Disaster Prevention and Management

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Annelie Holgersson Dzenan Sahovic Britt-Inger Saveman Ulf Björnstig

Received 11 December 2015
Revised 11 December 2015
Accepted 4 May 2016

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Annelie Holgersson
Department of Surgery, Umeå University, Umeå, Sweden
Dzenan Sahovic
Department of Political Science, Umeå University, Umeå, Sweden
Britt-Inger Saveman
Department of Nursing, Umeå University, Umeå, Sweden, and
Ulf Björnstig
Department of Surgery, Umeå University, Umeå, Sweden

Abstract

Purpose – The purpose of this paper is to analyse factors influencing perceptions of preparedness in the response to terrorist attacks of operational personnel in Swedish emergency organizations.

Design/methodology/approach – Data were collected using a questionnaire distributed to operational personnel from the police, rescue and ambulance services in eight Swedish counties; 864 responses were received and analysed.

Findings – Three aspects of the perception of preparedness for terrorist attacks among Swedish emergency responders were studied: willingness to respond; level of confidence with tasks; and estimated management capability. Factors which positively influenced these perceptions were male sex, training in first aid and dealing with mass casualty incidents, terrorism-related management training (MT), table-top simulations, participation in functional exercises, and access to personal protective equipment (PPE); work experience was inversely related. Occupation in police or rescue services was positively associated with willingness to respond whereas occupation within the emergency medical services was positively associated with estimated management capability.

Practical implications – These findings show that terrorism-related MT and access to PPE increase the perceptions of preparedness for terrorism among the emergency services, aiding judgements about investments in preparedness by crisis management planners.

Originality/value – Limited research in disaster management and hazard preparedness has been conducted in a European context, especially regarding terrorism. Little is known about aspects of preparedness for terrorism in Sweden, particularly from the perspective of the emergency responders.

Keywords Training, Confidence, Firefighters, Police, Capability, Willingness to respond, Emergency medical services

Paper type Research paper

Introduction

The operational personnel of the emergency organizations – the emergency responders – are a core component of society's initial response to a terrorist attack. In terms of preparedness for such attacks, it is assumed that the emergency responders are both

The authors thank the Swedish National Board of Health and Welfare, the Arnerska Foundation and the J.C. Kempe Memorial Fund for financial support. Statistical aid by senior lecturer Johan Svensson was also greatly appreciated, as was the help from R.N. Tom Uppstu in distributing questionnaires.

Disaster Prevention and Management
Vol. 25 No. 4, 2016
pp. 520-533

0965-3562
DOI 10.1108/DPM-12-2015-0280

capable of, and willing to, effectively manage the initial consequences of the attack by providing medical assistance, rescuing trapped casualties, securing the site from further attacks and tracking down the perpetrators. During such a complex response, personnel from the emergency medical services (EMS) and the police and rescue services are expected to perform a wide array of unfamiliar tasks, such as triage and treating blast injuries (Wightman and Gladish, 2001; Frykberg, 2002; Morley *et al.*, 2010). In doing so, they may potentially expose themselves to health and safety risks in the form of undetonated devices, secondary attacks, contamination and experiences causing both short- and long-term physical and psychological consequences (Eckstein and Cowen, 1998; Misra *et al.*, 2009; Autrey *et al.*, 2014; Beinecke, 2014). The first personnel to reach the scene from societal organizations will be the local emergency responders (Perry and Lindell, 2007; Autrey *et al.*, 2014). This means that local police departments, rescue services and EMS are key in the timely and effective response to a terrorist attack because the stand-up time of specialized teams (e.g. Special Weapons and Tactics and Tactical Emergency Medical Support) are usually too long for a timely response to rapidly unfolding events (Autrey *et al.*, 2014). It is therefore interesting to examine the perceptions of preparedness for terrorism of the operational personnel within the emergency organizations and to analyse the factors influencing the perception of preparedness.

