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**Crowd behaviour in chemical, biological, radiological and nuclear (CBRN)
emergencies: behavioural and psychological responses to incidents involving
emergency decontamination.**

Thesis submitted by Holly Elisabeth Carter to the University of Sussex for the qualification
of Doctor of Philosophy in Psychology, September 2013

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

Signature:.....

University of Sussex

Holly Elisabeth Carter, submitted for the award of Doctor of Philosophy in Psychology

**Crowd behaviour in chemical, biological, radiological and nuclear (CBRN)
emergencies: behavioural and psychological responses to incidents involving
emergency decontamination.**

Summary

Planning for incidents involving mass decontamination has focused almost exclusively on technical aspects of decontamination, with little attempt to understand public experiences and behaviour. This thesis aimed to examine relevant theory and research, in order to understand public behaviour during incidents involving mass decontamination, and to develop theoretically-derived recommendations for emergency responders. As these incidents involve groups, it was expected that social identity processes would play an important role in public responses.

A review of small-scale incidents involving decontamination is presented, along with a review of decontamination guidance documents for emergency responders. This literature shows that responder communication strategies play an important role in public experiences and behaviour, but that the importance of communication is not reflected in guidance documents. Theories of mass emergency behaviour, in particular the social identity approach, are reviewed, in order to generate hypotheses and recommendations for the management of incidents involving mass decontamination. It is hypothesised that effective responder communication will increase public compliance and cooperation, and reduce anxiety, mediated by social identity variables (e.g. perceptions of responder

legitimacy, identification with emergency responders and other members of public, and collective agency).

The empirical research presented in this thesis tests the hypotheses and recommendations derived from the social identity approach. The research includes: a responder interview study; three studies of volunteer feedback from field exercises; a visualisation experiment; and a mass decontamination field experiment. Findings show that effective responder communication consistently results in increased willingness to comply with decontamination, and increased public cooperation; this relationship is mediated by social identity variables.

Results support the hypotheses, and show that an understanding of the social identity approach facilitates the development of effective responder communication strategies for incidents involving mass decontamination. Four theoretically-derived, and evidence-based, recommendations for emergency responders are generated as a result of this thesis.

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Contents page

Table of tables.....	12
Table of figures.....	13
Context statement.....	14
Chapter 1: Overview of research.....	16
Introduction.....	17
Methods and measures.....	35
Overview of the thesis.....	38
Summary of findings.....	49
Implications of findings.....	51
Theoretical implications.....	51
Practical implications.....	53
Potential limitations and directions for future research.....	59
Conclusions.....	61
Chapter 2: Paper 1 – Communication during mass casualty decontamination: highlighting the gaps.....	63
Abstract.....	64
Introduction.....	66
Method.....	73
Results.....	78
Discussion.....	86
Conclusion.....	89
Chapter 3: Paper 2 – Applying crowd psychology to improve policy and practice in the management of mass decontamination.....	91

Abstract.....	92
Introduction.....	93
Health psychology theories and mass decontamination.....	96
Theories of mass emergency behaviour and decontamination.....	98
The social identity approach to crowd behaviour and decontamination.....	104
Suggestions about the management of incidents that involve decontamination, based on the social identity approach.....	109
Conclusion.....	119
Chapter 4: Paper 3 – Emergency responders’ experiences of and expectations regarding emergency decontamination.....	124
Abstract.....	125
Introduction.....	126
Method.....	128
Results.....	131
Discussion.....	143
Chapter 5: Paper 4 – Public experiences of mass casualty decontamination....	149
Abstract.....	150
Introduction.....	152
Method.....	155
Results.....	160
Discussion.....	169
Conclusions.....	173
Chapter 6: Paper 5 – The effect of communication during mass decontamination.....	174

Abstract.....	175
Introduction.....	177
Method.....	180
Results.....	185
Discussion.....	190
Conclusions.....	194
 Chapter 7: Paper 6 – Perceived responder legitimacy and group identification	
predict cooperation and compliance in a mass decontamination field exercise..	
Abstract.....	197
Introduction.....	198
Method.....	206
Results.....	209
Discussion.....	215
 Chapter 8: Paper 7 – Effective responder communication, perceived responder	
legitimacy and group identification predict public cooperation and compliance in	
a mass decontamination visualization experiment.....	
Abstract.....	223
Introduction.....	224
Method.....	232
Results.....	236
Discussion.....	244
 Chapter 9: Paper 8 – Effective responder communication improves efficiency and	
psychological outcomes in a mass decontamination field experiment: implications	
for public behaviour in the event of a chemical incident.....	

Abstract.....	254
Introduction.....	256
Method.....	264
Results.....	272
Discussion.....	284
Conclusion.....	293
References.....	294
Appendices.....	320
Appendix 1: Lancet abstract.....	320
Appendix 2: Social Psychology Section blog post.....	323
Appendix 3: Response to reviewers' comments on paper 5 (chapter 6).....	327
Appendix 4: Response to reviewers' comments on paper 6 (chapter 7).....	334
Appendix 5: Interview schedule for interviews with emergency responders (chapter 4).....	349
Appendix 6: Pre-exercise questionnaire used during multi-agency mass decontamination field exercise (chapter 7).....	352
Appendix 7: Post-exercise questionnaire used during multi-agency mass decontamination field exercise (chapter 7).....	354
Appendix 8: Scenario used in the mass decontamination visualisation experiment (chapter 8).....	360
Appendix 9: Communication intervention used during the mass decontamination visualisation experiment (chapter 8).....	361
Appendix 10: Pre-communication intervention questionnaire used during the mass decontamination visualisation experiment (chapter 8).....	363

Appendix 11: Post-communication intervention questionnaire used during the mass decontamination visualisation experiment (chapter 8).....	365
Appendix 12: Scenario used during the mass decontamination field experiment (chapter 9).....	369
Appendix 13: Communication intervention used during the mass decontamination field experiment (chapter 9).....	370
Appendix 14: Pre-communication intervention questionnaire used during the mass decontamination field experiment (chapter 9).....	373
Appendix 15: Post-communication intervention questionnaire used during the mass decontamination field experiment (chapter 9).....	377

Table of tables

Table 2.1: Decontamination guidance documents for responders.....	75
Table 2.2: Published papers describing field exercises involving mass decontamination.....	77
Table 4.1: Differences in beliefs about the likelihood of panic between those with real life experience of decontamination, and those without.....	141
Table 5.1: Details from the five emergency preparedness field exercises.....	156
Table 5.2: Questionnaire items used during each of the five emergency preparedness field exercises.....	158
Table 6.1: Items used to measure variables during each of the exercises.....	183
Table 6.2: Mean scores for all measures across the five exercises.....	185
Table 6.3: Correlations between variables following each of the five exercises.....	186
Table 7.1: Correlation matrix for all variables.....	211
Table 8.1: Mean scores of all measures at Time 2 for the three different communication conditions.....	239
Table 9.1: Time taken (in minutes) for each group to progress through the decontamination process in the three different communication conditions.....	274
Table 9.2: Observed behaviours within each of the three different communication conditions.....	275
Table 9.3: Mean scores of all measures at Time 2 for the three different communication conditions.....	279
Table 9.4: Results of qualitative questionnaire data from each of the three different communication conditions.....	284

Table of figures

Figure 3.1: The hypothesised mediating role of social identity variables.....	119
Figure 6.1: A path model representing the expected relationships between variables....	180
Figure 6.2: A path model representing the results from Exercise C.....	188
Figure 6.3: A path model representing the results from Exercise E.....	189
Figure 7.1: A path model representing the expected relationships between variables...	206
Figure 7.2: A path model of the data collected at Time 2, following the mass decontamination field exercise.....	212
Figure 8.1: A path model representing the expected relationships between variables....	232
Figure 8.2: A path model of the data collected at Time 2, following the communication intervention.....	241
Figure 9.1: A path model representing the expected relationships between variables...	263
Figure 9.2: Participants disrobing in the standard practice communication condition...	269
Figure 9.3: Participants entering the decontamination unit during the theory-based communication condition.....	271
Figure 9.4: A path model of the data collected at Time 2, following the mass decontamination field experiment.....	281

Context statement

This thesis has been prepared in the new (or alternative) format, as a series of papers for publication. The exception to this is chapter 1, which is more similar to a traditional thesis introductory chapter, and provides an overview of the thesis as a whole. All of the chapters (except Chapter 1 and Chapter 3) are currently either already published, in press, or under review. The full reference of each paper is included on the title page of each chapter. Given the format of this thesis, the text within the chapters is identical to the submitted or published papers, unless specifically stated otherwise on the chapter title page. However, to avoid repetition, I have created a single reference list at the end of the thesis. I have also numbered the tables and figures to be consistent with the chapter numbers, and then sequentially within each chapter (e.g. 1.1, 1.2, 2.1, 3.1 etc). Where a chapter of this thesis is referenced within another chapter, both the published reference and the chapter number are cited, in order to facilitate a greater sense of connection among the papers.

The published papers within this thesis all have five authors: myself, Dr John Drury and Dr Richard Amlôt (my main academic supervisors), and Dr James Rubin and Professor Richard Williams (my associate supervisors). I am the lead author on all papers, which represents the fact that in all of the papers I analysed the data collected (where applicable), and wrote the first draft of the paper. I then received comments from my four supervisors, which I addressed in subsequent drafts of the paper. In most of the papers, I also collected the data which I subsequently analysed. The exceptions to this are Chapters 5 and 6. The data presented in Chapters 5 and 6 (results from five emergency preparedness field exercises) had been collected prior to the start of this thesis, by a team from the Health Protection Agency, including myself. However, as in other chapters, I analysed the data presented in Chapters 5 and 6, and wrote the first drafts of the papers. Chapter 9 presents

the results of a mass decontamination field experiment. In this case, I received support from Dr John Drury and Dr Richard Amlôt, as well as staff from the University of Sussex, in planning for the field experiment. I also received support from Dr John Drury, Dr Richard Amlôt, and Professor Richard Williams, along with a team of Health Protection Agency staff, to collect data during the field experiment. As with the other chapters, I analysed the data and wrote a first draft of the paper.

The order of the authors on the published papers represents their input to any subsequent drafts of the paper, except submissions to medical-style journals (Chapters 2, 4, 5, and 6) where the last author position confers relative seniority. As well as the papers which are presented within the chapters, we have also published an abstract in the *Lancet* (Appendix 1), and a blog post on the Social Psychology Section website (Appendix 2). The author order on the abstract is the same as that for the papers in Chapters 2, 5, and 6, and I am the sole author on the blog post.

This PhD is funded by Public Health England (formerly the Health Protection Agency). The organisation became Public Health England in April 2013, prior to which it was the Health Protection Agency. The data presented in this thesis were all collected prior to April 2013, and therefore the organisation is referred to as the Health Protection Agency throughout. However, it should be noted that the organisation is now Public Health England.

CHAPTER 1

Overview of research

Introduction

The threat of incidents involving chemical, biological, radiological, and nuclear (CBRN) agents has increased in recent years, due to advances in technology (Alexander & Klein, 2006; HM Government, 2010a), and the increased willingness of terrorists to obtain and use CBRN materials (O'Brien, 2011; Schneidmiller, 2012). However, these types of events are still relatively low-likelihood, due to the risk to those handling the CBRN agents (Cornish, 2007), and to difficulties in weaponisation of CBRN agents (Mazzone, 2013).

Despite their relatively low-likelihood, incidents involving CBRN agents are likely to be high impact. One reason for this is that the uncertainty and unfamiliarity associated with these types of agents is likely to result in high numbers of people seeking treatment (e.g. Okumura et al., 1998); indeed, one of the key motivations of releasing a CBRN agent may be the anticipated psychological effect on the target population (Mazzone, 2013). It has been suggested that these types of incidents may result in 'panic' (Cornish, 2007; Holdsworth, Bland, & O'Reilly, 2012), and disorderly or aggressive public behaviour (Bhardwaj, 2012; Clarke et al., 2008; Koenig et al., 2008). Further, interventions designed to protect members of the public from the threat posed by CBRN agents, such as decontamination, may be more frightening than the contaminant itself, if they are not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997).

Decontamination showering involves those who have potentially been contaminated undergoing a shower with mild soapy water in order to remove any contaminant which may be present on their skin. This reduces the risk that the agent will be absorbed into the skin, and also reduces the risk of secondary contamination of other people and places, such as receiving hospitals.

Planning for incidents involving decontamination has included a focus on large-scale incidents involving ‘mass’ decontamination. There is no one accepted definition of how many contaminated individuals constitute a mass decontamination incident. Guidance on the scale required for an incident to be termed ‘mass’ is provided by the World Health Organization (WHO): ‘an event which generates more patients at one time than locally available resources can manage using routine procedures. It requires exceptional emergency arrangements and additional or extraordinary assistance’ (WHO, 2007, p. 9). However, this definition does not attempt to specify a number above which an incident is termed ‘mass’; possibly because, according to the above definition, whether an incident is termed ‘mass’ is related to the number of resources available to deal with the incident, which could vary widely depending on the country, or the location, in which the incident were to occur. The London Emergency Services Liaison Panel (LESLP) offer a definition of mass decontamination specifically: ‘Mass decontamination is the procedure to decontaminate people when the NHS, or the London Ambulance Service on its behalf, has identified to the London Fire Brigade that the number requiring decontamination has overwhelmed, or threatens to overwhelm, the Health Service’s capacity’ (LESLP, 2012, p. 65). However, like the WHO definition of a mass casualty incident, the LESLP definition does not specify a number above which an incident involving decontamination is termed ‘mass’, and this again may vary widely depending on the country or location in which mass decontamination is carried out. For this reason, there are likely to be cross-cultural differences in the definition of an incident as requiring ‘mass’ decontamination, with health services in smaller or less developed countries being more easily overwhelmed than those within larger, more developed countries.

Johnson and Calkins (1999) attempted to specify the number of people required for an incident to be termed 'mass'. They suggest that incidents of up to 50 victims may be defined as 'small-scale mass casualty incidents'. This therefore suggests that an incident of above 50 people would be described as a mass casualty incident. For the purposes of the current research, the term 'mass decontamination' shall refer to any incident involving either a response required as a result of normal capacity being exceeded (in line with WHO and LESLP definitions) or any incident involving the decontamination of about 50 people or more.

The focus on planning for incidents involving mass decontamination has increased following the sarin attacks on the Tokyo subway in 1995 (Okumura et al., 1998), and the terrorist attacks in the US in 2001. In the UK, this increased focus on planning for incidents involving mass decontamination has resulted in the development of specially designed New Dimension MD1 mass decontamination tents (New Dimension Regional Team, 2003). These facilitate the decontamination of up to 150 people per hour, and would be used by the UK Fire and Rescue Service (FRS) in the event that an incident requiring mass decontamination was to occur. Planning for incidents involving mass decontamination continues to be a major concern for the emergency services and policy makers.

However, mass decontamination has traditionally been seen as essentially a technical issue, with very little focus on planning for the management of large numbers of people during the process. A lack of consideration has therefore been given to how members of the public might experience the decontamination process, and how this might consequently affect their behaviour.

There are several unique aspects to incidents involving mass decontamination, which may affect the way members of the public experience and respond to the

decontamination process. First, decontamination is an unfamiliar and potentially embarrassing intervention, since it involves removing clothing, which members of the public may be reluctant to do (Holloway et al., 1997). Second, victims are required to remain at the scene of the incident, which, without further information, could be perceived as infringing on their human rights of freedom of movement (Pangi, 2002). Third, the personal protective equipment (PPE) which emergency responders are required to wear could create a sense of ‘us’ and ‘them’ between members of the public and emergency responders; it could also hamper communication between members of the public and responders (Al-Damouk & Bleetman, 2005; Taylor, Balfanz-Vertiz, Humrickhouse, & Jurik, 2009). These issues could therefore hamper emergency responders’ attempts to manage incidents involving mass decontamination, which could delay the decontamination process, and result in lives being lost (Edwards, Caldicott, Eliseo, & Pearce, 2006; Lillie, Mattis, Kelly, & Rayburn, 2006; Schulze & Lake, 2009).

No research to date has examined the factors which may affect public experiences and behaviour during CBRN incidents which require mass decontamination. However, extensive research has been carried out into public behaviour during conventional mass emergencies and disasters (such as building fires, crushes, and sinking ships) (e.g. Aguirre, Torres, Gill, & Hotchkiss, 2011; Cornwell, 2001; 2003; Drury, Cocking, & Reicher, 2009a; b; Feinberg & Johnson, 2001; Johnson, 1987; 1988; Quarantelli, 1954). The findings from this research suggest possible psychological responses that could be relevant to the understanding and management of public behaviour during CBRN incidents involving mass decontamination. In particular, this research shows that existing bonds, such as those between family members and friends, are typically maintained during disasters, and hence members of the public continue to behave in an orderly, rather than a disorderly, way. More

recently, the social identity approach has been applied to explain why cooperative behaviour is also common among groups of strangers, who share no existing bonds, during disasters (Drury et al., 2009a; 2009b). The social identity approach therefore represents one possible theoretical approach which could potentially be applied to generate an understanding of likely public behaviour during incidents involving mass decontamination. Other theoretical approaches which may be of relevance include health behaviour theories (since decontamination is a health intervention), and risk communication theories. Each of these theories will now be considered in more detail.

Health behaviour theories

There are several theories of health behaviour which might be relevant to an understanding of public behavior during mass decontamination. These include the Health Belief Model (HBM) (Hochbaum, 1958), Protection Motivation Theory (PMT) (Rogers, 1975), social-cognitive theory (Bandura, 1977), and the Theory of Planned Behaviour (Ajzen, 1985). Each of these theories specifies factors which may affect an individual's willingness to comply with recommended health behaviours. These factors include: perceived severity of a threat (HBM, PMT); perceived susceptibility to a threat (HBM, PMT); perceived benefits to carrying out a recommended health behaviour (HBM, PMT, social-cognitive theory); perceived barriers to carrying out a recommended health behavior (HBM, PMT, social-cognitive theory); perceived self-efficacy in carrying out a recommended health behavior (HBM, PMT, social-cognitive theory, TPB); and subjective norms (TPB). These factors are likely to play a part in an individual's willingness to comply with decontamination, as individuals in a contamination incident will experience a level of perceived threat and perceived susceptibility of potential contamination, and will assess the perceived benefits of undergoing decontamination (e.g. removing a harmful

substance from the skin) and perceived barriers to undergoing decontamination (e.g. undressing in public), before deciding whether to comply with the recommended decontamination process. Individuals are also likely to weigh up their ability to carry out decontamination effectively (self-efficacy) and assess the subjective norms of the situation (e.g. whether undergoing decontamination is normative). By highlighting the sociocognitive factors which play a role in individual willingness to comply with recommended health behaviours, these theories can be used to develop interventions which aim to increase individual compliance with recommended health behaviours, including the adoption of health behaviours during disasters.

Health psychology theories have been applied to various different types of disasters, including natural disasters (Elder et al., 2007; Mulilis & Lippa, 1990; Paton, 2003), disease outbreaks (de Zwart et al., 2009; Jiang et al., 2009; Tang & Wong, 2004; Voeten et al., 2009), food contamination incidents (Kuttschreuter, 2006), and CBRN incidents (Neuwirth, Dunwoody, & Griffin, 2000; Pearce, Rubin, Amlôt, Wessely, & Rogers, 2013a), in an attempt to improve communication with members of the public during these types of incidents. For example, Tang and Wong (2004) surveyed 1,329 residents of Hong Kong during the 2003 SARS outbreak, to establish whether the Health Belief Model could explain and predict people wearing facemasks to prevent them catching SARS. They found that three of the five factors described in the Health Belief Model (perceived susceptibility, cues to action, and perceived benefits) were significant predictors of facemask wearing, and concluded that public communication about SARS should highlight the prevalence of SARS, and also the benefits of various protective behaviours (including wearing facemasks).

Psychosocial theories of health behaviour tend to focus on changes in people's behaviour over the medium to long term. Hence disaster-related research based on these types of theories focuses on either public preparedness prior to a disaster (e.g. Elder et al., 2007; Mulilis & Lipa, 1990; Paton, 2003), or to the adoption of protective behaviours during longer term disasters (such as disease outbreaks) (e.g. Jiang et al., 2009; Tang & Wong, 2004; Voeten et al., 2009), rather than to behaviour during acute incidents. Acute incidents happen over a much shorter timescale, and require immediate responses from members of the public as well as the emergency services, in order to minimise the risk to those involved (e.g. a chemical release). Psychosocial theories of health behaviour are therefore under-tested in acute emergency settings, and their applicability to acute incidents is not established. This potential lack of applicability to acute incidents is a problem in terms of using health psychology theories to generate recommendations about communicating with members of the public during incidents that involve mass decontamination, as these types of incidents are inherently acute, and require members of the public to take certain actions immediately.

Perhaps a more important limitation when applying health psychology theories to responses to incidents that involve mass decontamination, and in attempting to use these theories to generate recommendations about communication strategies for these types of incidents, is that they do not refer to crowd behaviour. Incidents that involve mass decontamination will involve a crowd of people, most of whom are likely to be strangers to each other, and who find themselves in a frightening and/ or unfamiliar situation. Further, the people involved may perceive others who are also involved as a possible threat to their own safety (e.g. in increasing the length of time prior to an individual being decontaminated), or as a source of safety (e.g. in providing help during the decontamination

process). A key factor which will affect whether or not members of the public comply with the decontamination process is thought to be the extent to which undergoing decontamination is internalized as a norm of the group (e.g. Carter, Drury, Amlôt, Rubin, & Williams, 2013c: Chapter 7, submitted: Chapter 8). While the theory of planned behavior highlights the fact that subjective norms are important for predicting compliance, it does not offer any interventions which could potentially be employed to increase the likelihood that a behavior (e.g. decontamination) will be internalised as a norm of the group. The social identity approach, discussed in more detail below, suggests that the extent to which behaviours and values are internalised as norms is dependent on the social identity of group members. Thus increasing the salience of one social identity over another can facilitate the internalisation of different norms of behaviour.

Risk perception and risk communication theories

Another set of theories which may be applicable to understanding public behaviour during incidents involving mass decontamination are theories relating to risk perception (e.g. Slovic, 1987) and risk communication (e.g. Fischhoff, 1995; 2013). Much research has examined how and why people perceive risk in different ways, and the impact that this might have in their actions relating to the risk. This has implications for decontamination, because members of the public will face risk from an unfamiliar contaminant, and the way in which they perceive this risk is likely to have an impact on their behaviour. Slovic (1987) identified the concept of ‘dread’ risk. Threats which are classed as dread risks are those which are uncontrollable, have catastrophic potential, and have potentially fatal consequences. Examples of ‘dread’ risks include nerve gas accidents, radioactive waste, and nuclear reactor accidents; thus incidents involving mass decontamination as a result of potential exposure to CBRN agents fall into the category of dread risk. It is often more

difficult to communicate with members of the public about dread risks, because of the inherent uncertainty involved (Covello & Sandman, 2001). However, it has been suggested that authorities should be honest with members of the public about the nature of a threat, even if this means communicating a level of uncertainty (Lemyre, Johnson, & Corneil, 2010). One reason that honesty may be so important is that members of the public tend to have low knowledge about specific threats, and may therefore rely on their level of trust in the organisation or authority responsible for managing the threat in order to make judgements about the level of risk (Siegrist & Cvetkovich, 2000). Thus confidence in an authority or organisation and trust that the authority or organisation is able to effectively manage a particular threat leads to reduced perceptions of risk associated with the potential threat (Siegrist, 2000; Siegrist & Cvetkovich, 2000; Siegrist, Keller, Kastenholtz, Frey, & Wiek, 2007). Effective communication has been shown to be vital for increasing public trust in authorities (Longstaff & Yang, 2008; Wray, Rivers, Whitworth, Jupka, & Clements, 2006), and the study of risk perception is therefore closely linked to the study of risk communication, which aims to establish the best way to communicate risk to members of the public.

Theories of risk communication (e.g. Fischhoff, 1995; 2013) examine how communicating risk in different ways can impact on public behaviour in relation to the risk. Several aspects of risk communication have been shown to impact on the way in which risk is perceived, and to enable information on risk to be more easily communicated to members of the public.

According to Fischhoff (1995; 2013), aspects of effective risk communication include: providing members of the public with necessary information, but avoiding unnecessary information which could be unhelpful; providing members of the public with

information about the benefits, as well as the risks, of a certain course of action; and ensuring that those communicating with members of the public are perceived as being trustworthy (e.g. it is important that those communicating risks to members of the public treat them with respect). As noted above, incidents involving decontamination involve a dread risk (of potential contamination from an unknown substance); effective risk communication during incidents involving decontamination is therefore likely to be crucial for helping members of the public to understand the risk they face and the actions they can take to overcome the risk (e.g. undergoing decontamination). Indeed, theories of risk communication have been applied specifically to understand public communication needs during incidents involving terrorism, including those involving CBRN agents (e.g. Fischhoff, Gonzalez, Small, & Lerner, 2003; Rogers, Amlôt, Rubin, Wessely, & Krieger, 2007), and have shown that failure to communicate effectively can lead to potentially serious misunderstandings on the part of members of the public, which could impact on their behaviour if a terrorist incident were to occur (Fischhoff et al., 2003).

The research presented in this thesis focuses on applying theories of crowd behaviour (in particular the social identity approach) to further an understanding of likely public behaviour during incidents involving mass decontamination, since mass decontamination is inherently a crowd event, in which the actions of one group (emergency responders) are likely to impact on the experiences and behaviour of another (members of the public). However, several of the concepts from risk communication theory (e.g. the importance of providing members of the public with necessary information, the importance of communicating with members of the public in a respectful way in order to generate trust) overlap with the ideas of the social identity approach employed in this thesis. Trust, in particular, is a key element of perceptions of legitimacy (Tyler, 2011), a factor which is

important for understanding crowd behaviour (in particular crowd conflict) from a social identity perspective (e.g. Drury & Reicher, 2000; Reicher, 1996; Stott, Hutchison, & Drury, 2001). Another factor which is closely linked to both perceptions of responder legitimacy and trust in responders is confidence (Jackson, Bradford, Stanko, & Hohl, 2013).

Confidence has been shown to be closely linked to trust and legitimacy, both in terms of public perceptions of policing (Jackson & Bradford, 2010), and in public perceptions of authorities during disasters (Wray et al., 2006). Generally speaking, ‘confidence’ can be seen to represent a view that another party (e.g. police, emergency responders) will perform their expected duties effectively, while ‘trust’ is more nuanced, and can include a belief that another party will treat us fairly and will act in our best interests (Jackson et al., 2013). The current research aims to show how variables which are widely recognised as being important for the successful management of mass emergencies and disasters (e.g. effective communication from responders, trustworthiness of responders, confidence in responders) operate through social identity processes.

The social identity approach

Incidents involving mass decontamination are group encounters, and therefore the social identity approach (Social Identity Theory (SIT): Tajfel & Turner, 1979; Self-Categorisation Theory (SCT): Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) is likely to be especially relevant to incidents of this type. The social identity approach offers an understanding not only of relationships between crowd members (generally, as well as during mass emergencies), but also of intergroup relationships between crowd members and other relevant groups, such as the Police and other emergency responders (e.g. Social Identity Model of Collective Resilience (SIMCR): Drury et al., 2009a; b; Elaborated Social Identity Model (ESIM): Drury & Reicher, 2000; Reicher, 1984). In the case of mass

decontamination, members of the public respond both to the incident and to the emergency responders, and hence an analysis of intergroup relationships, facilitated by the social identity approach, is likely to be of particular relevance.

The social identity approach can be applied to generate some specific variables which might be applicable to understanding public behaviour during incidents involving mass decontamination. These are described in more detail below, along with the key outcome variables which are examined in this thesis.

Key outcome variables

The outcome variables examined in this thesis are those outcomes which are likely to impact on the overall consequences of an incident involving mass decontamination. These outcome variables include whether or not members of the public will comply with the need for decontamination, how anxious members of the public feel about decontamination, and whether members of the public are willing to help each other undergo decontamination.

Compliance. For incidents involving mass decontamination, compliance can be defined as members of the public undertaking any actions recommended by emergency responders in order to successfully undergo decontamination. These actions include disrobing prior to decontamination, undergoing a decontamination shower, and re-robing in the clothes provided. As noted above, decontamination is an unfamiliar and potentially embarrassing intervention. Members of the public may therefore be reluctant to undergo decontamination, especially if the process is not managed effectively (Holloway et al., 1997). Reduced public compliance and cooperation may result in disorder, and delays to the decontamination process (Edwards, Caldicott, Eliseo, & Pearce, 2006), which could cost lives during a real incident (Lillie, Mattis, Kelly, & Rayburn, 2006; Schulze & Lake,

2009). Thus examining ways to increase public compliance during mass decontamination could result in lives being saved.

Anxiety. Anxiety is defined as a “tense, unsettling anticipation of a threatening but vague event; a feeling of uneasy suspense” (Rachman, 2013, p. 3). Anxiety is distinct from fear, in that anxiety can occur around an imagined (or exaggerated) threat, while fear occurs in response to a specific identifiable threat (Rachman, 2013). Both of these concepts are distinct from ‘panic’, which as well as involving fear or anxiety about a real or imagined threat, also involves a degree of irrational behaviour (Sheppard, Rubin, Wardman, & Wessely, 2006). The focus in this thesis is on the impact of mass decontamination on public anxiety. The decision was taken to examine anxiety (rather than fear or panic) for three reasons. First, evidence suggests that panic is uncommon during mass emergencies and disasters, and that orderly behaviour is a more typical public response (e.g. Johnson, 1987, 1988; Quarantelli, 1954). Second, the concept of ‘panic’ revolves around a judgement of behaviour as being irrational. However, there is no standard reference point for this judgement, and therefore whether a behaviour is defined as ‘panic’ or not is entirely subjective (Sime, 1995). Third, decontamination occurs in response to potential contamination with a CBRN agent. Uncertainty is likely to be high during incidents involving releases of such agents, as identifying the substance involved (or indeed whether a release has actually taken place) can take several hours. Thus members of the public are more likely to experience anxiety (in relation to an uncertain threat) than fear (in relation to a specific identifiable threat).

Decontamination involves the need to shower naked, or barely clothed, in front of others, in an unfamiliar, frightening, and potentially embarrassing situation (Holloway et al., 1997). These factors therefore increase the potential for anxiety during incidents

involving decontamination (e.g. Hanley, 1999; Vogt & Sorensen, 2002), and increase the need for responders to plan for this in their management of the incident. Understanding both the factors which affect levels of public anxiety, and the effect which anxiety may have on public behavior during mass decontamination, is likely to be crucial for developing effective management strategies.

Willingness to help/ cooperate with others. Mass decontamination requires large numbers of people to wait their turn, and to progress through the process in an orderly fashion. Increased orderly and co-operative behaviour (e.g. orderly queuing) and helping behaviour (e.g. mutual help with disrobing, washing etc) will facilitate the smooth-running of the decontamination process, and could result in lives being saved. By contrast, failure of members of the public to behave co-operatively reduces the ability of emergency services to manage the incident, and may result in increased spread of any contaminant (Edwards et al., 2006). It is therefore important to understand factors which affect willingness to cooperate with and help others during incidents involving mass decontamination.

Variables of interest derived from the social identity approach

Perceptions of responder legitimacy. Legitimacy can be understood to revolve around two core issues (Tyler, 2006). First, the perceived trustworthiness and honesty of those in authority. Second, the belief that authority figures should be accepted and their instructions should be followed. Trust is therefore a key element of perceptions of responder legitimacy (Tyler, 2011). While the importance of perceptions of responder legitimacy is a concept which is derived from the social identity approach to crowd conflict (e.g. Drury & Reicher, 2000; Reicher, 1996; Stott et al., 2001), the idea that trust is important for communicating with members of the public about a threat is an aspect which is also recognised as being important for effective communication within risk perception

and risk communication theories (e.g. Fischhoff, 1995; Fischhoff et al., 2003; Rogers et al., 2007).

Studies of interactions between the public and police during football matches indicate that successful communication strategies, and the perceived sufficiency of practical information provided, result in increased perceptions of police legitimacy (Reicher et al., 2007; Stott, Adang, Livingstone, & Schreiber, 2008). The same ideas can be applied to incidents involving mass decontamination to suggest that effective communication from emergency responders, which includes both health-focused communication and sufficient practical information, will result in increased perceptions of responder legitimacy. Perceptions of responder legitimacy is likely to be a key factor in promoting public compliance with decontamination, by increasing identification with responders (described in more detail below) (cf. Stott et al., 2008; Stott, Hoggett, & Pearson, 2012). To understand the relationship between perceptions of responder legitimacy and identification with emergency responders, it is important to take into account the content of the shared identity; in the present case it is suggested that communication from emergency responders which emphasises the health-benefits of decontamination, and the importance of responders taking certain actions, should enhance identification between responders and members of the public around an identity of protecting and maintaining public health.

Identification with emergency responders. The social identity approach suggests that individuals have social as well as personal identities (Tajfel & Turner, 1979), and that identity is based on categorisations about the self, following comparison with others who are deemed as similar at some higher level of comparison (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987); individuals in any given situation are likely to categorise themselves as part of a group if the perceived differences between them are less than the differences

perceived between themselves and others outside the group. Categorising oneself as similar to others is the basis for identification with other group members. Since each social identity has different norms, collective behaviour within a crowd is therefore based on the norms specified by the identity shared by those making up the crowd (Reicher, Spears, & Haslam, 2010).

The social identity approach has been applied to understand identification among crowd members, and between crowd members and police, within crowds of football supporters and protestors (Drury & Reicher, 2000; Reicher, 1996; Stott et al., 2001). Identification with responders has been shown to increase public compliance with responder instructions, and reduce conflict between members of the public and responders, when examining relationships between police and football supporters (e.g. Stott et al., 2008; Stott et al., 2012). The same principles could be applied to incidents involving mass decontamination to suggest that perceptions of responder legitimacy will result in increased identification with responders, which will in turn enhance perceptions that responders' instructions are normative, perceived as objective, and valued, which will in turn enhance compliance.

Identification with other members of the public. While identification with emergency responders may have a direct positive effect to reduce anxiety and increase compliance, as noted above, it is also possible that the relationship between identification with emergency responders and the relevant outcome variables will be mediated by identification with members of the public. If members of the public share a common positive relationship with emergency responders, they may simply unite around a perceived shared norm for the situation (of cooperation and compliance with the decontamination process) (cf. Turner et al., 1987; Turner, Oakes, Haslam, & McGarty, 1994). In this

situation, identification with emergency responders around a (superordinate) identity (i.e. one that responders and crowd are perceived to have in common), may in turn serve to further enhance the unity within the crowd – for their shared identification with responders is something that unites them as a group.

The idea that identification with one group can strengthen identification among members of another group is supported by research into social identity and procedural justice (e.g. the Group Value Model; Lind & Tyler, 1988). This suggests that identification with a group who are seen to represent the wider values of society (e.g. police) can serve to strengthen identification among members of the public, who are also seen to share values which are relevant to the content of the identity which the police represent (e.g. preventing crime and maintaining order). The impact of identification with one group on identification with another group is dependent on the content of the identity which is represented. In the case of mass decontamination, the content of the identity represented by emergency responders is one of public health. If responders are seen to be legitimately upholding values of public health, this should serve to strengthen public identification with emergency responders. This unity with responders around the importance of promoting and protecting public health should serve to strengthen the shared social identity among members of the public, who should also unite around this identity.

Applied to incidents involving mass decontamination, shared social identity among members of the public is likely to play a key role in the successful management of the incident. As discussed, mass decontamination requires large numbers of people to wait their turn, and to progress through the process in an orderly fashion. Shared social identification around values and norms shared with the responders (around protecting and promoting public health) can increase orderly and co-operative behaviour and helping behaviour,

which will facilitate the smooth-running of the decontamination process, as noted above. Shared social identity has also been shown to reduce stress, by increasing shared expectations of group support (Haslam, Jetten, O'Brien, & Jacobs, 2004; Haslam, O'Brien, Jetten, Vormedal, & Penna, 2005; Haslam, Jetten, & Waghorn, 2009), and increasing individuals' ability to work together to challenge and reduce shared stressors (Haslam & Reicher, 2006). Relatedly, if emergency responders are perceived as being members of the ingroup, responders' communication strategies are likely to be more effective at reducing public anxiety (Haslam et al., 2004).

Collective agency. Collective agency is the belief that other members of a group will be supportive in the pursuit of shared group goals, and that group members can work together to challenge and reduce shared stressors (e.g. Haslam & Reicher, 2006). Identification among members of the public is likely to facilitate a sense of collective agency among the group, by promoting a belief that members of the public will be able to work together and support each other in order to achieve shared goals (Drury et al., 2009a; Haslam et al., 2009). To the extent that members of the public identify with emergency responders, they should also expect support from them in carrying out responder-normative actions, and hence a sense of collective agency should also develop between members of the public and emergency responders. A sense of collective agency may increase compliance by increasing public motivation to work together (and with emergency responders) to achieve the shared goal of decontamination. Thus collective agency is expected to play a part in increasing public compliance with decontamination which, as noted above, could result in lives being saved during a real incident (Lillie et al., 2006; Schulze & Lake, 2009).

Aims of the current research

As stated above, despite the increased likelihood of CBRN incidents involving mass decontamination, and the potential challenges for emergency responders in managing incidents of this type, no research to date has examined the factors which may affect public experiences and behaviour during CBRN incidents requiring mass decontamination. This is therefore the first aim of this thesis. The second aim of this thesis is to examine relevant theory and research in order to develop theoretically-derived recommendations for emergency responders, which could facilitate the successful management of incidents involving mass decontamination. In particular, the social identity approach will be examined. The third aim of this thesis is to test the efficacy of any theoretically-derived recommendations for emergency responders, in order to draw conclusions about how effective these recommendations are likely to be for improving the management of incidents involving mass decontamination. The final aim of this thesis is therefore to make recommendations for emergency responders managing incidents involving mass decontamination, which are both theoretically-derived and evidence-based.

Methods and measures

When designing the methods and measures used within this thesis, I was conscious of the fact that mass emergency behaviour has traditionally been a very difficult area to study, especially in an experimental context. Early research into mass emergency behaviour relied on anecdotal evidence, or findings from the military (e.g. LaPiere, 1938; Strauss, 1944). In the 1950's and 60's, advances in laboratory techniques made it possible for innovative laboratory research to be carried out, in an attempt to isolate the cause and effect of different factors during mass emergencies (e.g. Guten & Allen, 1972; Kelley, Condry, Dahlke, & Hill, 1965; Mintz, 1951). These studies allowed for an examination of how

different factors, including perceived likelihood of escape, perceived severity of danger, and group size, affect behaviour during mass emergencies. However, largely due to increased stringency of ethical guidelines, attempts to understand mass emergency behaviour using laboratory studies have become increasingly rare (Drury et al., 2009c). In the last 30 years, the main contribution to the area of mass emergency behaviour has been made by sociologists, rather than social psychologists, who have used archival, rather than experimental, data. However, the use of experimental designs is important, since it enables a greater degree of control over the study design and the variables which are measured, and therefore greater explanatory power.

Recently, there have been renewed attempts to apply social psychological theories, in particular the social identity approach, to explain behaviour during mass emergencies (e.g. Drury et al., 2009a; 2009b). Innovative virtual reality designs have been used to study mass emergency behaviour within an experimental context, and to examine how social identity processes can affect behaviour during mass emergencies (Drury et al., 2009c).

The research presented within this thesis represents an attempt to continue the application of social psychological theories, in particular the social identity approach, to the examination of mass emergency behaviour; specifically to the examination of behaviour during incidents involving mass decontamination. Two of the studies (Chapters 8 and 9) use an experimental design thereby allowing the impact of different interventions - specifically different levels of responder communication - on public behaviour during mass decontamination to be tested. The methods and measures used build upon one another, and in several cases, methods and measures used within one chapter are used to refine and develop methods and measures used in subsequent chapters. In particular, the methods and measures used are designed to inform the method used within the final chapter of this thesis

(Chapter 9), in which I carry out an experimental mass decontamination field experiment. Importantly, the methods used vary in the amount of control they allow, with the methods presented in the later chapters of the thesis (e.g. visualisation experiment, field experiment) allowing greater control than methods used in earlier chapters of the thesis (e.g. semi-structured interviews, analysis of secondary data); the amount of control increases with each chapter.

The first three empirical chapters (Chapters 2, 3, and 4) use literature reviews and interviews to determine what is already known about decontamination, including likely public behaviour, and current management strategies. Following this, I analyse pre-existing volunteer feedback data from five different emergency preparedness field exercises (Chapters 5 and 6). The methods used in Chapters 2 – 6 are either observational in their nature or use pre-existing datasets and therefore permit little control over the variables which are measured. In order to address this, the volunteer feedback questionnaires used to collect the pre-existing exercise data (Chapters 5 and 6) are then used to inform the development of a questionnaire which I test during a multi-agency field exercise involving mass decontamination; the results of this are reported in Chapter 7. This questionnaire includes measures of social identity variables, and therefore facilitates an examination of the role of social identity processes in public experiences and behaviour during mass decontamination; designing the questionnaire myself enabled me to exercise a far greater level of control over the variables and constructs which were measured. The questionnaire was designed to inform the development of a questionnaire which would later be used during the mass decontamination field experiment (Chapter 9).

In Chapter 8, I use an online visualisation experiment to pilot test three different communication messages, which are then used during the mass decontamination field

experiment (Chapter 9). The experimental designs used in Chapters 8 and 9 provide the greatest degree of control over the study design and the measures used. During the field experiment, volunteers were asked to undergo the decontamination process, which is managed by the Fire and Rescue Service, as they would be during a real incident of this type. Not only did this improve the ecological validity of the research, it also enabled behavioural data such as length of time for each participant to complete the decontamination process, and observational data concerning non-compliance, helping, and confusion, to be collected. The field experiment therefore represents the culmination of the research presented in this thesis, and the methodology used during the field experiment was informed by the research methods developed and tested during previous chapters.

The research presented in this thesis, in particular the mass decontamination field experiment (Chapter 9), adds to recent experimental research into mass emergency behaviour (Drury et al., 2009c), by examining the mediating role of social identity processes during an ecologically valid mass decontamination simulation.

Overview of the thesis

In Chapter 2 of this thesis, I review evidence from small-scale incidents involving decontamination, in order to gain an understanding of public behaviour during these types of incidents, and the factors which affect this. I show that there is the potential for high levels of non-compliance and anxiety during these types of incidents, if they are not managed appropriately (e.g. Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002). Specifically, failure of emergency responders to communicate effectively with members of the public is a key factor which may result in reduced compliance and increased anxiety, as is failure of emergency responders to show respect for public concerns about privacy. I also review current decontamination guidance documents for responders,

and show how these perpetuate the view, derived from traditional ‘mass panic’ theories of crowd behaviour (e.g. LaPiere, 1938; Smelser, 1963), that members of the public will behave in an irrational and disorderly way during incidents involving mass decontamination; as a result, these guidance documents also recommend ‘control’ management strategies (e.g. withholding information from members of the public, setting up barriers etc), and provide very little guidance on communication with members of the public during incidents involving mass decontamination. Further, in a review of published emergency preparedness field exercises, I show that communication strategies are rarely tested during emergency preparedness field exercises, and therefore that valuable opportunities to evaluate communication strategies are being wasted. Overall, Chapter 2 provides evidence that effective responder communication and respect for casualties’ concerns about privacy are two key factors which can facilitate the successful management of small-scale incidents involving decontamination. Despite this, decontamination guidance documents for emergency responders contain little or no mention about communicating with members of the public during these types of incidents. There is therefore a need for the development of theoretically-derived recommendations for emergency responders during the management of incidents involving mass decontamination, and this is addressed in Chapter 3.

Chapter 3 builds on the review of small-scale decontamination incidents, presented in Chapter 2, by reviewing relevant theory and research in an attempt to understand factors which might affect public experiences of decontamination within a mass emergency context. Since mass decontamination involves large crowds of people, various theories of crowd behaviour are reviewed, and applied to incidents involving mass decontamination, in order to generate recommendations for emergency responders during the management of

these types of incidents. The review reveals that traditional ‘mass panic’ theories (e.g. LaPiere, 1938; Smelser, 1963) are counterproductive for managing incidents of this type, since they result in the withholding of information from members of the public, for fear that they will be unable to cope adaptively (Dynes, 2003; Furedi, 2008; Gannt & Gannt, 2012); this can actually create the very disorder which responders are hoping to prevent (Stott, Hoggett, & Pearson, 2012). Further, the review suggests that the social identity approach (Tajfel & Turner, 1979; Turner et al., 1987) is the most useful for generating recommendations for emergency responders, since it provides evidence not only for factors which affect the relationship between members of the public during large scale incidents (e.g. Reicher, 1984), but also for factors which affect the relationship between members of the public and emergency responders during such incidents (cf. Drury & Reicher, 2000; Reicher, 1996; Stott, Hutchison, & Drury, 2001; Stott, Adang, Livingstone, & Schreiber, 2008; Stott, Hoggett, & Pearson, 2012). I highlight several concepts from the social identity approach which might be relevant for an understanding of public behaviour during incidents involving mass decontamination, namely perceptions of responder legitimacy, identification with emergency responders, identification with other members of the public, and collective agency. I present hypotheses in the form of a path model, which shows how these social identity variables may mediate the relationship between effective responder communication strategies, and the relevant outcome variables (e.g. public compliance, and public anxiety). Cooperative behaviour among members of the public is also included as a relevant outcome variable at this stage, since the review of the literature reveals that coordinated and cooperative behaviour among members of the public can facilitate more positive outcomes during mass emergencies and disasters (e.g. Drury et al., 2009a; Galea & Blake, 2004). This is likely to be the case during incidents involving mass decontamination,

since members of the public will need to cooperate with each other, in terms of waiting their turn to be decontaminated, and possibly helping each other undergo decontamination, if the decontamination process is to run smoothly. I conclude Chapter 3 by outlining four specific recommendations for the management of incidents involving mass decontamination: 1) Emergency responders should provide members of the public with sufficient practical information during the decontamination process; 2) Emergency responders should communicate honestly with members of the public; 3) Emergency responders should emphasise the health-benefits of decontamination; 4) Emergency responders should respect public rights of privacy and modesty.

