed consent and met the following  
12 inclusion criteria: (1) experienced one of the following events: domestic fire, fire in a public  
13 building, flood, earthquake or terrorist attack; (2) at least 18 years of age; (3) knew that the  
14 emergency services attended the incident; and (4) the incident was no longer than 11 years  
15 ago (i.e. occurred not earlier than 1999). Criterion number three regarding the emergency  
16 services was not mandatory for earthquake, terrorist attack and flood survivors since it can be  
17 assumed that the emergency services are always involved in such events even though  
18 survivors might not have been in direct contact with them. Criterion four was chosen in order  
19 to include survivors of the Izmir earthquake of 1999. Furthermore, research regarding  
20 memory biases has found that memories are less biased in children at the age of seven and  
21 older (Bauer, Burch, Scholin, & Güler, 2007; Cordon, Pipe, Sayfan, Melinder, & Goodman,  
22 2004; Pillemer, 1998; Rubin, 2000) and since participants had to be at least 18 years of age,  
23 this meant the sample only included participants who were at least seven years of age at the  
24 time of the incident. A sample of 1130 survivors met the inclusion criteria. Table 1 presents  
25 the socio-demographic information of the participants ( $N=1112$ ) that experienced the incident  
26 in one of the partner countries. Participants who experienced an event in other countries like  
27 the USA, Malaysia or Japan were excluded. The mean age of the sample was 40.40 years  
28 ( $SD=15.27$ ) with ages ranging from 18 years to 96 years. The mean time since the event was  
29 3.21 years ( $SD=3.39$ ).  
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### 54 55 56 *Measurement* 57 58 59 60

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3 The final BeSeCu-S questionnaire combines the findings from the cross-cultural focus groups  
4 and interviews, literature review, expert consultation and pretesting (Knuth, Kehl, & Schmidt,  
5 in press). A 5-point Likert scale ranging from 1 to 5 (1=not at all, 2=a little bit, 3=moderately,  
6 4=quite a bit, 5=extremely) was adopted from the IES-R (Weiss & Marmar, 1997) and used  
7 for all items of the emergency knowledge, emotional distress and perceived threat scales  
8 mentioned below, since translated versions already existed in the languages of participating  
9 countries (Bergh Johannesson, Stefanini, Lundin, & Anchisi, 2006; Corapcioglu, Yargıç,  
10 Geyran, & Kocabaşoğlu, 2006; Gargurevich, Luyten, Fils, & Corveleyn, 2009; Juczyński &  
11 Ogińska-Bulik, 2009; Maercker & Schützwohl, 1998; Pielmaier & Maercker, 2011; Preiss et  
12 al., 2004). The mean scores of these scales were calculated and used in analyses if at least  
13 75% of the scale items were answered.

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28 Select parts of the final BeSeCu-S are discussed here. The first part concerns pre-  
29 event variables of interest to this paper and the second peri- and post-event variables.

### 30 31 32 33 34 *Part I - Background information*

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36 This section consisted of socio-demographic items (see Table 1). Migrant background was  
37 assessed with questions about the participant's country of birth, the participant's parents'  
38 country of birth, as well as the participant's citizenship (Schenk et al., 2006).

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43 Additionally, participants' emergency knowledge prior to the event in question was  
44 addressed here with the Emergency Knowledge Scale (EKS). Participants were asked the  
45 following question: *Before the incident occurred, what knowledge did you have that would be*  
46 *of use in an emergency?* Seven different statements were used to assess emergency  
47 knowledge: *I had professional knowledge, gained from working for the emergency services; I*  
48 *had first aid knowledge, gained from a first aid course; I had fire safety knowledge, gained*  
49 *from being a warden/fire safety officer; I had taken part in fire drills at school; I had taken*  
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3 *part in fire drills at work; I had read safety notices/evacuation plans in public places, such as*  
4 *in hotel rooms, train carriages, etc.; and I had thought about what would happen if an*  
5 *emergency occurred in such a location and had prepared my own evacuation plan.*  
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12 *Part II – The specific incident*