As Grothmann and Reusswig (2006) have pointed out, most of the research on hazard preparedness has been conducted in the USA, which has a different culture from European countries. Since it is not clear how generalizable research conducted in the USA is to the Swedish context, this study will contribute both empirically and theoretically to preparedness research in Europe by pinpointing the factors of importance in the perception of preparedness to terrorist attack among emergency organization personnel. Little research has been conducted covering all the Swedish emergency organizations in a comparative manner, on their training for the management of a terrorist attack, or on their thoughts about the preparedness for response to terrorist attacks. As Sweden has not yet experienced a large-scale terrorist attack, it cannot be determined how the emergency responders will actually perform, but the conditions for an effective response can be analysed by considering the perceptions of preparedness among emergency responders and the influence of elements such as education, training exercises, co-training and access to personal protective equipment (PPE).

Theoretical background

Preparedness may be interpreted as protective and precautionary activities and behaviours that can be harnessed to protect from, and help lessen the impact of, hazardous events that threaten life and property (Paton *et al.*, 2005; Mishra and Suar, 2007). In terms of the emergency organizations, preparedness also implies a process of ensuring that the organizations have compiled preventive measures and are in a state of readiness to minimize any negative effects by providing rescue in the aftermath of the event, including the capability and resources to continue to sustain their essential functions without being overwhelmed (UNICEF, 1995). This study delineated three features of preparedness particularly selected to capture the perceptions of preparedness by the emergency responders in terms of their willingness to respond to a chemical/biological/radiological/nuclear/explosive (CBRNE) incident, their level of confidence in the tasks to be performed at the scene, and the estimated management capability of their own organization to manage a terrorist bombing scenario.

Characteristics and experience variables

Several studies have examined the factors that predict individual preparedness behaviour for disasters, including sex, age, education, knowledge about disasters and past exposure to a disaster (Norris *et al.*, 1999; Mishra and Suar, 2005, 2007; Bourque *et al.*, 2012a, b). Several studies have found that men report more preparedness activities than women (FEMA Citizen Corps, 2009; Bourque *et al.*, 2012a), who are less likely to make hazard adjustments (Lindell and Prater, 2000). Consistent with this, it was assumed that male sex would predict higher perceptions of preparedness. With respect to age and individual preparedness, Eisenman *et al.* (2006) found that people aged under 30 years were less likely to report preparedness activities than older people.

Bourque *et al.* (2012a) showed that residents who lived in New York City and Washington, DC, where terrorist attacks have occurred, were more likely to have emergency plans, stockpile supplies and to purchase things to be safer, than residents from other American cities, where such attacks have not taken place. Frykberg (2002) also reported that formal responses to attacks are more sophisticated and effective in countries that have more experience in dealing with terrorist incidents. Although it is improbable that Swedish emergency responders will have any practical, direct experience with terrorism, it can be assumed that longer work experience in these professions have led personnel to be repeatedly exposed to emergencies that could prompt higher perceptions of preparedness with longer work experience.

Although the emergency organizations are expected to work effectively together, they are three separate organizations. In Sweden, they are under the control of different authorities with different jurisdictions, command structures, roles and responsibilities (Berlin and Carlström, 2011b). They all have long, separate histories, which manifests as firm organizational cultures and terminology (Berlin and Carlström, 2011a). Thus it can be assumed that there are organizational differences in perceptions of preparedness between the three emergency organizations.

It may also be postulated that those who have experienced violence against themselves and those around them may have adopted a different perspective on preparedness. Social psychological research suggests that traumatic life events can challenge an individual's assumptive world (Janoff-Bulman, 1989). Perceptions of the world as a dangerous and threatening place can lead to a desire for more security and those who hold strong security values emphasize the safety of wider society (Goodwin *et al.*, 2005). Thus it might be anticipated that a person who has experienced violence against themselves or a colleague will aspire for more security and have higher expectations on preparedness efforts – that is, there is a negative association between direct or indirect experience of violence and perceived preparedness.