Having reviewed the relevant literature on small-scale incidents involving decontamination, and the current guidance for emergency responders on the management of these types of incidents (Chapter 2), in the first empirical chapter (Chapter 4) I examine emergency responders' perceptions and expectations regarding incidents involving mass decontamination. The research I report in Chapter 4 builds on the review of decontamination guidance documents for responders (Chapter 2), in illustrating how the perceptions and expectations which responders have about public behaviour in incidents involving mass decontamination might affect the way in which they manage these types of incidents. The chapter presents the results of interviews with 13 Fire and Rescue Service responders, six of whom had experience of carrying out decontamination during real life incidents, and seven of whom did not. The results reveal that responders with real life experience of decontamination understood the importance of communicating with members of the public during incidents involving decontamination; these responders highlighted the fact that effective communication is essential in order to increase public compliance and reduce public anxiety. Further, the results are in line with the review of responder guidance

documents (Chapter 2), in showing that there is insufficient recognition of the importance of communicating with members of the public; as in the guidance, the responders expressed a belief that members of the public would panic, and so stressed the importance of coercive control management strategies. The finding that responders emphasise control management strategies, rather than communication, is unsurprising, given that guidance documents for emergency responders tend to neglect communication with members of the public, and instead focus on controlling the public, who are perceived to be prone to panic. As noted in Chapter 3, such control management strategies may be counterproductive, since they result in a perception of responder illegitimacy (cf. Stott et al., 2012) and may therefore create, rather than prevent, public disorder (cf. Stott et al., 2008). I therefore conclude Chapter 4 by highlighting the need for improved training for emergency responders on both the likely public behaviour during incidents involving mass decontamination, and the importance of communicating effectively with members of the public during these types of incidents.

Having gained an understanding of factors affecting public experiences of decontamination during small-scale incidents involving decontamination (Chapter 2), in Chapters 5 and 6 I turn my attention to an examination of the factors which affect public experiences during incidents involving mass decontamination. By analysing qualitative and quantitative data collected previously from over 400 members of the public during five emergency preparedness field exercises involving mass decontamination, I examine some of the factors which affect public experiences of mass decontamination, with a particular focus on the role of responder communication strategies. In Chapter 5, I use the framework approach to analyse qualitative volunteer feedback data collected during the five exercises. This reveals that responder communication strategies were typically perceived as ineffective, with members of the public reporting high levels of confusion (e.g. not

knowing what to do during decontamination, not having enough information to take recommended actions) during the decontamination process. Further, some participants specifically suggested that the poor levels of communication they received would have resulted in non-compliance, or increased anxiety, had the exercise been a real incident. Several participants also highlighted concerns over the level of privacy they experienced, with some suggesting that this would have contributed to non-compliance had the exercise been a real incident. I conclude Chapter 5 with the recommendation that emergency responders should strive to communicate effectively with members of the public during mass decontamination, ensuring that members of the public are provided with sufficient practical information about what to do during the decontamination process. I also highlight the fact that the findings from exercise participants, in terms of concerns about a lack of communication and a lack of privacy, are very similar to the findings from real-life small-scale incidents involving decontamination (e.g. Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002). I therefore conclude that exercises provide a valuable opportunity to gain a greater understanding about the way in which members of the public might experience an incident involving mass decontamination.

In Chapter 6¹, I use path analysis to analyse quantitative feedback data from the same five exercises as in Chapter 5. I create two path models from this data, to explore the relationships between perceived effective responder communication strategies and the relevant outcome variables (willingness to comply with decontamination during a real incident, and reduced anxiety). I show that there is a relationship between effective responder communication and the relevant outcome variables, and discuss the implications

¹ A version of the paper presented in Chapter 6 was originally submitted to the American Journal of Disaster Medicine, and was reviewed by three reviewers. Our responses to the reviewers' comments are presented in Appendix 3.

of this during real life incidents involving mass decontamination. An interesting finding highlighted in this chapter is that participants' perceived confidence in emergency responders played a mediating role between effective responder communication and the relevant outcome variables. This therefore highlighted the importance of participants' perceptions of emergency responders. However, the measures used to collect data during these exercises were focused largely on practical aspects of the decontamination process, rather than psychosocial aspects of the process. It was therefore not possible to carry out further examination of the mediating role of participant perceptions of emergency responders, or indeed other relevant social identity processes, using the data collected during these exercises. I conclude Chapter 6 by highlighting the consistency of effective communication as a key predictor of positive outcomes (in terms of increased public compliance and reduced public anxiety) during field exercises involving mass decontamination. I also conclude that using emergency preparedness field exercises can be an effective way to gain a greater understanding about the importance of effective responder communication strategies during real life incidents involving mass decontamination, but that it is necessary to design measures which enable data to be collected about the role of social identity processes during decontamination.

In Chapter 7², I use participant feedback data from a field exercise involving mass decontamination to test some of the hypotheses presented in the path model in Chapter 3, regarding the mediating role of social identity variables between effective responder communication strategies, privacy, and the relevant outcome variables (compliance, anxiety, and cooperation). In order to carry out this research, I designed a pre-exercise and

² Chapter 7 is published in *Basic and Applied Social Psychology*. This paper was reviewed by two reviewers and the editor, and responses to reviewers' comments are presented in Appendix 4.

post-exercise questionnaire, and attended the exercise myself in order to collect the data. The questionnaire items were designed partly based on pre-existing volunteer feedback questionnaires (see Chapters 5 and 6), but the main priority when designing the new questionnaires was to include theoretical measures, to enable hypotheses about the role of social identity processes during mass decontamination to be tested. The research presented in Chapter 7 therefore employs a similar design to the research reported in Chapters 5 and 6, in using an emergency preparedness field exercise involving mass decontamination to gain an insight into public experiences and perceptions during the decontamination process. However, the research reported in Chapter 7 builds on the research reported in Chapters 5 and 6, by introducing theoretically-derived measures, based on the social identity approach, to facilitate an examination of the mediating role of social identity variables between effective responder communication strategies and the relevant outcome variables. I create a path model from participant feedback data, which shows that perceptions of responder legitimacy, identification with emergency responders, and identification with other members of the public, play an important mediating role between effective responder communication strategies, perceptions of privacy, and levels of public compliance and cooperative public behaviour. However, the results do not show a relationship between effective responder communication strategies and reduced public anxiety, possibly because the level of overall anxiety reported was so low. The results of this study therefore broadly support the hypotheses presented in Chapter 3. I conclude Chapter 7 by highlighting the importance of effective responder communication strategies for increasing public compliance and cooperative behaviour, and the importance of understanding the ways in which social identity variables mediate this relationship. I suggest that future research

should employ experimental research designs to establish why some responder communication strategies are perceived as effective, while others are not.

Having provided evidence that there is a relationship between effective responder communication strategies and the relevant outcome variables (Chapter 6), and that this relationship is mediated by social identity variables (Chapter 7), in Chapter 8 I extend this to examine why some responder communication strategies are perceived as being effective, while others are not. Using an online visualisation experiment, I examine public responses to one of three different communication strategies: theory-based, standard practice, and brief. The theory-based communication strategy is based on the communication recommendations I make in Chapter 3, therefore allowing these theoretically-derived recommendations for the management of incidents involving mass decontamination to be tested. In contrast, the standard practice communication strategy reflects current standard practice, while the brief communication strategy represents a ‘worst case scenario’, in which emergency responders communicate only minimally with members of the public. Manipulating the communication strategies in this way facilitates an understanding of why one communication strategy may be perceived as effective while another may not, and also allows causal relationships to be established, thus building on the correlational research reported in previous chapters of the thesis (Chapters 6 and 7). I show that the theory-based communication strategy is perceived as being significantly more effective than either of the other two communication strategies, and that this results in significantly higher perceptions of responder legitimacy, and significantly higher identification with emergency responders. To test the hypotheses presented in Chapter 3, I create a path model from the data, which shows that being in the theory-based communication condition significantly predicts perceptions of responder legitimacy. The model also supports the hypotheses presented in

Chapter 3 in showing that social identity variables play a significant mediating role between effective responder communication strategies and the relevant outcome variables (public compliance, cooperative public behaviour, and reduced public anxiety). This is in line with the findings presented in Chapter 7. I conclude that health-focused communication, and sufficient practical information (as provided to participants in the theory-based communication condition), result in the most positive perceptions of responder communication. In turn, these positive perceptions of responder communication result in increased perceptions of responder legitimacy, and increased identification with emergency responders. This paper therefore provides empirical support for the theoretically-derived recommendations, and hypotheses, presented in Chapter 3 of this thesis.

The final empirical chapter in this thesis is the culmination of research and the centre-piece of the project. It extends the research presented in Chapter 8, by testing the effectiveness of three different responder communication strategies in a field experiment involving mass decontamination that I designed myself. I planned the field experiment, along with a team of researchers from Public Health England (formerly the Health Protection Agency), and planners from the University of Sussex, over 10 months. I was in charge of organising all aspects of the field experiment, including method development, logistical planning, volunteer recruitment, and liaising with the Fire and Rescue Service. The field experiment extends the research presented in Chapter 7 (examining the role of social identity variables during a pre-existing exercise), as I designed and organised every aspect of the field experiment. This meant I had greater control over the participants' experiences, and so was able to test the effect of three different communication strategies; this was not possible using data from the pre-existing field exercise (Chapter 7). While the

online visualisation experiment (Chapter 8) also tested the effect of three different responder communication strategies, a potential limitation with the research presented in Chapter 8 is that the findings may lack ecological validity, due to the visualisation design used in the study; the research presented in Chapter 9 was designed to overcome this limitation, by actually asking participants to undergo the decontamination process, as they would if a real incident of this type were to occur. This also has the advantage of enabling behavioural outcomes to be examined, alongside self-report measures. The research presented in Chapter 9 therefore amalgamates the study designs used in Chapter 7 (high ecological validity, but no manipulation of communication strategy), and Chapter 8 (manipulation of communication strategy, but potentially low ecological validity). As in Chapter 8, I examine the effectiveness of the three different responder communication strategies (theory-based, standard practice, and brief) in terms of their impact on the relevant social identity variables and outcome variables. I also collect observational data, to examine direct observations of participant behaviour alongside self-report measures, as well as measuring the length of time it takes for participants to undergo the decontamination process within each communication condition. Results are in line with the findings in Chapter 8, in showing that the theory-based communication strategy is perceived as being significantly more effective than either of the other two communication strategies, and that this results in significantly higher perceptions of responder legitimacy and identification with emergency responders. This therefore provides support for the recommendations presented in Chapter 3, in an ecologically valid setting. A path model created from the data reveals that social identity variables mediate the relationship between effective responder communication strategies, perceptions of privacy, and the relevant outcome variables (cooperative public behaviour and compliance). This therefore provides

further support for the hypotheses presented in Chapter 3. Observational data support the findings from self-report measures, with those in the brief and standard practice conditions showing more non-compliant and confused behaviours. An analysis of the time taken for participants to undergo the decontamination process within each communication condition reveals that the process progressed most quickly and efficiently in the theory-based communication condition. This is an important finding, as it reveals that an improved communication strategy has a direct practical advantage, in terms of increasing the speed and efficiency of the decontamination process. Overall, this chapter provides support for the recommendations and hypotheses presented in Chapter 3, within an ecologically valid setting.

Summary of findings

The findings I present in this thesis provide evidence that effective responder communication strategies, and respect for public concerns about privacy, are two factors which play a key role in the successful management of incidents involving decontamination, and that social identity processes mediate the relationship between these two factors and positive public outcomes. However, the findings presented in Chapter 2 reveal that planning for these types of incidents currently places too much emphasis on the technical procedures involved in carrying out the decontamination process, with very little emphasis on planning for communicating with members of the public. As shown in the results of the empirical research presented (Chapters 4 – 9), failure to communicate effectively with members of the public could result in non-compliance and a lack of cooperative behaviour among members of the public, as well as increasing public anxiety about the decontamination process. This could have serious consequences in a real life incident involving decontamination, as increased anxiety, non-compliance, and

uncooperative behaviour among members of the public are likely to delay the decontamination process, which could result in lives being lost.

In Chapter 3 I extended the findings from small-scale incidents involving decontamination (presented in Chapter 2), by applying the social identity approach (Tajfel & Turner, 1979; Turner et al., 1987), in particular the social identity model of collective resilience (SIMCR: Drury et al., 2009a) and the elaborated social identity model (ESIM: Drury & Reicher, 2000), to incidents involving mass decontamination, in an attempt to generate recommendations for emergency responders for the successful management of these types of incidents. The application of the social identity approach led to the development of four theoretically-derived recommendations for emergency responders when managing incidents involving mass decontamination. It was hypothesised that social identity variables, such as perceptions of responder legitimacy, identification with emergency responders, identification with other members of the public, and collective agency, would play a key mediating role between effective responder communication strategies, respect for public concerns about privacy, and the relevant outcome variables (increased compliance, increased cooperative behaviour, and reduced anxiety). The results from the last three empirical studies (Chapters 7-9) provide evidence for the mediating role of social identity variables between effective responder communication and compliance and cooperative behaviour, although support for the hypothesised effect of these variables on reduced anxiety was mixed. Possible reasons for this are discussed in the relevant Chapters (7 and 9), and are also discussed under the limitations section below.

Overall, this thesis provides evidence across methods and measures for the relationship between effective responder communication strategies and public compliance and cooperation during incidents involving mass decontamination, as well as providing

evidence for the mediating role of social identity variables. These findings have both theoretical and practical implications, as discussed below.

Implications of findings

a. Theoretical implications

The work presented in this thesis is novel in applying social psychological theories, in particular the social identity approach, to incidents involving mass decontamination. Until now, mass decontamination has been seen as a purely technical issue (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2), with very little effort to understand how members of the public are likely to behave during such incidents. Where public behaviour has been considered, there has been a tendency for policy makers (Carter et al., 2013a: Chapter 2), and emergency responders (Carter, Drury, Rubin, Williams, & Amlôt, in press: Chapter 4) to rely on assumptions of ‘mass panic’. This has led to a focus on controlling, rather than communicating with, members of the public (Carter et al., 2013a: Chapter 2; Carter et al., in press: Chapter 4). By applying the social identity approach to incidents involving mass decontamination, the current research has been able to not only challenge existing assumptions about likely public behaviour, but also to generate theoretically-derived recommendations for the management of such incidents. Further, the findings from the empirical research presented within this thesis provide evidence that principles of the social identity approach are applicable in the context of incidents involving mass decontamination, an area in which the social identity approach has not previously been applied.

The work presented in this thesis provides support for the SIMCR (Drury et al., 2009a), as the studies reveal a significant relationship between shared identity among members of the public, a sense of collective agency, and increased willingness to help

others. The findings also provide support for the ESIM (Drury & Reicher, 2000) in showing that perceptions of responder communication predict increased perceptions of responder legitimacy, and increased identification with emergency responders.

The findings presented in this thesis extend the application of the ESIM, by showing that concepts which have traditionally been associated with crowd conflict events, such as legitimacy and identification with emergency responders, are also relevant during mass emergencies and disasters. In particular, findings reveal that these concepts not only mediate the relationship between effective responder communication and increased public compliance (as would be expected based on previous research using the ESIM), but that they also play a mediating role between effective responder communication and cooperative behaviour among members of the public.

The findings presented in this thesis make a novel contribution to the social identity approach, by combining aspects of the SIMCR (shared identity among members of the public, collective agency, cooperative and helping behaviour) and aspects of the ESIM (legitimacy, shared identity among members of the public, identification with emergency responders) into one model of crowd behaviour during emergencies (Figure 3.1, presented in Chapter 3). These proposed relationships are supported by the findings within the last three chapters of this thesis (Chapters 7 – 9). By combining aspects of the SIMCR and ESIM, the model presented in Figure 3.1 facilitates an understanding of how the actions of emergency responders may impact on the perceptions, and hence behaviour, of members of the public during incidents involving mass decontamination specifically, as well as during mass emergencies and disasters more broadly.

More generally, the application of social identity principles to social or health problems is in line with the development of the ‘social cure’ (Jetten, Haslam, & Haslam,

2011), in which a range of health issues have been found to be amenable to group based solutions. A review of the relevant literature reveals that social identity has an impact on health in many ways, from being a predictor of people's health-related behaviours (individuals are more likely to engage in a health-promoting behaviour if this is perceived as being a norm of a group with which they identify), to impacting on clinical outcomes (such as reduced depression and anxiety, enhanced quality of life, and reduced likelihood of developing a chronic illness) (Haslam, Jetten, Postmes, & Haslam, 2009). The current research is therefore in line with this approach, in showing how social identity can affect positive health outcomes (e.g. reduced anxiety, and increased compliance with recommended behaviours), in a mass emergency setting.

b. Practical implications

The application of the social identity approach (Tajfel & Turner, 1979; Turner et al., 1987) to incidents involving mass decontamination has facilitated the generation of four recommendations for emergency responders when managing incidents involving mass decontamination. Further, the empirical research presented within this thesis provides support for these recommendations. Thus these four recommendations, which are both theoretically-derived and evidence-based, can be included in future guidance for emergency responders:

1) Communicate openly with members of the public about the nature of the incident, and the actions which are being taken. Results from the initial review of small-scale incidents involving decontamination (Chapter 2) revealed that failure of emergency responders to communicate openly with members of the public resulted in non-compliance and increased anxiety. Further, evidence from the empirical studies presented in this thesis (Chapters 4-9) supports the fact that ineffective communication from emergency responders

can result in reduced public compliance, and in some cases increased public anxiety (Chapters 6 and 8). Chapters 8 and 9 specifically tested which aspects of responder communication strategies resulted in increased perceptions of effective responder communication. Results revealed that the inclusion of open communication about the nature of the incident, and regular updates about the actions emergency responders were taking, resulted in increased perceptions of effective responder communication. These increased perceptions of effective responder communication also resulted in increased perceptions of responder legitimacy, and increased identification with emergency responders. These factors played a key mediating role between effective responder communication and public compliance and cooperative behaviour (Chapters 7-9).

2) *Provide health-focused explanations about decontamination.* The inclusion of health-focused explanations about the decontamination process, such as why decontamination is necessary, and how it can protect those affected, resulted in increased perceptions of effective responder communication (Chapters 8 and 9). As above, this resulted in increased perceptions of responder legitimacy and increased identification with emergency responders, two factors which have been shown to play a key mediating role between effective responder communication and public compliance and cooperative behaviour (Chapters 7-9).

3) *Provide sufficient practical information.* The provision of sufficient practical information is likely to be necessary to enable members of the public to undergo the decontamination process successfully. In Chapter 5, several participants reported that a lack of practical information and instructions from emergency responders resulted in confusion, and in their not being able to complete the decontamination process successfully. This is supported by the observations carried out during the field experiment in Chapter 9, in

which less confusion was observed among participants who were provided with sufficient practical information. In Chapter 7, results revealed a significant relationship between the perception of having received sufficient practical information from emergency responders and perceptions of responder legitimacy. In Chapters 8 and 9, the communication strategy which was perceived as the most effective contained both increased overall communication (such as health-focused explanations about the decontamination process, and open communication about the nature of the incident), and sufficient practical information. As well as increasing the perceived legitimacy of responder actions, and identification with emergency responders, this condition also resulted in the most speedy and efficient progression of volunteers through the decontamination process.

4) Respect public concerns about privacy and modesty. The importance of respecting public concerns about privacy and modesty was a key finding from the review of small-scale incidents involving decontamination (Chapter 2), and has been supported by findings from several of the empirical research studies (Chapters 4, 5, 7, and 9). Further, Chapters 7 and 9 reveal a significant relationship between respect for public concerns about privacy, and perceptions of responder legitimacy, a key variable affecting public compliance and cooperative behaviour.

The four recommendations outlined above should be included in decontamination guidance documents for emergency responders, as well as being used to improve current responder training for communicating with members of the public during incidents involving mass decontamination. Indeed, the findings presented in Chapter 2 of this thesis have been used to inform a hospital decontamination “best practices” document prepared by the Harvard School of Public Health Emergency Preparedness and Response Exercise

Program³, while the findings presented in Chapter 5 of this thesis have been incorporated into a patient decontamination guidance document prepared by the U.S Department of Homeland Security and the U.S. Department of Health and Human Services⁴.

Findings presented in Chapter 4 reveal that emergency responders, especially those with no real life experience of carrying out decontamination, endorse common disaster myths in their beliefs about likely public behaviour during these types of incidents. This is of concern, since these types of beliefs have been shown to rationalise ‘control’ management strategies (Auf der Heide, 2004; Drury, Novelli, & Stott, in press), for example by withholding information for fear that members of the public will panic (Furedi, 2008; Gannt & Gannt, 2012). To overcome this reliance on common disaster myths, the findings presented in Chapter 3 of this thesis could be used to develop improved training for emergency responders regarding the ways in which members of the public are likely to behave during incidents involving mass decontamination. In particular, emergency responders should be provided with evidence of the public behaving normatively during disasters (e.g. Aguirre et al., 2011; Drury et al., 2009a; Johnson, 1987; 1988), since the provision of this type of evidence is likely to reduce responder reliance on common disaster myths (Chapter 4; see also Alexander, 2007).

This thesis has therefore highlighted the importance of effective responder communication strategies during incidents involving mass decontamination. However, in

³ Harvard School of Public Health Emergency Preparedness and Response Exercise Program. (2013). *Proposed minimum decontamination capabilities for hospitals in Massachusetts*. Boston, MA: Harvard School of Public Health. <http://www.hsph.harvard.edu/policy-translation-leadership-development/files/2013/01/Proposed-Decontamination-Capabilities-for-Hospitals-in-MA-2013.pdf>, accessed 20th August 2013.

⁴ U.S Department of Homeland Security & U.S Department of Health and Human Services. (2012). *Patient decontamination in a mass chemical exposure incident: National planning guidance for communities*. Washington, D.C: U.S Department of Homeland Security & U.S. Department of Health and Human Services. http://www.enmagine.com/items/PatientDeconinMassChemExposureIncident_Sept2012DraftforReview.pdf, accessed 28th May 2013.

order for the emergency services to communicate effectively with members of the public during these types of incidents, certain practical aspects will need to be addressed. In Chapter 5, findings revealed that the personal protective equipment (PPE) worn by emergency responders presented a challenge for responders when trying to hear, and be heard by, members of the public. Several approaches could be taken to overcome this. First, pre-recorded communication messages could be created, which could be played to crowd members over a loudspeaker during the incident (similar to the approach taken in the field experiment in Chapter 9 of this thesis). However, it is likely that members of the public will also want to be able to communicate directly with emergency responders. Second, therefore, it will be necessary to include a radio or amplifier within each personal protective suit, to allow emergency responders to make themselves heard more easily by members of the public. Finally, a board with visual instructions of the decontamination process could be set up at the entrance to the decontamination showers, to provide members of the public with a visual aid to show them what actions to take when going through the decontamination process.

This thesis may also have practical implications in terms of the way emergency preparedness exercises are planned and evaluated. The findings presented in Chapters 5-9 of this thesis reveal that exercises represent a realistic setting through which those responsible for preparing for mass emergencies and disasters could gain a vital understanding about public reactions to these types of events. However, the findings presented in Chapter 2 reveal that emergency preparedness exercises represent an as yet under-utilised resource for examining public reactions to incidents involving mass decontamination. It is hoped that the exercise evaluation strategies and measures developed in this thesis (Chapters 7 – 9) could be used by those responsible for organising emergency

preparedness exercises, in order to optimise the exercise evaluation strategies used, and to ensure that as much information as possible is captured from volunteers following an exercise. This would provide evidence as to whether current practices are effective, and if not, information captured could be used to inform lessons learned and instigate change in emergency response policy and practice.

Various different methods of decontaminating members of the public are now being proposed, alongside, or instead of, a decontamination shower in one of the New Dimension MD1 showering tents. These methods include: interim decontamination (a basic shower, using an FRS ladder and hose), which would take place prior to a full shower in the MD1 showering tents; dry decontamination, in which those affected would remove their clothes, and then apply an absorbent powder, such as Fuller's Earth; and wind decontamination (Air-Decon), in which those affected enter a wind tunnel with very high speed winds, to remove any gases which may be present beneath their clothes (Okumura, Seto, & Fuse, 2013). However, since each of these interventions involves an unfamiliar and potentially stressful situation for those affected, the findings presented in this thesis will likely be applicable across any or all of these interventions. Further, while incidents involving mass decontamination represent some unique challenges for emergency responders, as discussed throughout this thesis, it is likely that several of the outcomes from this thesis will also be applicable across a broad range of mass emergencies and disasters. In almost all mass emergencies and disasters, it is likely that the authorities will recommend actions for members of the public to take, in order to protect themselves, and others around them. The findings presented in this thesis reveal that perceptions of effective communication from the authorities will be essential for increasing public perceptions of the legitimacy of the authorities' messages, and hence for increasing public compliance with recommended

actions. Thus the findings from this thesis may be used to prepare effective communication strategies for a range of mass emergencies and disasters.

Potential limitations and directions for future research

A possible limitation of this thesis is that many of the chapters (with the exception of Chapters 2, 3, and 4) use emergency preparedness field exercises rather than real emergencies. Whilst exercises are designed to be as realistic as possible, in order to ensure that response plans and procedures are tested under realistic conditions, they can never replicate the level of threat and danger inherent during a real life incident. Thus certain variables, especially anxiety, are likely to be significantly different during real life incidents involving mass decontamination. This perhaps explains the lack of predicted relationships between anxiety and the other variables in two of the studies in this thesis (Chapters 7 and 9). Both of these studies revealed that volunteer anxiety was low during the decontamination process, likely because participants knew that the incident was simulated, and that they were not in any danger. It is therefore difficult to draw conclusions from these simulated exercises about how higher levels of anxiety may affect public perceptions and behaviour during real incidents involving mass decontamination.

However, the findings from the review of small-scale incidents involving decontamination (Chapter 2) show that, if these types of incidents are managed appropriately (in terms of effective responder communication, and respect for public concerns about privacy), levels of public anxiety are likely to be in proportion to the scale of the incident; thus members of the public are unlikely to exhibit excessive anxiety during incidents of this type. This is supported by the interviews with emergency responders (Chapter 4), with those responders who had real life experience of managing incidents involving decontamination stating that excessive public anxiety was rare during these types

of incidents, as long as responders communicated effectively with members of the public. While these findings are derived from small-scale incidents involving decontamination, the review of the relevant literature (Chapter 3), indicates that panic and excessive anxiety are also rare during mass emergencies and disasters. Taken together, these findings suggest that members of the public are unlikely to exhibit panic or excessive anxiety during incidents involving mass decontamination. Public anxiety is therefore unlikely to create a fundamental difference between emergency preparedness field exercises involving mass decontamination and real life incidents of this type, in terms of altering the relationships between other relevant variables. As no real life incidents involving mass decontamination have so far occurred in the UK, emergency preparedness field exercises currently represent the most effective way to understand public perceptions and behaviour during incidents of this type.

Based on the findings of this thesis, there are several possible directions for future research. First, it would be beneficial to replicate the field experiment (Chapter 9), using larger groups of volunteers ($n > 100$). This would enable conclusions to be drawn about whether the same communication strategies would be perceived as effective among larger groups of volunteers. Second, any future mass decontamination experiments could simulate more of the hypothetical incident, rather than focusing exclusively on the decontamination process. This would help to make the field experiment more realistic for participants, thus further increasing the ecological validity of the research. Third, the possibility of using physiological measures of anxiety (e.g. levels of cortisol, heart-rate monitoring) during exercises involving mass decontamination could be explored; while self-report measures of anxiety do not reveal any differences in levels of anxiety in relation to different responder

communication strategies, it is possible that there are subtle differences in levels of stress, which might be identified by using physiological measures.

Conclusions

This thesis provides evidence that effective responder communication is essential in order to facilitate the successful management of incidents involving mass decontamination. Further, the findings show that an understanding of the mediating role played by social identity variables during these types of incidents can help to inform more effective responder communication strategies. Despite the increasing evidence relating to the importance of communication during incidents involving mass decontamination, there is currently very little emphasis on planning for communicating with members of the public during these types of incidents.

The lack of planning for communicating with members of the public is likely to be due at least in part to the reliance on traditional ‘mass panic’ theories when understanding public behaviour during these types of incidents. Research has shown that members of the public rate themselves as unlikely to panic during CBRN incidents, although they expect that others will panic (Fischhoff, Gonzalez, Small, & Lerner, 2003); a quote from Wikipedia indicates this popular view of incidents which involve mass contamination:

“Scenes of mass contamination are often scenes of collective hysteria, with hundreds of thousands of victims in a state of panic. Therefore, mass decontamination may require police, security, or rescue supervision to help control panic and keep order.” (Wikipedia, 2013)

Perhaps of greater concern is the fact that this view is also perpetuated by policy makers and emergency services, with responsibility for planning for and managing incidents involving mass decontamination:

“A challenge [during incidents involving mass contamination] is that of rapidly establishing and maintaining an impermeable cordon of sufficient size to contain the population in an area of high population density following an incident that may cause distress and panic.” (Deegan & Donald, in Holdsworth et al., 2012).

As noted in this thesis, a belief in panic and the need for control management strategies is counterproductive, since it may result in withholding vital information from members of the public, and may therefore produce the very disorder which responders and policy makers are hoping to prevent. It is therefore essential that policy makers urgently move their focus away from planning for ‘control’ management strategies, and instead concentrate on preparing effective public communication strategies during incidents involving mass decontamination. As consistently shown in this thesis, in the increasingly likely event that an incident of this type occurs in the UK, an effective communication strategy, developed based on an understanding of social psychological factors, will facilitate the speedy and efficient management of the decontamination process, and will result in injuries being minimised and lives being saved.

CHAPTER 2

Paper 1: Communication during mass casualty decontamination: highlighting the gaps.

Reference:

Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2013). Communication during mass casualty decontamination: highlighting the gaps. *International Journal of Emergency Services*, 2(1), 29-48.

Abstract

Purpose

Effective communication has been recognised as an important issue for the management of incidents involving decontamination; evidence shows that failure to communicate effectively may result in increased public anxiety and non-compliance. This paper aims to examine current provision for communicating with members of the public during decontamination, to facilitate the development of improved responder communication strategies.

Methodology

To examine the current provision for communicating with members of the public, we reviewed open source decontamination guidance documents for responders, as well as published reports of emergency preparedness exercises involving decontamination.

Findings

The review of decontamination guidance documents showed that specific guidance for professional responders on how to communicate with the public during incidents that involve decontamination could be improved. Similarly, the review of published decontamination exercises shows that a stronger emphasis on communication with members of the public is needed, in addition to the use of exercises to evaluate the effectiveness of communication strategies.

Value

The present research summarises existing evidence relating to how communication strategies employed by responders can shape public responses to decontamination. Analysed alongside current decontamination guidance for emergency responders, this evidence highlights potential gaps in planning for communicating with members of the

public during decontamination. It is hoped that this will promote an increased understanding of the importance of communication during these types of incidents, which will in turn facilitate the development of more comprehensive responder communication strategies.

Introduction

Communicating with the public during chemical, biological, radiological, and nuclear (CBRN) incidents

Incidents involving chemical and biological agents are not a new phenomenon. Examples of large-scale chemical, biological, radiological, and nuclear (CBRN) incidents include: a radiation incident in Goiania, in which 249 people were contaminated, with 112,000 others seeking radiation monitoring (International Atomic Energy Agency, 1998); a nuclear accident at Three Mile Island (Baum, Gatchel, & Schaeffer, 1983); missile attacks on Israel during the Gulf War, using scud missiles believed at the time to be fitted with chemical warheads (Bleich, Dycian, Koslowsky, Solomon, & Wiener, 1992); a sarin release by the Aum Shinrikyo cult on Tokyo's subway system (Okumura et al., 1998); and anthrax attacks in the USA in 2001 (Regis, 2001).

Improvements in technology, as well as the increasing threat of new forms of terrorism, have increased the risk of incidents involving these types of agents (Alexander & Klein, 2006). CBRN weapons could be particularly devastating, due to their unfamiliar and often invisible nature, and the increased fear and anxiety that this could generate (Cornish, 2007; DiGiovanni, 1999; Regis, 2001). It has been suggested that public reactions to incidents involving CBRN agents may include panic (Cornish, 2007); public unrest (Clarke et al., 2008); aggression (Koenig et al., 2008); and demoralization (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997). It has also been suggested that CBRN incidents may be especially likely to result in multiple unexplained symptoms (MUS) (Pastel, 2001). This phenomenon has been well-documented following CBRN incidents (Carmeli, Liberman, & Mevorach, 1991; Holloway et al., 1997; Pangi, 2002; Vogt & Sorensen, 2002). CBRN

incidents have also been shown to put people at increased risk of ongoing psychological symptoms (Baum & Fleming, 1993; Pangi, 2002).

It has been suggested that in many cases anxiety may actually be caused by interventions which are intended to protect the public, such as decontamination (Holloway et al., 1997). Increased public anxiety during incidents involving decontamination can result in non-compliance with recommended decontamination procedures (Hanley, 1999). Responders should therefore ensure that the management strategy which they employ serves to reassure members of the public that the decontamination process is safe and effective. It has been argued that this should involve providing the public with practical information about how they should decontaminate themselves (Taylor, Balfanz-Vertiz, Humrickhouse, & Jurik, 2009), as well as communicating openly with members of the public about the nature of the threat and the efficacy of the decontamination process.

An interesting review by Lemyre, Johnson and Corneil (2010) highlights the need for responders to provide accurate information to the public during CBRN incidents, even informing them when certain factors or potential consequences are unknown. As Lemyre et al. point out, appropriate communication about risk and protective factors should result in reduced public uncertainty. This should increase the public's levels of trust in responders, reduce public stress, and consequently increase public compliance with recommended behaviours. However, although attempting to apply this information to incidents involving decontamination, Lemyre et al. spend little time discussing the acute phase of an incident, during which decontamination would take place. Instead, they focus on preparation and training prior to an incident, as well as potential psychosocial consequences following an incident. They therefore focus on the longer-term implications of communication strategies during CBRN incidents. In contrast, the current paper focuses exclusively on

communication strategies during the acute phase of a decontamination incident, and how communication from responders can affect public behaviour.

Communicating with the public during incidents involving decontamination specifically

Decontamination showering is the process employed by emergency responders to remove a contaminant from the skin of potential victims. During an incident involving decontamination, responders divide the scene of potential contamination into three zones: the hot zone, which is the area in which the CBRN contamination has occurred; the warm zone, which is the area surrounding the hot zone, in which the potential for cross-contamination may be present; and the cold zone, where no risk of contamination is expected (New Dimension Regional Team, 2003). Decontamination showers are set up by responders between the warm zone and the cold zone, and no-one within the warm zone is allowed to enter the cold zone without first undergoing decontamination. Decontamination showering serves two main purposes: to remove the contaminant from the victim's skin, and thus prevent further absorption; and to reduce the risk of secondary contamination, which can result from previously uncontaminated people coming into contact with someone who is contaminated.

It has also been suggested that decontamination may provide psychological comfort for victims⁵, if managed correctly (U.S Army Soldier and Biological Chemical Command (SBCCOM), 2003).

⁵ The UK New Dimension guidance for responders (New Dimension Regional Team, 2003) defines 'victims' as 'persons who are contaminated or partially contaminated with a substance, but who have not sustained any physical injuries' (p. 7). This is in contrast to 'casualties', who are 'persons who may or may not be contaminated, but have sustained physical injury' (p. 7). As the focus of this paper is on managing uninjured people during decontamination incidents, and as it is common parlance in decontamination guidance documents, the term 'victim' is used throughout.

Decontamination showering is a relatively new method of managing civilian incidents involving CBRN agents. The focus on this method increased following the sarin release on the Tokyo subway in 1995, during which decontamination of victims was required. Planning for decontamination has also increased since the attack on the World Trade Centre in 2001 demonstrated the willingness of terrorists to use unconventional means to kill large numbers of people. In the UK this increased focus on decontamination planning led to the development of New Dimension decontamination units in 2003. These are specialised showering tents, operated by the Fire and Rescue Service, which are capable of showering up to 150 people per hour (Devon and Somerset Fire and Rescue Service, 2010). Similar methods of water-based decontamination have also been adopted in other countries, such as Germany and the USA (Kuhar & Bomm, 2009), although innovative new methods of dry decontamination are currently under investigation in Japan (Saito, 2010). To date, only one large-scale incident involving decontamination has been reported (Okumura et al., 1998). However, several smaller-scale incidents involving decontamination have been reported, from which lessons can be identified in the event that a large-scale incident were to occur.

One of the most detailed case studies of a real-life incident involving decontamination was produced by the U.S Fire Administration, and describes a suspected white powder release at the headquarters of B'nai B'rith, an international Jewish organisation, in Washington, DC (United States Fire Administration, 1997). This incident was later revealed to be a hoax, but not before the decontamination of 30 people, including civilians, Fire and Rescue Service personnel, and Police officers, had taken place.

Several issues became apparent during this incident: 1). Non-compliance: some of the Police officers refused to undergo decontamination, and became aggressive, with one

Police officer striking one of the decontamination officials; 2). MUS: several people complained of headaches, dizziness, and other minor ailments, although the incident was later established to be a hoax; 3). Re-contamination of cold zone: some of the Police officers did not fully understand the nature of the incident, and moved in and out of the hot zone, which would have resulted in repeated re-contamination had the incident not been a hoax.

Non-compliance during incidents that require decontamination has been reported elsewhere. Hanley (1999) described a pesticide contamination incident, resulting in 25-30 people being decontaminated. Emergency responders used force during this incident to ensure that everyone complied with decontamination procedures, and victims complained that their concerns about privacy and dignity were disregarded. Consequently, the decontamination process during this incident was especially stressful for those affected, most of whom were women, and non-compliance was widespread:

They said to take off all my clothes. I left my underwear on. I said 'I'm not taking them off' (Hanley, 1999).

However, rather than being met with reassurance, non-compliance during this incident was met with force, with personnel forcibly removing the clothes from victims who would not comply. One woman commented that “it felt like we were raped.” A concerning finding from this incident was that some people actively did not seek treatment “because they didn’t want to be stripped and hosed down”. Victims in this incident therefore appeared to have no trust in the emergency responders who conducted the decontamination, and did not believe that the responders were acting in their best interests. This incident clearly shows the potential for non-compliance with decontamination showering, especially if victims feel they are not treated with respect and dignity, and if

trust in the emergency services is lacking. It also indicates that decontamination procedures can actually be more stressful for members of the public than the threat of contamination itself, if not handled correctly.

Vogt and Sorensen (2002) collected findings from several relatively small-scale incidents that resulted in decontamination of members of the public and emergency services personnel, in order to generate recommendations for emergency services personnel.

Conclusions which can be drawn from this report include: 1). *Increased/ improved communication*: Responders should make more effort to inform and communicate openly with the public throughout the incident, to reduce any anxiety which they may feel about the decontamination process. 2). *Increased explanation*: Responders should clearly explain why the decontamination process is necessary, to reduce uncertainty and confusion experienced by members of the public, and to increase the public's trust in emergency responders. 3). *Provision of information*: Providing information about the possible psychological reactions which people may experience following potential exposure helps to increase people's understanding of their own reactions, and may also help to reduce the potential for future distress. 4). *Communication issues associated with personal protective equipment (PPE)*: Responders need to be aware of the difficulty of communicating with victims while wearing PPE, and should aim to reduce this difficulty. 5). *Protect victims' dignity and modesty*: Responders should make every effort to protect victims' modesty and dignity, as failure to do so may decrease victims' trust in emergency responders, and may therefore result in non-compliance. It is essential that victims perceive that responders are acting in their best interests. If victims feel that responders have an agenda they are less likely to comply with recommended decontamination procedures.

Similar conclusions have been drawn in a number of reviews, research studies, and case studies. These suggest that the management of CBRN incidents/ incidents requiring decontamination can be improved by: increased provision of accurate, practical information from responders during the incident (Fontana, 1998; Holloway et al., 1997; Sternberg, 2005; Stone, 2007; Wray, Kreuter, Jacobsen, Clements, & Evans, 2004); protection of victims' modesty (Cole, 2000; Holloway et al., 1997); reassurance about the nature of the hazard (Cornish, 2007); provision of loudspeakers for communication with members of the public, to reduce communication issues associated with PPE (MacIntyre et al., 2000); and provision of follow-up information about possible long-term effects, and where to go for further treatment/ advice (MacIntyre et al., 2000; Wessely, 2005).

Many guidance documents have been developed to help emergency responders to manage incidents which require decontamination. Given the finding that communication strategies are essential to the successful management of incidents involving decontamination, it would be expected that communication strategies should feature prominently in guidance documents for responders about decontamination. Open source decontamination guidance documents were therefore reviewed, to assess whether they provide emergency responders with appropriate guidance on communicating with victims during incidents which require decontamination.

It is also important that communication strategies within decontamination guidance documents are tested during emergency preparedness exercises⁶, to ensure that suggested communication strategies are adhered to by responders, and that they are successful in

⁶ The UK Cabinet Office describes an exercise as 'a simulation of an emergency situation' (Cabinet Office, 2010), and lists three main aims of emergency preparedness exercises: to validate emergency response plans; to develop staff competencies and give them practice in carrying out their roles in the plans; and to test well-established procedures. It is essential for responders to exercise different aspects of their emergency response plans, to ensure that these are robust and effective should a real-life incident occur.

improving the management of potential victims. Published reports of emergency preparedness field exercises involving decontamination were therefore reviewed alongside the decontamination guidance documents for responders, to identify whether any communication plans outlined within the guidance documents are being tested during decontamination field exercises.

Method

Review of decontamination guidance documents

A search of the open literature was conducted to identify any relevant guidance documents. Documents were deemed to be relevant if they were dedicated to providing information to emergency responders about the management of incidents requiring decontamination. The search was limited to documents which were available in the open literature, and which were produced in English. Consequently, the guidance documents identified were limited to those from the UK, the USA, and Australia, and did not include any classified documents. The search was also limited to documents which were produced after the 9/11 terrorist attacks in the U.S. in 2001, due to the increased emphasis on planning for decontamination following these incidents.

The search strategy began with a broad Google search, using the search terms: ‘mass decontamination AND guidance’, ‘mass decontamination AND protocol’, ‘mass decontamination AND policy’, ‘mass decontamination AND strategy’, ‘CBRN AND decontamination AND guidance’, ‘CBRN AND decontamination AND procedures’, and ‘responders AND mass decontamination AND guidance’. Due to the high volume of results generated, the search was limited to the first ten pages from each set of results. All results were scanned, to identify any of relevance. Following the initial Google search, websites of relevant organisations were searched, including those of: the UK Fire and Rescue Services,

the Metropolitan Police, the UK Ambulance Services, the US Federal Emergency Management Agency (FEMA), the European Commission, the World Health Organization (WHO), and the North Atlantic Treaty Organization (NATO). These searches generated seventeen guidance documents which met the inclusion criteria.

The guidance documents returned by this search were reviewed to identify descriptions of public or crowd management, any guidance on how emergency responders should communicate with the public, and any efforts made to suggest what information the public would need during decontamination, including how best to provide this information. These guidance documents are presented in Table 2.1 and are taken from the UK: New Dimension Regional Team, Home Office, HM Government, Ambulance Service, National Policing Improvement Agency (NPIA), London Emergency Services Liaison Panel (LESLP), NHS; the USA: Governor's Office of Emergency Services, FEMA, U.S. Army Edgewood Chemical Biological Center, U.S. Army Soldier and Biological Chemical Command (SBCCOM), U.S. Army, Navy, Airforce, and Marine corps; and Australia: State Government Victoria.

Each guidance document was rated based on how much information was provided about a communication strategy. Ratings given were: Poor (no information about communication strategy); Basic (mention that communication is necessary, but no further detail); Moderate (some attempt to outline the information that victims will need); Detailed (full communication strategy). These ratings are also presented in Table 2.1.