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14 Questions concerning the event were subdivided into four different stages: 1. Beginning, 2.  
15 Realisation, 3. Evacuation and 4. Aftermath.  
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18 *1. Beginning.* The first stage related to the moment just prior to participants perceiving cues  
19 to the threat. Emotional distress was assessed as a proposed baseline level with respect to this  
20 stage using the Emotional Distress Scale (EDS). Participants were asked: *Before the incident*  
21 *occurred, what were your feelings?* and rated their emotional distress with respect to the  
22 following items: *I was nervous, I was scared, I was upset, I felt stress* and *I was calm* (reverse  
23 coded).  
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32 *2. Realisation.* The second stage related to the time from when participants perceived cues to  
33 the threat and realised something was happening. Emotional distress was evaluated again  
34 using the EDS with respect to this stage now. It was also of interest to look at participants'  
35 responses with more emphasis on their physiological state. Thus participants were asked  
36 whether they experienced the 13 symptoms (i.e. fast heartbeat, sweating, trembling/shaking,  
37 shortness of breath, feeling of choking, chest pain or discomfort, nausea or abdominal  
38 distress, feeling dizzy, feelings of unreality or being detached from oneself, fear of losing  
39 control or going crazy, fear of dying, numbness or tingling sensations, chills or hot flushes)  
40 from the *DSM IV* (American Psychiatric Association, 2000) criteria for a panic attack. It was  
41 thought that such symptoms would be most evident at this stage of the event and so  
42 participants were only asked about this here. The sum of experienced symptoms was used as  
43 a score.  
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3 The subjective evaluation of threat was assessed with the Perceived Threat Scale  
4 (PTS). Participants were asked the following two questions which were combined for the  
5 PTS: *When you realised you were in an emergency situation, did you think your own life was*  
6 *in danger?* and *When you realised you were in an emergency situation, did you think the lives*  
7 *of your family/friends were in danger?*  
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12 Perceived control was assessed with the following question: *When you realised you*  
13 *were in an emergency situation, did you think you were able to deal with the situation?*,  
14 which was rated on the aforementioned 5-point Likert scale.  
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19 Sense of urgency was primarily measured with a question about perceived time  
20 pressure (*Did you feel pressure to act fast (e.g. felt the situation could worsen at any*  
21 *moment)?,yes/no*). A second question (*How would you describe your behaviour when you*  
22 *understood something was happening?*) examined the sense of urgency further by exploring  
23 whether participants initially reacted in a more automatic manner, e.g. reverting to habitual  
24 behaviour, or whether they reacted in a more conscious manner, acting after reasoned  
25 deliberation. The answer options were *automatic/instinctive (reacted without thinking)* or  
26 *conscious/rational (thought first then reacted)*.  
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32 Initial activities were assessed as follows: *What was the first thing you did when you*  
33 *understood something was happening?* with the answer options: *I did nothing for a while; I*  
34 *tried to alert, comfort or save others who might be threatened by the situation; I tried to*  
35 *inform others about my situation, to reassure or update them; I sought help from the*  
36 *emergency services; I sought shelter inside the location; I tried to protect my property; I gave*  
37 *up and let happen whatever was about to happen; I gathered items in preparation for*  
38 *evacuation; I actively sought further information; Other*. Participants were asked to only  
39 choose one of these answers.  
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3 3. *Evacuation.* The third stage concerned the individual's evacuation from the structure and  
4 was therefore only mandatory for participants that either self-evacuated or had been rescued  
5 during the event. These participants were asked the following question: *Approximately how*  
6 *long did it take you to start evacuating/be rescued?* The answer options were: *Within 30*  
7 *seconds; Within 2 minutes; Within 5 minutes; Within 10 minutes; Within 30 minutes; Within 1*  
8 *hour; Within 5 hours; Within 12 hours; Within 24 hours; More than 24 hours.* Additionally,  
9 emotional distress, perceived threat and perceived control were assessed twice: once with  
10 reference to the period as they were making their way out of the structure and again at the end  
11 of this process (i.e. upon exiting the structure).  
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14 4. *Aftermath.* The last stage contained questions regarding consequences of the event.  
15 Participants were asked: *Did you incur any physical injuries during the incident?* (yes/no).  
16 In order to assess current posttraumatic stress symptoms resulting from the event, the IES-R  
17 (Weiss & Marmar, 1997) was included. The 22-item self-report instrument asked participants  
18 to rate their distress level during the past seven days with respect to the specific incident they  
19 described in the questionnaire. A total IES-R score was derived by calculating the mean score  
20 on the 22 items.  
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#### 41 **Data analysis**

42 Descriptive statistics were calculated. Scales were investigated using factor analyses  
43 (principal component analysis) with varimax rotation and Kaiser normalisation. The  
44 determinant of the *R*-matrix had to be greater than .00001, while all *Corrected Item-Total*  
45 *Correlation*  $\geq .3$  and reliability of each scale (Cronbach's  $\alpha$ ) had to be at least .7 (Field, 2009).  
46 Confirmatory factor analysis was performed for each scale introducing the different  
47 nationalities as groups and using maximum likelihood estimation with AMOS. Goodness of  
48 fit for each scale can be investigated by a number of different parameters: the comparative fit  
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3 index (CFI) with proposed cut off value of  $\geq .95$  for good fit (Hu & Bentler, 1999); the  
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5 incremental fit index (IFI) and the goodness of fit index (GFI) with values  $\geq .90$  indicating  
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7 good fit (Meyers, Gamst, & Guarino, 2005); the root mean square error of approximation  
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9 (RMSEA) with values  $\leq .06$  (Hu & Bentler, 1999) or at least  $\leq .10$  (Meyers et al., 2005)  
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11 indicating good fit. After scale and construct validity analyses, Friedman tests, followed up  
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13 with post hoc analyses using Wilcoxon signed-rank tests (with Bonferroni corrections  
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15 applied), were conducted to assess and locate any significant variations for variables that  
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17 were measured across three or more event stages. Finally, Spearman's rho, Mann-Whitney  $U$ ,  
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19 Kruskal-Wallis and Chi-Squared tests were conducted to assess relationships between pre-,  
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21 peri- and post-event variables (note, the last five categories for the time to begin evacuating  
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23 variable were merged as few people reported starting to leave after 30 minutes). Data  
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25 analyses were carried out using SPSS 19.0 and AMOS 19 computer software.  
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## 32 **Results**