Lastly, the availability of resources, knowledge and personnel may differ significantly from one jurisdiction to another. Compared with smaller communities, larger communities are often characterized by an elaborate structure of governmental offices, numerous resources and personnel (Perry and Lindell, 2003). A difference in preparedness perceptions is therefore expected between municipalities of different types and the estimated management capability is expected to be higher in more central areas.

Education and equipment variables

Effective planning, training and exercising, accompanied by the acquisition of appropriate equipment and apparatus, yield benefits in the form of a more effective

emergency response (Kartez and Lindell, 1987; Peterson and Perry, 1999; Perry and Lindell, 2003; Perry, 2004). These same aspects constitute an integral part of the process to achieve preparedness. The success of response operations is also noticeably affected by the achievement of effective inter-organizational coordination among the responder groups, which necessitates clearly pre-determined, common principles for incident management and defined tasks and responsibilities for each organization; the organizations, in turn, need to be drilled and jointly trained (Perry and Lindell, 2003; Perliger and Pedahzur, 2006; Autrey *et al.*, 2014; Jacobs *et al.*, 2014).

Exercises (sometimes referred to as drills or simulations) are commonly differentiated into three types: table-top, functional and full-scale. A table-top exercise is the least complex type, in which participants are assigned roles in the response system and are given a simulated scenario to manage. Participants respond by describing the actions they would initiate and their contacts with other responders and agencies. Functional exercises are more complex, focusing on testing a small number of functions under a response plan – for example, the response segment of the police and rescue service in the event of a terrorist-generated explosion. They are commonly conducted in real time, in the field, with operational personnel exercising their functions with the appropriate equipment. Full-scale exercises are the most complex type and test all or most of the functions specified in an emergency response plan (Perry, 2004).

With regard to preparedness, Gillespie and Colignon (1993) demonstrated that table-top drills were capable of generating new and useful knowledge for participants. Perry (2004) further showed that police officers, firefighters and civilian volunteers who had participated in functional exercises had enhanced perceptions of response knowledge and teamwork. A knowledge of disasters also influences preparedness. Gin *et al.* (2014) found that people who had a higher level of preparedness were also more aware of terrorism and the preparedness of others. Smith (2012) found that a willingness among responders to the 9/11 attacks to work during subsequent terrorist attacks was influenced by targeted and specialized training as well as the provision of better PPE. From this we may deduce that terrorism-related management training (MT) is correlated with a higher willingness to work, as is access to PPE. It is also anticipated that mass casualty incident (MCI) training, table-top simulations and functional exercises are likely to be correlated with higher estimates of knowledge of the responders about their own role and that of others during the management of a hostile event.

Aims

The aim of this study was to analyse the factors that influence the perceptions of preparedness for the response to terrorist attacks among operational personnel in the Swedish emergency organizations. The specific hypotheses were as follows:

- *H1.* Men and those with longer work experience will have higher perceptions of their own preparedness.
- *H2.* Preparedness perceptions will differ between the EMS, police and rescue services.
- *H3.* On duty experiences of violence against oneself or colleagues will be associated with a lower perception of preparedness.
- *H4.* More central areas will be associated with higher perceptions of preparedness.

H5. Participation in general and terrorism-related MT and exercises will be associated with higher individual preparedness.

H6. Participation in general and terrorism-related co-training with other emergency organizations will be associated with higher individual preparedness.

H7. Access to PPE in the workplace will be associated with a higher perception of preparedness.

Methods

Sample design and data collection

Data were collected by a purpose-designed questionnaire in Swedish – based on the work of Alexander and Wynia (2003), Dimaggio *et al.* (2005), Qureshi *et al.* (2005), Reilly *et al.* (2007) – and distributed between October 2014 and April 2015. Most of the questionnaires were distributed by mail by Statistics Sweden on behalf of Umeå University; another batch was distributed by the authors through intermediaries.