Table 2.1: Decontamination guidance documents for responders

Author(s)	Organisation	Year	Country	Title	Intended audience	Level of comms guidance
U.S. Army Soldier and Biological Chemical Command	U.S Army Soldier and Biological Chemical Command	2002	United States	Guidelines for cold weather mass decontamination during a terrorist chemical agent incident	Emergency responders	Basic
Home Office	Home Office	2003	United Kingdom	Guidance on dealing with fatalities in emergencies	Emergency responders	Poor
Federal Emergency Management Agency	Federal Emergency Management Agency	2003	United States	Don't be a victim! Medical management of patients contaminated with chemical agents	Emergency medical responders	Basic
New Dimension Regional Team	New Dimension Regional Team	2003	United Kingdom	National guidance document: Fire Service mass decontamination	Fire and Rescue Service	Moderate
Home Office	Home Office	2004	United Kingdom	The decontamination of people exposed to chemical, biological, radiological, or nuclear (CBRN) substances or material (2nd edition)	Responding agencies	Moderate
Great Western Ambulance Service and Avon Fire and Rescue	Ambulance Service and Fire and Rescue Service	2006	United Kingdom	Mass decontamination: Memorandum of Understanding between Avon Fire and Rescue Service and Great Western Ambulance Service NHS Trust	Emergency responders	Poor
Abeel, B.	Governor's Office of Emergency Services	2006	United States	Multi-casualty mass decontamination guidance for first responders	Emergency responders	Detailed
Lillie, S. H., Mattis, J. N., Kelly, J. M. and Rayburn, B. B.	Army, Marine Corps, Navy and Air Force	2006	United States	CBRN decontamination: Multi-service tactics, techniques, and procedures, for chemical, biological, radiological, and nuclear decontamination	Military responders	Basic
London Emergency Services Liaison Panel	London Emergency Services Liaison Panel	2007	United Kingdom	Major Incident Procedure Manual (Seventh edition)	Emergency responders	Poor

Table 2.1 continued: Decontamination guidance documents for responders

Author(s)	Organisation	Year	Country	Title	Intended audience	Level of comms guidance
State Government of Victoria	State Government Victoria	2007	Australia	Decontamination guidance for hospitals	Hospital responders	Basic
HM Government	HM Government	2008	United Kingdom	Fire and Rescue Manual. Volume 2: Fire Service Operations. Incident command.	Fire Service responders	Poor
National Policing Improvement Agency	National Policing Improvement Agency	2009	United Kingdom	Guidance on Emergency Procedures	Police responders	Poor
Schulze, P. and Lake, W. A.	U.S Army Edgewood Chemical Biological Center	2009	United States	Guidelines for mass casualty decontamination during a HAZMAT/ weapon of mass destruction incident (volume I)	Emergency responders	Moderate
Lake, W., Schulze, P. and Gougelet, R.	U.S Army Edgewood Chemical Biological Center	2009	United States	Guidelines for mass casualty decontamination during a HAZMAT/ weapon of mass destruction incident (volume II)	Emergency responders	Moderate
South Western Ambulance Service	South Western Ambulance Service	2010	United Kingdom	Major Incident Plan	Emergency responders	Poor
Amos, J., Redman, T., Few, G., Findlay, D. and Dyer, J.	South Central Ambulance Service	2010	United Kingdom	Major Incident Plan	Emergency responders	Basic
Diamond, T.	National Health Service	2010	United Kingdom	CBRN Plan: Procedure for management of patients from a haz-mat or C.B.R.N. incident	Hospital responders	Poor

Review of published emergency preparedness exercises involving decontamination

A search of published exercise reports was conducted to identify accounts of emergency preparedness exercises involving decontamination. A report was deemed to be relevant if it described an exercise in which mass decontamination was carried out in response to a simulated CBRN incident. Three search engines were used: Scopus, PubMed, and Google Scholar. Five search terms were used: ‘decontamination AND exercises’, ‘preparedness AND exercises’, ‘mass decontamination’, ‘decontamination AND drills’, and

‘preparedness AND drills’. For Scopus and PubMed, all identified abstracts were read, to identify papers of relevance. For Google Scholar, the first 10 pages of results were read, due to the high volume of results generated. Reference lists of identified articles were also scanned to identify relevant exercises. This search strategy identified 13 relevant exercise reports, which are summarised in Table 2.2. Ten of the reports were published in academic journals, one was published in an online newspaper article, one was taken directly from a UK Fire Service website, and another was published within the Health Protection Agency Chemical Hazards and Poisons Report.

Each exercise paper was rated based on whether a communication strategy was tested. Ratings given were: No (no information about whether a communication strategy was tested); Partially (some mention of communication with victims, but no detail about what this involved); Yes (details of communication strategy provided). These ratings are also presented in Table 2.2.

Table 2.2: Published papers describing field exercises involving mass decontamination

Author(s)	Year	Country	Scenario	Communication strategy tested
FitzGerald, Sztajnkrzyer, and Crocco	2003	United States	Deliberate chemical agent release	No
Schleipman, Gerbaudo and Castronovo	2004	United States	Detonation of a radiation dispersal device	Partially
Al-Damouk and Bleetman	2005	United Kingdom	Chemical agent incident	No
Edwards, Caldicott, Eliseo and Pearce	2006	Australia	Bomb blast and chemical release	Partially
Grant	2007	United States	Hydrogen fluoride explosion and contamination	No

Table 2.2 continued: Published papers describing field exercises involving mass decontamination

Author(s)	Year	Country	Scenario	Communication strategy tested
Okumura et al.,	2007	Japan	Chemical agent release	Partially
Turner, Jewkes, Amlôt and Simpson	2007	United Kingdom	Contaminant release from road traffic accident	Yes
Snyder and Sobieski	2008	United States	Terrorist detonation of nuclear device	Partially
Lenz and Richter	2009	Germany	Biohazard exposure	No
Taylor, Balfanz-Vertiz, Humrickhouse and Jurik	2009	United States	Not described	Yes
Fertel, Kohlhoff, Roblin and Arquilla	2009	United States	Radiation exposure	No
Hayes	2010	United Kingdom	Chemical leak	No
Devon and Somerset Fire and Rescue Service	2010	United Kingdom	Chemical release through air-conditioning	Yes

Results

Findings from decontamination guidance documents

Findings from the guidance documents are described under three headings: 1). Guidance on likely public behaviour during incidents involving decontamination; 2). Guidance on communication strategies for managing members of the public; 3). Guidance on specific information which members of the public are likely to require.

1. Guidance on suggested public behaviour during incidents that require decontamination. Five of the 17 guidance documents specifically suggest that victims of CBRN incidents are likely to panic, or behave in a disorderly or aggressive way (Abeel, 2006; Home Office, 2004; Lake, Schulze, & Gougelet, 2009; LESLP, 2007; New Dimension Regional Team, 2003). Suggestions about victims' behaviour include:

In the case of mass decontamination, and if there is impatience to enter the decontamination facility, responders could face public disorder (Home Office, 2004, p.24).

Risks to CBRN responders include harm from secondary devices, confused, violent, or rowdy victims (New Dimension Regional Team, 2003, p.12).

The threat from such a device (to release hazardous materials) is significant, not only as a result of its activation, but also in the fear and panic that it would create within society (LESLP, 2007, p.56).

The idea that the public cannot cope with emergencies or disasters, and that their behaviour will be maladaptive and require coercive or paternalistic control, reflects the assumptions of the vulnerability approach to emergency preparedness (Furedi, 2008). The implication is that the public will be unable to make sensible use of any information provided to them.

The need to 'control' victims is an issue which is raised in seven of the guidance documents (Abeel, 2006; Home Office, 2004; Lake et al., 2009; New Dimension Regional Team, 2003; Schulze & Lake, 2009; South Western Ambulance Service NHS Trust, 2010; State Government of Victoria, 2007). Ideas about controlling victims during incidents involving decontamination include:

Gaining control of victims is a difficult task, but rapidly gaining control is critical to getting victims to quickly perform the critical first step in mass decontamination (Lake et al., 2009, p.4).

State law provides some options for controlling people that choose not to undergo decontamination (Abeel, 2006, p.99).

The use of physical barriers may prove effective in gaining initial control of victims and preventing the spread of contamination (Lake et al., 2009, p.4).

Several of the guidance documents therefore reveal an underlying assumption that victims will behave obstructively, or will be excessively anxious, and so will need to be controlled by emergency responders.

2. Guidance on communication strategies for managing members of the public during decontamination incidents. Ten of the 17 guidance documents acknowledge the need to consider communication with members of the public during incidents involving decontamination (Abeel, 2006; Amos, Redman, Few, Findlay, & Dyer, 2010; FEMA, 2003; Home Office, 2004; Lake et al., 2009; Lillie, Mattis, Kelly, & Rayburn, 2006; New Dimension Regional Team, 2003; SBCCOM, 2003; Schulze & Lake, 2009; State Government of Victoria, 2007). However, even those which do acknowledge the need for communication with the public vary widely in the amount of detail they provide to responders about communication plans. The amount of information about communication strategies ranges from a few sentences recommending that information be provided to victims (Home Office, 2004) to several pages of in-depth description about what information victims will need, how information can be provided, and how responders should communicate with the public (Abeel, 2006).

Abeel (2006) suggests that responders and the public will view the severity of the situation differently, and that it is therefore essential that the threat and the need to follow instructions are communicated quickly to victims, in ‘a positive and reassuring manner’ (p.45). This is the only guidance document which not only suggests what information victims will need, but also how responders should communicate with the public. For example, it suggests that the following factors should be emphasised when communicating with the public, to encourage trust and credibility: ‘competency/ professionalism, care, empathy, compassion, respect, understanding, organization, commitment, knowledge, encouragement of involvement, and honesty’ (p.42).

A specific communication issue addressed in some of the guidance documents is the difficulty which responders are likely to face in communicating with the public whilst wearing PPE (FEMA, 2003; New Dimension Regional Team, 2003). This is important, as although some of the guidance documents do suggest information which victims will need during incidents requiring decontamination, they do not address how it should be provided by responders who are wearing PPE. Some guidance documents suggest that information can be provided over loudspeakers, or through written/ pictorial information (Abeel, 2006; Amos et al., 2010; Lillie et al., 2006; New Dimension Regional Team, 2003; Schulze & Lake, 2009;). These may be useful techniques for providing generic information to victims. However, they may not be adequate for ensuring that victims’ specific concerns and questions are addressed, and that they are reassured by emergency responders.

3. Guidance on specific information which members of the public are likely to require during incidents involving decontamination. Four of the guidance documents include some description of the type of information which the public might need during incidents involving decontamination. Suggested information needs include: why

decontamination is beneficial (Abeel, 2006; Home Office, 2004; Lake et al., 2009; New Dimension Regional Team, 2003); how victims can clean and protect themselves (Abeel, 2006; FEMA, 2003; Lake et al., 2009); and the nature of the harmful substance involved (Abeel, 2006). Four documents also suggest that follow-up information should be provided to victims after an incident, including information on possible symptoms, as well as where to go if further medical assistance is needed (Abeel, 2006; Lake et al., 2009; New Dimension Regional Team, 2003; Schulze & Lake, 2009). However, while a few of the documents have attempted to provide guidance on the types of information which may be necessary, this is generally brief, with no suggestion about why this information might be necessary, or how it can be provided.

Abeel (2006) again goes further than the other guidance documents in outlining exactly what sort of information victims' might need. For example, it is suggested that necessary information includes:

Why are they here, what is going on, how bad is the 'stuff', are we in harm's way, what are you doing about it (Abeel, 2006, p. 44).

This document also contains a comprehensive list of questions and concerns which members of the public might have, and suggests ways in which responders can answer these questions, and reduce any concerns about the decontamination process.

Seven of the decontamination guidance documents recognise that it is important to consider victims' modesty and privacy during the decontamination process (Abeel, 2006; Amos et al., 2010; Diamond, 2010; FEMA, 2003; Lillie et al., 2006; New Dimension Regional Team, 2003; State Government of Victoria, 2007), with three documents specifically highlighting, albeit only briefly, the fact that cultural issues may affect victims'

willingness to undress in public and take part in the decontamination process (Abeel, 2006; Amos et al., 2010; New Dimension Regional Team, 2003).

Some of the more recent guidance documents on decontamination (2006-2010) provide a stronger emphasis on communication with the public than do many of the earlier guidance documents (2002-2006). This may be because decontamination is a fairly new intervention, and as such a lot of emphasis has been placed on developing the technical aspects of decontamination, with communication with the public being seen as a side-issue, to be addressed once the technical aspects of decontamination had been perfected.

Findings from emergency preparedness field exercises involving decontamination

The exercise reports were reviewed to identify any evidence that communication strategies were tested, and if so, how successful they were in facilitating the management of victims during these exercises. Six of the 13 identified exercise papers make no mention of how communication strategies were employed, or what information simulated victims were provided with (Al-Damouk & Bleetman, 2005; Fertel, Kohlhoff, Roblin, & Arquilla, 2009; FitzGerald, Sztajnkrzyce, & Crocco, 2003; Grant, 2007; Hayes, 2010; Lenz & Richter, 2009).

Four of the exercise papers mention basic communication strategies, such as the type of information which simulated victims were provided with (Edwards, Caldicott, Eliseo, & Pearce, 2006; Okumura et al., 2007; Schleipman, Gerbaudo, & Castronovo, 2004; Snyder & Sobieski, 2007). An example of the type of information provided about communication strategies in these papers can be taken from Schleipman et al. (2004) 'Patients were cared for and advised of radiation risks and protective measures' (p. 26). This kind of statement does not allow the reader to understand what information was

provided, how it was delivered, who it was delivered by, and how it was received by simulated victims.

Of the 13 published reports, only three indicate that their exercise in any way set out to test responders' communication strategies (Devon and Somerset Fire and Rescue Service, 2010; Taylor et al., 2009; Turner, Jewkes, Amlôt, & Simpson, 2007). Of these three exercise reports, Taylor et al. (2009) provide the greatest detail about communication strategy, with a large part of their report being devoted to describing the communication strategies used, and the results of these. Taylor et al. identify a range of shortcomings in the communication strategies used during the exercise, as well as potential ways of solving these. To identify ways of improving communication strategies, Taylor et al. decontaminated simulated victims who were either physically disabled, deaf, or non-english speaking, and subsequently conducted focus groups with them, to establish any communication issues, as well as any suggested improvements to communication. Their findings on communication were applicable across all populations, and included: although it was an exercise, participants felt anxious, and stressed the need for increased information; participants wanted specific information about how to proceed through the decontamination shower; and participants wanted reassurance that the decontamination process had been successful. From these findings, the authors drew the following conclusion:

Staff must explain effective decontamination: that clothing removal eliminates 80% of the contaminant, that the solvent used is the one most highly recommended, and that a quick shower with a sponge is standard practice. (Taylor et al., 2009).

This paper indicates how beneficial exercises can be for improving communication strategies during incidents involving decontamination, and highlights the fact that opportunities to test communication strategies during exercises have largely been wasted.

While few of these exercises set out to test their communications procedures, several of them were useful in highlighting communications issues associated with the use of PPE, such as the difficulty which responders had in making themselves heard by the public (Al-Damouk & Bleetman, 2005; Okumura et al., 2007; Schleipman et al., 2004; Taylor et al., 2009; Turner et al., 2007). However, this was often mentioned only briefly, with little attempt to suggest ways in which communication difficulties could be overcome. The paper by Turner et al. (2007) does highlight a recommendation that non-verbal communication should be enhanced (e.g. through the use of pictorial instructions), in order to ‘gain the quickest and most efficient response’ (p. 22) from members of the public.

Another issue which is apparent in some of the exercise papers is that there is an assumption that crowd members will panic, and will behave uncontrollably. For example, FitzGerald et al. (2003) ask ‘would scared, hysterical individuals be able to comprehend the rational need to remove clothing as part of decontamination?’ (p. 210). Participants in some of these exercises appear to have behaved in an hysterical, uncontrollable way, disrupting emergency responders’ attempts to manage the incident. This confounded exercise players’ attempts to manage crowd members, with any attempts at communication largely being ignored. This was the case during an exercise at a hospital in Australia, during which responders made several unsuccessful attempts to communicate with the public (Edwards et al., 2006). Unfortunately, there is not enough detail given in the papers to ascertain whether participants were briefed to behave in this way, or whether they behaved in this way because they believed that it is how people would behave in a real incident. This issue

needs to be addressed, to ensure that exercise participants behave as realistically as possible.

Discussion

Few real-life incidents requiring decontamination have been analysed, but those which have reveal that successful communication with members of the public is vital for maintaining public trust in emergency responders, and so ensuring compliance with decontamination procedures.

However, the guidance documents reviewed for this paper show a disappointing lack of emphasis on communication strategies. They contain great detail about the physical and technical aspects of decontamination, but often neglect to provide responders with information about how best to communicate with the public. Moreover, decontamination guidance documents reveal a perception that members of the public will be prone to panic during incidents involving decontamination, and will therefore need to be ‘controlled’. This is of concern for three reasons. The first is that both recent case studies (Blake, Galea, Westeng, & Dixon, 2004; Drury, Cocking, & Reicher, 2009a) and recent reviews of published evidence (Chertkoff & Kushigian, 1999; Clarke, 2002) argue against ‘mass panic’ being a common reaction of the public in emergencies. The second is that crowd ‘disorder’ is best understood as a function of relations between the crowd and the actions of some other group, rather than being a feature of crowds per se (Stott, 2003). Most crowds are peaceful and orderly; conflict only tends to occur when one group infringes on another’s definition of legitimate conduct. Third, relating these points to the observation that decontamination may produce as much public anxiety as the CBRN incident itself (Holloway et al., 1997), it can be argued that management strategies perceived as ‘controlling’ and illegitimate may cause the public to exhibit the very ‘disorderly’, anxious,

maladaptive behaviours they are meant to prevent. This was evident in the report by Hanley (1999), in which forceful behaviour by emergency responders resulted in a decrease in victims' trust, and so decreased compliance with decontamination.

It would therefore be expected that control measures by the emergency services, such as physical barriers, might alienate victims, making them less likely to comply with recommended decontamination procedures. Also, it would be expected that assumptions about disorderly victim behaviour and the need for control would lead to emergency responders not providing members of the public with sufficient information about the situation, for fear that they would overreact and behave maladaptively (Drury, 2002). This could again prove counterproductive, as withholding information from the public has been shown to reduce compliance with recommended emergency measures (Perry & Lindell, 2003), as well as increasing public anxiety (Jones, Woolven, Durodie, & Wessely, 2006).

However, while decontamination guidance documents do not currently provide responders with enough instruction on communicating with the public during decontamination incidents, there does appear to have been a gradual move towards an increased focus on communication in decontamination guidance documents between 2002 and 2010.

There is no direct evidence that any communication strategies outlined in the guidance documents are being tested during exercises, and it will therefore be impossible for responders to ascertain whether they are successful until a real incident occurs. The fact that ten out of the thirteen identified exercise papers contained little or no mention of communication strategy highlights the lack of emphasis on communication across the field of decontamination as a whole. Clearly, there is much room for improvement across

emergency preparedness exercises involving decontamination, as valuable opportunities for testing and improving communication strategies are being missed.

Exercises have been used to good effect to test communication strategies during radiation screening incidents, with findings indicating that repeated and open communications, as well as pre-prepared communication templates, are likely to enhance responders' ability to successfully manage a radiation screening incident (Emery, Sprau, & Morecook, 2008; Emery, Sprau, Morecook, & Herbold, 2009). The authors note the applicability of these findings to other types of CBRN disasters. Future exercises involving decontamination should therefore ensure that aspects of communication strategy are tested, and that lessons are identified which can be used to improve existing decontamination guidance. Also, it is essential that exercise participants are briefed to behave in a realistic way, rather than simply being told to 'panic', as this will not allow responders to test the effectiveness of their communication strategy. Most of the exercises reviewed for this paper were carried out either on the assumption that victims would passively undergo the decontamination process without question, or else that they would panic and behave in a disorderly way, thereby denying responders the opportunity to see what effect their communication strategies might have on public behaviour.

Limitations

It should be noted that the review conducted for this paper was not exhaustive, and only guidance documents which are available in the open literature were used. However, it is assumed that any public-facing documents, such as the ones identified in this paper, would be more likely to contain a greater emphasis on communication strategies, and less emphasis on public order control strategies. Furthermore, if communication strategies are not being routinely tested and evaluated in exercises, as appears to be the case, it is likely

that such communication strategies either do not exist, or are not sufficiently prioritised at the present time.

Another potential limitation is that the lack of emphasis on responder communication strategies within the published exercise papers does not necessarily mean that communication strategies were not tested within the exercise itself. It may be the case that responders' communication strategies have simply been overlooked in the published paper or report. However, given that some aspects of the exercise are covered in detail in these papers, it seems likely that this lack of emphasis on communication was present during the exercise itself.

Conclusion

Exercises offer the emergency services a valuable opportunity to test their communication plans and procedures during simulated decontamination incidents, but currently this opportunity is being lost. Where communication strategies are outlined in guidance documents, they need to be tested through exercising, to ensure that they are effective, and that responders are capable of carrying them out. Also, it is essential that exercise participants are briefed to behave in a realistic way. Most of the exercises reviewed for this paper were carried out either on the assumption that victims would passively undergo the decontamination process without question, or else that they would panic and behave in a disorderly way. It is important that future exercises address this, as if participants behave in an unrealistic way, it will not be possible for emergency responders to draw conclusions about the effectiveness of their communication strategy. Recent research suggests that combining experimental designs with exercise scenarios can present a useful way to test novel communication strategies (Amlôt et al., 2010), and it has been

noted that further experimental studies should be conducted to test all aspects of decontamination protocols (Baker, 2010).

Finally, the lack of evidence on how people actually respond during real decontamination incidents was notable. Such incidents occur surprisingly regularly, both as a result of accidental releases and during false alarms about deliberate releases (Page et al., 2010). These incidents represent an as-yet under utilised way to build up a robust evidence-base on how members of the public behave during real incidents that require decontamination. Analysis of these types of incidents would allow more realistic exercises to be designed and better guidance on successful communication strategies to be compiled.

CHAPTER 3

Paper 2: Applying crowd psychology to improve policy and practice in the management of mass decontamination

Abstract

Mass decontamination is a public health intervention employed by emergency responders following a chemical, biological, or radiological release. Mass decontamination involves a crowd of people, whose interactions with each other, and with the emergency responders managing the incident, are likely to affect the success of the decontamination process. In this paper, we argue that current theories of health behaviour are not sufficient to explain group processes during incidents involving mass decontamination, and that social psychological theories of crowd behaviour should also be examined. The social identity approach goes beyond previous 'collective behaviour' approaches to crowds by emphasising that crowd events are characteristically intergroup encounters. We therefore extend the social identity approach to disasters and crowd conflict specifically to incidents that involve mass decontamination, to show how it can be applied to improve the management of these types of incidents. Recommendations for responder communication strategies focus on: 1. Increasing public compliance; 2. Increasing orderly and co-operative behaviour among members of the public; 3. Reducing public anxiety.

Introduction

The threat of incidents involving chemical, biological, radiological, and nuclear (CBRN) agents has increased in recent years, due to rapid technological advancements (Alexander & Klein, 2006), and the increasing willingness of terrorists to use unconventional weapons (O'Brien, 2011; Schneidmiller, 2012). It has been suggested that incidents involving CBRN agents are more likely than conventional incidents to result in members of the public 'panicking' (Cornish, 2007; Holdsworth, Bland, & O'Reilly, 2012), behaving in a disorderly way (Bhardwaj, 2010; Clarke et al., 2008), or behaving aggressively (Koenig et al., 2008). Further, interventions which have been designed to reduce the impact of incidents involving CBRN agents may actually be more frightening for members of the public than the incidents themselves, if they are not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997). One such intervention is decontamination showering. This involves members of the public going through large showering tents in order to remove any contaminant which might be present on their skin, thus reducing the risk to the members of the public who are directly involved, as well as the risk of secondary contamination of other people and places. The focus on planning for mass decontamination has increased in recent years, following the sarin attacks on the Tokyo subway in 1995 (Okumura et al., 1998), and the terrorist attacks in the USA in 2001.

Mass decontamination has traditionally been seen essentially as a technical issue, with little effort to understand how members of the public might feel during the decontamination process, and how this might affect their behaviour. This emphasis is reflected in the fact that priority in much of the published guidance and in field exercises has been given to developing technological aspects of decontamination, rather than to

communicating with members of the public (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2). However, findings from small-scale incidents involving decontamination, as well as large scale field exercises in which mass decontamination was simulated, suggest that failure to communicate successfully with members of the public during the decontamination process can result in increased anxiety (Carter, Drury, Rubin, Williams, & Amlôt, 2013b: Chapter 6; Hanley, 1999), attempts to challenge emergency responders (United States Fire Administration, 1997), and the potential for non-compliance with the process (Carter, Drury, Rubin, Williams, & Amlôt, 2012: Chapter 5; Hanley, 1999; U.S. Fire Administration, 1997). In effect, a purely technical approach to decontamination, in which insufficient attention is paid to social and psychological aspects (such as communication) risks compromising the effectiveness of the process.

In terms of public behaviour, there are several issues which may arise during incidents that involve mass decontamination and which therefore point to the need for a properly psychological perspective. First, members of the public may be reluctant to undergo decontamination, which is an unfamiliar and potentially embarrassing intervention (Holloway et al., 1997), especially in terms of creating a lack of privacy and modesty (Vogt & Sorensen, 2002). Second, due to their novelty, the types of agents involved have the potential to generate fear and anxiety out of proportion to the actual scale of the incident (Alexander & Klein, 2003; Bhardwaj, 2010; Bleich, Dycian, Koslowsky, Solomon, & Wiener, 1992; Cornish, 2007). Third, victims are asked to remain at the scene of the incident, which, without further information, could be perceived as infringing on human rights of freedom of movement (Pangi, 2002). Fourth, responders are required to wear personal protective equipment (PPE) during incidents involving decontamination, which could create a barrier between the public and responders, by creating a sense of ‘us’ and

‘them’. Fifth, the PPE which is worn by emergency responders can create difficulties in communicating with members of the public (Al-Damouk & Bleetman, 2005; Taylor, Balfanz-Vertiz, Humrickhouse, & Jurik, 2009).

Psychology offers a number of theoretical approaches which could be relevant to understanding these behaviours and providing a rationale for communication strategies during decontamination. These can be grouped into three areas.

First, since mass decontamination is a health intervention, designed to reduce the threat posed by a contaminant, theories of health behaviour might provide appropriate explanatory frameworks (e.g. the Health Belief Model, Hochbaum, 1958; Protection Motivation Theory, Rogers, 1975; and social-cognitive theory, Bandura, 1977). Second, since mass decontamination involves a mass emergency situation, theories of collective behaviour during emergencies and disasters might be relevant (e.g. Johnson, 1987, 1988; LaPiere, 1938; Smelser, 1963; Turner & Killian, 1957; 1972). Third, since mass decontamination involves not only crowd situations but intergroup relationships, where the public respond both to the incident and also to the emergency responders, the social identity approach to crowd behaviour, which emphasises intergroup dynamics, might be relevant (e.g. Drury, Cocking, & Reicher, 2009a; Drury & Reicher, 2000; Reicher, 1984).

In this paper we examine the extent to which health behaviour theories, theories of mass emergency behaviour, and the social identity approach, are useful to the understanding of public behaviour during mass decontamination. We argue that, given that mass decontamination is both a crowd event and involves an intergroup relationship, the social identity approach is the most fruitful for deriving some specific hypotheses about the way in which responder communication strategies might affect the way members of the public feel and behave during mass decontamination. Based on this approach, we offer

some specific predictions and recommendations for emergency responders when communicating with members of the public during these types of incidents.

Health psychology theories and mass decontamination

The Health Belief Model (HBM) (Hochbaum, 1958), Protection Motivation Theory (PMT) (Rogers, 1975), and social-cognitive theory (Bandura, 1977) can be read to suggest that communication can increase people's compliance with recommended health behaviours, by altering various cognitive factors, including their perceptions of the severity of a threat, beliefs about costs and benefits of recommended behaviours, and beliefs about their self-efficacy in carrying out recommended health behaviours.

Health psychology theories have been applied to various different types of disasters, including natural disasters (Elder et al., 2007; Mulilis & Lippa, 1990; Paton, 2003), disease outbreaks (de Zwart et al., 2009; Jiang et al., 2009; Tang & Wong, 2004; Voeten et al., 2009), food contamination incidents (Kuttschreuter, 2006), and CBRN incidents (Neuwirth, Dunwoody, & Griffin, 2000; Pearce, Rubin, Amlôt, Wessely, & Rogers, 2013a), in an attempt to improve communication with members of the public during these types of incidents. For example, Tang and Wong (2004) surveyed 1,329 residents of Hong Kong during the 2003 SARS outbreak, to establish whether the Health Belief Model could explain and predict people wearing facemasks to prevent them catching SARS. They found that three of the five factors described in the Health Belief Model (perceived susceptibility, cues to action, and perceived benefits) were significant predictors of facemask wearing, and concluded that public communication about SARS should highlight the prevalence of SARS, and also the benefits of various protective behaviours (including wearing facemasks).

Psychosocial theories of health behaviour tend to focus on changes in people's behaviour over the medium to long term. Hence disaster-related research based on these types of theories focuses on either public preparedness prior to a disaster (e.g. Elder et al., 2007; Mulilis & Lippa, 1990; Paton, 2003), or to the adoption of protective behaviours during longer term disasters (such as disease outbreaks) (e.g. Jiang et al., 2009; Tang & Wong, 2004; Voeten et al., 2009), rather than to behaviour during acute incidents. Acute incidents happen over a much shorter timescale, and require immediate responses from members of the public as well as the emergency services, in order to minimise the risk to those involved (e.g. a chemical release). Health psychology theories are therefore under-tested in acute emergency settings, and their applicability to acute incidents is not established. This potential lack of applicability to acute incidents is a problem in terms of using health psychology theories to generate recommendations about communicating with members of the public during incidents that involve mass decontamination, as these types of incidents are inherently acute, and require members of the public to take certain actions immediately.

Perhaps a more important limitation when applying health psychology theories to responses to incidents that involve mass decontamination, and in attempting to use these theories to generate recommendations about communication strategies for these types of incidents, is that they do not refer to crowd psychology. Incidents that involve mass decontamination will involve a crowd of people, most of whom are likely to be strangers to each other, and who find themselves in a frightening and unfamiliar situation. Further, the people involved may perceive others who are also involved as a possible threat to their own safety (e.g. in increasing the length of time prior to an individual being decontaminated), or as a source of safety (e.g. in providing help during the decontamination process). There are

several theories which aim to understand crowd behaviour during mass emergencies and disasters, and it is important to consider these as frameworks for understanding and improving the management of incidents involving mass decontamination.

Theories of mass emergency behaviour and decontamination

Theories of mass panic

According to Le Bon (1895), a psychological crowd exists when people, in close proximity to each other, become ‘submerged’. This results in the loss of an individual’s sense of self, which is replaced by a collective ‘racial unconscious’. Le Bon suggested that this resulted in ‘contagion’ of behaviour, whereby primitive sentiments are able to sweep unhindered through the crowd.

The concept of contagion was employed in early theories of mass emergency behaviour (e.g. LaPiere, 1938; McDougall, 1920). These theories suggest that people are highly susceptible to the behaviour of others during emergency situations, and that witnessing a few people within the crowd panicking (over-reacting) can lead to panic and irrational behaviour quickly spreading and overcoming a previously rational crowd of people. Later sociological theories built on these early theories of mass emergency behaviour, again reproducing the theory that crowd members are likely to behave irrationally during mass emergencies (Smelser, 1963). For example, of crowds during disasters, Smelser writes ‘the arguments they employ and those which are capable of influencing them are, from a logical point of view, of such an inferior kind that it is only by way of analogy that they can be described as reasoning’ (Smelser, 1963, p. 80).

However, theories of mass panic are not well supported by empirical evidence and have been discredited by more recent research which indicates that panic is not common during emergencies and that people continue to act normatively (based on existing norms of

behaviour) (e.g. Donald & Canter, 1990; Proulx & Sime, 1991; Quarantelli, 1954, 1960). For example, Johnson (1988) examined behaviour during a fire in a night club and concluded that even as exits became more crowded, the majority of people continued to act co-operatively rather than competitively, and social bonds were maintained. Further, evidence shows that people often help others during disasters, even at possible risk to their own safety (Mawson, 2005; Sime, 1983). Even those cases which may appear outwardly to involve supposedly selfish or irrational behaviour may actually be better explained by other factors, such as hazardous conditions which make co-operation physically impossible (Cornwell, 2001), or poor building design, which may hamper escape attempts (Chertkoff & Kushigian, 1999).

Laboratory experimental evidence has also been used to examine public behaviour during emergencies (Guten & Allen, 1972; Kelley, Condry, Dahlke, & Hill, 1965; Mintz, 1951). These studies examined individual escape attempts during simulated dangerous situations. Results showed that when urgency was increased, 'traffic jams' occurred within simulated escape routes, and not all participants were able to escape. This has led some researchers to claim that these experiments provide support for theories of mass panic. However, researchers note that when participants were able to discuss their actions with others (Kelley et al., 1965), or co-operation was promoted among participants rather than competition (Mintz, 1951), far fewer jams occurred. Further, Mintz makes the point that maladaptive outcomes (such as blocked doors) are possible based on individual ('rational') decisions, and without invoking emotion, contagion, or mass panic. Thus this research actually provides evidence against mass panic theories, which suggest that individuals act based on irrational emotion, rather than cognition, during emergencies.

Despite having been largely discredited by recent research showing that co-operation is common during emergencies (McPhail, 1991), these theories continue to influence authorities' views about public behaviour during emergencies (Dynes, 1990). This has resulted in attempts to control the actions of the public following disasters (Auf der Heide, 2004; Solnit, 2009), for example by withholding important information, in the belief that the public will be unable to cope adaptively (Dynes, 2003; Furedi, 2008; Gannt & Gannt, 2012). However, withholding information from members of the public may actually have adverse consequences during disasters and emergencies, because people will need such information in order to take the most appropriate actions to protect themselves and others (Proulx & Sime, 1991). Further, if responders are perceived to be withholding information from members of the public, this could lead to a perception that responders are acting illegitimately, which could create the very disorder which responders are seeking to avoid (Stott, Hoggett, & Pearson, 2012). It can therefore be concluded that a reliance on theories of mass panic during incidents involving mass decontamination may actually serve to create disorder and reduce compliance among members of the public. These theories therefore offer no constructive guidance for policymakers, emergency planners, or emergency responders who may be involved in the planning for, or management of, incidents involving mass decontamination.

Normative theories

Quarantelli (1954, 1960) was one of the first researchers to question the assumption that 'panic' occurred. Although initially setting out to examine empirical data to find out more about the causes of irrational 'panic' behaviour, Quarantelli found that panic, if it occurred at all, was rare, and therefore questioned whether it was a useful way to understand behaviour during disasters. Quarantelli's findings facilitated a move away from

traditional ‘panic’ theories, and opened the door to the suggestion that behaviour during disasters is normative, rather than irrational.

Experimental studies of small groups have also been influential in facilitating a move away from traditional panic theories. Based on Sherif’s (1936) experimental work on establishment of social norms, Turner and Killian’s (1957, 1972, 1987) Emergent Norm Theory (ENT) highlights the emergence of new norms of behaviour during disasters and suggests that these emerge within a crowd through ‘milling’, which involves crowd members interacting with each other to make sense of the unusual situation they find themselves in. ENT suggests that certain individuals will naturally become prominent within the crowd and that their views will be adopted by other crowd members, through a process called ‘keynoting’. Milling and keynoting form the basis of emerging norms of behaviour. To test hypotheses derived from ENT, Aguirre, Wenger, and Vigo (1998) studied evacuation times during the 1993 evacuation of the World Trade Center. They found that larger groups, in which everyone knew each other well, delayed their evacuation times. Aguirre et al. suggest that these findings support ENT, concluding that the delay in evacuation by larger groups of known others was due to an increased sense of familiarity and safety among these groups, which delayed the adoption of the emergent norm of evacuation, as well as to increased time spent milling within these groups.

ENT suggests that the emergent norm during disasters is ‘every man for himself and the devil take the hindmost!’ (Turner & Killian, 1987, p. 82). ENT has therefore been criticised for helping to perpetuate the myth of panic (McPhail, 1991), and for failing to recognise that existing norms continue to operate during disasters (Johnson, 1987). A further drawback of ENT is that it relies on the assumption that certain members of the crowd (‘keynoters’) will have influence over other members. This view implies that crowds

are open to manipulation, enabling powerful crowd members to incite disorder in the crowd for their own gain (Reicher, 1984). A final criticism of ENT is that the extended time period required for ‘milling’ cannot explain situations in which new norms of behaviour emerge almost immediately, without any extended interaction period (Reicher, 1984). Specifically, interpersonal interaction does not always appear to be necessary for collective behaviour to occur.

Another normative theory of crowd behaviour during disasters is that developed by Johnson (1987, 1988). This theory differs from ENT in suggesting that there is no radical break between existing norms and emergent norms during disasters. Numerous studies support this, by showing that existing norms, such as bonds between friends and family members, are maintained during disasters (Aguirre, Torres, Gill, & Hotchkiss, 2011; Cornwell, 2001, 2003; Donald & Canter, 1990; Feinberg & Johnson, 2001; Johnson, 1987, 1988). Feinberg and Johnson (2001) tested three different models of collective behaviour during the Beverley Hills Supper Club fire: a social organisation model, in which even weak social ties were maintained; a partial breakdown model, in which weak social ties broke down, but stronger family ties were maintained; and a complete breakdown model, in which even ties between close family members broke down. They concluded that there was most evidence for the social organisation model. If any break down in norms took place, they suggest that it occurred at such a late stage of the disaster as to have had no consequence for survival rates.

Aguirre (2005) has argued that Johnson’s normative model (Johnson, 1987) is currently the dominant normative theory of mass emergency behaviour. However, Johnson’s theory has been criticised for placing too much emphasis on the maintenance of existing norms during disasters, and for failing to recognise that there is an emergent

sociality during disasters which cannot be explained by existing norms (Drury et al., 2009a). The evidence for normative theories is taken from disasters during which people were with familiar others, such as the Beverley Hills Supper Club fire, and for which existing interpersonal bonds have been invoked to explain the motivation to help (e.g. Aguirre et al., 2011; Johnson, 1987). They are therefore unable to explain behaviour during disasters in which people are with strangers, as the existing norms during this type of situation would be much less clear. In short, they do not explain collective behaviour in an ad hoc crowd.

There is now a wealth of academic research which suggests that panic is not common during disasters, and that individuals continue to act based on social or cognitive factors (Donald & Canter, 1990; Proulx & Fahy, 2003; Proulx & Sime, 1991; Quarantelli, 1954; 1960; Sime, 1995; Weiseth, 1989). As people are unlikely to panic, there is no need to withhold information from them during a disaster; indeed, they will benefit from increased information, as this will enable them to make the best decisions to improve their chances of survival (Donald & Canter, 1990; Proulx & Sime, 1991; Sime, 1990; Sime, 1995). In this way, normative theories of crowd behaviour can be applied to promote an understanding of public information needs during incidents involving mass decontamination. However, the relationship between those giving the instructions and those receiving them can be just as important as the nature of the information and instructions provided (Reicher et al., 2007).

The social identity approach extends existing normative theories of mass emergency behaviour, by employing the concept of norm, and explaining how and why some norms of behaviour and not others become relevant for group members in particular contexts (Reicher, 1984).

The social identity approach to crowd behaviour and decontamination

Social identity theory (Tajfel & Turner, 1979) suggests that an individual has social as well as personal identities and that these social identities can be based on group memberships. Self-categorisation theory (SCT: Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) adds to this by suggesting that social identities consist of self categorizations at various levels of inclusiveness. In this account, what makes collective behaviour possible is not contagion (as in panic theories) or interpersonal interaction (as in normative theories) but self-stereotyping: knowing and applying the normative features of the social category to oneself. Since each social identity has different norms, collective behaviour in crowds is therefore based on the norms specified by the identity shared by those making up the crowd (Reicher, Spears, & Haslam, 2010).

Self-categorisation theory extends the principles of social identity theory, by showing that identity formation is a cognitive process, and as such it is important to examine how and when different identities become salient. The main principle of SCT is that identity is based on categorisations about the self following comparison with others who are deemed as similar at some higher level of comparison (Turner et al., 1987). The principle of comparative fit is used to explain how and why different identities become salient in different contexts: it suggests that individuals in any given situation are likely to categorise themselves as part of a group if the perceived differences between them are less than the differences perceived between themselves and others outside the group. Turner et al. (1987) suggest that factors which enhance the likelihood of categorising oneself as similar to others include proximity to others, a sense of shared fate with other group members, and the perception of a shared threat. These factors therefore enhance group cohesion, by creating a sense of shared social identity. The principles of self-categorization

theory have been applied to explain various group processes, including leadership (e.g. Haslam & Platow, 2001), social influence (e.g. Postmes, Haslam, & Swaab, 2005), and social solidarity (Reicher & Haslam, 2009).

Based on the principles of the social identity approach, Drury et al. (2009a) suggested that in emergencies people can develop a sense of shared identity, as a result of a sense of 'shared fate' (comparative fit) in relation to a common external threat (shared danger of death). This, it is argued, would explain the common observation that emergencies bring people together psychologically and create a sense of unity (e.g. Clarke, 2002). A prediction would therefore be that the greater the sense of shared identity, the greater the amount of cooperation and helping behaviour towards fellow survivors.

Drury et al. (2009b) tested this idea by comparing the interview responses of survivors from 11 different emergencies (e.g. the Hillsborough football stadium disaster, 1989, and the Fatboy Slim beach party, 2002), during which varying degrees of danger and shared fate were experienced. Drury et al. found that those who reported a high shared identity reported a greater perception of a shared danger of death (common fate), as well as reporting more solidaristic and helping behaviours. They were also more likely to report normative behaviours, such as courtesy, and acting according to social role. Drury et al. therefore concluded that the mechanism that explains when norms are instantiated is social identity.

Evidence from experimental research also supports the finding that those who experience higher social identification help ingroup others more (Drury et al., 2009c; Levine, Cassidy, Brazier, & Reicher, 2002; Levine, Prosser, Evans, & Reicher, 2005; Levine & Thompson, 2004). For example, Drury et al. (2009c) carried out a visualisation study using an interactive computer simulation programme that involved participants

having to escape from a fire in an underground rail station. The programme gave participants an opportunity to either help others to escape from the underground station, or to push others aside. This programme therefore allowed helping and selfish behaviours to be measured directly, to compare the behaviour of high-identifiers against that of low-identifiers. Drury et al. found that those who experienced higher social identification helped others more, and displayed fewer selfish, competitive behaviours.

A shared sense of identity is therefore argued to be crucial during emergencies; as well as motivating co-operation, it can empower group members to work together to achieve a shared goal of survival (Drury et al., 2009a; Drury et al., 2009b). It is also predicted to reduce stress and anxiety reactions, through the expectation that others will be supportive and helpful (Drury, 2012; Haslam, O'Brien, Jetten, Vormedal, & Penna, 2005), and increase trust in other ingroup members, resulting in expectations that others will take appropriate action for the good of the group, such as behaving in a coordinated, orderly way, and helping others who need help (Drury et al., 2009a; b).

While it would be expected, based on this account, that the sense of shared fate, if generated by the incident, would be enough to promote co-operation, coordination, and normative conduct among survivors, and therefore facilitate the smooth running of the decontamination process, this may not necessarily be the case. The social identity approach not only suggests how a shared social identity can impact on relations between ingroup members, but also how it can impact on relations between ingroup and outgroup members, and the potential consequences of this in terms of dysfunctional outcomes, such as non-compliance with responder instructions, and challenges to responders' authority (Drury & Reicher, 2000; Reicher, 1996; Stott, Hutchison, & Drury, 2001). Incidents that involve decontamination are unusual emergency situations, because during the incident it will be

necessary for emergency responders to ask the public to remain (rather than disperse as usual), and to instruct members of the public on specific actions they should take. Mass decontamination therefore involves not just a crowd but also a group of responders. Recent social identity approaches to crowds have looked at the dynamics of this relationship, which revolve around two dimensions: legitimacy and power (e.g. Stott et al., 2001; Stott & Drury, 2000).

The Elaborated Social Identity Model (ESIM: Drury & Reicher, 2000) expands on ideas from the earlier social identity model of crowd conflict (SIM: Reicher, 1984; 1996) to show that when examining the effect of shared social identification on crowd behaviour it is also essential to examine how social identity may develop and change among crowd members as a function of intergroup dynamics. One of the main principles of the ESIM is that crowd events are shaped by an interaction between the beliefs, and hence the behaviour, of two or more social groups, and it examines how the actions of one group can constrain the actions of another (Drury & Reicher, 2009).

The ESIM was developed following a series of studies of conflictual crowd events, all of which showed that treatment of an initially heterogeneous crowd as homogenous by the Police led to an escalation in conflict and antagonism between crowd members and the authorities (Drury & Reicher, 2000; Reicher, 1996; Stott & Drury, 2000; Stott, Hoggett, & Pearson, 2012; Stott & Reicher, 1998a; Stott & Reicher, 1998b; Stott et al., 2001). For example, Stott and Reicher (1998b) analysed the behaviour of English football fans during the 1990 World Cup in Italy. They found that Italian Police were perceived to treat all English fans as if they were violent and dangerous and had the power to impose physical restraints on crowd members, which resulted in an escalation of violence from English fans. Stott and Reicher suggest that this escalation in violence results from a perception that the

homogenous treatment by the Police of all crowd members as dangerous is illegitimate, and that their right to support their football team in an enthusiastic, but non-violent, way is being denied. The perceived indiscriminate threat results in a sense of shared fate, which creates a sense of shared identity among crowd members. This in turn promotes a sense of empowerment and a belief that crowd members can challenge the physical authority of the Police outgroup (Reicher, 2001).

To increase the perceived legitimacy of responder actions, Reicher et al. (2007) suggest that the Police must try to facilitate any legitimate aims of crowd members, where possible. Where this is not possible, the Police must communicate to the crowd why certain aims of crowd members are being denied. The ESIM has therefore not only provided a greater understanding of crowd events as intergroup relationships, it has also been used to suggest possible interventions to reduce the potential for conflict between crowd members and the Police (or any other outgroup). This is of relevance to incidents that involve mass decontamination, as during the response to such incidents it will be necessary for emergency responders to ask members of the public to take certain actions, for their own safety. It will therefore be important that responders communicate openly with members of the public about the need for decontamination, in order to increase public perceptions of the legitimacy of responder actions, increase shared identity between responders and members of the public, and hence increase public compliance with recommended decontamination procedures.

Suggestions about the management of incidents that involve decontamination, based on the social identity approach.