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34 The mean number of missing percentages varied across the questionnaire with 3.79% for the  
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36 stage Beginning, 2.69% for the stage Realisation, 4.48% for the Evacuation stage and 5.63%  
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38 for the last stage concerning the Aftermath.  
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## 43 **Scale analysis**

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45 The investigation of scales with the factor analyses (principal component analysis) revealed a  
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47 one-factor solution for all scales. With respect to these one-factor solutions, 46.55% of the  
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49 total variance was explained in the EKS, 64.69% in the EDS and 80.55% in the PTS. Scales  
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51 were also tested in a confirmatory factor analysis. Confirmatory factor analysis revealed very  
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53 good values for the EDS [RMSEA=0.044 (0.035-0.052), GFI=0.948, CFI=0.961, IFI=0.961,  
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55  $\chi^2=136.64$ ,  $df=48$ ;  $p<.001$ ]. For the EKS the values were as follows: RMSEA=0.050 (0.040-  
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0.055), GFI=0.900, CFI=0.873, IFI=0.876,  $\chi^2=390.39$ ,  $df=112$ ;  $p<.001$ . Table 2 shows descriptive scale characteristics and internal consistency values for all scales including their re-assessment through different stages. Internal consistency values (Cronbach's  $\alpha$ ) for the scales in the total sample were at least .7. These values were confirmed in the national subsamples for the EKS and EDS. The values of the PTS in the national samples of Spain and the UK were below the value of .7.

### ***Discriminant and convergent validity***

Discriminant validity was tested in all scales with respect to participants' current general health status and weeks since the incident given that these measures were conceptually different from the described scales (Brunet et al., 2001). Discriminant validity was considered verified if the correlation coefficient was smaller than .3. As can be seen in Table 3, the EKS, EDS as well as PTS at any time of the event showed no or only small correlations with weeks since the event and health status. Exceptions in the national subsamples were as follows: EKS with health status in the Spanish sample ( $r_{rho}=-.37$ ,  $p<.01$ ); EDS with health status in the Swedish (Beginning:  $r_{rho}=.31$ ,  $p<.01$ ) and Spanish (Realisation:  $r_{rho}=.36$ ,  $p<.01$ ; During evacuation:  $r_{rho}=.34$ ,  $p<.01$ ) samples, and with weeks since the event in the Czech (Beginning:  $r_{rho}=.39$ ,  $p<.01$ ), Italian (Beginning:  $r_{rho}=-.30$ ,  $p<.01$ ) and Turkish (During evacuation:  $r_{rho}=.45$ ,  $p<.01$ ) samples; PTS with health status in the UK (Realisation:  $r_{rho}=.39$ ,  $p<.05$ ; During evacuation:  $r_{rho}=.46$ ,  $p<.01$ ), Spanish (During evacuation:  $r_{rho}=.30$ ,  $p<.01$ ) and Swedish (During evacuation:  $r_{rho}=.33$ ,  $p>.05$ ) samples, and with weeks since the event in the Turkish (Realisation:  $r_{rho}=.45$ ,  $p<.01$ ; During evacuation:  $r_{rho}=.45$ ,  $p<.01$ ; Upon exiting:  $r_{rho}=.59$ ,  $p<.01$ ) sample.

For EDS and PTS, convergent validity was investigated with respect to the IES-R since the latter measure also assesses emotional and cognitive responses to a threatening



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3 event. The overall correlation between EDS during the incident and the IES-R was significant  
4 and ranged from  $r_{rho}=.57$  at realisation to  $r_{rho}=.64$  during the evacuation. For the PTS the  
5 correlation with the IES-R was significant and ranged from  $r_{rho}=.43$  upon exiting to  $r_{rho}=.52$   
6 during the evacuation. In the national samples there were only a few exceptions for the PTS:  
7 in the Turkish (During evacuation:  $r_{rho}=.23$ ,  $p>.05$ ; Upon exiting:  $r_{rho}=.23$ ,  $p>.05$ ), UK  
8 (During evacuation:  $r_{rho}=.29$ ,  $p>.05$ ) and Swedish (Upon exiting:  $r_{rho}=.26$ ,  $p>.05$ ) samples the  
9 correlations were smaller and not significant. Furthermore, it was expected that the measure  
10 of panic-like symptoms and EDS at realisation would be tapping into related constructs; the  
11 correlations, in the total sample ( $r_{rho}=.60$ ,  $p<.01$ ) as well as in all subsamples ( $r_{rho}=.51-.74$ ),  
12 supported this.  
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### 27 ***Stage variations in emotion and cognition***