Statistics Sweden sent the questionnaires by mail to 1,421 strategically and randomly selected operational personnel (1,090 men and 331 women) from the police, rescue and ambulance services in eight of the 21 counties in Sweden. The counties were selected based on the completeness of information provided from the EMS sector; this information was specifically requested for the purpose of the questionnaire because data on this personnel group were not available from the registry of Statistics Sweden. There was no reason to assume that these counties significantly differed from other counties and care was taken to include counties with different population densities.

In all, 63 people were selected from all subgroups in each county, except for the rescue services in one county (where there were only 35 people in the registry) and one subgroup of EMS responders in another county. To compensate for the partial loss of the EMS subgroup in this county, the questionnaire was also distributed to EMS personnel at two conferences targeting this population, as well as to six ambulance stations in the county. The mailed questionnaire had 805 respondents (56.7 per cent response rate) and 59 questionnaires were received from the EMS staff through additional distribution. The sociodemographic characteristics and experience of the personnel in the samples are given in Table I. In the total sample (including the complementary data collection), the respondents consisted of slightly more women, of somewhat younger age and less work experience, occupied within the EMS in a central municipality, and with more experience of violence on duty. The tables in the Results section are based on data from the total sample, noting when the data from only the mail respondents differed.

Constructs and variables

Endogenous variables. Perceived preparedness was measured with three questions, which included several sub-questions:

(1) "To what degree are you willing to act, even if it means a personal risk after a chemical attack/biological attack/radiological attack/bombing?"

(2) "To what degree do you deem yourself to have knowledge of your own tasks/ the other emergency organizations' tasks during a response effort after a terrorist attack?" Answers to both questions were given on five-point unipolar

Variable	Only mail respondents (%)[a] ($n = 805$)	Total sample, including complementary data respondents (%)[b] ($n = 864$)
Sex		
Male	78.1	76.7
Female	21.1	22.6
Age (years)	(24-65, mean 45)	(24-65, mean 45)
24-44	49.6	50.9
45-65	50.2	49.1
Work experience (years)	(0-45, mean 18.5)	(0-45, mean 18.0)
0-10	35.9	37.5
11-25	33.1	33.1
26-45	31.0	29.4
Organization		
Emergency medical services	32.5	37.2
Police	32.2	30.0
Rescue services	34.4	32.1
Experience of violence on duty		
Experienced violence against self on duty	52.0	52.8
Know of colleague who had experienced violence on duty	73.3	74.3
Municipality type		
Central	17.1	18.4
Urban	68.0	63.5
Rural	12.7	16.0

Notes: [a]Percentage of data missing in sample: sex = 0.7; age = 0.2; work experience = 0.1; organization = 0.8; municipality = 2; county = 0.6; violence exposure of self = 0.6; and violence exposure of other = 0.6.; [b]Percentage of data missing in sample: sex = 0.7; age = 0.2; work experience = 0.3; organization = 0.8; municipality = 2; violence exposure of self = 0.6; and violence exposure of other = 0.6

Table I. Characteristics and experience of study participants

scales ranging from "very high degree" to "very low degree". Values of Cronbach's α for the sub-questions were 0.921 and 0.706, respectively, and approximations of the items were created and dichotomized into either low (0) or high (1) "willingness to respond"/"level of confidence with tasks".

(3) The respondents were presented with a scenario of a bombing in the municipality where they worked and asked to estimate their organizations' access to resources (staff/transportation of equipment and staff/PPE/appropriate medical equipment/transportation of injured) and knowledge (use of PPE/leadership and organization/risk awareness/triage/appropriate treatment) on the scene within the first hour. Answers were given on four-point scales ranging from "very high" to "very low", with the alternative of choosing "not applicable" – for example, triage for those working in the police force. Cronbach's α for these was 0.816 and the construct "estimated management capability" was created with the total estimate defined as low (0) if either resource or knowledge approximations were low and high (1) if both approximations were high.