The social identity approach has therefore been influential in explaining crowd behaviour, generally, and has recently been applied to disasters and emergencies, being used to create recommendations for the management of conventional disasters (Cocking, Drury, & Reicher, 2009; Drury, 2012, Williams & Drury, 2010). The social identity approach can also be extended to create recommendations for the management of CBRN incidents, including those which involve emergency decontamination. Issues which responder communication strategies should address during these types of incidents include the potential for non-compliance (Hanley, 1999; U.S. Fire Administration, 1997), and the potential for increased anxiety (Hanley, 1999; U.S. Fire Administration, 1997). We show that the social identity approach can be applied to: 1) increase public compliance with recommended decontamination procedures; 2) promote helping behaviour and coordination among members of the public; and 3) reduce public anxiety.

1. Increasing compliance

The most crucial issue during incidents involving decontamination is whether or not members of the public will comply with behaviours recommended by the emergency services, such as remaining at the scene and undergoing decontamination. Non-compliance from members of the public during incidents involving decontamination could create delays, which could result in serious adverse health consequences, potentially increasing the number of deaths resulting from the incident. Suggested causes of non-compliance with recommended emergency measures include the provision of ‘vague or incomplete’ information about the nature of the hazard (Perry & Lindell, 2003) and the provision of information which is perceived as having been ‘managed’ by the authorities (Cornish,

2007). If responders fail to communicate openly with members of the public, their actions could be perceived as illegitimate, resulting in members of the public resisting, either passively or actively (Drury & Reicher, 2000; Stott & Reicher, 1998b). Resistance could involve attempts to leave the scene of the incident (Carter et al., 2012: Chapter 5), refusal to undergo decontamination (Hanley, 1999), or even aggressive, antagonistic behaviour towards responders (U.S. Fire Administration, 1997).

To increase perceptions of responder legitimacy during incidents involving mass decontamination, responders should provide members of the public with health-focused information (Drury, 2009). Communication interventions should strive to highlight how emergency responders are attempting to facilitate the legitimate wishes of members of the public, and should explain why responders are taking certain actions (Reicher et al., 2007; Reicher, Stott, Cronin, & Adang, 2004). Perceptions of responder legitimacy have been shown to result in increased shared social identity between the Police and members of the public, thus reducing conflict between members of the public and the Police (Stott, Adang, Livingstone, & Schreiber, 2008), and increasing compliance with Police instructions (Stott et al., 2012).

The development of a shared social identity between responders and members of the public will be crucial for increasing compliance with recommended decontamination procedures. SCT suggests that information which comes from other ingroup members is more likely to be trusted than information which comes from outgroup members. This is because ingroup members are likely to be perceived as similar to self, generating the perception that they are inherently more trustworthy than outgroup members, who are seen as different to self (Turner et al., 1987). In line with this, a study into public reactions to a hypothetical bioterrorist attack found that members of the public wanted to receive

information from others who they perceived as being similar to them, in terms of shared fate in relation to the emergency (e.g. local officials and responders), rather than from government organisations, which they perceived as being ‘abstract’ (Aldoory & Van Dyke, 2006).

In the case of decontamination, ‘ingroup’ members may be those who have been affected by the emergency, with the sense of shared fate created by the incident forming the basis of shared social identity. If members of the public identify with emergency responders around a (superordinate) identity (e.g. protecting public health), this may in turn serve to strengthen identification among members of the public; they may unite around their shared identification with responders. Thus it is the content of the shared identity which is important in determining how identification with outgroup members (e.g. emergency responders) can affect identification among ingroup members (e.g. members of the public). Support for the idea that identification with an outgroup can strengthen identification among ingroup members (depending on the content of the shared identity) can be found in work relating to social identity and procedural justice (e.g. Group Value Model: Lind & Tyler, 1988).

It is also possible that emergency responders may be able to actively promote increased shared identity among members of the public. If responders are seen as ‘us’ at some level, they may be able to further enhance the sense of social identity among members of the public, by defining and shaping the content of the social identity shared by the group (responders and members of the public) as a whole. Studies of leadership across a variety of group contexts have shown that, by communicating successfully with the group whose support they are seeking, leaders can define aspects of shared social identity among that group, and hence direct ingroup norms (Haslam & Reicher, 2007; Klein, Spears, &

Reicher, 2007; Reicher, Cassidy, Wolpert, Hopkins & Levine, 2006; Reicher, Hopkins, Levine, & Rath, 2005). This shared social identity will enable the internalisation of shared goals and will enhance shared expectations of support, thus creating a sense of collective agency (Drury et al., 2009a). During incidents that involve mass decontamination, a sense of collective agency within the group (including emergency responders) is likely to be crucial for compliance, as it will motivate members of the public to work together to achieve the shared goal of decontamination, and will thus increase compliance with the decontamination process.

However, while studies of leadership are useful for showing how identity can be defined and shaped through interaction, there are important differences between the studies of leadership described above and responses to incidents that involve decontamination. Leaders in a social movement are already a part of a group, the individuals within which are likely to have some level of shared identity. In this situation, one of the goals of a leader is to define and strengthen any existing shared social identity within the group. In contrast, members of the public and emergency responders who find themselves involved in an incident involving decontamination are unlikely to share any existing sense of social identity. One of the goals of emergency responders will therefore be to facilitate a shared understanding of the situation between themselves and members of the public, in order to develop an effective interaction between themselves and members of the public, and to enable information and instructions to be successfully communicated and carried out.

The development of a shared social identity between responders and the public can result in increased support for responders' actions, and reduced levels of conflict between responders and members of the public (Stott et al., 2008; Stott et al., 2012). However, if responders fail to facilitate a sense of shared social identity between themselves and

members of the public, and if they are viewed as members of an antagonistic outgroup, members of the public could unite against them, further strengthening the sense of shared social identity between members of the public, at the expense of a shared social identity between responders and the public (Stott et al., 2001). This could result in non-compliance with responder instructions and public attempts to challenge emergency responders (Drury & Reicher, 2000). However, it is important to note that, while the actions of emergency responders during responses to incidents that involve decontamination may be perceived by members of the public as illegitimate, the responders may not have the authority or the power (in terms of physical resources and personnel numbers) to force members of the public to undergo decontamination. Mass decontamination therefore differs from the types of events to which the social identity approach to crowd conflict has previously been applied, which tend to involve a power differential between authority figures (usually Police), and members of the public (e.g. Drury & Reicher, 2000; Reicher, 1996; Stott & Reicher, 1998a; Stott & Reicher, 1998b; Stott et al., 2008; Stott et al., 2012). It is therefore unclear what effect perceptions of responder illegitimacy will have on the relationship between members of the public and responders, in the absence of a perception that responders have the power to force members of the public to undergo decontamination.

Shared social identity and collective agency among members of the public are likely to be important for compliance during incidents that involve decontamination, due to the potentially embarrassing nature of the process. As Jiang et al. (2009, p. 65) suggest “people’s intentions to protect themselves are weakened by the perceived social costs of possible precautions.” If there is no sense of shared identity among those involved in the incident, the potential embarrassment of showering naked in front of a group of strangers could prevent members of the public from complying with responders’ instructions about

decontamination. However, if members of the public identify with other members of the group (they are perceived as ‘us’, rather than ‘they’), and decontamination is accepted as a norm of that group, there is likely to be less social cost associated with undergoing the decontamination process. Indeed, if decontamination is accepted as a group norm, there could be a social cost associated with not undergoing decontamination. Internalisation of the norm could lead to self-policing, whereby members of the ingroup unite to challenge anyone who refuses to comply with the norms of the group (Stott et al., 2001).

2. Increasing helping behaviour and orderliness

A shared sense of social identity leads individuals to view other ingroup members as self, which results in each individual perceiving their needs as being interchangeable with the needs of the group, and therefore leads to increased helping and co-operative behaviour amongst members of the public who are perceived to be members of the same group (Levine et al., 2002; Levine et al., 2005; Levine & Thompson, 2004; Reicher, 1984). During disasters, members of the public may even risk their own lives to help others who are perceived to be ingroup members (Drury et al., 2009a). A shared social identity also promotes trust in other group members, in the belief that they will be supportive (Drury & Reicher, 2009), and generates motivation to contribute to shared group goals (Haslam, Jetten, & Waghorn, 2009). If decontamination is accepted as a shared goal, members of the public are likely to help each other through the process when necessary, possible and appropriate, to ensure that the goal of decontamination is achieved.

Drury (2012) suggests that public helping should not only be supported by the emergency services, but actively encouraged. Not only will the help provided by members of the public assist emergency responders, but research has also shown that providing help and taking responsibility for one’s own defence and recovery during and after a disaster can

have positive psychological consequences for those involved, by increasing the morale of the community which has been affected (Jones, Woolven, Durodie, & Wessely, 2006).

While encouraging members of the public to help one another during a disaster is important, it is equally important that members of the public behave in an orderly, coordinated way. During emergencies involving large groups of people, all of whom need to take action to protect themselves from danger, orderly, coordinated behaviour among those affected is likely to be essential for survival. For example, during the 2001 attacks on the World Trade Center, it was necessary for at least 3,000 people to try to evacuate the 110 storey buildings, in less than two hours. This created a lot of congestion on the stairs and the evacuation moved slowly. However, research has shown that, despite this, people remained calm and evacuated in an orderly way (Galea & Blake, 2004). It is likely that this saved lives, as competitive pushing and shoving would only have delayed the evacuation. Uninjured people also chose to evacuate in single file, allowing those who were injured to be assisted down the other side of the stairs.

In order for members of the public to take appropriate actions to help themselves and others during a disaster, it is essential that they are provided with plenty of practical information about the best actions to take (Drury, 2012). This is likely to be even more important during incidents that involve decontamination, due to their unfamiliar and stressful nature (Holloway et al., 1997). Responders should therefore provide members of the public with practical information during decontamination, such as what to do when they go through each zone of the decontamination shower, when they will be sprayed with soap, and how effective the process is likely to be (Taylor et al., 2009).

3. Reducing fear and anxiety

Decontamination involves the need to shower naked, or barely clothed, in front of others, in an unfamiliar, frightening, and potentially embarrassing situation (Holloway et al., 1997). These factors therefore increase the potential for anxiety during incidents involving decontamination, and increase the need for responders to plan for this in their management of the incident. An issue which may arise during incidents involving CBRN agents is that members of the public may present with multiple unexplained symptoms (MUS), possibly generated by anxiety about the incident (Pastel, 2001). It may be unclear in the immediate aftermath of a CBRN release whether members of the public are suffering as a result of the effects of exposure to a contaminant or from the effects of MUS. This could increase demands on the healthcare system and hamper emergency response efforts; for example, in the 1995 sarin attack on the Tokyo subway, it is estimated that those suffering from MUS outnumbered those actually exposed by a ratio of greater than 4:1 (Beaton et al., 2005). Arguably, providing members of the public with sufficient information about the nature of the incident, and about the efficacy of recommended protective measures (such as decontamination), could reduce the number of people who report with MUS following the incident (Beaton et al., 2005; Stone, 2007).

The provision of open and health focused communication, such as information about the nature of the incident, and the steps which are being taken to manage the incident, has been shown to reduce public anxiety about the decontamination process (Taylor et al., 2009). Communication from authorities which is perceived by members of the public as being open and honest is likely to increase the trustworthiness of the information source (Glik, Harrison, Davoudi, & Riopelle, 2004; Rinchiuso-Hasselmann, Starr, McKay, Medina, & Raphael, 2010; Rubin, Chowdhury, & Amlôt, 2012). Further, people are more

likely to seek out information from sources which they perceive as being trustworthy (Rubin et al., 2012). Shared social identity between responders and members of the public is likely to play a crucial role in determining whether communication from responders succeeds in reducing public anxiety, as the provision of health-focused information will only help to reduce public anxiety if responders are perceived as being members of the ingroup (those affected by the disaster) (Haslam, Jetten, O'Brien, & Jacobs, 2004). Ingroup members are seen as being interchangeable with the self, and therefore qualified (and trusted) to provide relevant stress-related information. When social identity is shared between information provider and information receiver, the information and support provided are likely to be far more beneficial (Haslam et al., 2004). Responders must therefore communicate consistently with members of the public throughout the incident and its immediate aftermath, to ensure that their response is perceived as being legitimate, and that they are perceived as being members of the ingroup. Failure to communicate successfully at the start of the response to an incident could create a perception of responder illegitimacy, which could confound later attempts to communicate with members of the public.

Shared social identity has been shown to reduce anxiety and stress, through the expectation that other group members will be supportive (Haslam et al., 2009; Haslam et al., 2005). Shared social identity can also increase individuals' ability to work together to challenge and reduce stressors, thus creating a sense of collective agency, which then reduces anxiety (Haslam & Reicher, 2006). One way in which responders can encourage a sense of collective agency is through effective communication, which enables crowd members to successfully undertake recommended actions. As Drury and Reicher (2009) suggest, leaders can empower a crowd and facilitate a sense of collective agency through

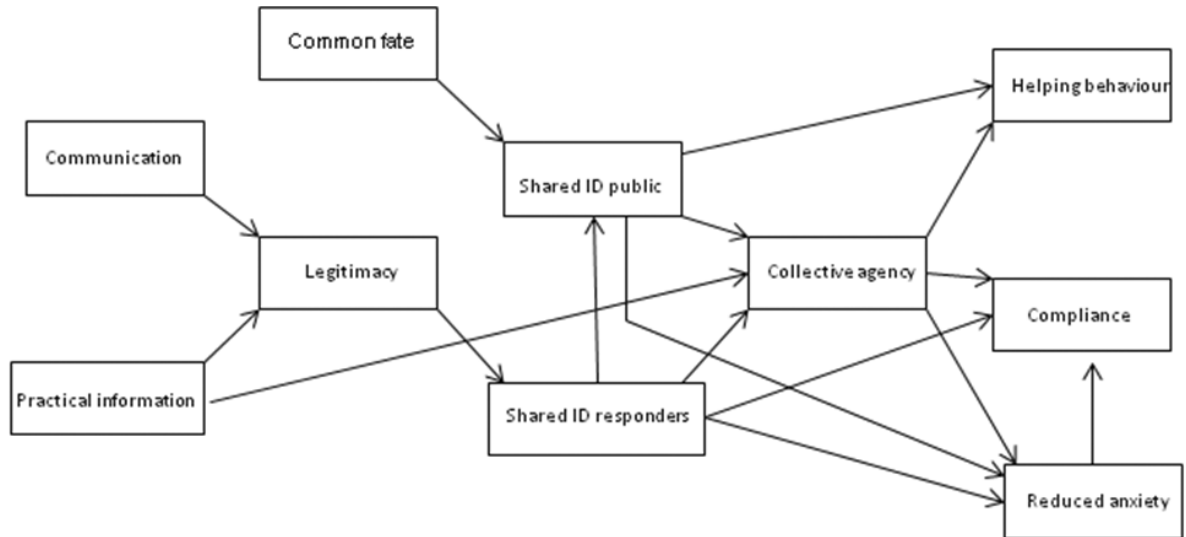
the provision of well-defined goals and clearly stated actions which can be taken to accomplish these goals. In terms of decontamination, the goal can be defined as the removal of a hazardous substance from the skin, and there are several specific actions which members of the public should be advised to take in order to achieve this goal. Research into the communication needs of members of the public during decontamination has shown that practical information is a major factor that affects public confidence in the decontamination process, and in their own ability to carry out recommended decontamination procedures (Taylor et al., 2009). Clearly then, the provision of sufficient practical information during decontamination can be seen as essential to creating a sense of collective agency among members of the public, and therefore in increasing survivors' perceived ability to take action to achieve shared goals (Drury, 2012).

There is an increasing body of evidence in support of the provision of practical information during CBRN incidents, which indicates that practical information is likely to reduce anxiety, by creating a sense of agency and control (Glass & Schoch-Spana, 2002; Pangi, 2002; Wessely, 2005). The less anxious people feel about undergoing decontamination, the less likely they are to refuse to comply with the process, enabling responders to carry out the decontamination process as quickly and efficiently as possible. It has also been suggested that increased practical information during an incident may reduce longer-term mental health problems for those involved, by enabling members of the public to take responsibility for their own protection and recovery (Jones et al., 2006).

From the recommendations above, a hypothesis path model has been created (Figure 3.1), showing how social identity variables (legitimacy, shared social identity, and collective agency) are predicted to mediate the relationship between successful responder

communication strategies and the relevant outcome variables (compliance, helping behaviour, and reduced anxiety).

Figure 3.1 – The hypothesised mediating role of social identity variables



Conclusion

The evidence that we present in this paper shows how social psychological theories of crowd behaviour during disasters have moved away from a view that crowd members are likely to panic. There is instead an emerging consensus across different disciplines that collective resilience is likely to be the norm during and immediately after disasters (Drury, 2012), facilitating adaptive behaviour from members of the public, rather than panic (Furedi, 2008; Solnit, 2009; Wessely, 2005). Indeed, it has been shown that individuals will take action during disasters, even if they are unsure of what action to take (Perry & Lindell, 2003). Hence, there is also a consensus across different disciplines that members of the public should be provided with more information during emergencies, rather than less, to enable them to make informed decisions about the best course of action to take (e.g. Donald & Canter, 1990; Drury et al., 2009a; Glass & Schoch-Spana, 2002; Perry & Lindell, 2003; Proulx & Sime, 1991; Wessely, 2005).

Applying social psychological theories of crowd behaviour to incidents that involve decontamination indicates that a successful responder communication strategy can increase helping behaviour among members of the public, increase compliance with recommended decontamination procedures, and reduce public anxiety. Evidence has shown that the public will often behave in a helpful and adaptive way during conventional disasters (Drury et al., 2009a), and this may also be the case during incidents that involve mass decontamination, providing they are managed appropriately. The principles we derive from the social psychological theories of crowd behaviour show that it is necessary to adapt certain aspects of disaster management strategies to ensure the successful management of incidents that involve decontamination. Specifically, responders must aim to:

Provide members of the public with sufficient practical information

The information provided should include information about the nature of decontamination and details of what the process will involve. This will promote a sense of agency and control, enabling members of the public to help themselves and each other, and also reduce public anxiety.

Communicate honestly with the public

Responders should not withhold any information or provide information that is vague or misleading. The provision of honest information is likely to increase public trust in responders, and will therefore increase compliance with recommended decontamination procedures.

Emphasise the health-benefits of decontamination

Responders should place an emphasis on health, rather than authority, when instructing members of the public about decontamination procedures. This is likely to help members of the public to understand why decontamination is necessary and will reduce the

likelihood that members of the public will perceive responder actions as illegitimate. This is important, as perceived illegitimacy of responders could result in public antagonism and non-compliance with recommended decontamination procedures.

Respect public rights of privacy and modesty

Ensure that the privacy and modesty needs of members of the public are protected. Failure to consider these needs could result in a perception that legitimate rights of privacy and modesty are being denied, and hence in a perception that responders are behaving illegitimately. If rights of privacy and modesty are upheld, it is more likely that responder behaviour will be perceived as legitimate, thus facilitating a sense of shared social identity between responders and members of the public, and hence increasing the likelihood that members of the public will comply with recommended decontamination procedures.

While there is a consensus across different disciplines that resilience is likely to be more common than vulnerability during disasters, the social identity approach is unique in offering a social psychological account of meaningful crowd behavior, based on the assumption that we have multiple group identities each with a set of norms to guide conduct, to understand why members of the public ‘come together’ during disasters, and how this leads to mutual helping and co-operative behaviour, and hence collective resilience in the face of disaster. In developing a greater understanding of these processes, the social identity approach also offers guidance on how management strategies can use this understanding to facilitate more adaptive behaviour from members of the public. The concept of collective resilience, based on a shared social identity, being the norm during disasters has had an impact on government and emergency services’ planning for disasters and emergencies, with increasing emphasis being placed on ways to encourage and

promote public resilience, through encouraging the public to take responsibility for their own protection and recovery (e.g. NATO, 2009).

However, planning based on the promotion of public resilience is still fairly limited, especially when considered alongside the wealth of academic evidence showing that public resilience is the most common response to disasters. Research shows that the belief in mass panic is still held by many of those responsible for planning for and responding to emergencies (Alexander, 2007; Carter et al., 2013a: Chapter 2; Carter, Drury, Rubin, Williams, & Amlôt, in press: Chapter 4; Drury, Novelli, & Stott, in press; Wester, 2011). A belief in mass panic can lead the authorities to withhold vital information from members of the public, for fear that they will not be able to cope adaptively with this information (Drury, 2002; Ripley, 2008). This can have serious adverse consequences for the management of the incident, as withholding information from members of the public can result in perceptions of responder illegitimacy, and hence can actually create, rather than prevent, disorder (e.g. Hanley, 1999).

There is therefore a conflict between academic research which shows that panic is not common following disasters, and emergency response plans, many of which still assume that panic will be a typical response from members of the public. This assumption has led to a lack of focus on developing effective communication strategies for responders (Carter et al., 2013a: Chapter 2), which could have serious adverse consequences for the management of an incident, and could even cost lives, if an incident involving mass decontamination were to occur.

While the social identity approach can be applied to make suggestions for improving management strategies for incidents involving mass decontamination, there has been a lack of research on communication with, and management of, the public during

incidents involving decontamination, so the theoretical suggestions made within this paper require substantiating. There is therefore a need for future research to examine how different management strategies might affect public behaviour during these types of incidents. This may include examining how communication strategies employed by the emergency services can affect psychological factors, such as perception of responder legitimacy, shared identity among members of the public, and shared identity between responders and members of the public, as well as how these psychological variables affect public behaviour, in terms of level of compliance, amount of helping behaviour, and level of anxiety.

CHAPTER 4

Paper 3: Emergency responders' experiences of and expectations regarding decontamination

Reference:

Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (In press). Emergency responders' experiences of and expectations regarding decontamination. *International Journal of Emergency Services*.

Abstract

Purpose: There is an assumption in emergency planning that the public will ‘panic’ or refuse to comply in the event of mass decontamination. This assumption has serious implications for how the public will be managed. *Method:* We carried out semi-structured interviews with 13 emergency responders, six of whom had experience of incidents involving decontamination. We asked them, first, about their experiences of these events and, second, about their expectations for decontamination involving a large crowd. The aim was to explore the extent to which responders perceived non-compliance and anxiety as (crowd) problems during decontamination and, if so, how they felt that they could be addressed. *Findings:* Responders with experience of decontamination perceived non-compliance and excessive anxiety to be rare and suggested that orderly behaviour was more common. However, the majority of emergency responders with no experience of decontamination said they expected panic and non-compliance. They therefore emphasised the importance of ‘controlling’, rather than communicating with, the public. *Implications:* We argue that ‘control’-based emergency management strategies can impact negatively on the relationship between the public and responders, and hence hinder effective management of an incident. It would therefore be beneficial to provide training for emergency responders on likely public behaviour during incidents involving decontamination.

Originality: This research extends previous research by facilitating a detailed understanding of emergency responders’ experiences and perceptions of managing incidents involving decontamination, and showing how these experiences and perceptions can affect the way in which such incidents are managed.

Introduction

Over 50 years of research on behaviour in emergencies and disasters has problematised the notion of ‘mass panic’ (e.g. Fritz & Williams, 1957; Quarantelli, 1954; 2001; Sime, 1990) and, on the contrary, has suggested that cooperation and order are the norm during such events (e.g., Aguirre, Wenger, & Vigo, 1998; Drury, Cocking, & Reicher, 2009a; Johnson, 1987). Despite this, a recent analysis revealed that common myths about disasters, such as inherent panic and public disorder, are present in the guidance for emergency responders (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2). Such disaster myths matter, for they have been shown to rationalise responders’ attempts to impose strict control on the actions of the public (Auf der Heide, 2004; Drury, Novelli, & Stott, in press; Dynes, 1994), for example by withholding vital information with the intention of preventing panic and maladaptive behaviour (Dynes, 1994; Furedi, 2008; Gannt & Gannt, 2012). The present study investigates whether these myths, and other beliefs about (dysfunctional) public behaviour, are held by emergency responders who have responsibility for decontamination in the case of a chemical or biological incident.

Psychosocial aspects of mass decontamination

The potential for incidents involving chemical, biological, radiological, or nuclear (CBRN) agents to occur has increased in recent years, due to advances in technology (Alexander & Klein, 2006) and the increasing potential for terrorists to obtain CBRN materials (HM Government, 2010b). These types of event could have particularly devastating effects, because they may generate fear and anxiety among members of the public which is out of proportion to the event itself (Bhardwaj, 2010; Cornish, 2007). Further, interventions intended to protect members of the public from the effects of

contamination, such as decontamination, may induce greater anxiety than the incident itself if they are not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997).

Evidence from small-scale incidents involving decontamination has shown that failure to communicate adequately with the public, and failure to consider their concerns about privacy, can result in non-compliance with decontamination procedures (U.S. Fire Administration, 1997; Vogt & Sorensen, 2002) and increased anxiety about the process (Dodgen, Norwood, Becker, Perez, & Hansen, 2011; Hanley, 1999; Vogt & Sorensen, 2002). Failure of members of the public to behave cooperatively during mass decontamination may result in increased spread of any contaminant (Edwards, Caldicott, Eliseo, & Pearce, 2006) and thus potentially increased numbers of dead and injured.

One reason why responders may not manage decontamination appropriately, and may neglect the psychosocial aspects (such as communication), is because of the ideas they have about public behaviour. Research into conflict between crowds and the Police has shown that informal models of crowd irrationality have been the basis of ‘crowd control’ measures that can actually create the very ‘disorder’ which the authorities were intending to prevent (Stott, Hoggett, & Pearson, 2012; Stott & Reicher, 1998b). In the domain of emergency management, it has likewise been shown that belief in ‘mass panic’ predicts support for exclusive expert control and restrictive information strategies (Drury, Novelli, & Stott, in press), which some argue may themselves produce the psychosocial vulnerability they are premised upon (Furedi, 2008; Wessely, 2005).

The present study

While recent studies have shown that notions of collective panic and psychosocial vulnerability are present in some of the relevant guidance on CBRN (Carter et al., 2013a:

Chapter 2; Drury, Novelli, & Stott, 2013), no research has been carried out yet on emergency responders' experiences of and beliefs about public behaviour during incidents involving CBRN decontamination. It is therefore not clear to what extent emergency responders regard public behaviour as difficult during these types of incident. Specifically, do they perceive non-compliance and anxiety as being a function of inherent (psychological) tendencies within the crowd or being due to their own management practices? Consequently, do they perceive effective communication as being a method of addressing any anxiety or potential non-compliance? To answer these questions we carried out semi-structured interviews with UK Fire and Rescue Service responders who had been trained to respond to CBRN incidents, and who would be required to manage the mass decontamination process if an incident of this type were to occur.

Method

Participants

In the UK the Fire and Rescue Service have responsibility for managing decontamination. Participants in this study were members of the Fire and Rescue Service, who had all been trained to respond to incidents involving decontamination. Six responders had experience of responding to these types of incident, seven did not.

Participants were recruited in two ways. First, participants were identified via the UK Health Protection Agency's (HPA) Chemical Incident database, which contains information about all chemical incidents which are reported to the HPA in the UK. Second, responders who had signed up to take part in other research studies conducted by the HPA were approached. Responders received a £10 gift voucher for taking part in this study.

In total, 17 Fire and Rescue Service responders were approached about taking part in an interview, of whom 13 were interviewed⁷. Of these, 6 had had experience of real incidents involving the decontamination of small groups (5-30 people). These incidents occurred between 2004 and 2010.

The other seven Fire and Rescue Service responders had no real life experience of managing decontamination, but had received standard national training to respond to these types of incidents. All participants were employed by the Fire and Rescue Service at the time of their interviews.

Interview schedule

The questions for the six responders who had real life experience of responding to incidents involving decontamination related to: general issues about the incident (e.g. “Please describe any specific issues or concerns which you had whilst managing the decontamination process”); level of public compliance (e.g. “Did you have any difficulty in getting those who were decontaminated to comply with the recommended decontamination procedures?”); level of public anxiety (e.g. “Did you feel that those who were decontaminated were scared during this incident?”); public concerns about privacy (e.g. “Did members of the public show any concern about being naked/ wearing only underwear during this incident?”); actions taken to overcome non-compliance (e.g. “What actions did you take to ensure compliance?”); whether or not members of the public were perceived to be panicking (e.g. “Did you see anyone panicking during this incident? If so, please describe what you mean by panicking.”); whether or not members of the public behaved in

⁷ The other four emergency responders initially agreed to be interviewed, but subsequently withdrew from the study due to increased work commitments.

an orderly and co-operative way during the incident (e.g. “Do you feel that the people who were decontaminated behaved in an orderly way during this incident?”).

Both these responders and those without experience of responding to real life incidents involving decontamination were asked questions relating to their expectations about future large-scale incidents involving *mass* decontamination (e.g. “How do you imagine members of the public might behave during a large-scale incident involving decontamination?”); and their opinions about current training for communicating with members of the public during incidents involving decontamination (e.g. “Please describe the training you receive for communicating with members of the public during incidents involving decontamination.”). Please see Appendix 5 for a copy of the interview schedule.

All interviews were carried out by phone and ranged in length from 12 minutes to 94 minutes (the average interview length was 33.5 minutes).

Analytic procedure

Data were analysed using the framework approach (Pope, Ziebland, & Mays, 2000). The framework approach is a top-down approach to qualitative analysis, in which pre-defined aims and objectives form the basis of the coding scheme. This approach was specifically designed for use in applied research which has implications for policy and practice, and it was therefore deemed to be the most appropriate approach for analysing the data collected during the current study. A danger of using the framework approach (and other top-down approaches) is that relevant but unanticipated themes within the data may be missed, because they were not included in the pre-defined coding scheme. To overcome this potential limitation, care was taken to ensure that researchers were fully immersed in the data, and kept an open mind to the identification of any previously unspecified themes.

A thematic framework was identified, based on the relevant issues highlighted in previously published literature. For those with experience of decontamination, relevant issues included Fire and Rescue Service responders' perceptions of: whether or not members of the public complied with the need for decontamination; whether or not members of the public were excessively anxious; and whether or not members of the public behaved in an orderly way. Each passage within the data was then coded into one or more of the relevant themes.

Data were also categorised into three broad themes of interest relating to responder expectations of incidents involving mass decontamination, and their opinions about current training for these types of incidents, based on interviews with all 13 responders. The first theme concerned responders' expectations about public behaviour during incidents involving mass decontamination. The second theme concerned their expectations about the way members of the public should be managed during these incidents. The third theme concerned their opinions about current training for incidents involving mass decontamination.

Results

The results are divided into two sections: experiences of real incidents, based on interviews with the six responders who had real life experience of decontamination; and expectations about incidents involving mass decontamination, based on interviews with all thirteen responders⁸.

⁸ Two letters and a number appear in brackets following each quote, for example (RL1). The letters RL indicate responders who had taken part in real life incidents involving decontamination, while the letters TR indicate responders who had been trained to carry out decontamination, but had not taken part in real incidents involving decontamination. The number denotes the number of the participant.

1. Experiences of real incidents involving decontamination

Compliance versus non-compliance. Responders who had experience of decontamination agreed that the majority of members of the public had complied with the decontamination process:

“Although we don’t think they were happy, they were compliant, and they all got on with it after a fashion.” (RL5)

Where individuals had been less compliant, specific reasons were identified for this. One reason for non-compliance, highlighted by several emergency responders, was a lack of communication about why the decontamination process was necessary, and what it would involve:

“In every situation I’ve seen, I’ve seen it where there’s been very little communication and that’s where we’ve had all sorts of problems, people leaving the building, and people not doing what you want them to do.” (RL4).

Another reason given for non-compliance was individuals’ concern about a lack of privacy during the decontamination process:

“A lot of people don’t want to cut [their clothes off] ...they don’t want to be naked for a start, cos the people they’re with...might not have seen them naked before” (RL6)

Several responders also noted a difference in levels of compliance during incidents in which people reported symptoms, and incidents where they did not. It was suggested that if people have no physical symptoms, they are less likely to understand the need for decontamination, and hence are less likely to comply with the process:

“They see us turn up and go through what looks like a very onerous process. You know, it’s only a white powder, it’s probably nothing – which in most cases it is probably nothing. And then you have that reticence on their part to engage in the process which is...potentially having to disrobe and go through some sort of decontamination.” (RL4)

Overcoming any incidents of non-compliance. One way that interviewees said non-compliance was overcome was by providing increased communication about what the process would involve, and why it was necessary:

“They were also told...you gotta go through here, you gotta take your clothes off, otherwise you ain’t gonna stop burning and you gotta go through here otherwise you’re gonna carry on burning and this is the only chance you’ve got of getting comfortable. So...they went along with it.” (RL2)

Other incidences of non-compliance were overcome by ensuring that individuals’ concerns about their privacy and modesty were addressed:

“The nurses and the doctor...kept their underwear on. Cos we were trying to keep them as modest as possible.” (RL2)

Excessive anxiety versus low anxiety. Generally, responders felt that members of the public did not exhibit excessive anxiety, either about the contaminant, or about the decontamination process itself. Almost all of the responders felt that any anxiety exhibited by members of the public was appropriate to the situation and was not an over-reaction:

Interviewer: “You mentioned that when responders ramped up the response, that people did get scared. Did you see anyone panicking or overreacting?”

RL4: “I think it was a reasonable reaction you know, but we saw a number of people sort of agitated, in tears. But there was an awful lot of comforting going on by their work colleagues.”

Incidents in which individuals had physical symptoms tended to result in higher levels of anxiety, compared to incidents where individuals had no symptoms:

“They were in...a form of discomfort. They were being burnt...or they felt like they were being burnt. And I think they were very worried about what was happening to them.” (RL2)

However, responders also suggested that, in certain cases, the symptoms which individuals experienced were reactions triggered by anxiety, rather than caused by exposure to the contaminant:

“People weren’t being irrational, it was easily identifiable, but the whole psychosomatic take on it meant that you got individuals who clearly hadn’t been anywhere near any contaminant believe that they’d been exposed to something that was harmful to their health, and needed to be decontaminated.” (RL5)

These quotes indicate that although emergency responders did not perceive members of the public as exhibiting excessive anxiety during incidents involving decontamination, they did feel that there was the potential for any stress experienced by members of the public to manifest itself in physical symptoms.

Responders suggested that a lack of communication before and during the decontamination process was one of the main factors which resulted in increased levels of public anxiety:

“That’s one fairly constant – once you’ve convinced people that they need to be doing it [...] it’s pretty straightforward then. As long as you maintain the comms throughout. Again if they’ve got questions about what they should be doing, then that’s when panic⁹ starts to set in again.” (RL4)

Overcoming any anxiety. Responders felt that most public anxiety could be overcome by effective communication, which included informing members of the public

⁹ It was clear to us from the context that this responder used the word ‘panic’ to refer to fear and anxiety, rather than meaning an irrational reaction, which might traditionally be associated with the use of the word ‘panic’ (cf. Cocking & Drury, in press).

about what the substance was, why decontamination was necessary, and what it would involve:

“Once we were able to communicate what the powder was in the first instance, then that very quickly enabled us to calm down the members of the public who’d been through the decontamination process, and resolve the incident and get it closed.” (RL5)

Responders also suggested that the decontamination process itself could play a role in reducing public anxiety:

“Once we were able to determine what the substance was, and as the people were now going through the full decontamination process, what we saw is a miraculous um...turnaround for their own symptoms. Suddenly they felt fine, their eyes were ok, and all the rest of it.” (RL5)

Responders therefore suggested that, if managed successfully, the decontamination process itself could reduce public anxiety. Responders felt that one of the key factors determining the successful management of decontamination is communication, with effective communication being one of the key factors in reducing any anxiety experienced by members of the public.

Orderly behaviour versus disorderly behaviour. Responders felt that the majority of members of the public behaved in an orderly way throughout the incidents:

Interviewer: “Would you say that you felt the people who were decontaminated behaved in an orderly way during the incident?”

RL4: “They did. They really did in this instance. Yeah. [...] they were all fairly well behaved and compliant.”

When discussing one of the two larger incidents (20-30 people), one responder noted that members of the public were co-operative and worked together during the incident:

“A lot of self-support going on within the environment and I...I guess it’s that fight or flight thing that kicks in with individuals, and uh...some took the lead on co-ordinating their little groups as it were [...] It’s that sort of cohesive element that...you know um people focus on the person in need, and if the person in need is a...particularly if they’re a juvenile or anybody vulnerable I guess, but particularly children, they’ll sort of rally round that.” (RL4)

The responder who took part in the other larger incident, and the responders who took part in smaller incidents (less than 10 people), noted that there was less requirement for members of the public to work together and help each other, due to a greater ratio of emergency responders to members of the public, but expressed a belief that members of the public would have helped each other, if the need had arisen.

2. Responders’ expectations about mass decontamination

Three themes emerged in relation to the question of responders’ expectations about mass decontamination incidents, each of which had several subthemes. The main themes

were: responders' expectations about public behaviour; responders' expectations about managing members of the public; and the training which responders receive for managing incidents involving mass decontamination.

Expectations about public behaviour. Three sub-themes emerged from the broad theme of responders' expectations about public behaviour. These were: non-compliance and disorderly behaviour; panic; and orderly behaviour.

Non-compliance and disorderly behaviour. Most responders said they expected that mass decontamination would involve either non-compliance or disorderly behaviour, or both, on the part of members of the public. Their expectations of non-compliance included people attempting to leave the scene, to avoid decontamination:

“The problem you’re going to have is the logistic of trying to manage people who are going into fight or flight syndrome of ‘I’m getting out of here, you can’t tell me to take my clothes off, I’m just going to run’.” (TR1)

Responders' expectations of disorderly behaviour included members of the public pushing responders out of the way to get into the decontamination structures, or attempting to tear off responders' breathing apparatus:

TR5: “One of the first things when this all came out was hang on a sec what happens when I go in there, will I not get mobbed and they’ll rip my suit off me and grab my breathing apparatus.”

Interviewer: “Do you think [that concern] isn’t there any more?”

TR5: “From our point of view? Personally I think [it is] definitely.”

It is clear that responders were concerned about the ways in which members of the public would behave during mass decontamination and expected that public behaviour would be non-compliant, or disorderly, or both.

Panic. Most of the responders who had no experience of decontamination expected that panic would be a common response by members of the public during mass decontamination. It was clear from this that they meant more than fear:

Interviewer: "If a large scale real incident were to occur, how do you think members of the public are likely to behave?"

TR3: "Irrationally. [...] people will just bomb-burst in all directions, quite possibly out of fear, out of panic."

"I think people would be panicking, you'd always get the few that are quite loud, they'd try and take control. And the problem is, it's very close to go from an organised group for it to descend into pandemonium or chaos. And it only takes a few people just to snowball that effect." (TR4)

Several responders who did not have experience of decontamination therefore endorsed the 'panic' myth, that members of the public would behave irrationally, and that this irrational behaviour would quickly spread through the whole crowd, making the situation very difficult to manage. This formulation was less evident in the accounts of those who did have experience of decontamination.

Orderly behaviour. While most of the responders who had not taken part in real life incidents involving decontamination expected that panic would be common, two of them felt that members of the public would behave in an orderly way. One of them cited evidence for this:

“Judging by things like the 7/7 bombings and King’s Cross and things like that, reading reports on that, talking to people that were actually at the incidents and that, the public behave really well.” (TR2)

This responder therefore referred to a well-documented recent major incident to explain his belief that members of the public would behave in an orderly way during incidents involving decontamination.

The two responders who believed that members of the public would behave in an orderly way also emphasised that the more information members of the public are given, the more likely it is that their behaviour will be orderly:

“I think if they [members of the public] understand what’s happening, and they understand that they’re going to have to be decontaminated because the potential spread of contamination and cross-contamination they might [...] respond favourably.” (TR7)

Table 4.1 summarises the number of interviewees who said they expected ‘panic’ versus those who said they expected orderly behaviour, comparing responders with real life experience of decontamination to those without.

Table 4.1 – Number of interviewees expecting panic versus order in mass decontamination, comparing responders with and those without real life experience of decontamination

	Real life experience	No real life experience
Expect panic	I	IIII
Do not expect panic	IIII	II

Expectations about managing members of the public. Two sub-themes emerged from the data under the broad theme of responders' expectations about managing members of the public. These were: the need to control members of the public; and the need to communicate with members of the public.

Members of the public will need to be controlled. Almost all of the responders felt that there would be a need to control people during incidents involving mass decontamination. When asked what the main issues with managing a large-scale incident would be, responders frequently stated that control would be the main issue, which was sometimes linked explicitly with their psychological state ('panic'):

"Again it's corralling people, cos people have their like...they'll do what they want to do, especially when they're in a panic state." (TR4)

"I think corralling them [members of the public], and controlling them, and having them be regimented." (TR7)

Communication with members of the public will be necessary. In contrast to the view that it would be necessary to control members of the public, less than half of the responders highlighted the need to communicate effectively with casualties. Those responders who had real life experience of responding to incidents involving decontamination were more likely to highlight the need for communication, and understood the consequences of not providing it. Only two responders who had not taken part in real life incidents highlighted the need for communication:

“I mean really you need people at the front end who are dishing out disrobe packs [...] instructing people to remove the outer layers of their clothing, because eighty percent of the contaminant is on the outer layers. Remove the outer layers um...put these ponchos on, remove any other layers you want to [...] Then you would be going through the shower.” (TR6).

The responders who highlighted the need for communication suggested that members of the public would need sufficient information to enable them to understand the need for decontamination, and to enable them to successfully go through the process. This finding suggests that these responders believe that members of the public are likely to behave rationally during incidents involving decontamination, rather than panicking, and that members of the public are therefore likely to be able to make rational decisions about the best course of action to take, as long as they are provided with sufficient information.

Current training for incidents involving mass decontamination. Interviewees stated that guidance on how to manage members of the public, including how to communicate successfully with members of the public, is either not included in their training, or is a very

small part of it. Several responders highlighted the fact that training focuses on technical issues, rather than on the management of members of the public and hence psychosocial issues such as communication:

“There’s a distinct lack within the fire service at the moment, of the knowledge of getting the members of the public out into a point of safety. It’s very...especially in my early days it was very much a focus on getting up the structures, getting it ready, and ignoring the casualties.” (TR4).

The responders’ accounts suggest that, currently, their training does not provide any insights into how members of the public are likely to behave during incidents involving mass decontamination, leaving responders to rely on popular beliefs about public behaviour, such as those described here, rather than on evidence about how members of the public are actually likely to behave.

Discussion

Analysis of these responders’ accounts of real incidents revealed no references to panic, and few incidences of public non-compliance or excessive anxiety. Most of the responders who had taken part in real incidents suggested that when problems arising from public non-compliance and excessive anxiety had occurred, they could be reduced by successful communication strategies and protection of casualties’ dignity and modesty. Responders viewed communication as being essential in order to reduce non-compliance, reduce anxiety, and generally facilitate the smooth-running of incidents involving decontamination. This was especially true for incidents in which people had no symptoms. These types of incident were often characterised by an initial reluctance on the part of the

public to engage with the need for decontamination, which was reduced once successful communication was initiated.

The responders who had experience of real life incidents involving decontamination also felt that most members of the public behaved in an orderly way. One of the responders who had taken part in the decontamination of larger groups of people (more than 20), observed that members of the group worked together and helped people who appeared to need it. This is likely to be a substantial benefit during incidents involving mass decontamination, as the lower ratio of responders to members of the public will likely increase the necessity for members of the public to co-operate with and assist each other.

Despite the finding that communication is essential to facilitate the successful management of incidents involving decontamination, the responders interviewed in this study said that they had not been trained on the importance of communicating with members of the public during incidents of this type. Responders who had no real life experience of decontamination therefore failed to recognise the importance of communication when they were asked about incidents involving mass decontamination, despite the likelihood of communication being particularly important during incidents of this type. Instead, responders expressed a belief that members of the public would need to be controlled. This is as would be expected on the basis of findings from a review of the guidance documents for responders, which reveal a strong emphasis on the importance of controlling casualties during incidents involving mass decontamination (Carter et al., 2013a: Chapter 2).

Most of the responders with no real life experience of decontamination endorsed common disaster myths in relation to incidents involving mass decontamination, stating that they thought there would be panic, non-compliance, or disorderly behaviour. Two of

the responders who did have experience of decontamination also believed that the public would panic and behave in a disorderly way during large-scale mass decontamination. This is despite them noting predominately compliant and orderly behaviour during the smaller scale real incidents to which they had responded. This might be due to a perception that mass incidents are inherently more likely than small-scale incidents to induce panic, as they are *crowd* events, reflecting a popular myth about crowd psychology in disasters (Drury et al., in press).

The finding that responders who had experience of decontamination were more likely to highlight the importance of communication, and were less likely to endorse the myth that members of the public would panic, than those without such experience is in line with research which has shown that experienced emergency managers endorse disaster myths less than do students taking part in disaster management training (Alexander, 2007), though it differs from more recent research on crowd safety professionals showing that experience made no difference to the attitudes and beliefs of crowd safety professionals (Drury et al., in press). Since those who did refer to ‘panic’ and downplayed communication had received (technical) training, this would suggest that emergency responders should receive more training incorporating current scientific research relating to crowd behaviour and psychosocial issues in emergencies; the provision of necessary information will promote adaptive behaviour among members of the public, thus facilitating the improved management of mass emergencies (Drury et al., in press).

Limitations and future research

A limitation of the research reported here is that the number of responders interviewed was fairly small ($N = 13$). However, Guest, Bunce, and Johnson (2006) suggest that twelve interviews is usually enough to reach data saturation (the point at which no new

themes arise from the data) when the research endeavours to understand common perceptions and experiences among fairly homogeneous samples, as is the case in the present study. Smith and Osborn (2008) suggest that homogeneity of a sample is of greater importance than sample size. Nevertheless, further research is needed to explore the prevalence and strength of the beliefs among responders identified in the current paper, perhaps by using a questionnaire survey based on the themes identified in this analysis.