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29 The EDS was administered across four event stages and a significant main effect was found,  
30  $\chi^2(3)=636.52$ ,  $p<.001$ . Specifically, emotional distress significantly differed from one stage to  
31 the next (Beginning vs. Realisation:  $Z=-23.51$ ,  $p<.001$ ; Realisation vs. During evacuation:  
32  $Z=-5.42$ ,  $p<.001$ ; During evacuation vs. Upon exiting:  $Z=-5.07$ ,  $p<.001$ ), peaking at  
33 Realisation, then decreasing thereafter but always remaining above the level at the Beginning  
34 (see Figure 1). Perceived threat was measured at the latter three event stages and a main  
35 effect was revealed,  $\chi^2(2)=482.74$ ,  $p<.001$ , with significant differences located between  
36 Realisation and During evacuation ( $Z=-9.85$ ,  $p<.001$ ) as well as between During evacuation  
37 and Upon exiting ( $Z=-14.95$ ,  $p<.001$ ). Like emotional distress, perceived threat peaked at  
38 Realisation and decreased thereafter. Perceived control, on the other hand, rose throughout  
39 the latter three event stages. A main effect was revealed,  $\chi^2(2)=60.12$ ,  $p<.001$ , with the  
40 significant difference located between Realisation and During evacuation ( $Z=-5.64$ ,  $p<.001$ ).  
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3 The apparent increase in perceived control between During evacuation and Upon exiting was  
4 not significant ( $Z=-1.73, p=.083$ ).  
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### 9 ***Relationships between pre-, peri- and post-event variables***

10 As mentioned earlier, some peri-event responses (emotional distress, perceived threat) were  
11 significantly associated with the measure of post-event stress, the IES-R. However, as Table  
12 3 and further tests show, other peri-event variables were also significantly associated with the  
13 IES-R, namely panic-like symptoms, perceived control, time pressure ( $Z=-8.53, p<.001$ ) and  
14 the type of initial reaction ( $Z=-9.10, p<.001$ ). In other words, participants who, during the  
15 event, perceived themselves to experience more panic-like symptoms, be less in control, felt  
16 time-pressured and initially reacted in an automatic manner reported greater posttraumatic  
17 stress symptoms.  
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29 Tests revealed support for the other hypotheses too. Time to begin evacuating  
30 ( $\chi^2[9]=45.90, p<.001$ ) and Injuries incurred ( $\chi^2[9]=38.22, p<.001$ ) were significantly related  
31 to participants' initial activities (see Table 4). However, time to begin evacuating was also  
32 significantly related to another peri-event variable, PTS at Realisation (i.e. the greater the  
33 threat perceived, the quicker participants were in starting their evacuation; see Table 3).  
34 Moreover, being injured was also significantly related to participants perceiving themselves  
35 to have experienced greater distress ( $Z=-2.76, p<.01$ ) and threat ( $Z=-4.18, p<.001$ ), more  
36 panic-like symptoms ( $Z=-5.51, p<.001$ ) and less control ( $Z=-3.45, p<.001$ ) at Realisation,  
37 plus if they felt time-pressured ( $\chi^2[1]=4.63, p<.05$ ) and reacted in an automatic way initially  
38 ( $\chi^2[1]=8.96, p<.01$ ). Finally, initial activities were revealed to be significantly related to the  
39 EKS ( $\chi^2[9]=43.95, p<.001$ ), EDS (Realisation:  $\chi^2[9]=42.43, p<.001$ ) and PTS (Realisation:  
40  $\chi^2[9]=63.86, p<.001$ ). Panic-like symptoms ( $\chi^2[9]=57.37, p<.001$ ), perceived control  
41 ( $\chi^2[9]=78.89, p<.001$ ), time pressure ( $\chi^2[9]=68.89, p<.001$ ), as well as reacting either  
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3 automatically or consciously ( $\chi^2[9]=40.07, p<.001$ ), were also significantly related to initial  
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5 activities. Table 5 displays descriptive statistics relating to these variables and the initial  
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7 activity undertaken by participants and shows that there was no one type of initial activity  
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9 that was most related to all the different emotions and cognitions.  
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## 11 **Discussion**