Exogenous variables. Two groups of independent variables were examined as direct predictors of perceived preparedness: characteristics/experience variables and education/equipment variables. The extracted background data consisted of demographic characteristics and past experience (sex, age, work experience, organization, municipality and experience of violence on duty). Regarding the experience of violence on duty, the respondent was asked whether they themselves had experienced violence on duty and whether they knew of a colleague who had experienced violence on duty. These responses had a fairly linear correlation with one another, which prompted the merger of this variable into two groups, one with personnel who had had both direct and indirect experience of violence (1) and one with personnel who had had no experience or limited experience of violence on duty (0). The age and work experience variables had a strong linear correlation, so only one variable (work experience) was used in the models to avoid multicollinearity problems. The work experience variable was divided into three groups with roughly a third of the study population in each and reflecting short, medium and long work experience: 0-10 years (38 per cent), 11-25 years (33 per cent) and 26-45 years (29 per cent).

Seven constructs represented education and equipment. Four questions measured education and training through dichotomous "no" or "yes" answers to funnel questions regarding whether the respondent had attended courses in first aid/pre-hospital medical management/major incident management and control/organization and leadership on an incident scene. If the answer to any of these questions was "yes", then they were asked if the course included the management of terrorist attacks/table-top simulations/full-scale practical exercises, with "no" (0) or "yes" (1) response options. Inter-organizational training was measured with two questions. The first funnel question asked if the respondent, while exercising their profession, had co-trained with another emergency organization. If the answer was "yes", then the respondent was asked whether or not the co-training entailed the response to terrorist attacks. The last question read: "does your workplace have extra PPE for you to use in an event out of the ordinary, which jeopardizes your health and safety?" Answers given were either "no", "yes" or "don't know". These were dichotomized to (1) for "yes" and (0) for "no", "don't know" and missing.

Analysis

Analysis was conducted using Stata Statistical Software release 13 (College Station, TX, USA; StataCorp LP 2013) to examine associations between defined factors and perceived preparedness. Univariate analysis was performed to characterize the sample. Multiple logistic regression analyses were then performed with each of the three preparedness variables. All regression models measured the relationship of each covariate to the outcome variables adjusted for confounding by the other variables – that is, the adjusted odds ratio with 95 per cent confidence intervals. Each model contained all covariates. All dichotomizations were performed to allow for the use of logistic regression models as the multiple statistical analysis adjusts for other variables and shows how one variable affects another, not just whether or not it causes an effect (as is shown in a bivariate analysis).

Results

In the total sample, 95 per cent of the personnel had received at least one of the four specified courses, whereas only 10 per cent had received any terrorism-related MT.

During one of these courses, 78 per cent had conducted a table-top simulation and 85 per cent had taken part in a functional exercise. Similarly, 86 per cent had co-trained with the other emergency organizations, but only 9 per cent had done so specifically focused on terrorism management. When asked whether there was any extra PPE available, 87 per cent said "yes". Overall, 65 per cent had a high willingness to respond to CBRNE incidents. In all, 34 per cent reported a high level of confidence with tasks and 31 per cent reported high estimated management capability in their organizations with respect to coping with a bombing scenario. About one in eight of the responders (12 per cent) had a high willingness to respond, high level of confidence with tasks and a high estimated management capability.

Table II gives the results of the multiple models predicting the three aspects of preparedness covered in the study in relation to the study hypotheses. Factors associated with a willingness to respond were male sex, less than 26 years of work experience, occupation within the police or rescue service, first aid and MCI training,