Another potential limitation of this research is that the incidents which responders had taken part in were relatively small in scale (<30 people were decontaminated). It is possible that larger scale incidents involving mass decontamination might affect not only emergency responders' perceptions about the way members of the public will behave during these types of incidents, but might also affect the way in which members of the public actually behave. Certainly, logistically there is a difference, in that responders and decontamination shower tents will be fewer relative to members of the public, and the time taken to decontaminate all those affected will be longer. However, much evidence shows that members of the public continue to behave in an orderly way, and do not overreact, during mass emergencies and disasters (Johnson, 1987; Quarantelli, 1954), including those involving terrorist attacks (Drury et al., 2009a).

A third potential limitation is the fact that emergency responders who had experience of carrying out decontamination during real life incidents spent some time discussing these experiences with the interviewer before answering questions relating to their expectations about incidents involving mass decontamination. In contrast, those with no experience of carrying out decontamination received no such preliminary questions, and were simply asked questions relating to their expectations about incidents involving mass decontamination. The decision was taken to ask the questions in this way because it seemed

sensible to ask responders about their experiences before asking them about their expectations. However, it is possible that asking the preliminary questions to those with experience of decontamination before asking them about their expectations of incidents involving mass decontamination may have primed them to provide certain responses. For example, after being asked ‘How did those who were decontaminated behave during this incident?’, responders were specifically asked ‘Did you see anyone panicking during this incident?’ This may therefore have primed them to highlight ‘panic’ as a likely public behavior when asked about their expectations of incidents involving mass decontamination. However, the finding that more of the responders with no experience highlighted panic as a likely public response during mass decontamination suggests that, in the case of panic, priming did not occur. We therefore feel that, while priming is a possible limitation which should be noted, this is unlikely to have altered the views expressed by the responders.

Conclusions

The evidence from interviews with responders is consistent with previous findings that non-compliance and excessive anxiety in members of the public are rare during incidents involving decontamination. Where non-compliance or anxiety does occur, this can be resolved by ensuring that emergency responders communicate effectively with members of the public, and show respect for their privacy and modesty concerns. Despite this, those responders who had never responded to a real life incident involving decontamination failed to recognise the importance of an effective communication strategy. Further, many of these responders also endorsed common disaster myths, such as a belief that members of the public are prone to panic, or are likely to behave in a disorderly way, and many thought their primary objective was to ‘control’ the public. These findings indicate that it may be beneficial to provide improved training for emergency responders on

likely public behaviour during incidents involving decontamination, and that this training should include details about current research on the behaviour of crowds during mass emergencies, disasters, and major incidents.

CHAPTER 5

Paper 4: Public experiences of mass casualty decontamination

Reference:

Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2012). Public experiences of mass casualty decontamination. *Biosecurity and Bioterrorism*, 10(3), 280-289.

Abstract

Objective

To analyse feedback from simulated casualties who have taken part in field exercises involving mass decontamination, to gain an understanding of how responder communication can affect people's experiences of and compliance with decontamination.

Methods

Questionnaire data gathered from 402 volunteers were analysed using the framework approach, to provide an insight into the public's experiences of decontamination, and how these experiences are shaped by the actions of emergency responders.

Results

Factors which affected casualties' experiences of the decontamination process included the need for greater practical information and better communication from responders, and the need for privacy. Results support previous findings from small-scale incidents which involved decontamination, in showing that participants wanted better communication from responders during the process of decontamination, including increased provision of practical information, and that the failure of responders to communicate effectively with members of the public led to anxiety about the decontamination process.

Conclusions

The similarity between the findings from the exercises described in this paper and previous research into real incidents involving decontamination suggests that field exercises provide a useful way to examine the effect of responder communication strategies on the public's experiences of decontamination. Future exercises should examine in more detail

the effect of different communication strategies on the public's experiences of decontamination. This will facilitate the development of evidence-based communication strategies that are intended to reduce anxiety about decontamination, and increase compliance among members of the public during real life incidents that involve mass decontamination.

Introduction

The threat of an incident involving chemical, biological, radiological, nuclear and explosive (CBRNE) agents has increased in recent years, due to rapid technological advances, and the increasing willingness of terrorists to use non-conventional weapons (Alexander & Klein, 2003). These types of agent are recognised as being especially likely to produce high levels of anxiety among members of the public, due to their often invisible, undetectable, and ambiguous nature (Cornish, 2007; Regis, 2001). It has been suggested that possible reactions of the public to these types of incident include: terror (Cornish, 2007); public unrest (Clarke et al., 2008); and aggression (Koenig et al., 2008). In addition to the increased fear and anxiety caused by CBRNE agents themselves, interventions designed to reduce the impact of CBRNE agents, such as decontamination and quarantine, may cause more anxiety than the agents themselves, if they are not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997).

There is evidence from small-scale incidents involving decontamination that the decontamination process can result in high levels of non-compliance, especially if the responders do not communicate adequately with members of the public, and if the public's concerns about privacy are not addressed (United States Fire Administration, 1997; Vogt & Sorensen, 2002); Members of the public may perceive inattention to their concerns as a lack of respect for their needs on the part of responders (Hanley, 1999). Failure of responders to communicate effectively with members of the public during decontamination has also been shown to result in increased public anxiety about the process (Taylor, Balfanz-Vertiz, Humrickhouse, & Jurik, 2009). A review of small-scale incidents involving decontamination highlighted two ways in which the management of incidents involving decontamination could be improved. First, by improving communication with members of

the public during the decontamination process, including offering better explanations about why the process is taking place. Second, by protecting the dignity and modesty of those involved (Vogt & Sorensen, 2002).

Although it has been recognised that successful communication is essential to facilitate the smooth-running of the decontamination process, a recent review of decontamination guidance documents from the UK, the USA, and Australia shows that the majority of current decontamination guidance documents for responders contain little or no mention of communication strategies (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2). Instead, several of the guidance documents recommend the requirement for a ‘control’ management strategy, which suggests that there is a belief that members of the public will need to be strictly controlled; for example a control method would be using physical barriers to ensure that the public undergo the decontamination process. The control method goes against evidence that attempts to ‘force’ members of the public to undertake recommended emergency measures are likely to result in non-compliance, as they lead members of the public to view actions taken by responders as illegitimate (Drury, 2009). A focus on ‘controlling’ members of the public during decontamination may also lead responders to actively withhold information from members of the public, for fear that they will overreact and behave maladaptively (Carter et al., 2013a: Chapter 2). By contrast, research suggests that members of the public are naturally resilient and will endeavour to take appropriate actions to protect themselves and others following a disaster (Drury, Cocking, & Reicher, 2009a; Fritz & Williams, 1957), provided they have sufficient practical information to make sensible decisions about the best course of action to take (Drury, 2009).

Existing research on public decontamination from real incidents is limited to small-scale emergencies (Hanley, 1999; United States Fire Administration, 1997; Vogt & Sorensen, 2002), as there have been no large scale incidents involving decontamination in the UK. This could create a problem if a real incident were to occur, as responders will have only a limited idea of how members of the public are likely to behave. A possible way to address this is to examine the experiences of members of the public during emergency preparedness exercises in which mass decontamination has been conducted. Emergency preparedness field exercises occur regularly throughout the UK, and often involve large numbers of simulated casualties. They provide a safe learning environment for responders, while aiming to be as realistic as possible, and are the best available source of insights into how members of the public might experience a real situation that involves mass decontamination. An analysis of such experiences could therefore form part of the evidence base for the necessary improvements to existing procedures.

This paper reports the analysis of feedback data provided by simulated casualties after five different emergency preparedness field exercises. Their feedback was collected using questionnaires which contained both open-ended questions and questions requiring a response on a five-point Likert scale. This paper reports the analysis of the data collected using the open-ended questionnaire items, while the results of the numerical casualty feedback is reported elsewhere (Carter, Drury, Rubin, Williams, & Amlôt, 2013b: Chapter 6). There were two aims for this research: first, and broadly, to provide an in-depth understanding of the casualties' experiences of the decontamination process; and second, and more specifically, to examine the effect which certain factors, such as the casualties' perceptions of communication from responders, and casualties' opinions about responders'

respect for their privacy, can have on the way in which members of the public experience the decontamination process.

Expectations were as follows. First, because there is little mention of communication strategies in decontamination guidance documents (Carter et al., 2013a: Chapter 2), it might be expected that casualties will report that communication was inadequate and could be improved. Second, a lack of communication will play an important role in how members of the public experience the decontamination process, with a lack of practical information and an absence of explanation about why decontamination is necessary resulting in increased anxiety and confusion about the decontamination process (Taylor et al., 2009). Third, if members of the public do not feel that their needs for privacy have been met, they are more likely to experience stress during the process and indicate a reluctance to comply with instructions (Hanley, 1999; United States Fire Administration, 1997; Vogt & Sorensen, 2002). Fourth, a final expectation is that, to the extent that members of the public define themselves as a psychological group, they are more likely to report giving and receiving help from others, in order to achieve the goal of undergoing decontamination (Drury et al., 2009a).

Method

Participants

Participants were people who took part as simulated casualties in one of five field exercises which involved decontamination. Participants were recruited by the Health Protection Agency, and included members of organisations such as Casualties Union and Amputees in Action, trainee paramedics, medical students, and members of the public. The number of simulated casualties who were decontaminated, and hence from whom feedback was obtained, varied from 28 volunteers (Exercise A) to 131 volunteers (Exercise C). See

Table 5.1 for full details of each of these exercises, including the numbers of participants, and the scenarios. Across the five exercises, a total of 402 simulated casualties completed feedback questionnaires. No specific data about age and gender of participants were collected, but roughly equal numbers of male and female participants took part, with the age of volunteers ranging from 18 to approximately 85 years. Participants received no payment for taking part in an exercise, although their expenses were reimbursed. Casualties Union and Amputees in Action each received a small donation to their organisation.

Table 5.1 – Details from the five emergency preparedness field exercises

Exercise	Number of casualty volunteers	Number decontaminated	Scenario
A	80	28	Casualties trapped in collapsed multi-storey building, and sarin release at motorway service station
B	144	69	Road traffic collision involving a lorry carrying hazardous material
C	200	131	Detonation of a dirty bomb
D	96	40	Accidental contamination of 70 disabled and able-bodied casualties by a chemical following a road traffic collision
E	180	134	Detonation of a dirty bomb at a large sporting venue

Measures

Data were collected using feedback questionnaires, which were created by the Health Protection Agency in order to inform the evaluation of exercise play and identify lessons for future exercises and real incidents. Such questionnaires are used regularly following field exercises, to ensure that all participants' views are captured. Feedback questionnaires were completed by simulated casualty volunteers following each exercise, and contained questions relating to their experiences of the exercise and of the

decontamination process specifically. The content of the questionnaire varied slightly between exercises, but the items were broadly similar. See Table 5.2 for full details of the open-ended questions used in each exercise.

Table 5.2 – Questionnaire items used during each of the five emergency preparedness field exercises

Exercise A	Exercise B	Exercise C	Exercise D	Exercise E
1. Please provide a description of your injuries/ symptoms and your location before you were attended to and moved by the emergency services.	1. Please provide a short account of what happened to you during the exercise – please include details of how your injuries were treated (if applicable)	1. Please provide a description of your injuries/ symptoms/ behaviours before you were attended to by the emergency services or hospital staff.	1. Please provide a description of your injuries/ symptoms/ behaviours before you were attended to by the emergency services or hospital staff.	1. Please describe what you felt went well during the exercise.
2. Please provide an account of what happened to you when the emergency services arrived at the scene of the incident – please include details of how you injuries were treated.		2. Please provide an account of what happened to you during the exercise – please include details of how your injuries were treated (if applicable)	2. Please provide an account of what happened to you during the exercise – please include details of how your injuries were treated (if applicable)	2. Please describe what you felt could have been improved during the exercise.
3. Please explain if there was anything that the staff attending to you missed, or if you think there was anything more that the ambulance or fire service staff could have done for you during the exercise.	2. Please explain if you think there was anything that your character needed that the staff attending to you missed, or if you felt there was any more that they could have done for you.	3. Please explain if you think there was anything your character needed that the emergency responders or healthcare workers attending to you missed, or if you felt there was any more that they could have done for you.	3. Please explain if you think there was anything that your characters needed that the emergency responders or healthcare workers attending to you missed, or if you felt there was any more they could have done for you.	3. Please explain if you felt there was any more that emergency responders could have done for you.
4. If you had any difficulties communicating with the staff attending to you at any point during the exercise, please explain this here.	3. If you had any difficulties communicating with the hospital staff attending to you at any point during the exercise, please explain this here.	4. If you had any difficulties communicating with the emergency responders or hospital staff attending to you at any point during the exercise, please explain this here.	4. If you had any difficulties communicating with the emergency responders or hospital staff attending to you at any point during the exercise, please explain this here.	4. If you had any difficulties communicating with the emergency responders attending to you at any point during the exercise, please explain this here.
5. Please describe any improvements that you think could be made to the undressing stage before you entered the decontamination tents, for example, changes to the instructions on undressing, communication with the staff, or changes to the temporary clothing.	4. Please describe any issues you had at the undressing stage and any improvements you think could be made.	5. Please describe any issues you had at the undressing stage and any improvements you think could be made.	5. Please describe any issues you had at the undressing stage and any improvements you think could be made.	5. Please describe any issues you had at the undressing stage and any improvements you think could be made.
6. Please describe any improvements that you think could be made to the decontamination showers that would make you feel more comfortable in a real incident.	5. Please describe any issues you had inside the decontamination showers and any improvements you think could be made.	6. Please describe any issues you had inside the decontamination showers and any improvements you think could be made.	6. Please describe any issues you had inside the decontamination showers and any improvements you think could be made.	6. Please describe any issues you had inside the decontamination showers and any improvements you think could be made.
	6. Please describe any issues you had at the dressing stage and any improvements you think could be made.	7. Please describe any issues you had at the dressing stage and any improvements you think could be made.	7. Please describe any issues you had at the dressing stage and any improvements you think could be made.	7. Please describe any issues you had at the dressing stage and any improvements you think could be made.
	7. Please describe any improvements that you think could be made to the decontamination showers that would make you feel more comfortable in a real incident.	8. Please describe any improvements that you think could be made to the decontamination showers that would make you feel more comfortable in a real incident.	8. Please describe any improvements that you think could be made to the decontamination showers that would make you feel more comfortable in a real incident.	8. Please describe any improvements that you think could be made to the decontamination showers that would make you feel more comfortable in a real incident.
7. Please explain if you think Exercise A could have been more like a real incident.		9. Please explain how Exercise C could have been more like a real incident, including what aspects of the exercise were not realistic.	9. Please explain how Exercise D could have been more like a real incident, including what aspects of the exercise were not realistic.	9. Please explain how Exercise E could have been more like a real incident, including what aspects of the exercise were not realistic.
		10. If you thought you would leave the incident site, please explain where you think you would go, and what you would do.	10. If you thought you would leave the incident site, please explain where you think you would go, and what you would do.	
	8. Please provide any further comments you have on the hospital response.	11. Please provide any further comments you have on the emergency services' response during Exercise C.	11. Please provide any further comments you have on the emergency services' or hospital response during Exercise D.	10. Please provide any further comments you have on the emergency services' response during Exercise E.

Procedure

Volunteers were recruited by the Health Protection Agency Exercises team and were provided with briefing information prior to arriving at the exercise. On arrival, volunteers received a group briefing presentation, which provided them with more information about what would happen during the exercise. This included information on the exercise scenario and how the casualties were expected to behave. Immediately after taking part in an exercise, the volunteers were debriefed, and each volunteer was asked to complete a feedback questionnaire.

Analytic procedure

Not all volunteers were decontaminated during the exercises, due to either a lack of time or a lack of resources. Only feedback from those who were decontaminated was analysed. As data were collected using standardised, structured feedback questionnaires, it was decided that the framework approach would be the most appropriate method of analysis (Pope, Ziebland, & Mays, 2000). As the framework approach is a top-down approach, involving a pre-defined coding scheme, there is a danger that relevant themes within the data may be missed. To overcome this potential limitation, care was taken to ensure that researchers were fully immersed in the data, and kept an open mind to the identification of any previously unspecified themes; indeed several sub-themes (which were not included in the pre-defined coding scheme) were identified during data analysis. Initial data analysis involved a broad coding scheme of four main themes (described below) being applied to the data. New sub-themes were then allowed to emerge from the data, to ensure that no relevant themes were missed.

A thematic framework was identified, based on the relevant issues highlighted in previously published literature. Each passage within the data was then coded into one or

more of the relevant themes. This allowed the relevant data to be easily rearranged into chart form, using Microsoft Word, to express the themes more clearly, and to establish relationships between them. Data were categorised into four broad themes of interest. The first theme was perceptions about communication from responders during the decontamination process. The second theme focused on casualties' concerns about privacy, and how a lack of privacy affected their experiences of decontamination. The third theme examined any fear or anxiety which members of the public experienced during the exercises. The fourth theme concerned participants' beliefs about how they would behave during a real incident of this type. This fourth theme concerning participants' beliefs about how they would behave during a real incident emerged from the data, and was not pre-defined prior to analysis.

Another researcher, who was provided with the coding scheme, coded a subsection of the data. This enabled a check of inter-rater reliability. There was an agreement rate of 89% between the first and second researchers.

Results

Results are presented under the four themes identified and include any sub-themes which emerged during data analysis.¹⁰

Perceptions about communication from responders during the decontamination process

Three sub-themes emerged from the data under the broad theme of perceptions about communication from responders during the decontamination process. These were: the need for clearer instructions during the decontamination process; the need for greater explanation as to why decontamination was necessary; and difficulties in communicating

¹⁰ A letter and a number will appear in brackets following each quote, for example (A1). The letter denotes which exercise the participant took part in, while the number denotes the participant number of the person who provided the quote.

with emergency responders through personal protective equipment (PPE). Each sub-theme is described below, including example quotes relating to each sub-theme.

The need for clearer instructions. Perceptions about communication from responders were the most widely reported theme, with over half of all participants reporting at least one problem with communication during the process. Within the wider communication theme, the sub-theme of the casualties' needs for clearer instructions was reported by over a quarter of all participants. Comments included:

“There were no instructions given and services just kept throwing in more suits and telling us to speed up and get out” (C126).

“We were sent through the showers with very poor instructions on how to proceed and what to do” (D2).

“The information provided by the fire service prior to entering [the decontamination shower] was poor at best” (D17)

“I received NO instructions on what/ how to wash in the showers!!” (E63)

The above quotes illustrate that at least some simulated casualties wanted clearer instructions about how to proceed through the showers, and how to wash while they were in there. Simulated casualties highlighted the potential consequences which could result from a lack of clear instructions. One potential consequence was that casualties didn't know what to do when in the decontamination showers:

“I received no instructions about showering, so simply walked through. I don't know if this is correct” (D1)

“No one directed us what to do. I was told to walk through got to the end no one had a clue and told me to walk back through” (A24)

“As there was not much communication when in the tunnel this led to some people not being able to clean and put on protective outfit in the right manner” (D13)

The above quotes suggest that a lack of clear instructions resulted in confusion among casualties, with several people not knowing what to do when they went through the decontamination showers. There was also a suggestion that providing clearer instructions could help to reduce any stress that casualties might feel:

“Perhaps an A board at the gated area with instructions of the derobing would help with stress” (E121)

Importantly, while not all casualties directly expressed a need for clearer instructions, only a very small minority specifically stated that they had received sufficient instructions and that they were confident about what to do during the decontamination process.

The need for greater explanation. Along with a lack of clear instructions, another communication sub-theme was that the simulated casualties felt that there was a lack of explanation from responders about what the process of decontamination would involve and why it was necessary. This was the issue most commonly highlighted by casualties, and was reported by more than half of all participants. Comments included the following:

“I did not feel we knew enough about what was happening and when” (A25)

“No attempt to explain why we were pushed through the showers was ever fully made” (B63)

“Was not explained was just told to move forward, felt like I was a sheep being herded!” (C89)

“No one explained why we had to go through the shower” (D4)

“They could have explained what the situation was more so that we understood exactly what was going on” (E64)

Across all the exercises, casualties felt that they were not given enough information about the decontamination process or about why decontamination was necessary. The casualties noted specific consequences of the responders not providing sufficient explanation. One consequence was that the lack of information caused some people to become agitated, even though this was an exercise and not a real incident:

“The second group could of told us what was happening because some people were getting a bit agitated” (E102)

Casualties therefore suggested that the stress of the situation, which would be even greater if this had been a real incident, was made worse by the lack of information and explanation they received from the emergency services, leading them to experience increased agitation. As well as increased agitation, casualties also highlighted that the lack of information they received would have led to their non-compliance in a real situation, with people leaving the scene before they had been decontaminated:

“I would sneak out after waiting around for so long and not being told why” (C109)

“[Would go] home, because I was not clearly informed of what was happening”
(C116)

“[Would leave the scene] because we were not kept up to date with what was going on” (D11)

“Because information was not given by the fireman about the need for decontamination before anything else I would probably have wandered off” (D28)

The above quotes make it clear that the lack of information and explanation provided to casualties contributed to their increased stress, and the potential for their non-compliance with instructions.

As with the need for clearer instructions, not all casualties directly expressed a need for improved communication from responders. However, only a small minority specifically stated that they felt communication from responders had been adequate.

Difficulties in communicating with responders through personal protective equipment. A practical consideration about responders' communications with casualties was raised, with casualties noting that even when the responders did attempt to communicate with them, this was often hampered by the PPE which the responders were wearing:

"The suits made it difficult to hear clearly" (A27)

"They all had gas masks and couldn't hear them at all, so badly in fact that they had to have 'civilians' repeat it louder to the crowd" (C119)

"CBRN suits especially made it difficult both to hear responders and for them to hear you" (D14)

"They had to shout due to the outfit so felt slightly disconcerting" (E45)

"You couldn't hear their voices due to mask so you can't hear their instructions" (E96)

Clearly there is a practical challenge for responders in communicating effectively with casualties, and this should be addressed. The comments above suggest that even when responders did attempt to communicate with casualties, the protective suits made this almost impossible.

When asked about communicating with responders, the majority of casualty volunteers stated that they had found it difficult to communicate with responders through the PPE which they are required to wear. Some casualty volunteers did not directly express that they had found it difficult to communicate with responders through the PPE, but no casualties stated that they had not had a problem communicating with responders who were wearing PPE.

Privacy

A lack of privacy during the decontamination process was a common concern arising within all of the exercises. Comments included the following:

“In a real situation to strip off naked would need more privacy” (B24)

“There was NO privacy, in or out of the tent” (B33)

“BASIC privacy could have been offered in a real situation if the process required complete nudity in order to preserve dignity where possible” (C128)

“[Needed] curtains either end of shower. I was aware there were a lot of people peering in” (D14)

“There should be a private place to get changed” (E50)

Participants also highlighted some negative results of a lack of privacy. Several casualties experienced embarrassment as a result of the lack of privacy offered to them:

“More privacy as it was quite embarrassing undressing at the front of the hospital” (B17)

“I felt quite embarrassed at being half dressed to the public” (B60)

One casualty was so concerned about the lack of privacy available that she refused to go through the showers at all:

“I didn’t do it. I wouldn’t strip in front of everyone” (E98)

Some simulated casualties did not mention concerns about privacy, but none of them specifically stated that they had had sufficient privacy during the decontamination process.

Fear and anxiety

Although these were only exercises, several casualties described feeling anxious during the decontamination process. Overall feelings during the exercise included: “nervous and a bit scared” (E65); “threatened” (E43); and “afraid” (E59). Other casualties were more specific about their feelings of anxiety during the exercises, which they attributed to aspects of the decontamination process itself, such as the presence of responders in PPE, as well as to a lack of information and communication from the emergency services. Results are therefore reported under two sub-themes: fear and anxiety about the decontamination process; and fear and anxiety due to a lack of communication and information from responders.

Fear and anxiety about the decontamination process.

“Men in masks and suits, quite scary looking and a little aggressive” (A15)

“It would have been scary for my character being handled by so many strangers.

The suits dehumanise them” (A27)

“Would have been a rather frightening experience for real situation” (B14)

“Decontamination staff need to introduce themselves more clearly as look threatening to a confused casualty” (B24)

Several casualties therefore found the decontamination process scary, despite the fact that this was not a real incident. Some casualties suggested that the failure of emergency responders to communicate with them led to their increased fear and anxiety

about the decontamination process, which could have been alleviated if more information had been provided. This is described in more detail under the heading below.

Fear and anxiety due to a lack of communication and information from responders.

Comments from casualties about the effect of a lack of communication and information on their levels of fear and anxiety included the following:

“I would have been more reassured if I was told what the process involved [...] I have been through decontamination many times – if it was the first time I may have been nervous or terrified” (A2)

“Members of the team did not let us know what was going on which would of made people panic because it all seemed a bit strange” (C105)

“The emergency services should have been more willing to explain what was going on, in a real situation, people would have been incredibly scared and confused and a lot of the first hour we were left with no one giving us anything” (C88)

“No reassurance given to casualties who would have been frightened and in shock” (D27)

“I had no idea what was going to happen which made me feel nervous and scared” (E65)

The above quotes therefore suggest that fear and anxiety about the decontamination process could be reduced if a satisfactory level of explanation was provided, and that responders’ failure to communicate with the casualty volunteers contributed directly to increased levels of anxiety during each exercise.

However, not all casualties said that they felt anxious during the exercise. Several casualties stated that they did not feel anxious, but that they would have if the situation had

been real. A few casualties specifically stated that they did not feel anxious, and that this was because they had taken part in many of these types of exercises before.

Likely behaviour during a real incident of this kind

In response to a question asking casualties whether or not they would have left the incident site if this had been a real incident and, if so, where they would go, several participants described how they felt they would behave during a real incident of this kind. Three sub-themes emerged under this theme, which were: participants would go home; participants would go to hospital; and participants would, or did, try to help others. The results are reported under each of these sub-themes.

Participants would go home. Several casualties suggested that they would go home during a real incident of this kind, rather than wait for emergency services' assistance:

“[I would] try to get home and treat myself” (C28)

“[I would] probably go home and call Dr or NHS Direct” (C40)

The reason for this was often stated as being due to a delayed response or lack of communication from the emergency services:

“I would leave, head home, shower and see to my own injuries as the services were far from interested” (C89)

“If no input [from emergency responders], would not know of dangerous chemicals and would probably shower at home” (D20)

Participants would go to hospital. Several participants also stated that they would go to hospital, rather than wait for assistance from the emergency services:

“In a real situation I would probably take myself to hospital if possible” (C32)

“I would head to my local hospital that way I would eventually be seen to” (C44)

“If I was able to walk I would go to the hospital myself” (D14)

Participants would, or did, try to help others. Several casualties expressed a desire to help others, and stated that they would have helped others if the incident had been real:

“Would have either tried to help worse cases or gone to find help” (C52)

“If my injury allowed I would try to help others and make sure help was on the way” (C79)

“If I could help other casualties I would stay, but if not I would go and find help” (C84)

“I would try and help who I could and walk away” (D6)

In support of the quotes above relating to intended helping behaviour, some casualties reported that they actually gave help to, or received help from, another casualty during their exercise:

“Sat on floor but needed help from another casualty to get up” (A19)

“A fellow walking casualty helped me understand” (C110)

“I helped a non-sighted person through the shower” (D4)

“Little assistance from the teams and fellow casualties had to help me” (D29)

Although not all casualties said that they would help others in a real incident of this type, no casualties specifically stated that they would not have helped others if the situation had been real.

Discussion

The accounts from volunteers during field exercises provide a valuable insight into the way in which casualties experience the decontamination process, albeit under exercise rather than real-life conditions. The main finding was that casualties wanted clearer instructions about how to go through the decontamination showers, as well as better explanation about why decontamination was necessary and what would actually happen to

them during the decontamination process. These findings were consistent across all of the exercises, with a lack of communication from responders and a lack of practical information being the most commonly reported themes in each of the exercises. Ineffective communication and lack of practical information provided by responders were reported by several casualties as contributing directly to their anxiety. This is a key finding, as it is likely that if communication from responders and the provision of practical information are important during the relatively stress-free environment of an exercise, they will be even more important during a real incident.

This lack of communication with casualties is as would be expected based on the finding that few decontamination guidance documents for responders contain a strategy for communicating with casualties (Carter et al., 2013a: Chapter 2). Another interesting finding, which is to be expected based on the recent review of guidance documents for responders, is that responders were perceived as having employed a ‘control’ strategy, which resulted in the casualties feeling as if they were treated with a lack of respect, and in a perception that information was not prioritised. Their perception of the ‘control’ strategy is evident in quotes in which casualties’ make reference to being: “treated like animals, no communication”, “like I was a sheep being herded!”, and also in quotes which indicate that they perceived the responders as showing a lack of respect for casualties: “services just kept throwing in more suits and telling us to speed up and get out”, and “if we attempted to address emergency staff, we were just turned away”. This perception of a ‘control’ strategy could have serious consequences during real-life incidents involving decontamination, as the perceived lack of respect shown by responders could result in a belief that the actions being taken by responders are illegitimate, and this might increase the risk of non-compliance with responder instructions (Drury, 2009).

Another factor contributing to stress during the exercises was a lack of privacy offered to the casualties. It is likely that concerns about privacy would be even greater during a real incident, as casualties would not be allowed to keep their underwear on. Therefore, it is possible that many more casualties might refuse to comply with the showering process. This is again as would be expected, based on previous findings which have shown that a lack of privacy contributes to non-compliance during incidents involving decontamination (Hanley, 1999; United States Fire Administration, 1997; Vogt & Sorensen, 2002). Finally, although casualty volunteers were not directly asked whether they would help others during a real incident, several casualty volunteers spontaneously said that they were willing to help each other during the exercises, and that they would expect to give help to and receive help from others in the event of a real incident. This is as would be expected based on findings from research into real-life disasters, which indicate that cooperation rather than panic is common (Clarke, 2002). One explanation is that such mutual aid is a function of the extent to which survivors develop a shared identity based on their shared fate (Drury et al., 2009a).

There were several limitations with the current research. First, although exercises attempt to replicate real-life incidents as closely as possible, certain variables (especially anxiety) are likely to be quite different during real-life incidents. Despite this, however, the findings relating to the casualties' needs for communication and privacy are similar to those reported following real-life decontamination incidents (Hanley, 1999; Vogt & Sorensen, 2002), which suggests that exercises provide a fairly realistic environment in which to examine the public's reactions to the decontamination process. A second limitation is that the analysis reported here does not contain any numerical data, and therefore it was not possible to test any hypotheses within this paper. However, the feedback collected

following these five exercises did contain quantitative data, allowing for certain hypotheses to be tested, the results of which are reported elsewhere (Carter et al., 2013b: Chapter 6). A third potential limitation is that some of the volunteers from whom feedback data was collected had taken part in similar exercises before (e.g. volunteers from Casualties' Union and Amputees in Action). They were therefore more familiar with emergency response procedures, including potentially decontamination, than other members of the public might be. This may therefore have resulted in reduced levels of anxiety and confusion, and increased levels of compliance. However, while this potential limitation should be noted, little research has examined public responses during incidents involving mass decontamination, and it is therefore unclear what effect previous experience may have on public experiences and behaviour during the decontamination process. To overcome this, future research could examine public experiences of mass decontamination among participants who have no previous experience of decontamination.

Finally, an analysis of data gathered purely for the practical purpose of exercise evaluation cannot, by definition, examine possible psychological processes that lie behind the outcomes. Thus, while the finding that the casualties displayed mutual aid in relation to each other and dissatisfaction in relation to the emergency services may be consistent with some predictions of the social identity approach, there may be other explanations. Specifically, there was no test included of the role of psychological group membership which is predicted to play a role in real life CBRNE incidents involving decontamination (Drury, 2009). Future exercises that involve mass decontamination might therefore be evaluated using questionnaire methods that are more theoretically driven, since the argument is that by taking into account key social psychological variables, such as group identity, perceived legitimacy, sense of agency (as well as established measures such as

anxiety etc.), better – more socially realistic and effective – procedures for decontamination can be designed (Carter, Drury, Amlôt, Rubin, & Williams, in preparation: Chapter 3).

Conclusions

The findings presented in this paper support the idea that field exercises involving mass decontamination can, in principle, provide valuable insights into the ways in which members of the public experience the decontamination process. The similarity between the findings presented within this paper and findings from real-life incidents involving decontamination suggest that exercises provide a realistic setting within which the experiences of members of the public can be examined. Future research should strive to examine in more detail the ways in which members of the public experience the decontamination process and determine which types of communication strategy employed by responders are most effective in decreasing casualties' levels of anxiety and in increasing their rates of compliance with the procedures that are recommended. This will facilitate the development of evidence-based communication strategies for emergency responders, in order to reduce non-compliance and anxiety among members of the public during real life incidents involving mass decontamination. In the meantime, emergency responders should ensure that they provide sufficient explanation about the need for decontamination, as well as clear instructions about what members of the public are expected to do during the process, as these actions are likely to reduce anxiety about decontamination and increase compliance among members of the public during real-life incidents involving mass decontamination.

CHAPTER 6**Paper 5: The effect of communication during mass decontamination**

Reference:

Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2013). The effect of communication during mass decontamination. *Disaster Prevention and Management*, 22(2), 132-147.

Abstract

Purpose

Reports from small-scale incidents in which decontamination was conducted suggest that a successful communication strategy is vital in order to increase public compliance with, and reduce public anxiety about, decontamination. However, it has not been possible to examine public behaviour during large scale incidents involving decontamination. The aim of the research reported here was to examine the relationship between people's positive perceptions of responding agencies' communication strategies and relevant outcome variables, such as level of compliance and level of reassurance, in several field exercises involving mass decontamination.

Methods

Data were collected using feedback questionnaires completed by simulated casualties, which contained items relating to casualties' perceptions of the success of responding agencies' communication strategies, their confidence in emergency responders, and their compliance with the decontamination process. Path analysis was used to examine the relationships between variables.

Findings

Results show a significant relationship between responding agencies' communication strategies, level of public reassurance, and level of public compliance. The relationship between responders' communication strategies and the outcome variables was partially mediated by public confidence in responders.

Practical implications

Emergency responders should focus on communication with members of the public as a key element of the decontamination process, as failure to do so could result in high levels of anxiety and low levels of compliance among those who are affected.

Originality

This research highlights the importance of effective responder communication strategies. Further, findings indicate the value of examining feedback from field exercises in order to facilitate a greater understanding of public experiences of the decontamination process.

Introduction

The willingness of terrorists to use unconventional weapons, as well as rapid technological advances, has increased the threat from incidents involving chemical, biological, radiological, nuclear and explosive (CBRNE) agents (Alexander & Klein, 2006). These agents may be particularly frightening to people who are potentially exposed, as they are often invisible, undetectable, ambiguous, and can pose long-term health risks (Cornish, 2007; Regis, 2001). In addition, interventions intended to reduce the impact of CBRNE agents, such as decontamination and quarantine, can be more stressful than the incident itself, if they are not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997; Mason & Lyons, 2003).

Evidence from small-scale incidents has shown that the process of decontamination can generate high levels of anxiety, especially if people's concerns about their privacy and modesty are not met, and if the people who are being decontaminated do not feel that responders are treating them with respect (Hanley, 1999). Public anxiety about decontamination can have a detrimental impact on how well incidents involving mass decontamination are managed. Increased anxiety during real-life incidents involving decontamination may result in a high risk of non-compliance with recommended decontamination procedures, especially if those involved are not provided with enough information about the process (Fontana, 1998), or if the actions taken by responders are perceived as unfair, or illegitimate, causing the public to lose trust in responders (Hanley, 1999; U.S. Fire Administration, 1997). Accounts from incidents involving decontamination show that people who are affected want reassurance that they are clean and that their decontamination has been successful (Vogt & Sorensen, 2002). It is possible that failure to provide affected persons with information about the efficacy of their decontamination could

lead people to seek treatment at medical facilities instead of, or after, decontamination, with high numbers of people who are not contaminated but believe themselves to be converging on local hospitals (Rubin & Dickmann, 2010).

Taylor, Balfanz-Vertiz, Humrickhouse, and Jurik (2009) found that participants became stressed during a simulated incident involving decontamination, and reported that they would have liked more information about the decontamination process. Their desire for information corresponds with a broader desire among the public for information about both conventional and CBRNE incidents, with successful responder communication strategies and the provision of practical information having been shown to increase public compliance with recommended emergency measures (Drury, 2009; Glass & Schoch-Spana, 2002; Lemyre, Johnson, & Corneil, 2010; Proulx & Sime, 1991; Seeger, 2006) and to reduce people's anxiety (Drury, 2009; Glass & Schoch-Spana, 2002; Jones, Woolven, Durodie, & Wessely, 2006; Perry & Lindell, 2003; Stokes & Banderet, 1997; Wessely, 2005). Indeed, it has been suggested that members of the public want to know as much information as possible, even if this means responders communicating any uncertain aspects to them (Lemyre et al., 2010). Attempts to withhold information until all the facts are known have been shown to reduce public trust in the authorities and increase public anxiety (Glass & Schoch-Spana, 2002).

Vogt and Sorensen (2002) identified several ways in which the management of incidents involving decontamination could be improved. They include: improving communication with members of the public during the decontamination process (e.g. by increasing explanation about why the process is taking place); providing follow-up information after decontamination; and protecting dignity and modesty. Despite this, communication strategies are often overlooked in planning for mass decontamination and

the focus of planning is almost exclusively on the technical issues involved in the decontamination process (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2).

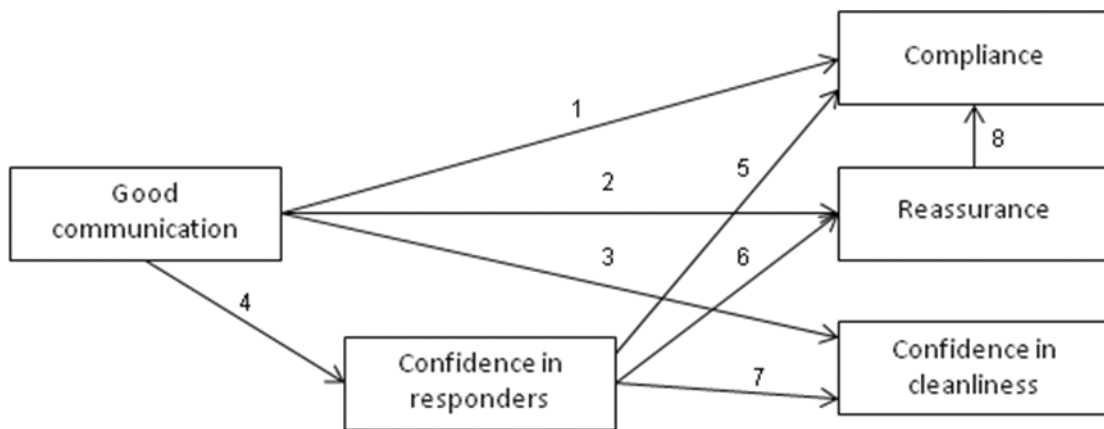
The potential for these types of incident is increasing, with as many as 30-40 small-scale incidents involving decontamination occurring in England each year (Page et al., 2010). One of the reasons why there has not been more research into the factors that affect public behaviour during mass casualty decontamination is that few large-scale incidents requiring mass-casualty decontamination have so far occurred. To date, the largest chemical incident involving the need for mass decontamination is the sarin attack on the Tokyo subway (Okumura et al., 1998). However, delays in identifying the substance used resulted in responders being unable to carry out any prehospital mass decontamination. Any decontamination which was carried out was performed by hospitals (Bowler, Murai, & True, 2001).

One way in which the impact of mass decontamination processes on members of the public could be examined with a view to recommending psychosocial evidence-based improvements is through studying emergency preparedness field exercises that involve decontamination. Field exercises involve the testing of emergency response plans and procedures, under simulated emergency conditions, to ensure that effective plans are put in place in the event that a real incident were to occur. To increase the realism of field exercises, members of the public are recruited to take part in the exercise as simulated casualties.

In this study we analysed feedback questionnaires completed by simulated casualties following five different field exercises that involved decontamination. The intention was to examine the effect of responders' communication strategies on simulated casualties' experiences of the decontamination process. Variables measured included

casualties': perceptions of responder communication; confidence in responders; levels of reassurance; confidence in their cleanliness following decontamination; and willingness to be naked/ willingness to remain at the scene (compliance). The aim was to examine the relationships between casualties' perceptions of responders' communication strategies and the outcome variables. Several hypotheses were generated from the evidence summarised above about the ways in which responders' communication strategies could affect the public's responses to decontamination, and they are illustrated in the path model in Figure 6.1.

Figure 6.1¹¹: A path model representing the expected relationships between variables.



Method

Participants

Participants were volunteers who each took part in one of five emergency preparedness field exercises. The exercises were multi-agency 'live' exercises led by the Health Protection Agency's Exercises and Events Team. In these exercises, the Fire Service led the mass decontamination of a large number of notionally 'contaminated' simulated

¹¹ Paths are numbered to reflect the eight different hypotheses.

casualties. Volunteers who took part as simulated casualties were university students, members of the general public, or were recruited from Casualties Union (www.casualtiesunion.org.uk) or Amputees in Action (www.amputeesinaction.co.uk). The number of simulated casualties decontaminated during each exercise ranged from 28 (Exercise A) to 131 (Exercise C). Full information about the number of participants who were decontaminated, and the exercise scenarios, is published elsewhere (Carter, Drury, Rubin, Williams, & Amlôt, 2012: Chapter 5). Roughly equal numbers of male and female participants took part in each exercise, and their ages ranged from 18 to 85 years. Volunteers received no payment for taking part, but volunteers from some organisations received reimbursement of their travel and subsistence expenses from the exercise co-ordinators, and a small donation towards the running costs of their charitable organisations.

Measures

Data were collected using casualty feedback questionnaires, which were developed to inform the evaluation of each exercise. Following each exercise, simulated casualties completed the feedback questionnaires, which contained open-ended questions about participants' experiences (the results of which are reported elsewhere: Carter et al., 2012: Chapter 5), as well as closed questions to which casualties' responses were measured using a 5-point Likert scale. The present analysis focuses on analysis of the quantitative questionnaire items. Items of interest to the current research were those relating to simulated casualties': perceptions of responders' communication (e.g. 'I found it easy to communicate with the emergency services staff at the decontamination tents'); confidence in responders (e.g. 'how confident do you feel that the authorities are prepared to deal with a real incident like the one you participated in during Exercise B?'); levels of reassurance ('I felt reassured by the staff who were attending to me during the exercise'); willingness to

comply with the need to be naked during decontamination ('I would be willing to be naked inside the decontamination showers in a real incident'); and confidence in their cleanliness following decontamination (e.g. 'How confident do you feel that you were completely clean after going through the decontamination showers?').

The items used to measure each of the variables were broadly similar across each of the exercises. See Table 6.1 for a full break down of the items which were used during each of the exercises, as well as the Cronbach's alpha scores (where appropriate). The only item which differed between exercises was that used to measure compliance. Exercises A, B, D, and E used 'willingness to be naked' (see Table 6.1 for the full item) as a measure of compliance, while Exercise C used 'willingness to remain at the scene'. Both of these measures were taken as proxies for compliance, because they both address whether or not simulated casualties would be willing to do something necessary and out of the ordinary in order to undergo decontamination.

Table 6.1: Items used to measure variables during each of the exercises

Exercise	Communication	Confidence in responders	Anxiety	Compliance	Confidence in cleanliness
A	<p>1. The instructions I was given about changing out of my clothes were easy to hear (i.e. it wasn't too noisy).</p> <p>2. I understood the instructions provided concerning undressing before entering the decontamination tents.</p> <p>3. I found it easy to communicate with the emergency services staff at the decontamination tents.</p> <p>($\alpha = .63$)</p>	1. How confident do you feel that the authorities are prepared to deal with a real incident like the one you participated in during Exercise A?	1. I felt reassured by the staff who were attending to me during the exercise.	1. I would feel comfortable being naked inside the decontamination showers.	N/A
B	<p>1. I understood the instructions provided concerning undressing before entering the decontamination facilities.</p> <p>2. I found it easy to communicate with the emergency services staff at the decontamination facilities.</p> <p>3. I understood the instructions provided concerning dressing after showering in the decontamination facilities.</p> <p>4. I found it easy to communicate with the hospital staff at the dressing stage of the decontamination facilities.</p> <p>($\alpha = .69$)</p>	1. How confident do you feel that the hospital is prepared to deal with a real incident like the one you participated in during Exercise B?	1. I felt reassured by the hospital staff who were attending to me during the exercise.	1. I would be willing to be naked inside the decontamination showers in a real incident.	1. How confident do you feel that you were completely clean after going through the decontamination showers?
C	<p>1. I found it easy to communicate with the emergency services staff at the decontamination facilities.</p> <p>2. The instructions I was given about the decontamination showers were clear.</p> <p>3. I understood the instructions provided about what to do in the decontamination showers.</p> <p>($\alpha = .90$)</p>	1. How confident do you feel that the authorities are prepared to deal with a real incident like the one you participated in during Exercise C?	1. I felt reassured by the emergency responders who were attending to me during the exercise.	1. In a real incident, how likely is it that you would stay and wait at the incident site for this length of time?	1. How confident do you feel that you were completely clean after going through the decontamination showers?
D	<p>1. I understood the instructions provided concerning undressing before entering the decontamination facilities.</p> <p>2. I found it easy to communicate with the emergency services staff at the decontamination facilities.</p> <p>3. I understood the instructions provided concerning dressing after showering in the decontamination facilities.</p> <p>4. I found it easy to communicate with the emergency services staff at the dressing stage of the decontamination facilities.</p> <p>($\alpha = .85$)</p>	1. How confident do you feel that the authorities are prepared to deal with a real incident like the one you participated in during Exercise D?	1. I felt reassured by the emergency responders who were attending to me during the exercise.	1. I would be willing to be naked inside the decontamination showers in a real incident.	1. How confident do you feel that you were completely clean after going through the decontamination showers?
E	<p>1. I understood the instructions provided concerning undressing before entering the decontamination facilities.</p> <p>2. I found it easy to communicate with the emergency services staff at the decontamination facilities.</p> <p>3. I understood the instructions provided concerning dressing after showering in the decontamination facilities.</p> <p>4. I found it easy to communicate with the emergency services staff at the dressing stage of the decontamination facilities.</p> <p>($\alpha = .82$)</p>	1. How confident do you feel that the authorities are prepared to deal with a real incident like the one you participated in during Exercise E?	1. I felt reassured by the emergency responders who were attending to me during the exercise.	1. I would be willing to be naked inside the decontamination showers in a real incident.	1. How confident do you feel that you were completely clean after going through the decontamination showers?