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14 This paper illustrates the content and psychometric properties of the BeSeCu-S, a  
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16 comprehensive questionnaire for survivors. Project partners from eight different European  
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18 countries elaborated the questionnaire specifically to learn more about human activities,  
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20 emotions and cognition across cultures in relation to emergency situations. This process  
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22 represents the first attempt to develop a standardised cross-cultural instrument for such  
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24 interests. Survivors were not restricted to a specific incident (e.g. one particular fire or one  
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26 particular flood), therefore this approach results in a more heterogeneous sample which  
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28 increases the possibility of generalising findings with respect to different types of events  
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30 (Briere & Elliott, 2000).  
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37 Analyses confirmed that the questionnaire, on the whole, seemed to work as  
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39 anticipated and captured what it was set out to capture. Scale analysis revealed one-factor  
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41 solutions for the emergency knowledge, emotional distress and perceived threat scales,  
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43 suggesting a unidimensionality of these scales. Internal consistency values (Cronbach's  $\alpha$ ) for  
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45 the scales were satisfactory for the total sample since they were at least .7, which is  
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47 considered the limit for acceptable scales (Gliem & Gliem, 2003). These values were also  
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49 confirmed in each national and incident subsample except for the two-item PTS. The PTS  
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51 had poor internal consistency values in the UK and Spanish subsamples and therefore this  
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53 scale cannot be considered reliable for these subsamples. Since these items refer to the  
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55 perceived threat to oneself and one's family, the results might be due to specific terrorist  
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3 incidents in the UK and Spain. These events happened in the morning and mainly affected  
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5 commuters. People commuting to and from work usually do not have friends or family  
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7 around them and therefore should perceive no threat to them at the time of event. As a  
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9 consequence, this scale might only be appropriate in other settings. Looking at the internal  
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11 consistency values of the incident subsamples, this hypothesis is supported since these values  
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13 are acceptable and good for domestic fires, floods and earthquakes but not for terrorist attacks  
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15 and public building fires. Results of the confirmatory factor analysis suggest a very good fit  
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17 in all indices for the EDS model. With respect to the other scales, CFI and IFI values were  
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19 not satisfactory, whereas GFI and RMSEA values indicate at least an acceptable fit.  
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21 Convergent and discriminant validity investigations suggest that the EDS especially can be  
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23 considered valid in all national subsamples. The testing across different countries as well as  
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25 different incidents largely supports our hypotheses (1) and (2) which stated that the BeSeCu-  
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27 S would be suitable for international use as well as for capturing the experiences in different  
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29 event types. Furthermore, emotional distress, perceived threat and perceived control  
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31 significantly differed between the stages investigated, highlighting the dynamic, temporal  
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33 aspects of survivor responses and supporting the additional suggestion that the BeSeCu-S  
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35 would be suitable for capturing experiences across different stages of an event.  
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40 Hypothesis (3) was supported by significant relationships between the peri-event  
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42 responses emotional distress and perceived threat with posttraumatic stress symptoms as  
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44 measured by the IES-R. These relationships are in line with results from a meta-analysis  
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46 concerning PTSD (Ozer et al., 2003). However, measures of panic-like symptoms, perceived  
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48 control and sense of urgency were also significantly related to the IES-R suggesting  
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50 researchers and clinicians should continue to consider a wide range of peri-event responses as  
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52 being involved in the development of posttraumatic stress symptoms.  
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Significant relationships between initial activities and the time to begin evacuating, the experience of being injured, prior emergency knowledge plus emotional and cognitive peri-event responses were not only in line with hypotheses (4) and (5) but also in line with previously found interactions (Glenshaw et al., 2008; Zhao et al., 2009). However, analyses revealed additional relationships between these variables, e.g. peri-event emotional or cognitive responses also being significantly related to how quickly survivors began moving away from the scene of danger and their success in avoiding physical harm. Any attempt to model causal relationships between pre-, peri- and post-event variables and to establish the relative size of their effects on one another is beyond the scope of this paper. Nevertheless, the data collected by the BeSeCu-S would allow for such attempts and more detailed analyses incorporating also possible effects of nationality, the type of incident and demographic factors will follow in subsequent papers.

The BeSeCu-S employs a retrospective self-reporting approach. Despite employing survey and interview techniques during the development of the instrument, one could nevertheless question if it is possible to obtain the desired information by self-report. Previous research regarding the relationship between emotional distress and memory differs greatly with respect to the type of event (emotional vs. neutral), type of information required (central vs. peripheral), time since the event (immediate vs. delayed), role in the event (witness vs. victim), way in which emotion was induced (through sudden shocking sights vs. thematically), and the type of recall (cued vs. free recall) (Bornstein, Liebel, & Scarberry, 1998; Christianson & Loftus, 1991; Christianson, 1992; Hulse, Allan, Memon, & Read, 2007). Memories of disasters have been found to be very durable, even after two years (Stallings, 2007, p. 66). Although there was great variation in the time elapsed since the event in the current study (up to 11 years ago) the mean number of years elapsed since the event was just over three years and should be reasonable for assessing peri-event psychological

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3 responses at least (Brunet et al., 2001). Furthermore, the non-significant or weak correlations  
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5 between the number of weeks since the event and other variables in the current study would  
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7 indicate that participants' memories of their responses were not distorted by the passage of  
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9 time. Experimental studies have concluded that for emotionally arousing events involving  
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11 shocking sights such as horrific injuries, central details seem to be remembered better while  
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13 peripheral information is remembered less well than in emotionally neutral events (Brown,  
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15 2003; Christianson & Loftus, 1991). A further study, which investigated the reliability of  
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17 delayed self-reports regarding experiences in a hurricane (Norris & Kaniasty, 1992), found  
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19 that, in particular, reports of losses and preparedness remained stable when compared to the  
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21 first reports made ten months earlier. A small tendency toward recalling more information  
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23 was only found with respect to social support (Norris & Kaniasty, 1992). To conclude then, it  
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25 has been shown that survivors are quite able to remember aspects of a distressing event, even  
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27 after a long period of time, although longitudinal studies covering longer periods of time are  
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29 very rare. Nevertheless it is important to note that some outcomes of an event (e.g. impacted  
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31 life domains, support received or damage incurred) cannot be investigated immediately after  
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33 the event.  
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39 The use of various sources for item generation is one of the strengths of the BeSeCu-  
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41 S. Not only were actual survivors of different threatening events included, but also experts  
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43 from the field of disaster and security research and, just as importantly, practitioners, who  
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45 could include their needs for specific information. Practitioners were included at all stages of  
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47 the development process to achieve an increased interaction with researchers as demanded by  
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49 scholars (Fischer, 2008). The different parts of the questionnaire (i.e. pre-, peri- and post-  
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51 event) are a very distinctive and a unique attribute of the BeSeCu-S which allows the  
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53 researcher to get information in relation to different phases.  
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### Limitations of the study