Hypothesis	Variable	Adjusted odds ratio (AOR) (95% CI) for Willingness to respond	Level of confidence with tasks	Estimated management capability
	Characteristics and experiences			
H1	Sex			
	Male	*1.7* (1.2–2.6)**	*4.5* (2.7–7.5)***	0.8 (0.5–1.2)
	Work experience (years)[b]			
	0-10	*1.6* (1.0-2.3)*	1.3 (0.8-2.0)	0.7 (0.5-1.1)
	11-25	*1.5* (1.0-2.2)*[c]	1.0 (0.7-1.5)	0.8 (0.5-1.2)
H2	Organization			
	Police	*2.1* (1.3-3.3)**	0.9 (0.6-1.5)	*0.4* (0.3-0.7)***
	Rescue service	*2.6* (1.6-4.0)***	0.9 (0.6-1.4)	*0.6* (0.4-0.9)*
H3	Experience of violence on duty			
	Against self and colleague	1.4 (0.9-2.1)	1.0 (0.7-1.6)	0.8 (0.6-1.2)
H4	Municipality type			
	Rural	1.0 (0.7-1.5)	0.7 (0.5-1.2)	0.7 (0.4-1.1)
	Central	1.0 (0.6-1.4)	1.3 (0.9-2.0)	1.4 (0.9-2.1)
	Education and equipment			
H5	First aid and mass casualty incident training	*3.6* (1.6-8.2)**	0.7 (0.3-2.0)	0.6 (0.3-1.4)
	Terrorism-related management training	*1.9* (1.0-3.5)*	*4.6* (2.5-8.3)***	*1.8* (1.0-3.1)*[c]
	Table-top simulations	*1.6* (1.1-2.4)**	*1.6 (1.1-2.5)**	1.3 (0.9-1.9)
	Functional exercises	1.2 (0.7-1.8)	*1.9* (1.1-3.3)*	0.9 (0.6-1.5)
H6	General co-training	0.9 (0.6-1.5)	1.7 (0.9-3.1)	1.1 (0.7-1.9)
	Specific co-training	0.9 (0.5-1.7)	1.6 (0.9-2.9)	0.9 (0.5-1.6)
H7	Existing personal protective equipment	*2.1* (1.3-3.3)**	*2.4* (1.3-4.4)**	1.5 (0.9-2.6)

Notes: [a]Based on data from all respondents. Reference groups are female, work experience 26-45 years, emergency medical services, urban; [b]In a logistic regression model with work time as the interval data, work time had significant associations both with willingness to respond (AOR = 0.98; CI = 0.97-0.99; $p > 0.018$) and estimated management capability (AOR = 1.01; CI = 1.00-1.02; $p > 0.049$); [c]Difference in significance with data only from respondents to mailed questionnaire. Numbers in italic significance: *$p > 0.05$; **$p > 0.01$; ***$p > 0.001$

Table II. Results of full multiple logistic models of perception of preparedness variables[a]

terrorism-related MT, table-top simulations and PPE available at the workplace. Factors associated with the level of confidence with tasks included male sex, terrorism-related MT, table-top simulations, participation in functional exercises and extra PPE at the workplace. Estimated management capability was positively associated with terrorism-related MT, whereas it was negatively associated with occupation within the police and rescue service. In summary, the multiple logistic analysis supported *H2*, *H5* and *H7*, and partly supported *H1*, whereas *H3*, *H4* and *H6* could not be proved.

Discussion

This study included three aspects of preparedness perception for terrorist attacks – willingness to respond, level of confidence with tasks and estimated management capability – among Swedish emergency responders. These perceptions were influenced by gender, work experience, organizational affiliation, various training arrangements and access to PPE; which will be discussed more in depth below.

Sex was found to affect perceptions of preparedness, with men grading a higher willingness to respond and higher level of confidence with tasks. Other research has similarly showed a higher willingness in men to report for duty during different types of disasters (Shapira *et al.*, 1991; Qureshi *et al.*, 2005). This study also showed that work experience significantly affected the respondents' perceptions of preparedness. In terms of a willingness to respond to CBRNE incidents, we saw a decrease in willingness to respond with longer work experience, whereas Barnett *et al.* (2014) found the opposite, with the willingness to respond being higher in the age group older than 40 years. Although not clear in the logistic regression with work experience as scaled data, the same model with work experience as a continuous variable showed that work experience had a small, but significant, influence on estimated management capability. Work experience (or age) thus influenced preparedness aspects in opposite ways, with a higher willingness among less experienced personnel, but a higher estimated management capability among more experienced workers. As this study indicated rather ambiguous effects of work experience (or age) on the measured preparedness aspects, more research is needed to test this effect. However, this would mean considering the potential benefits to other contexts in terms of changeability, desirability and generalizability.