Procedure

The simulated casualties were recruited through the various organisations described earlier. They were provided with information about the nature of the exercise. They received a group briefing on arrival, to provide them with more information about what would happen during the exercise. The exercise was then initiated at a set time. Emergency responders were told beforehand that the exercise would involve a CBRNE threat, but did not know the exact nature of the scenario. Responders therefore arrived at the scene, and used the information and equipment available to them to determine the nature of the incident. The exercise then progressed as if it were a real incident, and was terminated at a set time. The simulated casualties were asked to complete the casualty feedback questionnaires at the end of each exercise.

Analysis

Feedback data from the simulated casualties were analysed using SPSS 19.0. The three smaller exercises (A, B, and D; $N < 70$) were analysed using correlational statistics, in order to provide preliminary ideas about whether or not the hypotheses were supported. Data from the two larger exercises (C and E; $N > 100$) were then used to create two path models, using AMOS Graphics, which were then compared with the hypothesised model presented in Figure 6.1.

Results

Table 6.2 shows the mean values for each of the variables across all exercises.

Table 6.2¹²: Mean scores for all measures across the five exercises

	<i>Overall mean (across exercises)</i>	<i>Lowest mean</i>	<i>Highest mean</i>
<i>Perceived communication</i>	3.41	2.85 (Exercise D)	3.85 (Exercise E)
<i>Compliance</i>	3.26	1.79 (Exercise C)	3.76 (Exercise E)
<i>Reassurance</i>	3.09	2.06 (Exercise C)	3.94 (Exercise E)
<i>Confidence in responders</i>	2.96	1.98 (Exercise C)	3.89 (Exercise E)
<i>Confidence in cleanliness</i>	3.03	2.30 (Exercise D)	3.67 (Exercise B)

Correlational analysis

Results for the three exercises included in the correlational analyses are shown in Table 6.3.

¹² The variables were measured on a scale from 1 – 5, with a higher score indicating greater agreement.

Table 6.3¹³: Correlations between variables following each of the five exercises

Exercise A					
	<i>Good comms</i>	<i>Confidence in responders</i>	<i>Reassurance</i>	<i>Compliance</i>	<i>Confidence cleanliness</i>
<i>Good comms</i>	--	$r = .54$ $p = .006$	$r = .48$ $p = .02$	N.S.	No item
<i>Confidence in responders</i>	$r = .54$ $p = .006$	--	$r = .52$ $p = .008$	N.S.	No item
<i>Reassurance</i>	$r = .48$ $p < .05$	$r = .52$ $p = .008$	--	N.S.	N/A
<i>Compliance</i>	N.S.	N.S.	N.S.	--	N/A
<i>Confidence in cleanliness</i>	No item	No item	N/A	N/A	--
Exercise B					
	<i>Good comms</i>	<i>Confidence in responders</i>	<i>Reassurance</i>	<i>Compliance</i>	<i>Confidence cleanliness</i>
<i>Good comms</i>	--	$r = .40$ $p = .002$	$r = .28$ $p = .02$	N.S.	$r = .30$ $p = .02$
<i>Confidence in responders</i>	$r = .40$ $p = .002$	--	$r = .33$ $p = .009$	N.S.	$r = .39$ $p = .003$
<i>Reassurance</i>	$r = .28$ $p = .02$	$r = .33$ $p = .009$	--	N.S.	N/A
<i>Compliance</i>	N.S.	N.S.	N.S.	--	N/A
<i>Confidence in cleanliness</i>	$r = .30$ $p = .02$	$r = .39$ $p = .003$	N/A	N/A	--
Exercise D					
	<i>Good comms</i>	<i>Confidence responders</i>	<i>Reassurance</i>	<i>Compliance</i>	<i>Confidence cleanliness</i>
<i>Good comms</i>	--	$r = .60$ $p < .001$	$r = .43$ $p = .01$	$r = .32$ $p = .06$	$r = .50$ $p = .003$
<i>Confidence in responders</i>	$r = .60$ $p < .001$	--	$r = .23$ $p = .11$	$r = .35$ $p = .03$	$r = .39$ $p = .02$
<i>Reassurance</i>	$r = .43$ $p = .01$	$r = .23$ $p = .11$	--	N.S.	N/A
<i>Compliance</i>	$r = .32$ $p = .06$	$r = .35$ $p = .03$	N.S.	--	N/A
<i>Confidence in cleanliness</i>	$r = .50$ $p = .003$	$r = .39$ $p = .02$	N/A	N/A	--

¹³ Where correlations were examined but were not significant this is represented as N.S. Where correlations were not examined, because there was no hypothesised relationship, this is represented as N/A. Any variables which could not be tested because the necessary items were not included in the questionnaire, were represented as "No item".

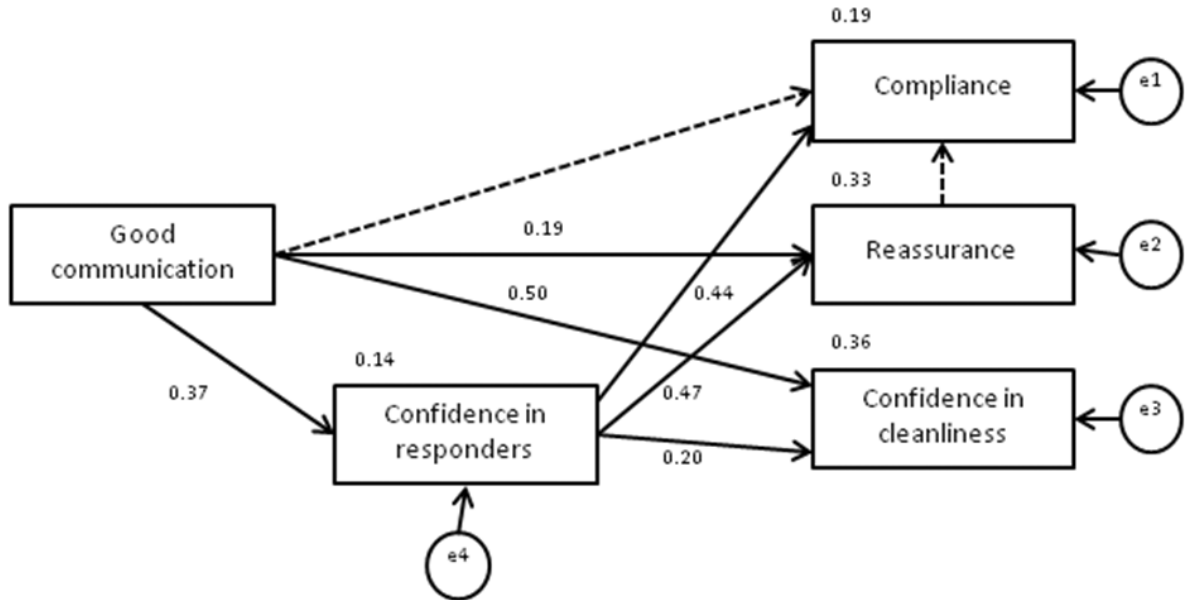
The results from the correlational analysis provide some preliminary support for the hypotheses. There was consistent support across the three exercises for the hypotheses that there would be a significant relationship between: good communication and confidence in responders; good communication and increased reassurance; and confidence in responders and greater reassurance. However, support for the other hypotheses was mixed.

Path analysis

Exercise C. The model represented in Figure 6.2 (model 2) illustrates the results from Exercise C. Model chi-square was used to evaluate overall model-data fit. A non-significant chi-square result indicates that the null hypothesis can be accepted, and that the model has good overall fit with the data. Chi-square is the most widely used measure of model fit, but it is sensitive to sample size (Marsh, Hau, & Wen, 2004) and should therefore be used in conjunction with other measures of model fit, such as the comparative fit index (CFI) and the root mean square of approximation (RMSEA). A model should have a CFI value of above .95, and an RMSEA value of below .08 (Hu & Bentler, 1999) if it is said to have a good fit. Some data were missing from the participants' responses, and that was dealt with by using the Maximum Likelihood Robust estimation method.

Model 2 has a reasonable fit with the data, $\chi^2(4) = 8.9, p = .06$. Other fit indices support this interpretation, with CFI giving a value of .96, above the recommended cut-off value of .95, and RMSEA giving a value of .10, which is slightly above the recommended cut-off value of .08. All reported path coefficients are significant at the .05 level. The model explains 19% of participants' compliance with remaining at the scene of an incident, 33% of the reassurance that simulated casualties felt during an incident, and 36% of their confidence in cleanliness following decontamination.

Figure 6.2¹⁴: A path model representing the results from Exercise C.



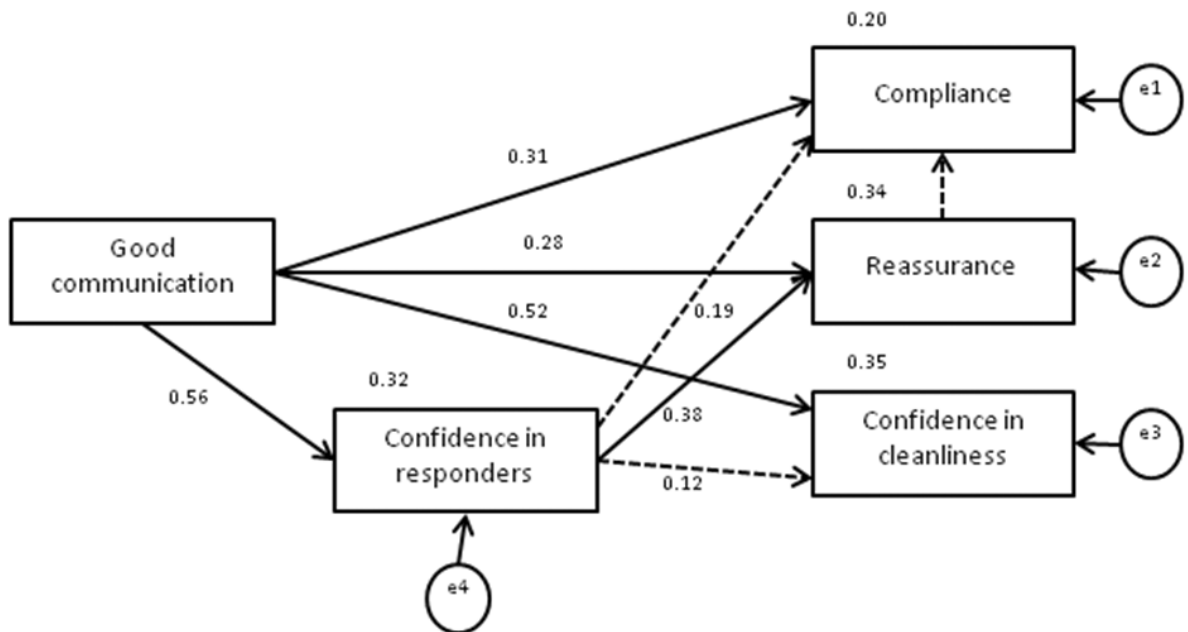
Model 2 supports the findings from the correlational analysis, in showing a significant relationship between casualties' perceptions of good responder communication and their reassurance, $\beta = .19$, $p = .03$, casualties' perceptions of good responder communication and their confidence in responders, $\beta = .37$, $p < .001$, and casualties' confidence in responders and their reassurance, $\beta = .47$, $p < .001$. The model also shows a significant relationship between confidence in responders and compliance, $\beta = .44$, $p < .05$, confidence in responders and confidence in cleanliness, $\beta = .20$, $p < .001$, and perceptions of good responder communication and confidence in cleanliness, $\beta = .50$, $p < .001$. The Sobel test indicates that confidence in responders is a significant partial mediator between perceptions of good responder communication and levels of compliance ($p = .05$), and between perceptions of good responder communication and levels of reassurance ($p = .05$).

¹⁴ The dotted lines represent relationships which were noted in the hypothesised model (Figure 6.1), but which were not supported by the data.

As with the results of the correlational analysis the path model shows no significant relationship between higher levels of reassurance and increased compliance.

Exercise E. The model represented in Figure 6.3 (model 3) illustrates the results from Exercise E. The model has very good overall fit with the data, $\chi^2(3) = 1.84, p = .61$. CFI and RMSEA values also indicate a very good overall fit with the data (CFI = 1.00, RMSEA = .0). The model explains 20% of casualties' compliance rates, 34% of their reassurance levels, and 35% of their confidence in their cleanliness following decontamination.

Figure 6.3¹⁵: A path model representing the results from Exercise E.



In line with the findings from the correlational analyses and the findings from model 2, model 3 shows that there is a significant relationship between perceptions of good responder communication and reassurance, $\beta = .28, p = .006$, perceptions of good

¹⁵ The dotted lines represent relationships which were noted in the hypothesised model (Figure 6.1), but which were not supported by the data.

responder communication and confidence in responders, $\beta = .56, p < .001$, and confidence in responders and reassurance, $\beta = .38, p < .001$. The Sobel test indicates that casualties' confidence in responders is a significant mediator between perceptions of good responder communication and reassurance ($p = .001$).

In line with the findings from model 2, model 3 also shows a significant relationship between perceptions of good responder communication and confidence in cleanliness following decontamination, $\beta = .52, p < .001$. However, unlike model 2, model 3 indicates that there is a significant relationship between perceptions of good responder communication and compliance, $\beta = .31, p = .007$, and non-significant relationships between confidence in responders and compliance, $\beta = .19, p = .10$, and confidence in responders and confidence in cleanliness, $\beta = .12, n.s.$

Model 3 again shows no significant relationship between higher levels of reassurance and increased compliance.

Discussion

Field exercises that involve mass decontamination provide a useful setting in which to test the effects of responders' communication strategies on casualties' levels of compliance and reassurance. Findings from the correlational analysis and path diagrams largely support the first three hypotheses, by showing that there is a relationship between casualties' perceptions of good responder communications and increased compliance (both with willingness to be naked and to remain at the scene), greater reassurance, and increased confidence in cleanliness following decontamination. However, the relationship between casualties' perceptions of effective communication and the three outcome variables was almost always at least partially mediated by their confidence in the responders. This

suggests that increasing casualties' confidence in responders is one of the ways in which responding agencies can use their communication strategies to improve public compliance, increase reassurance, and increase confidence in cleanliness following decontamination.

Results also largely support the next four hypotheses. They show that there are significant associations between: perceptions of good responder communication and confidence in responders; confidence in responders and increased compliance; confidence in responders and increased reassurance; and confidence in responders and increased confidence in cleanliness.

The only hypothesis which is not supported is that greater levels of reassurance would result in higher levels of compliance. There is a possible explanation for this, which is that the reassurance measure used during this research was broad, and did not relate specifically to casualties' reassurance about decontamination. This might therefore explain why greater levels of reassurance show the expected relationship with other variables, but are not associated with increased compliance with decontamination. Future research should therefore measure anxiety relating specifically to the decontamination process, in order to establish its relationship with compliance.

The findings support previous research which indicates the importance of effective responder communication strategies during conventional and CBRNE incidents (Drury, 2009; Glass & Schoch-Spana, 2002; Proulx & Sime, 1991; Seeger, 2006). Analysis showed that confidence in responders was a mediating variable between perceptions of good responder communication and increased compliance, but that it was not the only mediating variable. Future research should therefore examine other variables which could mediate the relationship between the quality of responders' communications and casualties' levels of compliance, reassurance, and confidence in cleanliness following decontamination. For

example, based on evidence described in the Introduction, which shows that perceived forceful and disrespectful behaviour by responders during decontamination incidents can lead to reduced trust in responders and non-compliance with the decontamination process (Hanley, 1999), it may be that perceived legitimacy of response is another important mediating variable.

The elaborated social identity model (ESIM) (Drury and Reicher, 2000), based on ideas from the social identity approach (Tajfel & Turner, 1979; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), suggests that where crowd members perceive the actions of another group (such as responders) to be legitimate, this can facilitate a sense of shared social identity between crowd members and responders, which may in turn increase the likelihood that crowd members will see actions that are recommended by responders as ingroup normative. However, where crowd members perceive responder actions as illegitimate this could cause crowd members to unite against, and challenge the authority of, responders. Based on the ideas of the ESIM, it can be suggested that successful responder communication strategies during incidents that involve decontamination should appeal to mutually shared values - for example by explaining why the decontamination process is necessary in public (i.e. collective) health terms (e.g. it could prevent secondary contamination of family and community members). Neglect in explaining the purpose and benefits of decontamination could be perceived as an illegitimate denial of public rights to dignity and respect by members of an outgroup (responders), in the same way that any attempts to control (e.g. through barriers) or force (Hanley, 1999) people to undergo decontamination would cause both anxiety and offence. Public perception of an illegitimate response could result in non-compliance with decontamination, or even attempts to

challenge the authority of the emergency services (Carter, Drury, Amlôt, Rubin, & Williams, 2013c: Chapter 7).

This argument also provides an explanation for previous findings, which show that responders must take public concerns about privacy into account to ensure that members of the public comply with the decontamination process (U.S. Fire Administration, 1997). Future research into communication strategies during incidents involving decontamination should therefore examine public perceptions of responder legitimacy as a predictor of compliance. In line with the social identity hypotheses outlined here, this should be combined with measures of social identification.

This point takes us to the limitations of the present analysis. First, although exercises attempt to replicate a real incident as closely as possible, certain variables (especially fear, anxiety, and uncertainty) are likely to be significantly different during a real incident. While there is no reason to believe that the relationship between these variables should be any different during a real incident (indeed successful communication is likely to be even more important for reducing anxiety during a real incident), the fact that an exercise cannot closely represent a real life situation should be noted. Second, some of the volunteers from whom feedback data was collected had taken part in previous exercises involving an emergency response, and a few had previous experience of undergoing decontamination. While the effect of increased experience on public perceptions and behaviour during decontamination has not been established, the potential for increased experience to impact on public perceptions and behaviour during decontamination should be noted. See Chapter 5 for further discussion of this potential limitation. Third, the measures used in this research were not originally designed to test the current hypotheses, or indeed any theoretically derived hypotheses. Rather, they were primarily designed to

inform the evaluation and reporting of the exercise outcomes by the exercise planning teams. However, for many if not most of the items, there is a good *prima facie* case for interpreting each of the measures in the way we have in the analysis. Hence the fact that the measures were not designed with any specific hypotheses in mind does not necessarily preclude them from being used as successful measures of the relevant variables. The items were designed to measure relevant aspects of public feeling and behaviour during mass decontamination and, as such, they arguably capture important aspects of these experiences.

Due to the fact that the items were not originally designed to test these kinds of hypotheses, there is also a question regarding their reliability. While most of the scales had good to excellent reliability, some variables were measured by only one item, which may reduce the reliability of these items. However, the consistency in the outcomes across the exercises suggests that the items are reliably measuring the same concepts each time.

Finally, the data presented within this paper are wholly cross-sectional, so we cannot be sure about causal relationships between variables. It is possible that there are other explanations for the relationships between variables. The paths we have suggested therefore require validation using experimental methods, to clarify the causal paths between variables.

Conclusions

The findings presented within this paper show that exercises can provide valuable opportunities to test the impact of responders' communication strategies on public behaviour. The study showed very similar relationships between key variables across all five exercises, which indicates that there is a relationship between public perceptions of good responder communication strategies and the key outcome variables. Future research should strive to develop validated scales with which to measure the relevant variables. It

would also be beneficial to include specific items measuring social identity variables (e.g. perceived legitimacy of response, shared social identity etc.), in order to ascertain the mediating role which these variables may play between successful responder communication strategies and the relevant outcome variables. In the meantime, people who are tasked with communicating with the public during a real incident involving decontamination should be aware that inadequate or disrespectful communications with members of the public, and providing insufficient practical information about the decontamination process, may impact on public compliance and anxiety during mass decontamination.

CHAPTER 7**Paper 6: Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise**

Reference:

Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (2013). Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise. *Basic and Applied Social Psychology*, 35(6), 575-585.

Abstract

Emergency responders' failure to communicate effectively during decontamination following a chemical, biological, radiological, or nuclear (CBRN) incident has been associated with increased public anxiety and reduced public compliance. In this study we applied the social identity approach to evaluating a field exercise that involved mass decontamination. Questionnaires were collected from 115 volunteers, who participated in the exercise as simulated casualties. Volunteers' perceptions of effective responder communication predicted increased self-reported compliance with decontamination, mediated by perceived responder legitimacy and identification with other group members. Developing effective communication strategies using a social psychology perspective could improve the way in which incidents are managed.

Introduction

Decontamination is an intervention which can be employed by the emergency services following a chemical, biological, radiological, or nuclear (CBRN) release.

Decontamination involves those who have potentially come into contact with a contaminant removing their clothing and going through a showering process. This has two aims: to remove any contaminant from a victim's skin, and thus prevent the victim from suffering further ill-effects, and to reduce the risk of secondary contamination of other people and places. Failure to carry out decontamination effectively could result in increased numbers of casualties and lives being lost. In the UK, the Fire and Rescue Service have specialised decontamination showering units, which can process up to 150 people per hour (Devon and Somerset Fire and Rescue Service, 2010).

The likelihood of an incident involving CBRN agents has increased in recent years (Alexander & Klein, 2006; HM Government, 2010b; Holdsworth, Bland, & O'Reilly, 2012; O'Brien, 2011; Schneidmiller, 2012), and therefore the development of effective management strategies for incidents involving decontamination is more important than ever. Research into small scale incidents involving decontamination has shown that a successful communication strategy and respect for public concerns about privacy and modesty are essential to facilitate the successful management of these types of incident (Vogt & Sorensen, 2002). Failure to communicate effectively or to show respect for public concerns about privacy may result in non-compliance with the decontamination process (U.S. Fire Administration, 1997), either directly, perhaps through concerns about perceived legitimacy of the intervention, or indirectly, by increasing anxiety (Hanley, 1999). High levels of public non-compliance and anxiety are therefore two factors which could hinder the successful management of the decontamination process during a real life incident; an

understanding of the factors which affect non-compliance and anxiety will be crucial for generating recommendations for the management of incidents involving decontamination.

Whilst the evidence above provides important insights into the way members of the public experience the decontamination process, it is taken from small-scale incidents (< 30 people), rather than incidents involving mass decontamination. Mass decontamination may present different challenges for members of the public and responders since it involves *crowds* (Edwards, Caldicott, Eliseo, & Pearce, 2006). Social psychological theories of crowd behaviour in emergencies and disasters may therefore provide important insights into factors which play a part in the successful management of incidents involving mass decontamination. The present study applies social psychological theories of crowd behaviour, in particular the social identity approach, to public experiences of mass decontamination during a multi-agency field exercise. The aim was to generate an understanding of how social psychological factors can affect public experiences, and hence behaviour, during incidents involving mass decontamination. In particular, the present study aimed to examine the role of effective responder communication in predicting three key outcome variables: public compliance; reduced public anxiety; and co-operative public behaviour, as well as how social identity variables can mediate these relationships.

Applying social psychological theories of crowd behaviour to mass decontamination

Early theories of crowd behaviour during disasters are based on the ideas of Le Bon (1895), and suggest that members of the public are likely to panic, and hence behave maladaptively, during such events (e.g. LaPiere, 1938; Smelser, 1963). However, these theories have been discredited by a wealth of evidence from mass emergencies showing that existing bonds, such as those between family members and friends, will be maintained, and hence normative conduct is typically maintained, leading to cooperative behaviour (e.g.

Aguirre, Torres, Gill, & Hotchkiss, 2011; Johnson, 1987; 1988; Quarantelli, 1954). The social identity approach to crowds (Reicher, 1984) has been applied to mass emergency behaviour in order to explain why cooperative behaviour has also been found in novel contexts among strangers who have no pre-existing social bonds – as among survivors of the London bombings of July 7th 2005 (Drury, Cocking, & Reicher, 2009a).

Applying principles of self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) to explain these group-like phenomena in emergencies, Drury et al. (2009b) suggested that strangers can develop a shared social identity during disasters and emergencies, as a result of a perception of ‘shared fate’ in relation to the threat they all face. Based on a perception of shared fate, those who are affected by a disaster categorise themselves as similar to one another, in terms of their relationship to the disaster, and thus shared identity develops. In turn, a shared social identity can lead to the expectation that other crowd members will behave supportively and cooperatively and, in addition, enhances own willingness to cooperate with and help other crowd members. By examining crowd behaviour during various different disasters and mass emergencies, including bombings, fires, and sinking ships, Drury et al. found that shared social identity among members of the public resulted in increased levels of cooperative and helping behaviour (such as forming an orderly queue rather than pushing, helping others up who had fallen, and taking the injured to a place of safety) (Drury et al., 2009a; b; Drury, Cocking, Reicher, Burton et al., 2009c). It has also been shown that shared social identity can result in reduced levels of stress (Haslam, Jetten, O’Brien, & Jacobs, 2004; Haslam, O’Brien, Jetten, Vormedal, & Penna, 2005), since it is the basis of expectations of social support (Haslam, Jetten, & Waghorn, 2009; Haslam et al., 2005; Haslam & Reicher, 2006). In the current study, it was therefore predicted that increased identification among members of the public,

and between members of the public and emergency responders, would reduce levels of public anxiety.

The idea of emergent shared social identity as a result of perception of common fate can be applied to situations of a crowd facing mass decontamination; the threat and certainly the intervention is likely to be experienced collectively amongst people who may have no previous bonds; and the intervention will require co-ordination (orderly queuing) and perhaps help (in disrobing, washing etc.) amongst members of the public. Mass decontamination requires large numbers of people to wait their turn in order to go through the decontamination process, and so orderly and cooperative behaviour from members of the public will be essential to facilitate the smooth-running of the process. Put differently, a disorderly public response could turn a major incident into a catastrophe, resulting in increased spread of any contaminant into the wider community (Edwards et al., 2006).

However, mass decontamination is not only a relationship between a crowd and a threat, but also between the crowd and a team of professional responders. Research based on the social identity approach may also provide insights into this relationship. Studies of interactions between the public and Police during football matches indicate that successful communication strategies, and the perceived sufficiency of practical information provided, result in increased perceptions of Police legitimacy (Reicher et al., 2007; Stott, Adang, Livingstone, & Schreiber, 2008). These increased perceptions of legitimacy have been shown to increase public compliance with instructions (Stott, Hoggett, & Pearson, 2012), and reduce conflict between Police and members of the public (Stott et al., 2008), by increasing shared identity between Police and members of the public.

The same principles could be applied to incidents involving mass decontamination (Carter, Drury, Amlôt, Rubin, & Williams, in preparation: Chapter 3). It has been

hypothesised that showing respect for public concerns about privacy may also increase perceptions of responder legitimacy, and hence increase compliance with the decontamination process, during incidents involving decontamination (Carter et al., in preparation: Chapter 3). Thus in the present study we would expect perceptions of responder legitimacy to result in increased identification with responders, which will in turn enhance perceptions that responders instructions are normative, objective, and valued, which will in turn enhance compliance.

While identification with emergency responders may have a direct positive effect on reduced anxiety and increased compliance, as noted above, it is also possible that the relationship between identification with emergency responders and the relevant outcome variables will be mediated by identification with members of the public. If members of the public share a common positive relationship with emergency responders, they may simply unite around a perceived shared norm for the situation (of cooperation and compliance with the decontamination process) (cf. Turner et al., 1987; Turner, Oakes, Haslam, & McGarty, 1994). In this situation, identification with emergency responders around a (superordinate) identity (i.e. one that responders and crowd are perceived to have in common), may in turn serve to further enhance the unity within the crowd – for their shared identification with responders is something that unites them as a group.

The idea that identification with one group can strengthen identification among members of another group is supported by research into social identity and procedural justice (e.g. Group Value Model: Lind & Tyler, 1988). This suggests that identification with a group who are seen to represent wider values of society (e.g. Police), can serve to strengthen identification among members of the public, who are also seen to share values which are relevant to the content of the identity which the Police represent (e.g. preventing

crime and maintaining order). The impact of identification with one group on identification with another group is dependent on the content of the two groups' identities. In the case of mass decontamination, the content of the identity of the emergency responders is one of public health. If responders are seen to be legitimately upholding values of public health, this should serve to strengthen public identification with emergency responders. This unity with responders around the importance of promoting and protecting public health should serve to strengthen the shared social identity among members of the public who share these values, and who should therefore unite around this identity.

It is also possible that emergency responders may be able to actively promote increased shared identity among members of the public, as a level of shared identification between the public and responders may allow the latter to shape a norm of unity and cooperation through what and how they communicate when interacting with the crowd. Studies of leadership and social influence across a variety of group contexts have shown that leaders who are 'entrepreneurs of identity' are able to persuade others of their common identity and the legitimacy of their cause through the social categories and values they invoke (e.g. Klein, Spears, & Reicher, 2007; Reicher, Cassidy, Wolpert, Hopkins, & Levine, 2006). Thus by communicating effectively with a group whose support they are seeking, leaders can define aspects of shared social identity among that group, and hence strengthen the sense of shared social identity with the group as a whole.

No studies to date have explicitly examined the effect of identification with a relevant outgroup (e.g. emergency responders) on identification with other ingroup members (e.g. members of the public) in the context of mass emergencies. However, it is certainly possible that findings regarding the role of social identity in other contexts (e.g. procedural justice, leadership) may be equally applicable in the context of mass

emergencies; this will be tested in the current study by examining the relationship, if any, between identification with emergency responders and identification with members of the public. Based on the evidence above, it would be expected that if members of the public identify with emergency responders, around a norm of promoting public health, this will serve to strengthen the shared identity among members of the public, who will also unite around this norm; thus, we would expect a positive relationship between identification with emergency responders and identification with members of the public.

The present study

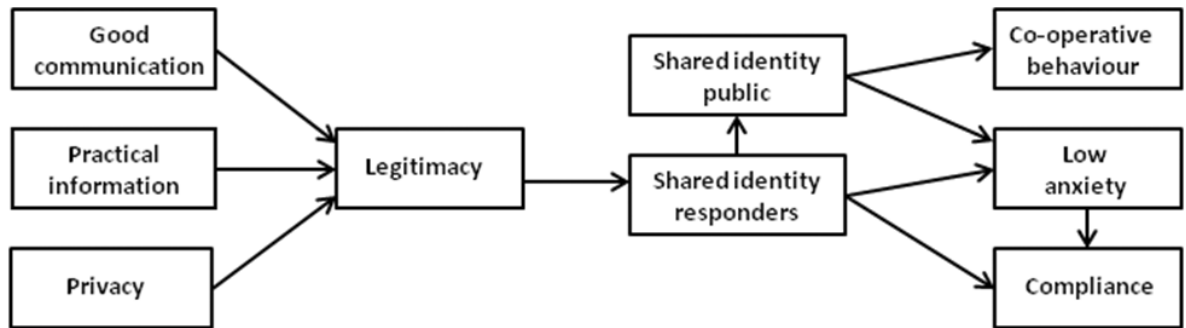
Opportunities to examine public experiences of mass decontamination have been limited, due to the relative scarcity of these types of incidents. Useful insights have been gained from surveying members of the public who have undergone large-scale field exercises involving mass decontamination (Carter, Drury, Rubin, Williams, & Amlôt, 2012: Chapter 5; 2013b: Chapter 6). These studies have shown that effective communication strategies can increase public compliance, and reduce anxiety, during decontamination. However, in these exercises, like most previous exercises, the emphasis has been on decontamination as a technical process only. Feedback collected from volunteers in these exercises focused on the physical success of the decontamination process, and did not examine the psychological variables which may play a part in the way in which members of the public experience the decontamination process.

This study examined the mediating role of social psychological variables between effective responder communication strategies and outcome variables, during a large scale field exercise involving mass decontamination. Feedback questionnaires were developed which included measures of social identification and other measures. These were completed by casualty volunteers following the exercise. Variables measured included: perceptions of

responder communication; levels of concern about privacy; perceptions of responder legitimacy; shared social identity between responders and members of the public; shared social identity among members of the public; levels of anxiety; levels of compliance; and perceptions of co-operative behaviour among casualties.

Based on the evidence outlined above, several hypotheses were generated about the ways in which responders' communication strategies might affect the relevant outcome variables (public cooperation, compliance, and anxiety), and the mediating role which relevant social identity variables might play. First, we hypothesised that perceptions of effective responder communication, provision of practical information, and levels of privacy would all predict perceptions of responder legitimacy. Second, we hypothesised that perceptions of responder legitimacy would result in increased identification with emergency responders. Third, we hypothesised that if members of the public identified with emergency responders around norms and values of protecting public health, this would serve to strengthen unity among members of the public around the same norms and values; we therefore predicted a positive relationship between identification with emergency responders and identification with members of the public. Fourth, we hypothesised that identification with members of the public would predict both co-operative behaviour and reduced anxiety among members of the public. Fifth, we hypothesised that identification with emergency responders would predict increased compliance, and reduced anxiety, among members of the public. Finally, we hypothesised that reduced anxiety about the decontamination process would predict increased compliance with decontamination. These hypotheses are illustrated in our path model in Figure 7.1.

Figure 7.1: A path model representing the expected relationships between variables



Method

Background

Emergency preparedness field exercises occur regularly throughout the UK, and are designed to provide a safe learning environment for emergency responders to test their response procedures, whilst aiming to be as realistic as possible. Feedback questionnaires are routinely completed following field exercises by volunteers who act as simulated casualties. These usually focus on evaluating aspects of the emergency response and do not include items designed to measure psychosocial aspects of the public's response to the decontamination process. The exercise reported in this paper was a multi-agency 'live' exercise, involving a scenario where a perpetrator deliberately released an unidentified chemical in a large room full of people attending a conference. Following this, those affected began to show symptoms such as eye irritation, shortness of breath, and nausea. The exercise involved closing several roads in a city centre, for over 5 hours, in order to decontaminate over 100 notionally 'contaminated' simulated casualties. The decontamination process was led by the Fire and Rescue Service and large numbers of Police and Ambulance Service staff also helped to manage the simulated incident.

Participants

Volunteers were members of the public who were recruited by the British Red Cross. In total, 115 volunteers were decontaminated during this exercise. Thirty eight percent of the volunteers were male and 62% were female. Their ages ranged from six to 69 years, with an average age of 31. Twenty four volunteers (21%) were under the age of 16 and 3 volunteers (2.6%) were under the age of 12. There were no age restrictions on participating in the study. Volunteers received no payment for taking part, but did receive reimbursement of their travel and subsistence expenses.

Measures

Data were collected using the feedback questionnaires, which were completed by volunteers both before and after the exercise. The pre-exercise and post-exercise questionnaires contained items relating to volunteers' identification with other members of the public (other volunteers) and to volunteers' identification with the emergency responders, to allow an examination of how these variables might have changed as a result of taking part in the exercise. The pre-exercise questionnaire (Appendix 6) contained items relating to simulated casualties' identification with other volunteers (e.g. "I feel a sense of unity with the other casualty volunteers who are taking part in the exercise today") (two items, $r = .69$), and items relating to identification with emergency responders (e.g. "I feel a sense of unity with the emergency responders who will be managing the incident during the exercise today") (two items, $r = .83$). As the correlation between the two pre-exercise identification with other volunteers items was acceptable, the decision was taken to include these items as a scale. The post-exercise questionnaire (Appendix 7) contained items relating to simulated casualties': perceptions of responder communication (e.g. "Emergency responders explained clearly what was happening during the decontamination

process”) (three items, $\alpha = .85$); perceptions of level of practical information provided (e.g. “Emergency responders provided sufficient practical information about what we were supposed to do during the decontamination process”) (two items, $r = .84$); perceptions of level of privacy (“I had sufficient privacy during the decontamination process”) (one item); perceptions of responder legitimacy (e.g. “Emergency responders behaved in a fair way during this incident”) (five items, $\alpha = .92$); identification with other volunteers (e.g. “I felt a sense of unity with other casualty volunteers who took part in this exercise”) (two items, $r = .74$); identification with emergency responders (e.g. “I felt a sense of unity with the emergency responders who were managing this incident”) (two items, $r = .86$); level of anxiety (e.g. “I felt anxious during the decontamination process”) (three items, $\alpha = .84$); willingness to comply with the need for decontamination during a real incident of this type (“I would be willing to undergo a decontamination shower during a real life incident of this kind”) (one item); and perceptions of co-operative behaviour among exercise volunteers (e.g. “I saw casualty volunteers co-operating with each other during this exercise”) (two items, $r = .85$). The post-exercise questionnaire also contained a measure to check volunteers’ engagement with the exercise (e.g. “I felt emotionally engaged during the exercise”) (three items, $\alpha = .76$).

Each item on the pre-exercise and post-exercise questionnaires was measured using a 7-point Likert scale, with 1 being ‘strongly disagree’, and 7 being ‘strongly agree’.

Procedure

Volunteers were provided with information about the nature of the exercise and their role as simulated casualties before they decided whether or not to take part. On arrival, the casualties were registered and were asked to complete the pre-exercise questionnaire.

They then received a group briefing, to provide them with more information about what would happen during the exercise. Following this, simulated casualties entered the exercise venue, and were sprayed with water, to simulate a chemical and start the exercise. Staff from the Fire and Rescue Service instructed simulated casualties to disrobe down to swimwear and undergo a decontamination shower. The volunteers were asked to complete the post-exercise feedback questionnaires at the end of the exercise.

Ethics

This study was carried out as part of a wider emergency preparedness field exercise, designed as an evaluation of the plans and procedures of the emergency services. Participants were recruited to go through the decontamination process during the exercise as part of a service evaluation of the emergency services. As the primary aim of the exercise was as a service evaluation, and as the data collected during this research informed that service evaluation, ethical approval was not required (National Patient Safety Agency, 2010).

Results

Preliminary results

Independent samples *t*-tests were carried out to examine any possible differences relating to age or sex of volunteers. Results revealed that there were no significant differences between males and females on any of the variables. To establish the effect of including those under the age of 16 in the analysis, the variable means for the group as a whole (including the data from those under 16) were compared to the means for the group of adult volunteers (excluding the data from those under 16). Results showed that removing those under the age of 16 from the analysis did not significantly alter the means of any of

the variables. The decision was therefore taken to include the data from those under 16 in the overall analysis.

Engagement checks

An initial one sample *t*-test revealed that participants reported good engagement with the exercise, with a mean scale score for engagement of 5.1, which was significantly above the mid-point value of 4, $t(84) = 8.07, p < .001$.

Pre-exercise-post-exercise tests

A within-subjects *t*-test revealed that there was a significant increase in identification with other members of the public from Time 1 (before the exercise) ($M = 4.38, SD = 1.06$), to Time 2 (after the exercise) ($M = 5.19, SD = 1.26$), $t(71) = -4.40, p < .001$, and a decrease in identification with emergency responders from Time 1 ($M = 4.18, SD = 1.24$) to Time 2 ($M = 3.84, SD = 1.45$), which approached significance, $t(69) = 1.80, p = .08$.

To examine whether the increase in identification with other members of the public following the exercise was due to decreased perceptions of responder legitimacy, as might be expected, a correlation was carried out between the level of change in identification with members of the public (created by subtracting identification with other members of the public at Time 1 from identification with members of the public at Time 2) and perceptions of responder legitimacy following the exercise. This showed a very small positive correlation, which was not significant, $r = .10, p = .42$. A second correlation was then carried out between the level of change in identification with members of the public from Time 1 to Time 2, and the level of change in identification with emergency responders from Time 1 to Time 2. This showed a strong positive correlation, which was significant, $r = .37, p = .002$. This indicates that the change in identification with other members of the public

following the exercise increased as the change in identification with emergency responders following the exercise increased.

Path analysis

Before carrying out path analysis, bivariate correlations were carried out to examine relationships between the variables. Results of the bivariate correlations are presented in Table 7.1.

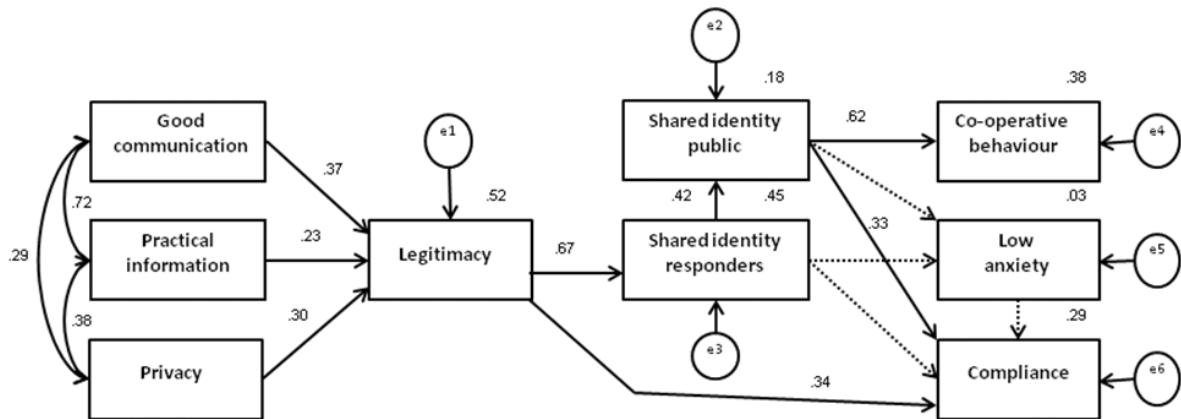
Table 7.1: Correlation matrix for all variables

	Effective comms	Practical info	Privacy	Legitimacy	Shared ID responders	Shared ID public	Compliance	Low anxiety	Co- operation
Effective comms	1								
Practical info	.72**	1							
Privacy	.30*	.38**	1						
Legitimacy	.63**	.62**	.50**	1					
Shared ID responders	.44**	.46**	.41**	.68**	1				
Shared ID public	-.04	.006	.30*	.29*	.43**	1			
Compliance	.23*	.21*	.36**	.44**	.30*	.44**	1		
Low anxiety	.01	.08	.10	.01	-.13	-.15	.01	1	
Co- operation	-.06	-.02	.24*	.22*	.27*	.61**	.31*	-.15	1
Note:	**.Correlation is significant at the .001 level				*.Correlation is significant at the .05 level				

Scores from the measures used at Time 2 were then entered into a path model, which is presented in Figure 7.2. Model chi-square was used to evaluate the overall model-data fit. A non-significant chi-square result indicates that the null hypothesis can be accepted, and that the model has good overall fit with the data. Chi-square is the most widely used measure of model fit, but it is sensitive to sample size (Marsh, Hau, & Wen, 2004). It is therefore recommended that other fit indices, such as the comparative fit index (CFI) and the root mean square of approximation (RMSEA) should be used alongside

model chi-square. To be said to have good fit with the data, a model should have a CFI value of above .95, and an RMSEA value of below .08 (Hu & Bentler, 1999). Some data were missing from the participants' responses, and that was dealt with by using the Maximum Likelihood Robust estimation method.

Figure 7.2: A path model of the data collected at Time 2, following the mass decontamination field exercise.



The path model showed a good overall fit with the data, $\chi^2(23) = 27.10, p = .25$.

CFI gave a value of .98, above the recommended cut off value of .95, and RMSEA gave a value of .04, below the recommended cut off value of .08.

The model explained 38% of the variance in perceptions of co-operative behaviour amongst members of the public, 29% of compliance (willingness to undergo decontamination during a real incident), and 3% of low anxiety.

As hypothesised, the model showed that there was a significant relationship between perceived effective responder communication and perceptions of responder legitimacy, $b = .40, p < .001$, provision of sufficient practical information and perceptions of responder legitimacy, $b = .22, p = .04$, and level of privacy and perceptions of responder legitimacy, $b = .22, p < .001$. The model also supported the hypotheses in showing

significant relationships between perceptions of responder legitimacy and identification with emergency responders, $b = .67, p < .001$, identification with emergency responders and identification with other members of the public, $b = .36, p < .001$, and identification with other members of the public and perceptions of co-operative behaviour amongst members of the public, $b = .69, p < .001$. There was also a significant direct relationship between perceptions of responder legitimacy and compliance, $b = .38, p < .001$.

However, there was no significant direct relationship between identification with emergency responders and level of compliance. There was instead a significant indirect relationship between identification with emergency responders and level of compliance, mediated by identification with other members of the public. The indirect effect through identification with other members of the public was estimated to lie between .05 and .40 with 95% confidence.

The model showed that there was no significant relationship between identification with other members of the public and low anxiety, identification with emergency responders and low anxiety, or between low anxiety and level of compliance.

Three of the social identity variables (perceptions of legitimacy, identification with emergency responders, and identification with other members of the public) performed a significant mediating role within the model. Legitimacy mediated the relationship between perceived effective responder communication and compliance (indirect effect through legitimacy estimated to lie between .12 and .67 with 95% confidence), and between level of privacy and compliance (indirect effect through legitimacy estimated to lie between .03 and .28 with 95% confidence). Legitimacy also mediated the relationship between: effective responder communication and identification with emergency responders (indirect effect through legitimacy estimated to lie between .28 and .62 with 95% confidence); sufficient

practical information and identification with emergency responders (indirect effect through legitimacy estimated to lie between .23 and .54 with 95% confidence); and between level of privacy and identification with emergency responders (indirect effect through legitimacy estimated to lie between .14 and .34 with 95% confidence). Identification with responders mediated the relationship between legitimacy and identification with other members of the public (indirect effect through identification with responders estimated to lie between .08 and .45 with 95% confidence). Identification with other members of the public mediated the relationship between identification with emergency responders and perceptions of cooperative public behaviour (indirect effect through identification with other members of the public estimated to lie between .09 and .42 with 95% confidence), and between identification with emergency responders and compliance (indirect effect through identification with other members of the public estimated to lie between .05 and .40 with 95% confidence).