One limitation of the questionnaire might be the aim of its global usage. Although the questionnaire was designed with respect to five different event types, it might not be as applicable for one as for another. For flood incidents, the stages approach might be challenging. Since flooding is frequently caused and accompanied by heavy rain or bad weather conditions, it can be argued that the onset is therefore rather slow giving people more time to prepare and react. In addition, the duration of the incident itself can be much longer (days or weeks even) than for the other events. Questions regarding the exact date, time, start of evacuation and even emotional distress at the different event stages are more difficult to answer since each stage might take several days in itself. Additionally, the focus of this questionnaire concerned known threats to property as well as lives and therefore the process of leaving a specific structure. The BeSeCu-S might therefore be more appropriate for smaller-scale evacuations (e.g. of a single building or a few properties located close together) rather than larger-scale evacuations (e.g. of whole communities due to nuclear accidents or hurricanes).

Another issue is that the length of the BeSeCu-S is considerable, since completing it can take up to 40 minutes. Nevertheless, feedback regarding design and the subdivision of the BeSeCu-S into different stages was very positive and people were glad to express some specifics not just once in an overall matter but for specified periods of time (i.e. stages) during the incident. However, it is unclear if this is also applicable for vulnerable groups such as older adults, children or people with cognitive impairments. It must be noted that a representative sample from all countries and regarding all incidents could not be obtained due to the fact that not all incidents occurred in each respective country. A potential self-selection bias needs to be taken into account as well. It is possible that survivors who participated in the study may represent a sub-group of individuals and therefore generalisability of findings

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3 is unknown. Survivors with severe traumatic experiences might have refused to participate to  
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5 avoid reminders. Furthermore it needs to be noted that non-response rates are not available  
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7 for these data.  
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### 10 11 **Conclusion and perspectives**

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13 BeSeCu-S is a questionnaire for threatening events and enables the comparison of survivor  
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15 responses (emotions, cognitions, activities) across different event types, stages of an event  
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17 and cultures. How stressful is a fire in a public building compared to a domestic fire?  
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19 Answering questions like this is very difficult since different methodological approaches  
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21 have been used over the past years. The BeSeCu-S can help advance understanding for  
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23 researchers and practitioners alike.  
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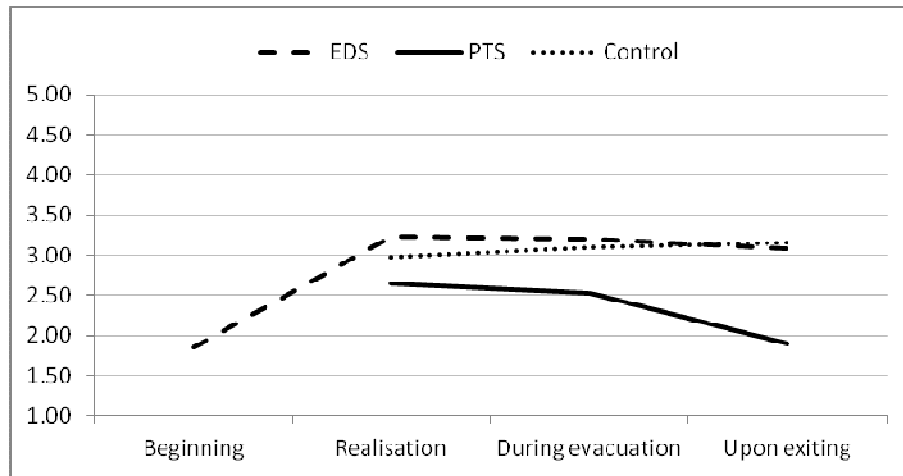


Figure 1. Stage variation of Emotional distress (EDS), Perceived threat (PTS) and perceived control

Table 1

Sample characteristics (n= 1112) with respect to participants' nationality.