The perceptions of preparedness among emergency responders differed between organizations, showing that these three organizations were not homogenous, either culturally or structurally. With respect to organizational differences, Goodwin *et al.* (2005) reported the importance of group norms in the perception of risk, the assessment of a situation and the intention to respond. Other research on collaboration between emergency organizations in Sweden has found differences in culture between organizations (Berlin and Carlström, 2011a) as well as different interpretations of the same situation (Danielsson *et al.*, 2015). In terms of insecurity and a more defensive approach at the scene, Berlin and Carlström (2009) reported differences between the emergency responders in terms of schooling and occupational background. Personnel working in the EMS often come from a health care background and have previous experience of working on a hospital ward, a more predictable and less risky work environment than in the field. This could be part of an explanation for the lower willingness of the EMS to respond. Regarding willingness to respond, there may be a critical distinction between what respondents claim to be willing to do compared with what they actually would do or are able to do. Willingness to respond may be a part of an idealistic rhetoric rather than a practical occurrence, similar to an intention to

collaborate, as shown by Berlin and Carlström (2011b). Previous research (Qureshi *et al.*, 2005) has shown important distinctions in the barriers that affect the ability of health care workers to report to duty (transportation, child care, elder care, pet obligations) and their willingness to report to duty (fear and concern for family and self, personal health problems) during different kinds of disasters. These issues were not considered in this study, but remain an interesting aspect for future research within the decentralized and geographically diverse Swedish context.

This study reaffirms previous reports from other contexts (Qureshi *et al.*, 2005; Reilly *et al.*, 2007) that there is a lack of terrorism-related training and co-training provided to the personnel who are expected to respond to terrorist-induced emergencies. Education and training have been proved to have an effect on perceptions of preparedness. Participation in general first aid, MCI training and table-top simulations had a positive effect on the willingness to respond as well as the level of confidence with tasks, which was also positively influenced by functional exercises. Terrorism-related MT had a positive effect on all three aspects of preparedness. Through test and re-tests after courses, other researchers have shown that training of EMS in response to active shooter incidents did affect their attitudes and perceptions of preparedness (Jones *et al.*, 2014). Although only about one in ten participants in this study had received terrorism-related MT, they had a much higher level of confidence with the tasks to be performed during response to a terrorist attack. This is supported by the findings of Gin *et al.* (2014) of a higher preparedness among those with a higher awareness of terrorism. Among the education and equipment variables, terrorism-related MT was the only variable found to affect the estimated management capability of respondents. DiMaggio *et al.* (2005), Ludtke *et al.* (2014) and Smith (2012) have shown that terrorism-related MT positively influenced the willingness to respond. DiMaggio *et al.* (2005) also highlighted the importance of recent terrorism-related MT; they showed that those who had received such training within the previous two years were more likely to be willing to respond to a biological or chemical incident. It should be noted that our questionnaire only asked whether the MCI courses had included terrorism-related MT, although Reilly *et al.* (2007) showed an even higher effect of agent-specific CBRN training compared with general CBRN training, arguing that the all-hazards approach in general courses may not be enough to develop proficiency and comfort, but also stating that more research is needed. More research is also needed regarding the interaction between levels of confidence and knowledge, likewise suggested by Ludtke *et al.* (2014).