Possible alternative model

To rule out other potential explanations for the relationships among variables within the model, a second model was also tested. Whilst the first model revealed a correlation between perceptions of legitimacy and identification with emergency responders, it is possible that increased identification with emergency responders resulted in increased perceptions of legitimacy, rather than increased perceptions of legitimacy resulting in increased identification with emergency responders. We therefore tested an alternative model, where the relationship between overall communication, perceptions of legitimacy, and identification with responders was entered as: overall communication → identification with responders → perceptions of legitimacy. The model did not fit well with the data when compared with the first model, $\chi^2(23) = 45.74, p = .003, CFI = .91, RMSEA = .09$,

suggesting that the initial model, based on the hypothesised relationships, provided a better explanation for the data

Discussion

The results supported the initial hypotheses, in showing that social identity variables (perceptions of responder legitimacy, shared social identity among members of the public, and shared social identity between responders and members of the public) played a significant mediating role between perceived good communication strategies and respect for casualties' concerns about privacy, and two of the relevant outcome variables (compliance and perceptions of co-operative behaviour). As expected, legitimacy was a significant mediating variable between perceived good communication, sufficient practical information and level of privacy, and shared social identity between responders and members of the public. In turn, shared social identity between responders and members of the public, and shared identity among members of the public, were significant mediators between perceptions of responder legitimacy and level of public compliance and between perceptions of responder legitimacy and perceptions of co-operative behaviour between members of the public.

The mediating role played by these variables was therefore broadly as expected, although there were a few hypotheses which were not supported. The data failed to show a direct relationship between shared social identity between responders and members of the public and compliance. However, as predicted, there was an indirect relationship between these two variables, mediated by shared social identity among members of the public. We suggest that this may be because decontamination is a potentially embarrassing situation for members of the public, and therefore identifying with emergency responders will be necessary, but not sufficient, to encourage members of the public to comply with the

decontamination process; it will also be necessary for decontamination to be adopted by members of the public as a shared group norm. If members of the public do not identify with emergency responders (and therefore do not internalise responder norms of protecting public health), decontamination will not be accepted as a shared norm, and therefore the potential embarrassment of showering naked in front of a group of strangers could prevent members of the public from complying with responder instructions. However, if members of the public have a shared social identity, based on their shared social identity with emergency responders (around a norm of health protection), this may facilitate compliance and cooperation with actions which are seen to be in line with the norm of protecting public health (such as undergoing decontamination), and will hence reduce any social cost (in terms of embarrassment) associated with undergoing the decontamination process. Whilst the current research measured intentions to comply during a real incident, rather than actual compliance, the high level of realism in the scenario generates confidence that intentions to comply will be an accurate measure of actual compliance during a real incident of this type.

The other hypotheses which were not supported were those relating to anxiety, which did not correlate with any of the other measures. We suggest that the reason for this may be that the mean score for anxiety was very low, possibly because this was a simulated situation. This point is discussed further in the limitations section below.

The results showed that there was a decrease in shared social identity between responders and members of the public over the course of the exercise, which approached significance. This suggests that members of the public may have been unhappy with the way in which emergency responders managed the decontamination process. This is supported by the fact that perceptions of responder legitimacy correlated strongly with identification with emergency responders. This is also supported by informal observations

made by the research team during the exercise. Whilst participants were initially quiet and fairly compliant with responder instructions, the longer they were left to wait with no communication or instruction from responders (over an hour in total), the more the relationship between the group of members of the public and the emergency responders appeared to deteriorate. This was demonstrated by members of the public talking to each other about the poor level of communication and instruction they were receiving from emergency responders, arguing with emergency responders, and even attempting to leave the scene (before being decontaminated). The fact that identification with responders decreased following the exercise could have had serious consequences in terms of level of compliance with the decontamination process had the exercise been a real incident, which could have resulted in serious delays to the decontamination process, and lives being lost.

Further, written quotes from participants themselves provide evidence that a lack of communication from emergency responders resulted in reduced compliance and co-operation: *“Communication was severely lacking/ inadequate throughout the event. People would’ve felt calmer/ co-operated more readily if comms had been better”* (Participant 56). Further, when asked why they felt anxious during the exercise (if at all), several participants stated that this was directly due to a lack of communication from emergency responders, or to a perceived lack of respect from emergency responders (perceived illegitimate response), which in some cases was very strongly felt: *“I can’t begin to describe how humiliated my children and I felt, there was a total lack of respect. No one helped us”* (Participant 27).

The results also showed that there was a significant increase in shared social identity between members of the public over the course of the exercise. This is consistent with findings from many real emergencies (e.g. Drury et al., 2009a; 2009b) and other

crowd events (Stott, Hutchison, & Drury, 2001; Stott & Reicher, 1998b). This increased identification with the rest of the crowd may have either been as a result of the shared experience of taking part in the decontamination exercise itself, or as a result of perceived illegitimacy on the part of emergency responders (cf. Stott et al., 2001; Stott & Reicher, 1998b). However, as the correlation between the change in identification with members of the public following the exercise and the change in identification with emergency responders following the exercise was positive, it is unlikely that the increased sense of identification with other members of the public following the exercise resulted from perceived illegitimate behaviour on the part of emergency responders. It is therefore more likely that the increase in shared social identity between members of the public following the exercise resulted directly from members of the public having participated in the exercise together and this experience operating as a form of perceived common fate (or, in self-categorization terms, comparative fit; Turner et al., 1987).

Implications

Overall, the findings reported here show that effective responder communication strategies, sufficient practical information, and respect for casualties' concerns about privacy and modesty, can significantly affect public compliance with the decontamination process and perceptions of co-operative behaviours among members of the public. This has important implications for real-life incidents involving mass decontamination, during which quick and efficient decontamination could save lives. This study shows that failure of emergency responders to communicate openly with members of the public creates a perception of responder illegitimacy, which may result not only in members of the public being less likely to comply with responder instructions (cf. Stott et al., 2012), but also in members of the public uniting to challenge the authority of emergency responders (Stott et

al., 2001). Failure of members of the public to undergo the decontamination process successfully could result in prolonged contamination and increased risk for those involved, as well as secondary contamination of other people and places.

A crucial issue is that in any emergency, the professional responders will rely on members of the public to internalise the duty of complying with recommended protective actions, such as decontamination. There are unlikely to be enough responders to force the public to undergo the process; and even if there were, we suggest that such an approach would badly backfire. The current findings underline the importance of considering soft skills (such as communication, and the need to respect public concerns about privacy), and indeed the whole social relationship between professional responders and members of the public. This relationship has been neglected until now in favour of technical solutions, and hence technical preparation and training.

Limitations

A limitation of the current research relates to the lack of relationship between anxiety and any of the other variables. This may be because, although participants reported good engagement with the exercise, this was still a simulated situation, in which participants knew that no harm would come to them. In this way, it was far less stressful than a real situation of this type might be. This may have led to the very low overall levels of anxiety reported during this exercise, which presented difficulties in accurately examining the effect of other variables on level of anxiety. However, previous research has shown that volunteers do experience increased stress when undergoing decontamination during an exercise, due to the unfamiliar and unusual nature of the situation (Carter et al., 2012: Chapter 5). It is therefore possible that the low level of anxiety reported during this

study was an artefact of the anxiety measure used, rather than because volunteers did not experience any increased anxiety.

While anxiety is obviously likely to be lower during a simulated incident than during a real life incident, it is possible that other variables might also be different if a real life situation involving mass decontamination were to occur. However, the findings reported in this study mirror those which have been found during real life small-scale incidents involving decontamination, in showing that effective communication and respect for casualties' concerns about privacy resulted in increased levels of compliance (e.g. Hanley, 1999; U.S. Fire Administration, 1997).

A second limitation is that outcome measures were self-reported rather than direct observations of behaviour. In future studies of this kind, systematic direct observation of behavioural variables that reflect public cooperation and compliance would help to corroborate the findings in this study.

Conclusion

Effective management of incidents involving mass decontamination is likely to be crucial in order to reduce numbers of casualties, and ultimately to save lives. This study goes beyond previous research into incidents involving decontamination by adding theoretically-driven social psychological measures to standard evaluation questionnaires; these allowed us to examine the extent to which social identity variables mediate the relationship between communication strategies and respect for privacy, and the relevant outcome variables. Future research should manipulate and compare different types of communication strategy, to measure the extent to which some communication strategies are perceived by members of the public as effective (hence increasing perceptions of responder legitimacy), while others are not. It may not be enough to simply provide more information

to members of the public – the content of such communication, and the way in which it is delivered, should also be considered.

CHAPTER 8

Paper 7: Effective responder communication, perceived responder legitimacy and group identification predict public cooperation and compliance in a mass decontamination visualisation experiment

Reference:

Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (Submitted). Effective responder communication, perceived legitimacy and group identification predict public cooperation and compliance in a mass decontamination visualisation experiment.

Abstract

This visualisation experiment tests hypotheses, based on the social identity approach, about the effectiveness of communication strategies during mass decontamination. Specifically, the mediating role of social identity processes between effective responder communication and relevant outcome variables (e.g. public compliance) is examined. After visualising that they had been involved in a hypothetical incident involving decontamination, participants ($N = 129$) received one of three different communication strategies: 1) Health-focused information about decontamination, sufficient practical information; 2) No health-focused information, sufficient practical information; 3) No health-focused information, low practical information. The communication strategy perceived as the most effective included health-focused information and practical information; this resulted in the highest levels of expected compliance, mediated by social identity variables. The implications of this finding for management of mass decontamination are discussed.

Introduction

The potential for incidents involving releases of chemical, biological, radiological, or nuclear (CBRN) agents has increased in recent years, due to technological advances, and the increased willingness of terrorists to use unconventional weapons (Alexander & Klein, 2006; HM Government, 2010b; Holdsworth, Bland, & O'Reilly, 2012). Despite the death of Al-Qaeda leader Osama Bin Laden in 2011, experts believe that the threat from this type of incident has not diminished and, indeed, continues to increase (O'Brien, 2011; Schneidmiller, 2012). This is of concern to policy makers and planners, since incidents involving the release of CBRN agents have the “capability to cause significant disruption and loss of life” (HM Government, 2010b, p. 6).

One intervention which can be employed by emergency responders to reduce the risk from incidents involving CBRN agents is decontamination. Decontamination involves those who have potentially come into contact with a contaminant undergoing a shower in order to remove the contaminant from their skin. Decontamination serves two main aims: to remove as much contaminant from the skin as possible, and thus reduce the risk of adverse health effects from the contaminant, and to prevent the secondary contamination of other people and places. In order to be effective, decontamination needs to be carried out as quickly as possible following a potential CBRN release. In the UK, the Fire and Rescue Service have specially designed decontamination tents, which can be set up near the scene of any possible large scale contamination (New Dimension Regional Team, 2003), and which can facilitate the showering of up to 150 people per hour (Devon and Somerset Fire and Rescue Service, 2010).

Incidents involving CBRN agents have the potential to be especially frightening for those involved, due to their unfamiliar and ambiguous nature (Bhardwaj, 2010; Cornish,

2007). Further, although decontamination is designed to reduce the risk to members of the public during incidents involving CBRN agents, it may actually be more frightening for members of the public than the risk from the CBRN agent itself, if not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997). Evidence from small-scale incidents involving decontamination has shown that failure of emergency responders to communicate effectively with members of the public, or to show respect for public concerns about privacy and modesty, may result in increased levels of public anxiety and decreased public compliance (Hanley, 1999; United States Fire Administration, 1997). Effective responder communication strategies are therefore essential to facilitate the smooth-running of incidents involving decontamination (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2; Vogt & Sorensen, 2002). Reduced public compliance and cooperation may result in disorder and delays to the decontamination process (Edwards, Caldicott, Eliseo, & Pearce, 2006), which could cost lives during a real incident (Lillie, Mattis, Kelly, & Rayburn, 2006; Schulze & Lake, 2009).

While the evidence described above provides insights into the importance of communication with members of the public during incidents involving decontamination, it is taken from small-scale incidents involving decontamination (< 30 people), and not from incidents involving *mass* decontamination. Incidents involving mass decontamination may present greater challenges for emergency responders and members of the public, as they involve crowds (Edwards et al., 2006), which responders perceive as a source of disorder and psychosocial dysfunction in emergencies (Carter, Drury, Rubin, Williams, & Amlôt, in press: Chapter 4). Theories of crowd behaviour during mass emergencies may therefore yield important insights into factors which play a part in the successful management of incidents involving mass decontamination.

Early theories of crowd behaviour during mass emergencies were based on the ideas of Le Bon (1895) and saw the disaster crowd as being irrational and prone to panic (e.g. LaPiere, 1938; Smelser, 1963; see Bendersky, 2007). However, evidence from disasters such as fires and crushes has shown that panic is rare; existing social bonds, such as those between family members and friends, are typically maintained during such disasters (Johnson, 1987; 1988; Quarantelli, 1954). Normative theories of crowd behaviour during disasters therefore suggest that the maintenance of existing social relationships promotes normative conduct, and hence members of the public typically attempt to behave co-operatively, rather than competitively, during such disasters (e.g. Aguirre, Torres, Gill, & Hotchkiss, 2011; Cornwell, 2003; Johnson, 1987; 1988).

More recently, the social identity approach to crowds (Reicher, 1984) has been applied to disasters and mass emergencies, to understand why co-operative behaviour is not only present among groups of people who already know each other, and among whom social bonds already exist, but also among groups of strangers (social identity model of collective resilience (SIMCR): Drury, Cocking, & Reicher, 2009a; 2009b). Drury et al. (2009a, 2009b) applied the principles of self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) to suggest that an emergency may create a sense of common fate among survivors, who then use this as a criterion for inferring self-category boundaries. Based on an analysis of public experiences of various disasters, from building fires to sinking ships, Drury et al. concluded that those who experience shared social identity, as a result of this sense of shared fate, are more likely to coordinate with, co-operate with and help others involved in the disaster, even at the possible expense of their own safety. This hypothesis is in line with experimental research on small groups which shows that the motivation to help and cooperate is a function of shared social identity

(Levine, Cassidy, Brazier, & Reicher, 2002; Levine, Prosser, Evans, & Reicher, 2005; Levine & Thompson, 2004).

The social identity approach has been used to generate recommendations for emergency responders, both during mass emergencies and disasters more generally (Cocking, Drury, & Reicher, 2009; Drury, 2012), and during incidents involving mass decontamination specifically (Carter, Drury, Amlôt, Rubin, & Williams, in preparation: Chapter 3). Carter et al. suggest that communication is a key intervention through which emergency responders can improve the management of the decontamination process, and that the reason for this is that effective communication is likely to result in increased public perceptions of responders' legitimacy. There is some support for this suggestion from parallel research. Studies examining interactions between crowd members and Police has found that effective communication from the Police results in increased perceptions that Police actions are legitimate (elaborated social identity model (ESIM): Drury & Reicher, 2000; Reicher et al., 2007; Stott, Adang, Livingstone, & Schreiber, 2008). These increased perceptions of Police legitimacy have been shown to result in greater public compliance with Police instructions (Stott, Hoggett, & Pearson, 2012) and to reduce conflict between members of the public and Police (Stott et al., 2008), by increasing a sense of shared social identity between Police and members of the public. Research into public responses to mass decontamination during emergency preparedness field exercises has shown that an effective responder communication strategy, along with consideration for public concerns about privacy, increases public perceptions of responders' legitimacy; this in turn can increase the public's identification with emergency responders and hence increase the willingness of members of the public to comply with decontamination (Carter, Drury, Amlôt, Rubin, & Williams, 2013c: Chapter 7).

While there is often a sense of shared identity among members of the public during disasters, as a result of the sense of shared fate they all face (Drury et al., 2009a), research has also shown that greater identification with emergency responders may increase identification with other members of the public; it is suggested that this is because members of the public may unite around their shared relationship with emergency responders (Carter et al., 2013c: Chapter 7; in preparation: Chapter 3). Applied to incidents involving mass decontamination, shared social identity among members of the public is likely to play a key role in the successful management of the incident. Mass decontamination requires large numbers of people to wait their turn, and to progress through the process in an orderly fashion. Shared social identification around values and norms shared with the responders can increase orderly and co-operative behaviour (e.g. orderly queuing) and helping behaviour (e.g. mutual help with disrobing, washing etc), which will facilitate the smooth-running of the decontamination process. By contrast, failure of members of the public to behave co-operatively reduces the ability of emergency services to manage the incident, and may result in increased spread of any contaminant (Edwards et al., 2006).

There are two other possible benefits of increased shared identity among members of the public, and between emergency responders and members of the public, during incidents involving mass decontamination. First, shared social identity is likely to facilitate a sense of collective agency among the group, by promoting a belief that members of the public will be able to work together and support each other in order to achieve shared goals (Drury et al., 2009a; Haslam, Jetten, & Waghorn, 2009). To the extent that members of the public identify with emergency responders, they should also expect support from them in carrying out responder-normative actions, and hence a sense of collective agency should also develop between members of the public and emergency responders. A sense of

collective agency may increase compliance by increasing public motivation to work together (and with emergency responders) to achieve the shared goal of decontamination (Carter et al., in preparation: Chapter 3). Second, shared social identity has been shown to reduce stress, by increasing shared expectations of group support (Haslam, Jetten, O'Brien, & Jacobs, 2004; Haslam, O'Brien, Jetten, Vormedal, & Penna, 2005; Haslam et al., 2009), and increasing individuals' ability to work together to challenge and reduce shared stressors (Haslam & Reicher, 2006). Relatedly, if emergency responders are perceived as being members of the ingroup, as described above, responders' communication strategies are likely to be more effective at reducing public anxiety (Haslam et al., 2004). Reducing anxiety about the decontamination process may also increase compliance with the process (Carter et al., in preparation: Chapter 3).

Carter et al. suggest three specific recommendations to facilitate the successful management of incidents involving mass decontamination, by optimising communication from emergency responders to members of the public: 1. Emergency responders should communicate openly and honestly with members of the public; 2. Emergency responders should provide health-focused communication to members of the public, such as why the decontamination process is necessary; 3. Emergency responders should provide sufficient practical information to members of the public. The present study sought to test these recommendations through a visualisation experiment.

The present study

Opportunities to examine the effectiveness of different responder communication strategies during real life incidents involving mass decontamination have been limited, as these types of incidents are rare. Useful insights into the relationship between responders' communication strategies and the relevant outcome variables (co-operative public

behaviour, compliance, and anxiety) have been gained by surveying members of the public who have undergone mass decontamination during field exercises (Carter, Drury, Amlôt, Rubin, & Williams, 2013c: Chapter 7; Carter, Drury, Rubin, Williams, & Amlôt, 2012: Chapter 5; 2013b: Chapter 6). Recent research examining public reactions to mass decontamination during a field exercise has revealed that social identity variables play an important mediating role between responders' communication strategies and the relevant outcome variables (Carter et al., 2013c: Chapter 7). However, this research relies on correlational data, and so while relationships between communication strategies and relevant outcome variables can be established, further research is required to confirm causal relationships.

One method which may enable the effect of different communication strategies during incidents involving decontamination to be tested is visualisation. Visualisation studies involve participants being asked to engage with a scenario, and to imagine themselves in the context of that scenario. While visualisation studies can involve elaborate role-playing technologies (e.g. Drury et al., 2009c), research has shown that simply asking participants to read and visualise simple written vignettes can facilitate good engagement with hypothetical scenarios (Ford & Ayres, 2009), including scenarios that aim to test the effect of different responder management strategies on public perceptions and actions during CBRN incidents (e.g. Pearce, Rubin, Amlôt, Wessely, & Rogers, 2013a; Pearce et al., 2013b). It is therefore possible that this method may also be usefully employed to examine the effect of different responder communication strategies on public perceptions and actions during incidents involving mass decontamination.

The study reported here builds on previous work by using an online visualisation experiment to specifically test the effect of three different responder communication

strategies on public responses during a hypothetical incident involving decontamination: ‘theory-based’, ‘standard practice’ and ‘brief’. The ‘theory-based’ communication strategy used in this research was designed based on the recommendations derived from the literature (Carter et al., in preparation: Chapter 3), and in this condition participants received health-focused explanations about why decontamination was necessary, regular updates about the actions emergency responders were taking, and sufficient practical information about the decontamination process. The ‘standard practice’ communication strategy was based on current standard practices used by emergency responders. In this condition participants were given sufficient practical information, but no health-focused information or updates about the actions responders were taking. The ‘brief’ communication strategy was designed to illustrate a ‘worst case’ communication strategy, which emergency responders have been seen to use during several field exercises involving mass decontamination. Participants in this condition were given neither health-focused information about the decontamination process, nor sufficient practical information.

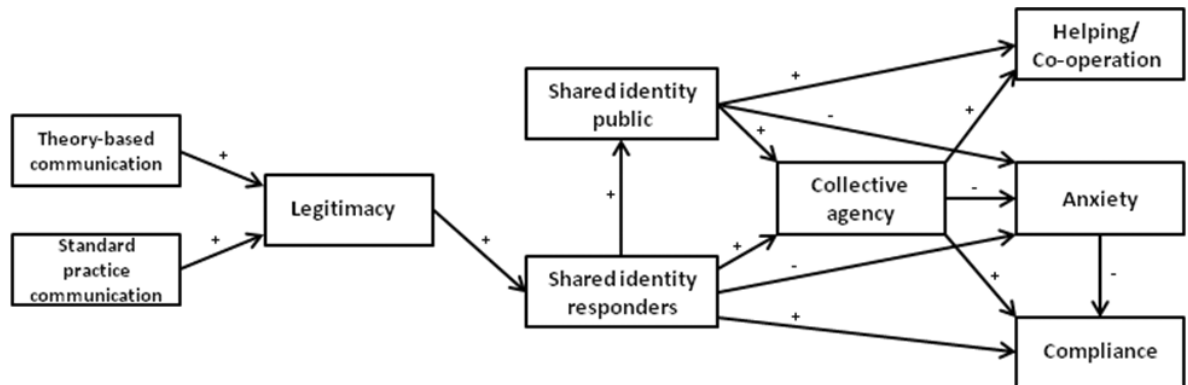
It was expected that those in the theory-based communication group would report more positive outcomes (e.g. increased responder legitimacy, increased identification with emergency responders, increased identification with other members of the public, increased expectations of collective agency, increased expectations of co-operative behaviour, increased expectations of compliance, and decreased expectations of anxiety), than those in the standard practice or brief communication groups. In turn, it was expected that those in the standard practice communication group would report more positive outcomes than those in the brief communication group.

It was also expected that those in the theory-based communication group would report more positive outcomes after the communication intervention (Time 2) compared to

before the communication intervention (Time 1) and that those in the brief communication group would report more negative outcomes at Time 2 compared to Time 1. As the standard practice communication condition was designed to reflect current standard practice, and might therefore be broadly the type of communication which participants would expect, it was predicted that those in the standard practice communication group would report similar outcomes at Time 2 compared to Time 1.

A model was created to illustrate the expected relationships between the different variables, based on the previous literature outlined above, and this is presented in Figure 8.1¹⁶.

Figure 8.1 - A path model representing the expected relationships between variables.



Method

Design

A mixed between- and within-subjects experimental design was used. The between-subjects design had one factor (quality of communication), with three levels (theory-based,

¹⁶ The 'theory-based communication' variable is in comparison to the standard practice and brief communication conditions, while the 'standard practice communication' variable is in comparison to the brief communication condition. Plus and minus signs indicate the direction of the expected relationship between variables.

standard practice, and brief). The within-subjects design had one factor (time), with two levels (Time 1, before receiving the communication intervention; Time 2, after receiving the communication intervention). The dependent measures were: perceptions of responders' legitimacy; shared social identity among members of the public; shared social identity between responders and members of the public; perceptions of collective agency; expected levels of anxiety during a real incident; expected levels of compliance during a real incident; and expected levels of co-operative behaviour among members of the public during a real incident.

Participants

A self-selected convenience sample of 129 psychology students from the University of Sussex were recruited via the University of Sussex online system for recruiting research participants. Participants signed up to take part in one of the three different communication conditions, without knowing which condition was which (theory-based condition, $N = 45$; standard practice condition, $N = 41$; brief condition, $N = 43$). The order in which the three conditions were advertised on the website was varied, to ensure that participant sign up for each condition was random. Thus participants had no way of knowing which condition was which, or of knowing what the three different conditions were. Participants were given no information about the hypotheses of the study, and were simply told that the aim of the study was to find out more about how people might experience the decontamination process. Participants received course credits for taking part in the research.

Materials

Scenario. A scenario was developed by the research team and was then discussed with a senior exercise planner, who had extensive experience of designing scenarios for emergency preparedness exercises. The scenario contained a description of the initial phase

of the incident, up to and including emergency responders setting up a decontamination tent. This was designed to give participants an idea of what the initial phase of this type of incident might look like, before they received one of the three different communication interventions. See Appendix 8 for a copy of the scenario used during this study.

Communication intervention. Three different communication interventions were developed, to reflect different communication strategies which could be used by emergency responders during an incident involving decontamination. See Appendix 9 for a copy of the three different communication interventions used during this study.

Pre-communication intervention questionnaire. The pre-communication intervention questionnaire (Appendix 10) contained items relating to: expectations of responders' legitimacy (e.g. "I imagined the emergency responders to be respectful") (2 items, $r = .70$); expected level of identification with other members of the public (e.g. "If this situation had been real, I would have identified with the other survivors") (2 items, $r = .86$); expected level of identification with emergency responders (e.g. "If this situation had been real, I would have felt a sense of unity with the Fire and Rescue Service personnel responding to the incident") (2 items, $r = .88$); and expectations of anxiety during a real incident of this type (e.g. "If this had been a real incident, I would have felt scared") (3 items, $\alpha = .84$).

Post-communication intervention questionnaire. The post-communication intervention questionnaire (Appendix 11) contained items relating to: perceptions of responders' communication (manipulation check) (e.g. "I felt that emergency responders provided me with sufficient information about what I needed to do during the decontamination process") (6 items, $\alpha = .87$); engagement with the scenario (manipulation

check) (e.g. “I felt emotionally engaged with the scenario”) (2 items, $r = .73$); perceptions of responders’ legitimacy (e.g. “I imagined the emergency responders to be fair”) (4 items, $\alpha = .85$); expected identification with emergency responders (e.g. “If this situation had been real, I would have identified with the Fire and Rescue Service personnel responding to the incident”) (2 items, $r = .89$); expected identification with other members of the public (e.g. “If this situation had been real, I would have felt a sense of unity with other survivors”) (2 items, $r = .93$); expectations of collective agency during a real incident (e.g. “If this situation had been real, I would have felt able to work with others to take appropriate actions to reduce the danger we were in”) (1 item); expectations of compliance with the process during a real incident (e.g. “If this situation had been real, I would have complied with the instructions of the emergency responders”) (3 items, $\alpha = .84$); expectations of helping and orderly behaviour during a real incident (e.g. “If this situation had been real I would have been willing to help other survivors”) (3 items, $\alpha = .81$); and expectations of anxiety during a real incident (e.g. “If this had been a real incident, I would have felt anxious”) (3 items, $\alpha = .91$).

Each item on the pre-communication intervention and post-communication intervention questionnaires was measured using a 7-point Likert scale, with 1 being ‘strongly disagree’, and 7 being ‘strongly agree’.

Procedure

Ethical approval was obtained from the University of Sussex Psychology and Life Sciences Ethics Committee. After signing up for the study, participants received a link to the online survey. When completing the survey, participants were first asked to read the online scenario, to visualise that they had been involved in the incident described, and to

imagine how they thought they might feel and act during an incident of this type. Participants then completed a pre-communication intervention questionnaire, before reading one of the three different communication interventions. Participants in the theory-based communication group received health-focused explanations about why the decontamination process was necessary, regular updates about the actions emergency responders were taking, and sufficient practical information about the decontamination process. Those in the standard practice communication group received the same level of practical information as those in the theory-based communication group, but no explanation about why decontamination was necessary, or the actions that emergency responders were taking. Those in the brief communication group received neither explanation about why the process was necessary, nor sufficient practical information. Finally, participants were asked to complete the post-communication intervention questionnaire, before receiving a debriefing statement. All variables were measured after the communication intervention, and four variables (perceptions of responders' legitimacy, identification with emergency responders, identification with other members of the public, and expected levels of anxiety) were also measured prior to the communication intervention, to examine any changes in these variables from before the communication intervention to after the communication intervention.

Results

Manipulation checks

The participants reported good engagement with the study, with a mean scale score for engagement of 5.30, which was significantly higher than the mid-point value of 4, $t(121) = 13.67, p < .001$. There were no significant differences in engagement between the three groups. The participants also reported high perceived realism of the scenario, with a

mean scale score for perceived realism of 4.35, which was significantly higher than the mid-point value of 4, $t(123) = 2.64$, $p = .009$. There were no significant differences between groups in terms of perceived realism of the scenario.

MANOVA indicated that there were no significant differences between the three communication groups on any of the variables which were measured at Time 1 (prior to the communication intervention) (shared identity with members of the public; shared identity with responders; legitimacy; and anxiety).

To check whether the manipulations of communication were perceived in the ways intended, MANOVA was carried out on perceptions of communication and practical information. This revealed that there were some significant differences between groups, $F(4, 242) = 17.61$, $p < .001$. When the results for the two dependent variables were considered separately, it was revealed that there were significant differences in the perception of responders' communication between groups, $F(2, 121) = 44.8$, $p < .001$, with the theory-based communication group reporting significantly higher perceptions of responders' communication than either the standard practice group ($p < .001$) or the brief group ($p < .001$), and the standard practice group reporting significantly higher perceptions of responders' communication than did the brief group ($p = .03$). There were also significant differences in the perception of the provision of practical information between groups, $F(2, 121) = 15.35$, $p < .001$, with the theory-based communication group reporting significantly higher perceptions of the provision of practical information than either the standard practice group ($p = .005$) or the brief group ($p < .001$), and the standard practice group reporting significantly higher perceptions of the provision of practical information than the brief group ($p = .01$). The manipulation checks therefore showed that the different communication messages had been perceived as intended.

Between groups analysis

MANOVA was carried out to test for predicted differences between the three different communication groups on the variables measured at Time 2 (following the communication intervention). Univariate analyses were included as part of the output from MANOVA, to enable differences between each of the dependent variables to be examined separately between groups. MANOVA revealed that there were some significant differences between the three different communication groups, $F(14, 218) = 1.75, p = .05$. When the results for the dependent variables were considered separately, it was revealed that there were significant differences in the perception of responders' legitimacy between groups, $F(2, 114) = 10.07, p < .001$, with those in the theory-based communication group reporting significantly higher perceived legitimacy than those in either the standard practice group ($p < .001$) or the brief group ($p < .001$). There were no significant differences in perceptions of legitimacy between the standard practice and brief communication groups. A similar difference between groups was found for identification with emergency responders, $F(2, 114) = 5.91, p = .004$, with those in the theory-based communication group reporting significantly higher identification with responders than those in either the standard practice communication group ($p = .001$) or the brief communication group ($p = .04$). Again, there were no significant differences in identification with responders between the standard practice and brief communication groups. There was also a significant difference between groups for collective agency, $F(2, 114) = 3.54, p = .03$, with those in the theory-based communication group reporting significantly higher expectations of collective agency than those in either the standard practice communication group ($p = .05$) or the brief communication group ($p = .01$). There was no significant difference in expectations of collective agency between the standard practice and brief communication groups.

Although there were no other significant differences between groups, the theory-based communication condition did generate higher mean values for all variables, compared to the other two groups. The exception to this was anxiety, for which the theory-based communication condition generated a lower mean value, compared to the other two groups. See Table 8.1 for the variable mean scores and standard deviations at Time 2 for the three different communication conditions.

Table 8.1: Mean scores of all measures at Time 2 for the three different communication conditions.

Variable	Brief communication		Standard practice communication		Theory-based communication	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Legitimacy	3.85 _a	1.24	3.86 _a	1.22	4.84 _b	1.06
Identification responders	3.22 _a	1.29	2.84 _a	1.27	3.84 _b	1.23
Identification public	4.85 _a	1.30	4.64 _a	1.51	4.94 _a	1.21
Collective agency	4.76 _a	1.20	4.98 _a	1.41	5.35 _b	1.25
Compliance	4.69 _a	1.37	4.65 _a	1.43	5.05 _a	1.41
Anxiety	6.15 _a	.98	6.30 _a	.88	6.05 _a	.74
Helping/cooperation	5.15 _a	1.11	5.14 _a	1.03	5.36 _a	.99

Values denoted as _a are significantly different to values denoted as _b.

Time 1 to Time 2 differences

Mixed measures ANOVAs were carried out to examine any interaction effects between Time and Group (communication condition) for each of the four variables which were measured at Time 1 and Time 2 (legitimacy, identification with responders, identification with other members of the public, anxiety). This was followed by a series of within-subjects *t*-tests, which enabled differences between pairs of variables within each condition to be examined (for example, enabling the difference between identification with

responders at Time 1 and identification with responders at Time 2 to be analysed for each of the three different communication conditions). There was a significant interaction between time and group for legitimacy, $F(2, 121) = 13.03, p < .001$. Within subjects t -tests revealed that there was a significant increase in perceptions of responders' legitimacy in the theory-based communication group from Time 1 to Time 2, $t(41) = 4.43, p < .001$, and a significant decrease in perceptions of responders' legitimacy in the brief communication group from Time 1 to Time 2, $t(40) = -4.94, p < .001$. There was a significant interaction between time and group for anxiety, $F(2, 117) = 6.69, p = .002$. Within-subjects t -tests revealed that there was a significant decrease in anxiety in the theory-based communication group from Time 1 to Time 2, $t(40) = -2.79, p = .008$. There was a significant interaction between time and group for shared identity with responders, $F(2, 121) = 7.52, p = .001$. Within-subjects t -tests revealed that there was a significant decrease in identification with emergency responders in the standard practice communication group, $t(39) = -3.87, p < .001$, and the brief communication group, $t(40) = -5.09, p < .001$, from Time 1 to Time 2. There was no significant interaction between time and group for identification with other members of the public. Within-subjects t -tests revealed that there was a significant decrease in identification with other members of the public in the standard practice communication group, $t(39) = -3.76, p = .001$, and the brief communication group, $t(40) = -2.84, p = .007$, from Time 1 to Time 2.

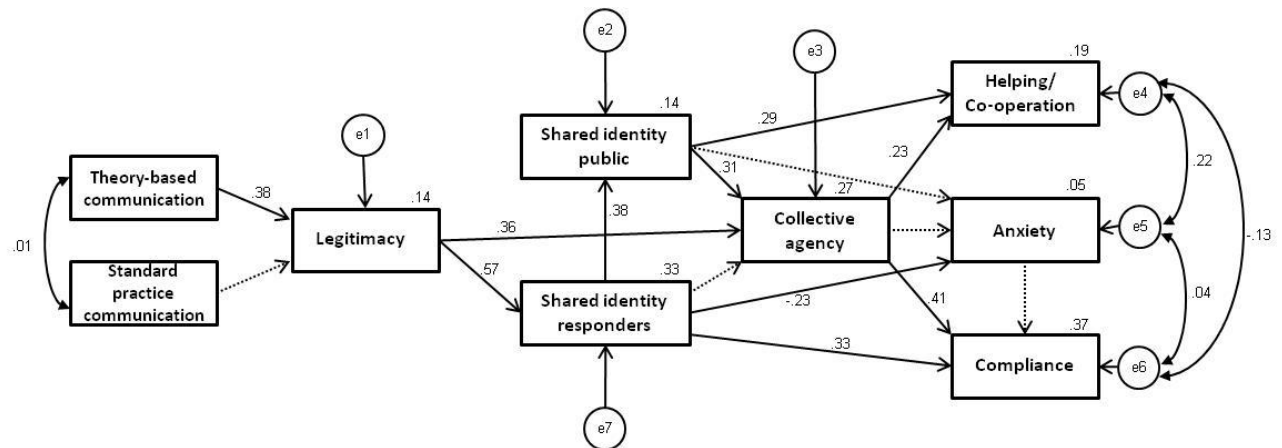
Path analysis

The Time 2 measures were entered into a path model, which is presented in Figure 8.2¹⁷. Model chi-square was used to evaluate the overall model-data fit¹⁸. Orthogonal

¹⁷ The dotted lines represent relationships which were predicted in the hypothesised model (Figure 8.1), but which were not supported by the data.

contrast coding was used to create two categorical variables ('theory-based communication' and 'standard practice communication') out of the three different communication groups. The 'theory-based communication' variable was coded to compare the theory-based communication condition to the standard practice and brief communication conditions (theory-based condition = 2, standard practice condition = -1, brief condition = -1), and the 'standard practice communication' variable was coded to compare the standard practice communication condition to the brief communication condition (theory-based condition = 0, standard practice condition = 1, brief condition = -1).

Figure 8.2: A path model of the data collected at Time 2, following the communication intervention.



The path model shows very good overall fit with the data, $\chi^2(21) = 24.58, p = .27$.

CFI gives a value of .98, above the recommended cut off value of .95, and RMSEA gives a value of .04, below the recommended cut off value of .08.

¹⁸ A non-significant chi-square result indicates that the model has good overall fit with the data. Chi-square is the most widely used measure of model fit, but it is sensitive to sample size (Marsh, Hau, & Wen, 2004), so other fit indices (such as the Comparative Fit Index)(CFI) and the Root Mean Square of Approximation (RMSEA)) should also be used alongside model chi-square. To be said to have a good fit with the data, a model should have a CFI value of above .95, and an RMSEA value of below .08 (Hu and Bentler, 1999).

The model explains 37% of the variance in compliance, 19% of the variance in expectations of co-operative and helping behaviour, and 5% of the variance in reduced anxiety. As hypothesised, the model shows that being in the theory-based communication group, as opposed to the standard practice or brief communication groups, was a significant predictor of increased perceptions of responders' legitimacy, $\beta = .38, p < .001$. However, being in the standard practice communication group, as opposed to the brief communication group, was not a significant predictor of perceptions of responders' legitimacy, $\beta = .0, p = .97$. As hypothesised, there was also a significant relationship between perceptions of responders' legitimacy and identification with emergency responders, $\beta = .57, p < .001$, and between identification with emergency responders and identification with other members of the public, $\beta = .38, p < .001$. The model also supports the hypotheses in showing a significant relationship between identification with members of the public and collective agency, $\beta = .31, p < .001$, identification with members of the public and helping/ cooperation, $\beta = .29, p < .001$, identification with emergency responders and increased compliance, $\beta = .33, p < .001$, identification with emergency responders and reduced anxiety, $\beta = -.23, p = .009$, collective agency and helping/ cooperation, $\beta = .23, p = .009$, and collective agency and increased compliance, $\beta = .41, p < .001$. There was also a significant direct relationship between perceptions of responders' legitimacy and collective agency, $\beta = .36, p < .001$.

There was no significant direct relationship between shared identity with emergency responders and collective agency. There was, however, a significant indirect relationship between identification with emergency responders and collective agency, mediated by

identification with other members of the public, $b = .11$, BCa CI [.04, .21], $K^2 = .11$, 95% BCa CI [.04, .21].

The model shows that there is no significant relationship between identification with other members of the public and reduced anxiety, collective agency and reduced anxiety, or reduced anxiety and compliance.

As predicted, the four social identity variables (perceptions of responders' legitimacy, identification with emergency responders, identification with other members of the public, and collective agency) performed a significant mediating role within the model. Legitimacy mediated the relationship between being in the theory-based communication condition and identification with emergency responders, $b = .28$, BCa CI [.13, .46], $K^2 = .21$, 95% BCa CI [.10, .32], and being in the theory-based communication condition and collective agency, $b = .22$, BCa CI [.11, .37], $K^2 = .16$, 95% BCa CI [.08, .26]. Identification with emergency responders mediated the relationship between legitimacy and identification with other members of the public, $b = .22$, BCa CI [.11, .37], $K^2 = .17$, 95% BCa CI [.09, .27], legitimacy and compliance, $b = .25$, BCa CI [.11, .41], $K^2 = .20$, 95% BCa CI [.10, .30], and legitimacy and reduced anxiety, $b = -.08$, BCa CI [-.20, -.01], $K^2 = .10$, 95% BCa CI [.01, .21]. Identification with other members of the public mediated the relationship between identification with emergency responders and collective agency, $b = .11$, BCa CI [.03, .20], $K^2 = .11$, 95% BCa CI [.04, .20], and between identification with emergency responders and helping/ cooperation, $b = .13$, BCa CI [.04, .26], $K^2 = .16$, 95% BCa CI [.06, .29]. Collective agency mediated the relationship between legitimacy and helping/ cooperation, $b = .09$, BCa CI [.03, .18], $K^2 = .11$, 95% BCa CI [.04, .20], legitimacy and compliance, $b = .22$, BCa CI [.12, .36], $K^2 = .19$, 95% BCa CI [.11, .30], identification with other members of the public and helping/ cooperation, $b = .06$, BCa CI

$[-.002, .14]$, $K^2 = .08$, 95% BCa CI $[-.01, .18]$, and identification with other members of the public and compliance, $b = .21$, BCa CI $[-.11, .35]$, $K^2 = .20$, 95% BCa CI $[-.11, .30]$.

Possible alternative model

To rule out other potential explanations for the relationships among variables within the model, a second model was also tested. While the first model revealed a correlation between perceptions of legitimacy and identification with emergency responders, it is possible that identification with responders resulted in increased perceptions of responders' legitimacy, rather than increased perceptions of responders' legitimacy resulting in increased identification with emergency responders. Therefore an alternative model was tested, in which the relationship between theory-based communication, perceptions of responder legitimacy, and identification with responders was entered as: theory-based communication \rightarrow identification with responders \rightarrow perceptions of legitimacy. This model had a reasonable fit with the data, but had worse fit with the data than the first model, $\chi^2(21) = 31.55$, $p = .065$, CFI = .95, RMSEA = .063, as the chi-square and RMSEA values were lower in the first model, while the CFI value was higher. This therefore suggests that the initial model, based on the hypothesised relationships, provided a better explanation for the data.

Discussion

Results reveal that, as expected, the communication intervention in which participants received both health-focused explanations about the decontamination process and sufficient practical information about the process was perceived to be the most effective. Several of the initial hypotheses regarding how certain variables would vary between communication conditions were supported. Those in the theory-based

communication condition reported significantly higher perceptions of responders' legitimacy, identification with emergency responders, and collective agency than those in the other two groups. Although not significant, those in the theory-based communication group also reported higher levels of compliance, shared identity with other members of the public, and co-operative/ helping behaviour, as well as reporting lower levels of expected anxiety during a real incident.

While several of the hypotheses about differences between the theory-based communication condition and the other communication conditions were therefore supported, there were no significant differences between the standard practice communication condition and the brief communication condition. We suggest two possible reasons for this. First, the only difference between these two groups was the level of practical information provided. As this was an online study, and participants were not asked to actually undergo the decontamination process, it may be that the difference in practical information was too subtle to make a difference to the results; a lack of practical information would be far more apparent if participants were asked to actually undergo the decontamination process. Alternatively, it may be that it is the explanation of why decontamination is necessary, and how this will help members of the public, which increases perceptions of responders' legitimacy, rather than legitimacy being predicted by both increased explanation and practical information, as hypothesised. Further study would be needed to confirm whether this is the case.

Results of before and after tests also revealed some interesting results. Especially interesting was that those in the theory-based communication condition reported a significant increase in their perceptions of responders' legitimacy, and a significant decrease in their expectations of anxiety during a real incident, from before the

communication intervention to after the communication intervention. In contrast, those in the brief communication condition reported no significant change in their perceptions of responders' legitimacy, or expectations of anxiety during a real incident, while those in the standard practice communication condition reported no significant change in their perceptions of responders' legitimacy, and an almost significant increase in their expectations of anxiety. This therefore indicates that the theory-based communication intervention resulted in increased perceptions of responders' legitimacy, and reduced expectations of anxiety during a real incident, two variables which, as described above, could play an important role in the success of a real life incident involving mass decontamination (cf. Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002). Further, those in the standard practice and brief communication groups reported significant reductions in shared social identity with emergency responders, and shared social identity with other members of the public, from before the communication intervention to after the communication intervention. This is in line with correlational findings from a field exercise, which have shown similar reductions in identification with responders and members of the public following perceived ineffective communication from emergency responders (Carter et al., 2013c: Chapter 7). As indicated in the path model, identification with emergency responders and identification with other members of the public are key mediators between effective communication strategies and the relevant outcome variables. Therefore, reductions in identification with emergency responders and with other members of the public, are likely to result in increased anxiety, reduced compliance, and a reduction in co-operative and orderly behaviour among members of the public.

Many of the hypothesised relationships between variables, as illustrated in the hypothesised path model, were also supported. Results broadly supported the idea that effective communication would facilitate improved outcomes (increased compliance, increased co-operation and orderly behaviour, and reduced anxiety), and that this relationship would be mediated by social identity variables. Most of the predicted relationships were supported by the data. Almost all of the relationships which were not supported involved anxiety as a variable; indeed, the only hypothesis relating to anxiety which was supported was that there would be a significant negative correlation between shared identity with emergency responders and level of anxiety. The lack of support for predicted relationships between anxiety and the relevant variables may be due to difficulties which members of the public may experience in trying to anticipate the level of anxiety they would experience during a real incident. There may be a tendency to automatically assume a high level of anxiety¹⁹, and thus this may not relate in the expected direction with other relevant variables; it is likely that this would be quite different during a real incident. The other hypothesis which was not supported was that there would be a direct relationship between identification with emergency responders and collective agency. However, there was an indirect relationship between these two variables, mediated by shared social identity with other members of the public.