	German		U.K.		Czech		Polish		Spanish		Swedish		Turkish		Italian		Other	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Incident	209	100	42	100	166	100	174	100	106	100	79	100	146	100	170	100	15	100
Fire in a home	134	64.1	17	40.5	88	53.0	109	62.6	40	37.7	72	91.1	74	50.7	43	25.3	8	53.3
Terrorist attack	0	0.0	12	28.6	0	0	0	0	29	27.4	0	0	5	3.4	1	0.6	3	20
Flood	43	20.6	3	7.1	63	38.0	45	25.9	1	0.9	0	0	0	0	17	10	0	0
Public building fire	31	14.8	10	23.8	15	9	20	11.5	36	34	7	8.9	30	20.5	21	12.4	4	26.7
Earthquake	1	0.5	0	0	0	0	0	0	0	0	0	0	37	25.3	88	51.8	0	0
Female gender	116	55.5	19	45.2	116	69.9	93	53.4	54	50.9	47	59.5	50	35.5	97	57.4	7	46.7
Migrant background	25	12.0	10	24.4	21	12.7	18	10.3	15	14.4	17	22.4	3	2.1	11	6.5	15	100
Relationship status																		
Single	42	20.2	9	21.4	30	18.1	39	22.5	19	17.9	26	33.3	34	23.8	48	28.4	4	26.7
Married	81	38.9	23	54.8	84	50.6	112	64.7	52	49.1	21	26.9	99	69.2	42	24.9	5	33.3
Relationship	70	33.7	7	16.7	19	11.4	10	5.8	24	22.6	22	28.2	0	0	75	44.4	1	6.7

Table 1 continued

Sample characteristics (n= 1112) with respect to participants' nationality.

	German		U.K.		Czech		Polish		Spanish		Swedish		Turkish		Italian		Other	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Divorced	10	4.8	3	7.1	15	9	4	2.3	8	7.5	6	7.7	6	4.2	3	1.8	3	20
Widowed	5	2.4	0	0	18	10.8	8	4.6	3	2.8	3	3.8	4	2.8	1	0.6	2	13.3
Qualification																		
No or lowest	20	9.7	2	4.8	24	14.5	9	5.2	20	18.9	15	19.2	18	12.4	4	2.4	1	6.7
Intermediary	59	28.5	5	11.9	34	20.5	2	1.2	13	12.3	4	5.1	15	10.3	13	7.7	1	6.7
Higher secondary	64	30.9	10	23.8	68	41	99	57.2	25	23.6	31	39.7	55	37.9	68	40.5	6	40
University degree	64	30.9	25	59.5	40	24.1	63	36.4	48	45.3	28	35.9	57	39.3	83	49.4	7	46.7
Income <70%	68	33.8	5	11.9	78	47.3	54	32.7	14	14.3	17	21.8	45	32.8	97	62.2	3	20
70% ≥ x ≤ 150%	91	45.3	11	26.2	63	38.2	93	56.4	46	46.9	34	43.6	48	35	52	33.3	12	80
Income >150%	42	20.9	26	61.9	24	14.5	18	10.9	38	38.8	27	34.6	44	32.1	7	4.5	0	0
Age M(SD)	40.84(15.57)		42.10(13.89)		44.28(17.15)		39.85(12.99)		45.07(12.68)		47.65(20.07)		37.69(11.49)		32.53(13.55)		35.67(9.53)	

Table 2

Descriptive statistics and reliabilities for the three scales depending on their stage

	$\alpha$	M	SD	Items	$\alpha$ in national subsamples	$\alpha$ in incident subsamples
EKS - Beginning	.81	15.47	6.09	7	.66 - .92	.76 - .82
EDS - Beginning	.90	9.26	5.17	5	.70 - .96	.75 - .93
EDS - Realisation	.86	16.04	5.66	5	.78 - .90	.81 - .89
PTS - Realisation	.76	5.30	2.56	2	.33, .43, .69 - .84	.54, .59, .72 - .83
EDS - During evac.	.89	15.86	5.89	5	.82 - .91	.79 - .92
PTS - During evac.	.81	5.07	2.59	2	.51, .61, .78 - .84	.57, .66 - .86
EDS - Upon exiting	.88	15.30	5.75	5	.83 - .92	.83 - .90
PTS - Upon exiting	.78	3.80	2.21	2	.28, .59, .70 - .91	.44, .64, .78 - .80

Note. EKS= Emergency knowledge scale; EDS= Emotional distress scale; PTS= Perceived stress scale; evac. = evacuation

Table 3

Intercorrelations (Spearman-Rho) between pre-, peri- and post-event variables with respect to event stages

1 EKS <sup>a</sup>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2 EDS <sup>a</sup>	.02														
3 PTS <sup>b</sup>	-.07*	.12**													
4 EDS <sup>b</sup>	-.23**	.18**	.51**												
5 Panic <sup>b</sup>	-.12**	.16**	.41**	.60**											
6 Control <sup>b</sup>	.31**	-.12**	-.29**	-.45**	-.34**										
7 Evac starting <sup>c</sup>	-.07*	.13**	-.10**	-.03	-.01	-.06									
8 PTS <sup>c</sup>	-.06	.11**	.82**	.55**	.44**	-.28**	-.13**								
9 EDS <sup>c</sup>	-.24**	.19**	.57**	.88**	.59**	-.46**	-.04	.61**							
10 Control <sup>c</sup>	.27**	-.13**	-.32**	-.45**	-.37**	.72**	-.07*	-.35**	-.49**						
11 PTS <sup>d</sup>	-.07	.20**	.56**	.36**	.37**	-.26**	-.10**	.62**	.41**	-.28**					
12 EDS <sup>d</sup>	-.24**	.18**	.52**	.80**	.60**	-.43**	-.08*	.55**	.86**	-.47**	.46**				
13 Control <sup>d</sup>	.21**	-.16**	-.29**	-.38**	-.31**	.62**	-.02	-.29**	-.41**	.72**	-.32**	-.48**			
14 Weeks since event	-.13**	.02	.10**	.00	.00	-.11**	.12**	.03	.03	-.09*	.11**	.03	-.07		