Access to PPE was shown to affect the perceptions of preparedness in two instances: the willingness to respond to a CBRNE incident and the level of confidence with tasks. Other research has also shown that a willingness to respond to subsequent terrorist attacks was positively influenced by the provision of better PPE (Smith, 2012). Based on their survey data, Shapira *et al.* (1991) similarly hypothesized that the willingness to respond increased notably if safety measures were provided. The finding in this study regarding willingness to respond makes sense as the responders with access to PPE felt protected from certain harmful consequences, such as exposure to harmful agents. How this could affect the task comfort level may not seem as logical at first glance. We, however, suggest that this is not primarily due to access to PPE, but rather the knowledge of access to PPE. A person with an awareness of access to PPE may similarly be aware of other aspects of preparedness for terrorist attacks, such as the tasks to be performed. In terms of the comfort level of EMS providers in responding to CBRNE events, Reilly *et al.* (2007) showed that providers who had equipment, but no

training, had lower comfort levels than those who had only training. Thus equipping responders is not enough; the availability of PPE has to be complemented by the necessary training. In this study we found that terrorism-related MT had nearly double the effect on the level of confidence with tasks compared with access to PPE.

Limited research has been conducted in a European context in the fields of disaster management and hazard preparedness, especially regarding terrorism. Little is known about the preparedness for terrorism in Sweden, particularly from the perspective of the emergency organizations. Sweden has not to date experienced a large-scale terrorist attack and the emergency responders therefore have little actual experience in managing the challenges on scene after such an incident. Although the formal response is more sophisticated and effective in countries with more experience in dealing with terrorist incidents (Frykberg, 2002), research has also shown that those with limited experience are more likely to achieve good practice if they have effective planning activities, such as multidisciplinary simulations (Kartez and Lindell, 1987). This study has identified several factors that influence the perceptions of preparedness among emergency responders, which, in turn, are amenable to intervention. Education, especially terrorism-related MT and table-top simulations, and PPE are worthy of investment if better perceptions of preparedness are to be achieved among those who are expected to respond to terrorist attacks. This research could thus help in making judgements about investments in terrorism preparedness by crisis management planners. Further research is needed to determine how perceptions of preparedness translate to actual preparedness and response effectiveness.

Methodological limitations

This study has two main limitations or reasons to view the results with caution. First, to the best of our knowledge, this is the first time that these groups have been studied together in Sweden through one questionnaire. On a population basis the characteristics of the groups as a whole were not clear. There is no cohesive registry that includes everyone employed in the EMS, police and rescue service covering all personnel working on a full-time, part-time or voluntary basis. This complicated the population sampling. As previously stated, counties were selected based on the completeness of information provided by the EMS. Even if we see no reason to assume that the personnel from these counties differed from other Swedish counties, we cannot be certain that the response rates and perceptions of preparedness are the same nationally. These limitations should be considered before generalizing the findings to all operational personnel within the Swedish emergency organizations.

Second, the questionnaire study design contained certain unknown factors. Although the content and wording of the questionnaire was reviewed by laymen, experts in mass casualty management and experts on statistics and questionnaires from Statistics Sweden, we do not know how the questions were interpreted by the respondents. In terms of education, for example, four different course choices were given, whereas no open question asked about other relevant education. Thus we cannot be sure that these questions captured all the training received by the respondents or whether the educational input in some subgroup was underestimated as a result of the line of questioning. However, this study is a first step towards gaining a cohesive and comparative knowledge of the Swedish emergency organizations with respect to preparedness for a terrorist attack.

Conclusions

The three aspects of preparedness (willingness to respond, level of confidence with tasks, estimated management capability) among Swedish emergency responders were influenced by sex, work experience (inversely related), first aid and MCI courses, terrorism-related MT, table-top simulations, functional exercises and access to PPE, in addition to organizational affiliation. This study attests that few emergency responders in Sweden have specific terrorism MT and that investment in such training and in PPE and its proper use could increase the perceptions of preparedness for terrorism among the EMS and the police and rescue services.

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Corresponding author
Annelie Holgersson can be contacted at: annelie.holgersson@umu.se