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Table 3 continued

Intercorrelations (Spearman-Rho) between pre-, peri- and post-event variables with respect to event stages

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
15 Health	-.14**	.12**	.05	.09**	.11**	-.10**	.00	.04	.08*	-.09*	.08*	.10**	-.17**	-.03	
16 IES-R	-.10**	.22**	.47**	.57**	.49**	-.35**	.03	.52**	.64**	-.39**	.43**	.62**	-.40**	-.03	.18**

Note. \* p < .05 \*\* p < .01.; <sup>a</sup>= Beginning; <sup>b</sup>=Realisation; <sup>c</sup>=During Evacuation; <sup>d</sup>=Upon Exiting; Health = current health status from 1 (very good) – 5 (very bad); Evac starting: 1=within 30 sec – 6= more than 30min

Table 4

Initial activities with respect to the time taken to begin evacuating and injuries incurred

	Evacuation starting time						Injuries	
	≤ 30 sec	≤ 2 min	≤ 5 min	≤ 10 min	≤ 30 min	> 30min	Yes	No
Initial activities	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)	N(%)
Nothing for a while	8(15.4)	25(16.9)	20(12.9)	23(17.3)	16(17.8)	16(12.6)	13(14.8)	143(15.7)
Alert/save others	15(28.8)	44(29.7)	42(27.1)	36(27.1)	23(25.6)	27(21.3)	25(28.4)	216(23.7)
Inform others	2(3.8)	5(3.4)	5(3.2)	5(3.8)	3(3.3)	6(4.7)	4(4.5)	41(4.5)
Sought help from emergency services	3(5.8)	15(10.1)	17(11.0)	19(14.3)	15(16.7)	5(3.9)	7(8.0)	103(11.3)
Sought shelter inside	0(0.0)	6(4.1)	6(3.9)	5(3.8)	4(4.4)	2(1.6)	6(6.8)	21(2.3)
Protect my property	1(1.9)	4(2.7)	7(4.5)	6(4.5)	4(4.4)	31(24.4)	3(3.4)	75(8.2)
Gave up	0(0.0)	2(1.4)	1(0.6)	6(4.5)	3(3.3)	2(1.6)	0(0.0)	17(1.9)
Gathered items	4(7.7)	17(11.5)	19(12.3)	13(9.8)	7(7.8)	21(16.5)	6(6.8)	85(9.3)
Sought information	6(11.5)	13(8.8)	16(10.3)	8(6.0)	5(5.6)	7(5.5)	0(0.0)	106(11.6)
Other	13(25.0)	17(11.5)	22(14.2)	12(9.0)	10(11.1)	10(7.9)	24(27.3)	104(11.4)

Table 5

Initial activities with respect to pre-event and other peri-event variables

Initial activities	EKS		EDS		PTS		Panic		Control		Time pressure		Reaction	
	M	SD	M	SD	M	SD	M	SD	M	SD	Yes N(%)	No N(%)	Automatic N(%)	Conscious N(%)
Nothing for a while	1.93	0.71	3.52	1.12	3.00	1.36	2.33	2.14	2.47	1.20	104(13.4)	53(22.3)	92(20.0)	63(11.6)
Alert/save others	2.40	0.89	3.14	1.04	2.77	1.22	1.62	1.71	3.23	1.13	210(27.1)	35(14.7)	116(25.2)	129(23.7)
Inform others	2.06	0.83	2.96	1.14	1.91	1.16	0.98	1.34	3.25	1.04	27(3.5)	18(7.6)	13(2.8)	33(6.1)
Sought help from emergency services	2.12	0.84	3.54	1.09	2.50	1.21	2.29	2.56	2.55	1.17	105(13.6)	9(3.8)	58(12.6)	54(9.9)
Sought shelter inside	2.38	1.03	3.75	1.13	3.46	1.40	2.85	2.51	3.11	1.05	22(2.8)	5(2.1)	13(2.8)	14(2.6)
Protect my property	2.14	0.78	3.10	1.15	2.18	1.15	1.58	1.92	3.03	1.09	66(8.5)	13(5.5)	38(8.2)	41(7.5)
Gave up	2.18	0.96	3.24	1.23	3.06	1.52	1.81	1.83	2.00	1.17	14(1.8)	3(1.3)	11(2.4)	6(1.1)
Gathered items	2.11	0.82	3.13	1.08	2.58	1.26	1.76	2.18	3.17	1.09	69(8.9)	23(9.7)	34(7.4)	58(10.7)
Sought information	2.50	0.92	2.84	1.12	2.19	1.11	1.14	1.82	3.38	1.13	61(7.9)	46(19.3)	28(6.1)	77(14.2)
Other	2.22	0.93	3.09	1.17	2.63	1.38	1.83	2.21	2.97	1.24	96(12.4)	33(13.9)	58(12.6)	69(12.7)