Overall, the findings reported here show that responder communication strategies which include health-focused information about why the decontamination process is necessary, information about the actions emergency responders are taking, and sufficient practical information, are perceived as being most effective by members of the public. In

¹⁹ The mean score for anxiety in this case was 6.17, significantly above the mid-point value of 4, $t(122) = 27.58, p < .001$.

turn, responder communication strategies which are perceived as being effective may result in increased compliance with the decontamination process and increased co-operative and orderly behaviour among members of the public. Further, results show that the relationship between effective responder communication strategies and the relevant outcome variables is mediated by social identity variables (perceptions of responders' legitimacy; identification with emergency responders; identification with other members of the public; and collective agency).

Implications

Theoretical implications. Planning for incidents involving mass decontamination has focused on technical aspects of the decontamination process, with very little attempt to understand how members of the public are likely to behave during such incidents (Carter et al., 2013a: Chapter 2). Where psychosocial issues have been considered in planning for mass decontamination, there has been a reliance on assumptions about 'mass panic' (Carter et al., in press: Chapter 4), rather than on evidence. The current research goes some way to addressing this, by applying the social identity approach to understand more about the ways in which responder communication strategies can affect public behaviour during incidents involving mass decontamination, and the mediating role of social identity processes.

This research provides support for the SIMCR (Drury et al., 2009a), in showing a significant relationship between shared identity among members of the public, a sense of collective agency, and increased willingness to help others. The findings also provide support for the ESIM (Drury & Reicher, 2000) in showing that perceptions of effective responder communication predict increased perceptions of responder legitimacy and increased identification with emergency responders. This study also extends the application of the ESIM, by showing that concepts which have traditionally been associated with crowd

conflict events (e.g. legitimacy and identification with emergency responders), are also relevant during mass emergencies.

Practical implications. The findings presented here have important implications for real incidents involving decontamination. Increasing the effectiveness of responder communication strategies is likely to increase public perceptions of responders' legitimacy, and identification with emergency responders, which in turn is likely to increase public compliance (cf. Stott et al., 2008; Stott et al., 2012). This is likely to be vital during real incidents involving decontamination, as higher levels of public compliance should increase the speed and efficiency of the decontamination process, resulting in reduced length of contamination, and reduced risk of secondary contamination of other people and places. If members of the public do not comply with the need for decontamination, the process will be delayed, and lives could be lost (Edwards et al., 2006; Lillie et al., 2006; Schulze & Lake, 2009).

While similar results have been found from a previous study which examined correlational data collected from members of the public following an emergency preparedness field exercise (Carter et al., 2013c: Chapter 7), this is the first study to vary the amount and type of communication provided to members of the public during a hypothetical scenario involving mass decontamination, and to examine the effect of three different responder communication strategies on the relevant outcome variables. In using an experimental design to manipulate different responder communication strategies, this study extends a growing body of research examining the effect of responder communication strategies on psychological and behavioural outcomes during mass decontamination (e.g. Carter et al., 2012: Chapter 5; Carter et al., 2013b: Chapter 6; Carter et al., 2013c: Chapter 7). Taken together, the findings from these studies provide compelling evidence that

effective responder communication strategies are vital for improving public compliance and co-operation during incidents involving mass decontamination and thus can contribute to saving lives, and that social identity processes play a key role in public experiences, and hence behaviour, during such incidents.

In the event of a mass CBRN incident, there will not be enough emergency responders involved to force members of the public to undergo decontamination; in any case, we believe such an approach would do more harm than good. A crucial factor affecting the successful management of mass decontamination (and indeed any large scale emergency), will therefore be whether members of the public *internalise* the need to participate in decontamination and comply with the recommendations of emergency responders. Decontamination needs to become normative for the emergency crowd. This internalisation of recommended behaviours is much more likely if members of the public perceive the actions of emergency responders to be legitimate. The findings reported in the current study, and elsewhere (e.g. Carter et al., 2012: Chapter 5; 2013a: Chapter 2; 2013b: Chapter 6; 2013c: Chapter 7; in press: Chapter 4), point to the need for increased training for emergency responders on ‘soft skills’, including effective communication strategies, during mass decontamination; this has been neglected until now, in favour of technical aspects of the decontamination process.

Limitations and future research

A limitation of this research is that it was an online visualisation study and did not involve participants actually going through the decontamination process. It may therefore have been difficult for participants to accurately visualise the type of situation described in the scenario, and therefore to accurately imagine how they would feel and act during this type of situation, and so, as with all simulation research, the ecological validity of this

research may be questioned. However, the current findings are as would be expected based on findings from real incidents (e.g. Hanley, 1999; U.S. Fire Administration, 1997) and are in-line with previous research which has examined public experiences of mass decontamination during emergency preparedness field exercises (e.g. Carter et al., 2012: Chapter 5; 2013b: Chapter 6; 2013c: Chapter 7). Further, participants reported high engagement with the scenario, and high perceived realism of the scenario, which suggests that ecological validity was adequate. This research therefore provides evidence that visualisation methods may be effectively used to examine public perceptions and expectations about CBRN incidents that involve mass decontamination.

Another potential limitation of this research was that participants were University students, the majority of whom were Psychology undergraduates. As University students tend to be better educated, and possibly more willing to comply with establishment figures, than the general population, the representativeness of the current findings could be questioned. However, similar results have been found using broader samples of participants of different educational level, age, and socio-economic status (Carter et al., 2012: Chapter 5; 2013b: Chapter 6; 2013c: Chapter 7). Thus we believe that the findings presented here are generalisable to a wider population.

This study goes beyond previous research, by manipulating the communication strategies employed by emergency responders, and examining the effect of different types of responder communication strategies on the relevant outcome variables. This enabled preliminary conclusions to be drawn about what makes an effective responder communication strategy, and how an effective responder communication strategy can potentially facilitate the smooth running of the decontamination process during a real incident of this type. This study also provides evidence that visualisation methodologies

using simple written vignettes can be used successfully to examine the mediating role of social identity variables between responder communication strategies and relevant outcome variables during mass emergencies. Future research should aim to manipulate and compare different communication strategies during emergency preparedness exercises involving mass decontamination, since this will increase the realism of the experience for participants, and should therefore increase the ecological validity of the research.

CHAPTER 9

Paper 8: Effective responder communication improves efficiency and psychological outcomes in a mass decontamination field experiment: implications for public behaviour in the event of a chemical incident.

Reference: Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (2014). Effective responder communication improves efficiency and psychological outcomes in a mass decontamination field experiment: implications for public behaviour in the event of a chemical incident. *PLoS ONE*, 9(3): e89846. doi:10.1371/journal.pone.0089846.

Abstract

The risk of incidents involving mass decontamination in response to a chemical, biological, radiological, or nuclear release has increased in recent years, due to technological advances and the willingness of terrorists to use unconventional weapons. Planning for such incidents has focused on the technical issues involved, rather than on psychosocial concerns. This paper presents a novel experimental study examining the effect of three different responder communication strategies on public experiences and behaviour during a mass decontamination field experiment. Specifically, the research examined the impact of social identity processes on the relationship between effective responder communication and relevant outcome variables (e.g. public compliance, public anxiety, and co-operative public behaviour). All participants ($N = 111$) were asked to visualise that they had been involved in an incident involving mass decontamination, before undergoing the decontamination process, and receiving one of three different communication strategies: 1) Health-focused explanations about decontamination and sufficient practical information; 2) No health-focused explanations about decontamination, sufficient practical information; 3) No health-focused explanations about decontamination, insufficient practical information. Four types of data were collected: timings of the decontamination process; observational data; and quantitative and qualitative self-report data. The communication strategy which resulted in the most efficient progression of participants through the decontamination process, as well as the fewest observations of non-compliance and confusion, was that which included both health-focused explanations about decontamination and sufficient practical information. Further, this strategy resulted in increased perceptions of responder legitimacy and increased identification with responders, which in turn resulted in higher levels of expected compliance during a real incident, and increased willingness to help other members of the

public. This study shows that an understanding of the social identity approach facilitates the development of effective responder communication strategies for incidents involving mass decontamination.

Introduction

The likelihood of incidents involving chemical, biological, radiological, and nuclear (CBRN) agents has increased in recent years, due to advances in technology (Alexander & Klein, 2006), and the willingness of terrorists to obtain and use CBRN materials (HM Government, 2010b; Holdsworth, Bland, & O'Reilly, 2012). Interventions designed to reduce the risk from CBRN agents, such as decontamination, may be more stressful for those involved than the incident itself, if not managed appropriately (Holloway, Norwood, Fullerton, Engel, & Ursano, 1997). This may result in increased anxiety and reduced compliance during incidents involving decontamination (Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002), which could have serious consequences during an incident involving mass decontamination; failure of members of the public to behave cooperatively during mass decontamination may result in disorder, increased spread of any contaminant (Edwards et al., 2006), and potentially increased numbers of dead and injured.

Despite this, planning for incidents involving mass decontamination has focused almost exclusively on technical aspects of decontamination, with little attempt to understand public feelings and behaviour (Carter, Drury, Rubin, Williams, & Amlôt, 2013a: Chapter 2). The aim of this paper is to employ an experimental design to test the effect of three different responder communication strategies on public experiences and behaviour during a mass decontamination field experiment.

Decontamination involves those who have potentially been contaminated undergoing a shower, in order to remove any contaminant from their skin. This reduces the risk of the agent being absorbed into the skin and causing further harm and also reduces the risk of secondary contamination of other people and places. In the UK, the Fire and Rescue

Service (FRS) have specially designed mass decontamination (MD1) units, which can facilitate the decontamination of up to 150 people per hour (New Dimension Regional Team, 2003).

Findings from small-scale incidents involving decontamination have shown that failure of emergency responders to communicate effectively with members of the public, and to respect public concerns about privacy, can result in non-compliance and increased anxiety among members of the public (e.g. Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002). Incidents involving mass decontamination may present further challenges for emergency responders since they involve crowds (Edwards, Caldicott, Eliseo, & Pearce, 2006), which may be perceived by responders as a source of disorder and ‘panic’ during emergencies (Carter, Drury, Rubin, Williams, & Amlôt, in press: Chapter 4).

While the concern about disorder and panic is in line with early theories of crowd behaviour (e.g. LaPiere, 1938; Smelser, 1963), contemporary theories instead suggest that behaviour in emergencies is usually normatively structured (e.g. Aguirre et al., 1998; 2011; Johnson, 1987; 1988) and shaped by group identities (Drury, Cocking, & Reicher, 2009a). Specifically, self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) suggests that, under certain conditions, those involved in such disasters perceive that they have a common fate, around which they categorise themselves as members of the same group (those affected by the disaster). The social identity model of collective resilience (SIMCR: Drury et al., 2009a; 2009b) has been applied to various mass emergencies; results from this research show that shared identity, based on a sense of common fate, can result in increased helping and cooperative behaviour among those affected (Drury et al., 2009a; 2009b).

In the study described in this paper, we apply the social identity approach to mass decontamination. This approach not only facilitates an understanding of how shared identity among group members can enable the development of shared group norms, but also of how interactions between different groups can shape the norms, and hence behaviour, of a group. This is likely to be particularly relevant to incidents involving mass decontamination, since mass decontamination involves an intergroup situation (members of the public and emergency responders), in which one group (emergency responders) is trying to direct the behaviour of another (members of the public) (Carter et al., in preparation: Chapter 3).

Research in related domains of crowd behaviour suggests that communication is a key intervention through which emergency responders can improve the management of the decontamination process, as effective communication results in increased perceptions of responder legitimacy (Reicher et al., 2007). Applying the elaborated social identity model (ESIM: Drury & Reicher, 2000) to understand interactions between Police and football supporters has shown that increased perceptions of Police legitimacy result in increased identification with Police (Stott, Adang, Livingstone, & Schreiber, 2008), which in turn results in increased compliance with Police instructions (Stott, Hoggett, & Pearson, 2012).

While shared identity is likely to be present among members of the public during disasters, as a result of the sense of shared fate they all face (Drury et al., 2009a; 2009b), research has also shown that increased identification with emergency responders can result in increased identification with other members of the public, possibly because members of the public may unite around their shared identification with emergency responders (Carter et al., 2013c: Chapter 7; submitted: Chapter 8; in preparation: Chapter 3). Shared identity among members of the public around a shared identity with emergency responders is likely

to play a key role during incidents involving mass decontamination. This is because if members of the public unite around their shared identity with emergency responders, they will internalise the aims of responders (e.g. to facilitate effective decontamination of all those potentially contaminated), which will become shared goals of the group; the internalisation of decontamination as a shared group goal will result in increased cooperative and helping behaviour during incidents involving mass decontamination.

There are two other ways in which shared social identity may be of benefit during incidents involving mass decontamination. First, shared identity may facilitate a sense of collective agency among members of the public (Drury et al., 2009a; Haslam, Jetten, & Waghorn, 2009), enabling members of the public to work together to achieve the shared goal of decontamination, and thus increasing compliance (Carter et al., 2013c: Chapter 7; in preparation: Chapter 3). This will be crucial during a real life incident involving mass decontamination, in which emergency responders will have insufficient resources to force members of the public to undergo decontamination; a belief that the group can work together to achieve shared norms and goals (e.g. decontamination) will therefore promote willingness to comply with responder instructions, and hence facilitate orderly and efficient decontamination. Second, shared identity may reduce public anxiety, by increasing shared expectations of support (Haslam, Jetten, O'Brien, & Jacobs, 2004; Haslam, O'Brien, Jetten, Vormedal, & Penna, 2005; Haslam et al., 2009) and enabling members of the public to work together to challenge and reduce shared stressors (Haslam & Reicher, 2006). Reduced anxiety about decontamination may also increase compliance with the process (Carter et al., in preparation: Chapter 3).

The present study

As noted above, decontamination has traditionally been seen as a technical issue (Carter et al., 2013a: Chapter 2). Planning for such incidents has been based on assumptions about likely crowd behaviour (e.g. ‘mass panic’), which has resulted in a focus on controlling, rather than communicating with, members of the public (Carter et al., 2013a: Chapter 2; in press: Chapter 4). There is therefore a need for research to examine the effectiveness of different communication strategies, to ensure that plans for the management of decontamination are based on evidence, rather than assumptions. Social psychological theories, in particular the social identity approach, provide a useful basis for understanding how different responder communication strategies might affect public experiences and behaviour during incidents involving mass decontamination, and hence affect the successful management of such incidents.

Previous research that has attempted to examine hypotheses relating to the effect of social identity processes during mass decontamination has involved purely self-report, rather than behavioural, measures (Carter et al., 2013c: Chapter 7; submitted: Chapter 8). Further, previous research which has used an experimental design to test the effect of different communication strategies has employed an online visualisation design (Carter et al., submitted: Chapter 8) and may therefore have lacked ecological validity.

The present study extended previous research (Carter et al., 2013c: Chapter 7; submitted: Chapter 8) by asking participants to actually undergo the decontamination process during a mass decontamination field experiment, in which the effect of three different responder communication strategies were tested. To increase realism, participants were decontaminated within an MD1 showering unit, such as would be used by the Fire and Rescue Service (FRS) during a real life incident involving mass decontamination, and

the decontamination process was managed by members of the East Sussex FRS, who were dressed in personal protective equipment (PPE). Asking participants to actually undergo the decontamination process not only increased the ecological validity of the research, but also enabled behavioural measures, such as observations of participant behaviour, and measures of the speed and efficiency of the decontamination process, to be collected alongside self-report measures. Thus the present study combines an experimental research design with a realistic scenario in order to examine both participant experiences and behaviour during mass decontamination.

During the field experiment, the effect of three different responder communication strategies on public experiences and behaviour during the decontamination process was tested. The ‘theory-based’ communication strategy used in this research was designed based on the recommendations derived from the literature (Carter et al., in preparation: Chapter 3) and included health-focused explanation about why the decontamination process was necessary, regular updates on the actions emergency responders were taking, and sufficient practical information. The ‘standard practice’ communication condition was based on current practices, and included sufficient practical information, but no health-focused explanation or information about actions emergency responders were taking. The ‘brief’ communication condition was designed to reflect a ‘worst case’ communication strategy (as has been observed during field exercises involving mass decontamination) and included no health-focused explanation, no updates on actions emergency responders were taking, and only very basic practical information.

In line with previous research showing that increased information resulted in quicker, more efficient evacuations from a railway station during a simulated fire evacuation (Proulx & Sime, 1991), in the present study it was expected that the

decontamination process would progress most efficiently in the theory-based communication condition. The optimum time for members of the public to undergo the decontamination process is 10 minutes²⁰; a quicker time might mean that decontamination has not been carried out effectively, while a slower time could result in delays to the process, and could cost lives. It was therefore expected that those in the theory-based communication condition would progress through the decontamination process in closest to the optimum time.

In line with findings from small scale incidents involving decontamination (e.g. Hanley, 1999; U.S. Fire Administration, 1997; Vogt & Sorensen, 2002), it was expected that the observational data would show greater compliance and less confusion among participants in the theory-based communication condition. Further, in line with the principles of the social identity approach (e.g. Drury et al., 2009a; b), it was expected that participants would be more willing to help each other in the theory-based communication condition, and therefore that more helping behaviours would be observed among participants. However, it was also thought to be possible that there might be less helping behaviours observed among participants during the theory-based communication condition, since participants would receive more information and communication from responders in this condition, thereby reducing the need for participants to help each other.

In terms of the self-report measures, it was expected that those in the theory-based communication group would report more positive outcomes (e.g. increased: responder legitimacy; identification with emergency responders; identification with other members of

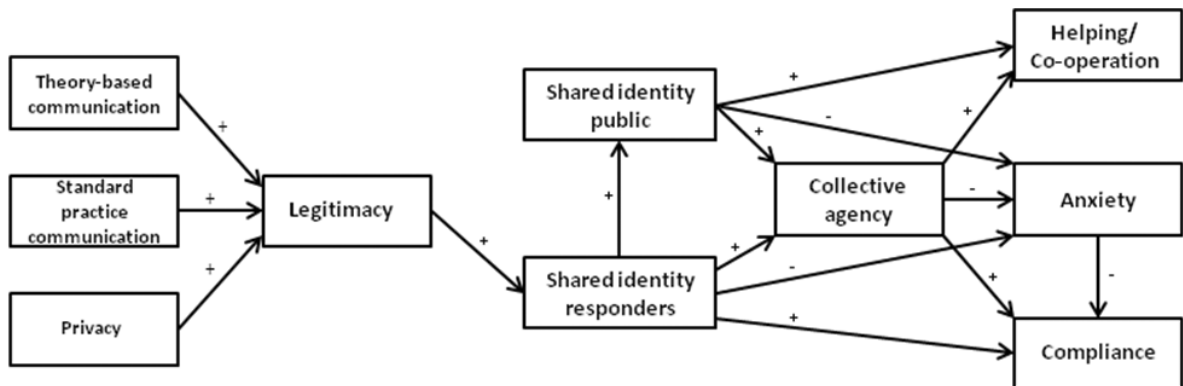
²⁰ The optimum time for participants to complete the process using a standard FRS decontamination unit is 10 minutes (3 minutes 20 seconds for each of the three sections of the unit: disrobe, showering, rerobe). The decontamination unit used in this experiment differed slightly, with each section taking 3 minutes 10 seconds. Thus the optimum time in this experiment was 9 minutes 30 seconds.

the public; expectations of collective agency; expectations of compliance; willingness to help others; and decreased actual anxiety experienced, and expectations of anxiety during a real incident), than those in the standard practice or brief communication groups. In turn, it was expected that those in the standard practice communication group would report more positive outcomes than those in the brief communication group.

It was also expected that those in the theory-based communication group would report more positive outcomes at Time 2 (post-communication intervention) than at Time 1 (pre-communication intervention), while those in the brief communication group would report more negative outcomes at Time 2 than at Time 1. As the standard practice condition was designed to reflect current standard practice, it was expected that those in the standard practice communication group might report similar outcomes at Time 2 as at Time 1.

A path model was created to illustrate the predicted relationships between variables, based on the previous literature, and this is presented in Figure 9.1²¹.

Figure 9.1: A path model representing the expected relationships between variables.



²¹ The 'theory-based communication' variable is in comparison to the standard practice and brief communication conditions, while the 'standard practice communication' variable is in comparison to the brief communication condition. Plus and minus signs indicate the direction of the expected relationship between variables.

Method

Ethics statement

Ethical approval was obtained from the University of Sussex Psychology and Life Science Ethics Committee. Before taking part in the study, participants were asked to read an information sheet about the research and complete a consent form to indicate their informed consent to participate. Participants were informed that any information they provided would be confidential and that they were free to withdraw from the study at any time.

Design

A mixed design was used, with one between-subjects factor (quality of communication), with three levels (theory-based, standard practice and brief), and one within-subjects factor (time), with two levels (Time 1, before undergoing decontamination; Time 2, after undergoing decontamination). Four different types of data were collected for participants in each group: timings for how long each participant took to progress through the decontamination process; observational data relating to incidences of non-compliance, confusion, and helping behaviours; quantitative questionnaire data; and qualitative questionnaire data. For the quantitative self-report data, the dependent variables were: perceptions of responder legitimacy, identification with emergency responders, identification with other members of the public, perceptions of collective agency, willingness to help others during a real incident, expectations of compliance during a real incident, and expectations of anxiety during a real incident.

Participants

A self-selected sample of 111 students from the University of Sussex were recruited using the University of Sussex online system for recruiting research participants, email, Twitter, Facebook, and recruitment posters. Participants signed up to one of three different

timeslots, without knowing which timeslot corresponded to which communication condition, or even knowing that there were three different communication conditions (theory-based: $N = 42$; standard practice: $N = 32$; brief: $N = 37$). Participants received course credit or a £20 high street gift voucher for taking part in the research.

Materials

Scenario. A scenario involving a potential chemical release within a University lecture theatre was developed by the research team, and was then discussed with a senior Exercise Planner, who has extensive experience of writing scenarios for emergency preparedness exercises. The scenario was then pilot tested using an online visualisation study and was perceived to be highly realistic (Carter et al., submitted: Chapter 8). The scenario contained a description of the initial phase of the incident, up to and including FRS responders setting up a decontamination tent. This was designed to set the scene for participants, and to allow them to visualise that they had been involved in the type of incident described. See Appendix 12 for a copy of the scenario used during this study.

Communication intervention. Three different communication interventions were developed, which were designed to reflect different communication strategies which responders might use during a real incident involving mass decontamination. These were then pilot-tested using an online visualisation experiment, to ensure that each condition was perceived as intended (Carter et al., submitted: Chapter 8). See Appendix 13 for a copy of the three communication interventions used during this study. The relevant communication interventions were provided to participants over loudspeaker during each of the three study sessions. In order to ensure that the communication which participants received was consistent within each of the three conditions, FRS responders were briefed to behave in accordance with the communication intervention which participants received. Prior to the

study, FRS responders were briefed to be as helpful and communicative as possible in the theory-based communication condition, provide only practical information and no extra communication during the standard practice condition, and provide no extra information or help in the brief condition. This was to ensure that the level of communication provided to participants by FRS responders was in line with the communication intervention which participants received, in order to accurately represent the three different types of communication strategy.

Pre-communication intervention questionnaire. The pre-communication intervention questionnaire (Appendix 14) contained items relating to: perceptions of responder legitimacy (e.g. “I think that the emergency responders will treat people with respect during the decontamination process today”) (4 items, $\alpha = .83$); identification with emergency responders (e.g. “I feel a sense of unity with the emergency responders who will be managing the decontamination process today”) (3 items, $\alpha = .83$); identification with other members of the public (e.g. “I identify with the other volunteers who are taking part in the trial today”) (3 items, $\alpha = .75$); and expectations of anxiety during a real incident (e.g. “If a real incident of this kind were to occur, I would feel nervous”) (3 items, $\alpha = .79$).

Post-communication intervention questionnaire (quantitative items). The post-communication intervention questionnaire (Appendix 15) contained items relating to: perceptions of responder communication²² (manipulation check) (e.g. “The emergency responders explained clearly what was happening during the decontamination process”) (2 items, $r = .87$); perceptions of communication messages (manipulation check) (e.g. “I

²² The items measuring perceptions of responder communication were designed to measure perceptions of direct communication from and with emergency responders, while the items measuring perceptions of communication messages were designed to measure perceptions of the pre-prepared communication messages provided over a loudspeaker by a member of the research team.

understood why I was being asked to go through the decontamination process”) (2 items, $r = .85$); sufficiency of practical information (manipulation check) (e.g. “I was provided with sufficient practical information about what I was supposed to do during the decontamination process”) (3 items, $\alpha = .94$); perceptions of privacy (“I had sufficient privacy during the decontamination process”) (1 item); perceptions of responder legitimacy (e.g. “I felt that the emergency responders behaved in a fair way towards us during the decontamination process”) (4 items, $\alpha = .91$); identification with emergency responders (e.g. “I felt that I had a lot in common with the emergency responders who were managing the decontamination process today”) (3 items, $\alpha = .93$); identification with other members of the public (e.g. “I felt a sense of unity with the other volunteers who took part in the trial today”) (3 items, $\alpha = .89$); perceptions of collective agency (e.g. “I felt able to work with other volunteers to successfully undergo the decontamination process”) (2 items, $r = .95$); willingness to help others during a real incident (“If this was a real incident, I would be willing to help other members of the public”) (1 item); expectations of compliance during a real incident (e.g. “I would be willing to undergo a decontamination shower during a real life incident of this kind”) (3 items, $\alpha = .79$); expectations of anxiety during a real incident (e.g. “If this had been a real incident, I would have felt worried”) (3 items, $\alpha = .87$); and actual anxiety experienced during the study (e.g. “I felt nervous during the decontamination process”) (3 items, $\alpha = .78$).

Post-communication intervention questionnaire (qualitative items)

There were six qualitative items on the post-communication intervention questionnaire. These were: “Please explain any ways in which you feel communication/information during the decontamination process could have been improved”; “If you would

not be willing to undergo a decontamination shower during a real incident, or would not be willing to be naked inside the decontamination showers in a real incident, please explain why”; “Please describe any ways in which emergency responders could have improved the way they dealt with the decontamination process”; “Please explain any instances when you saw volunteers co-operating. Include any instances when you gave help to another volunteer, or received help from another volunteer”; “If you felt nervous or worried, please describe what the main reason for this was”; and “Please describe any ways in which you feel this trial could have been improved.”

Procedure

Before taking part in the experiment, participants received briefing instructions, informing them about the nature of the research and that they would be required to undergo a decontamination shower. The experiment took place in a vacant car park on the University of Sussex campus, where an MD1 decontamination unit had been set up by members of the research team. Nine members of the East Sussex FRS agreed to assist with the experiment, in order to increase the realism of the scenario.

Participants took part in the experiment in one of three different timeslots, each corresponding to a different communication condition (theory-based, standard practice, or brief)²³. Participants in each group received a briefing presentation, in which they listened to the scenario, were shown a picture of members of the public going through an MD1 decontamination tent, and were asked to visualise that they had been involved in the incident described. Participants then completed the pre-communication intervention questionnaire, before listening to the scenario a second time. Following this, three

²³ The brief condition took place first, followed by the standard practice condition, and then the theory-based condition. Although responders were briefed on how to act during each condition, it is possible that the way in which they managed the incident might have improved slightly through practice over the three conditions.

responders from East Sussex FRS, dressed in full personal protective equipment (PPE), entered the briefing room to escort participants outside, to where the decontamination process would take place. Participants then experienced a 20 minute pre-planned ‘delay’, during which time participants were asked to disrobe²⁴, and received one of three different communication interventions. Those in the theory-based communication condition received regular messages over loudspeaker, including health-focused explanations about why the decontamination process was necessary, and the actions emergency responders were taking. Figure 9.2 shows participants disrobing before taking part in the decontamination process during the standard practice communication condition.

Figure 9.2 – Participants disrobing in the standard practice communication condition



²⁴ In the present study, participants were asked to disrobe down to their swimwear, to protect their modesty; in a real incident, those affected would be asked to fully disrobe, and would be naked during the decontamination process.

Participants in each condition entered the decontamination shower in groups of ten, until all participants in that condition had been decontaminated²⁵. On beginning the decontamination process, participants in the theory-based communication condition received practical information messages, via loudspeaker, which included full details of the actions they were expected to take during the decontamination process. In contrast, those in the standard practice communication condition received only two update messages during the initial 20 minute wait (one at the beginning of the delay, and one at the end), and the same practical information messages as those in the theory-based communication condition, while those in the brief communication condition received the same irregular updates during the initial 20 minute waiting period as those in the standard practice condition, and only basic practical information during the decontamination process. As well as receiving the different messages over loudspeaker, participants in each of the three different groups also received different treatment from the FRS responders. Prior to the study, FRS responders were briefed to be as helpful and communicative as possible in the theory-based communication condition, provide only practical information and no extra communication during the standard practice condition, and provide no extra information or help in the brief condition. See Figure 9.3 for a photo of participants entering the decontamination unit during the theory-based communication condition.

²⁵ The last participants in each condition went through the shower in smaller groups, as the participant numbers within each condition were not evenly divisible by ten (e.g. if there were 38 participants in a condition, the first three groups went through the shower as a group of ten, and the last group went through the shower as a group of 8).

Figure 9.3 – Participants entering the decontamination unit during the theory-based communication condition



Video footage was collected during the initial 20 minute waiting period, and during the decontamination process itself, to allow observational analysis to be conducted. Video footage was collected using six different video cameras: two cameras were positioned at the disrobe end of the MD1 decontamination tent; two cameras were positioned within the two showering sections of the decontamination tent; and two cameras were positioned at the rerobe end of the decontamination tent. Each group of participants (10 per group) was also timed going through the decontamination process by a member of the research team, who recorded the time each group entered and exited the decontamination unit, using a stopwatch. Participants were timed from the point they entered the disrobe section of the decontamination tent, to the point they exited the rerobe section of the decontamination tent.

Following the decontamination process, participants were escorted to a changing area and were then asked to complete the post-communication intervention questionnaire. Participants then received a debriefing statement about the research.

Analysis

The quantitative questionnaire data and the experiment timing data were analysed using SPSS 20. The quantitative questionnaire data were also analysed using AMOS 19, which was used to create a path model.

The qualitative questionnaire data were analysed using content analysis. Based on the hypotheses of the study, four relevant coding categories were identified: did participants say they received sufficient overall communication from emergency responders; did participants say they received sufficient practical information from emergency responders; did a lack of communication contribute to any anxiety experienced by participants; and did participants feel confused during the process.

A similar method was used to analyse the video observational data. Three behaviours of interest were identified prior to the study, based on the hypotheses: non-compliant behaviours (such as disobeying responder instructions), helping behaviours (such as providing another volunteer with information, or helping them to disrobe); and confusion (evidenced by hesitating prior to carrying out responder instructions, or asking another volunteer for clarification). Data were coded to show how many times behaviours of each type were observed during each of the three different communication conditions.

Results

Experiment timing data

The times taken for each group to complete the shower process were recorded and a comparison was made between groups in each of the three communication conditions. The

mean time taken for groups to progress through the showers in each condition was then compared to the optimum time (9 minutes and 30 seconds). Results revealed that the mean time for those in the theory-based communication condition was 1 minute 18 seconds longer than the optimum time, the mean time for those in the brief communication condition was 2 minutes 20 seconds longer than the optimum time, and the mean time for those in the standard practice condition was 5 minutes 20 seconds longer than the optimum time. Further, those in the theory-based communication group progressed through the process more consistently, with the slowest group in that condition taking only 1 minute 30 seconds longer than the quickest group. In contrast, the slowest group in the standard practice condition took 6 minutes 30 seconds longer than the quickest group, while the slowest group in the brief condition took 11 minutes 18 seconds longer than the quickest group. This is partly due to the fact that the quickest group in the brief condition took only 8 minutes 30 seconds to complete the process, which was 1 minute quicker than the optimum time, and raises questions as to whether the process was completed appropriately. Thus, as predicted, the theory-based communication strategy resulted in the quickest and most efficient progression of volunteers through the decontamination process. See Table 9.1 for the mean, standard deviation, min, max, and range times for the three different communication conditions.

Table 9.1 – Time taken (in minutes) for each group to progress through the decontamination process in the three different communication conditions.

Condition	<i>M</i>	<i>SD</i>	Min	Max	Range
Theory-based communication	10.80	0.67	10.00	11.50	1.50
Standard practice communication	14.84	3.42	11.80	18.30	6.50
Brief communication	11.83	5.34	8.50	19.80	11.30

Observational data

We recorded the frequency of non-compliant, confused, and helping behaviours within each of the three conditions. Two observers analysed the data, and a test of inter-rater reliability revealed that there was a 74% agreement rate between the two observers. A chi-squared test revealed that the difference between the scores of the two raters was not significant, $\chi^2(1, N = 2) = .12, p = .72$. Chi-square tests were carried out to examine whether the differences in observations of non-compliance, confusion, and helping behavior between groups were significant. As there were different numbers of participants in each group, the expected frequency for each type of behavior was adjusted to take into account the proportions of expected behaviours within each condition. In order to calculate the expected frequencies we calculated the percentage of expected behaviours within each condition, based on the proportion of total observed behaviours of each type and the number of participants in each condition. We then used these adjusted expected frequencies to carry out the chi-square test. As expected, non-compliant behaviours (e.g. disobeying responder instructions) were observed more often in the brief communication condition than in either the standard practice or theory-based communication conditions (see Table

9.2). The difference between groups was significant, $\chi^2(2, N = 111) = 24.49, p < .001$.

Similarly, behaviours indicative of confusion (e.g. asking others what to do before carrying out actions) were also observed most often in the brief communication condition, and were observed more commonly in the standard practice communication condition than in the theory-based communication condition. The difference between groups was significant, $\chi^2(2, N = 111) = 17.03, p < .001$. Observed helping behaviours were also higher in the brief communication group than in the other two groups, although the difference between groups was not significant, $\chi^2(2, N = 111) = 4.19, p = .12$. Possible reasons for this are outlined in the discussion.

Table 9.2 – Observed behaviours within each of the three different communication conditions

Condition	Non-compliance	Confusion	Helping
Theory-based communication	2	31	8
Standard practice communication	5	44	10
Brief communication	21	66	16

0 cells (0%) have expected count less than 5.

Quantitative questionnaire data

Manipulation checks. Participants in all groups reported good engagement with the study, with a mean scale score for engagement of 4.59 which was significantly higher than the mid-point value of 4, $t(110) = 4.33, p < .001$. There were no significant differences in engagement between the three groups.

MANOVA indicated that there were no significant differences between the three communication groups on any of the variables which were measured at Time 1 (prior to

receiving the communication intervention during decontamination) (shared identity with members of the public; shared identity with responders; legitimacy; and anxiety). There were also no significant differences in perceptions of privacy between the three different communication groups, $F(2, 108) = 1.11$, n.s.

To check whether the manipulations of communication were perceived in the ways intended, MANOVA was carried out on perceptions of communication with responders, communication messages (provided over loudspeaker), and practical information. This revealed that there were some significant differences between groups, $F(6, 214) = 8.56$, $p < .001$. When the results for the three dependent variables were considered separately, it was revealed that there were significant differences in perceptions of communication from responders between groups, $F(2, 108) = 26.10$, $p < .001$, with the theory-based communication group reporting significantly better perceptions of communication from responders than either the standard practice communication group ($p < .001$) or the brief communication group ($p < .001$). There were no significant differences in perceptions of communication from responders between the standard practice and brief communication groups. There were also significant differences in perceptions of communication messages between groups, $F(2, 108) = 13.12$, $p < .001$, with the theory-based communication group reporting significantly better perceptions of communication messages than either the standard practice communication group ($p < .001$) or the brief communication group ($p < .001$). There were no significant differences in perceptions of communication messages between the standard practice and brief communication groups. There were also significant differences in the perception of the provision of practical information between groups, $F(2, 108) = 19.61$, $p < .001$, with the theory-based communication group reporting significantly better perceptions of the provision of practical information than either the standard practice

communication group ($p < .001$) or the brief communication group ($p < .001$). There were no significant differences in the perception of the provision of practical information between the standard practice and brief communication groups. The manipulation checks therefore showed that the theory-based communication message had been perceived as intended, but that participants had not perceived any differences between the standard practice and brief communication messages.

Between groups analysis. MANOVA was carried out to test for predicted differences between the three different communication groups on the variables measured at Time 2 (after receiving the communication intervention during decontamination) (see Table 9.3 for the variable mean scores and standard deviations at Time 2 for the three different communication conditions). Univariate analyses were included as part of the output from MANOVA, to enable differences between each of the dependent variables to be examined separately between groups. MANOVA revealed that there were some significant differences between the three different communication groups, $F(18, 190) = 2.91, p < .001$. When the results for the dependent variables were considered separately, it was revealed that there were significant differences in perceptions of responder legitimacy between groups, $F(2, 102) = 19.99, p < .001$, with those in the theory-based communication group reporting significantly higher perceptions of responder legitimacy than those in either the standard practice ($p < .001$) or brief communication groups ($p < .001$). There were no significant differences in perceptions of responder legitimacy between the standard practice and brief communication groups. There were also significant differences in identification with emergency responders between groups, $F(2, 102) = 9.85, p < .001$, with those in the theory-based communication group reporting significantly higher identification with responders than those in either the standard practice ($p = .008$) or brief communication

groups ($p < .001$). There were no significant differences in identification with emergency responders between the standard practice and brief communication groups. There was a significant difference in expectations of anxiety during a real incident between groups, $F(2, 102) = 3.01, p = .05$. This was due to reduced expectations of anxiety in the theory-based communication group compared to the standard practice and brief communication groups, although the difference between individual groups was not significant.

Although there were no other significant differences between groups, the theory-based communication condition did generate higher mean values for compliance, collective agency, and willingness to help others during a real incident (see Table 9.3). Results of between-groups analysis were broadly as expected, in showing that those in the theory-based communication condition reported higher mean scores of almost all variables, compared to the other two groups. However, results were not as expected in relation to the brief and standard communication conditions, as there were no significant differences between these two conditions.

Table 9.3: Mean scores of all measures at Time 2 for the three different communication conditions.

Variable	Brief communication		Standard practice communication		Theory-based communication	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Legitimacy	4.85	1.50	5.01	1.28	6.41	0.67
Identification responders	2.83	1.16	3.17	1.33	4.12	1.37
Identification public	5.27	0.86	5.10	1.21	4.98	1.21
Collective agency	5.77	0.82	5.88	1.31	6.24	1.01
Compliance	5.45	1.28	5.61	1.23	5.68	1.30
Actual anxiety	3.31	1.29	3.15	1.43	3.17	1.32
Expectations anxiety	5.73	0.91	5.72	1.26	5.11	1.46
Willingness to help others	6.09	0.95	6.34	1.00	6.37	0.77
Privacy	4.62	1.59	4.91	1.71	4.31	1.83

Time 1 to Time 2 differences. Mixed measures ANOVAs were carried out to examine any interaction effects between Time and Group (communication condition) for each of the four variables which were measured at Time 1 and Time 2 (legitimacy, identification with responders, identification with other members of the public, anxiety). This was followed by a series of within-subjects *t*-tests, which enabled differences between pairs of variables within each condition to be examined (for example, enabling the difference between identification with responders at Time 1 and identification with responders at Time 2 to be analysed for each of the three different communication conditions). There was a significant interaction between time and group for legitimacy,

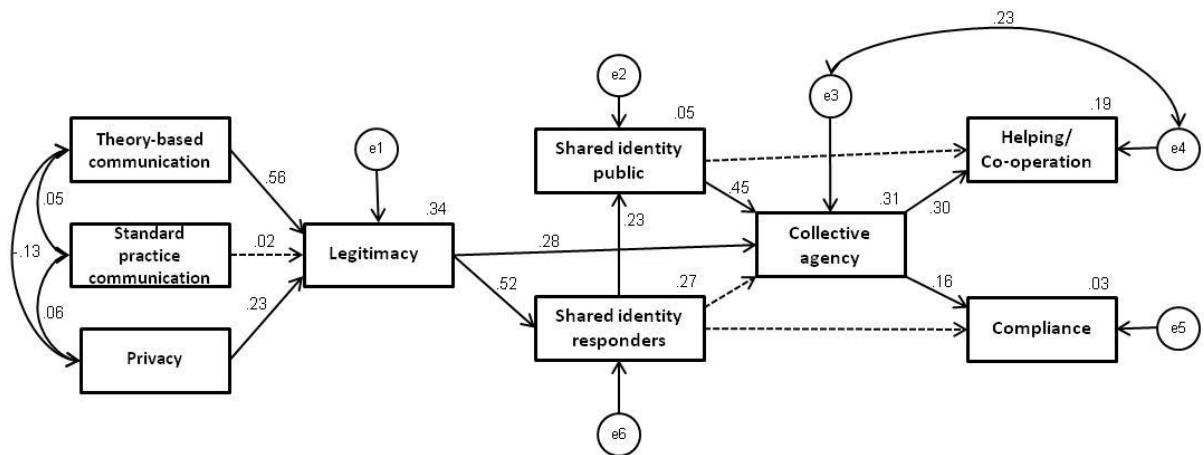
$F(2,103) = 14.71, p < .001$. Within-subjects t -tests revealed that there was a significant increase in perceptions of responder legitimacy in the theory-based communication group from Time 1 to Time 2, $t(40) = -2.07, p = .05$, and a significant decrease in responder legitimacy in the standard practice communication group, $t(31) = 4.71, p < .001$, and the brief communication group, $t(32) = 3.66, p = .001$, from Time 1 to Time 2. There was no significant interaction between time and group for anxiety. Within-subjects t -tests revealed that there was a significant decrease in expectations of anxiety in the theory-based communication group from Time 1 to Time 2, $t(40) = 4.52, p < .001$, a decrease in expectations of anxiety in the standard practice communication group from Time 1 to Time 2, which was not significant, and no significant change in expectations of anxiety in the brief communication group from Time 1 to Time 2. There was a significant interaction between time and group for identification with emergency responders, $F(2,107) = 13.16, p < .001$. Within-subjects t -tests revealed that there was a significant increase in identification with emergency responders in the theory-based communication group from Time 1 to Time 2, $t(40) = -5.70, p < .001$, and a non-significant decrease in identification with emergency responders in the standard practice, $t(31) = 1.78, p = .08$, and brief, $t(36) = 1.5, p = .14$, communication groups from Time 1 to Time 2. There was no significant interaction between time and group for identification with other members of the public. Within-subjects t -tests revealed that there was a significant increase in identification with other members of the public in all groups from Time 1 to Time 2 (theory-based: $t(40) = -7.67, p < .001$; standard practice: $t(31) = -4.44, p < .001$; brief: $t(36) = -6.40, p < .001$).

Results from the within-subjects analysis were therefore broadly as expected, in showing a significant increase in positive outcomes (perceptions of responder legitimacy, identification with other members of the public, identification with emergency responders),

and a reduction in anxiety, in the theory-based communication condition from Time 1 to Time 2. Results were also broadly as expected in showing that this increase in positive outcomes, and reduction in anxiety, did not occur in either of the other two conditions.

Path analysis. The Time 2 measures were entered into a path model, which is presented in Figure 9.4. Model chi-square was used to evaluate the overall model-data fit. Orthogonal contrast coding was used to create two categorical variables ('theory-based communication' and 'standard practice communication') out of the three different communication groups²⁶.

Figure 9.4: A path model of the data collected at Time 2, following the mass decontamination field experiment.



The path model showed a reasonable overall fit with the data, $\chi^2(22) = 35.03$, $p = .04$, CFI = .91, RMSEA = .07.

The model explains 34% of the variance in perceptions of responder legitimacy, 27% of the variance in identification with emergency responders, 5% of the variance in

²⁶ The 'theory-based communication' variable was coded to compare the theory-based communication condition to the standard practice and brief communication conditions (theory-based condition = 2, standard practice condition = -1, brief condition = -1), and the 'standard practice communication' variable was coded to compare the standard practice communication condition to the brief communication condition (theory-based condition = 0, standard practice condition = 1, brief condition = -1).

identification with other members of the public, 31% of the variance in collective agency, 3% of the variance in willingness to comply during a real incident, and 19% of the variance in willingness to help others during a real incident²⁷. As hypothesised, the model shows that being in the theory-based communication group, as opposed to the standard practice or brief communication groups, was a significant predictor of increased perceptions of responder legitimacy, $\beta = .56, p < .001$. However, being in the standard practice communication group, as opposed to the brief communication group, was not a significant predictor of perceptions of responder legitimacy, $\beta = .02, n.s.$ As hypothesised, there was also a significant relationship between perceptions of sufficient privacy and perceptions of responder legitimacy, $\beta = .23, p = .004$, perceptions of responder legitimacy and identification with emergency responders, $\beta = .52, p < .001$, and identification with emergency responders and identification with other members of the public, $\beta = .23, p = .02$. The model also supported the hypotheses in showing a significant relationship between identification with other members of the public and collective agency, $\beta = .45, p < .001$, and between collective agency and willingness to help others, $\beta = .30, p = .05$. There was also a positive relationship between collective agency and compliance, which approached significance, $\beta = .16, p = .09$. There was also a significant direct relationship between perceptions of responder legitimacy and collective agency, $\beta = .28, p < .001$.

There was no significant direct relationship between identification with emergency responders and collective agency, identification with emergency responders and compliance, or identification with members of the public and willingness to help others.

²⁷ There was no significant relationship between expectations of anxiety and any of the other variables, and so expectations of anxiety during a real incident was not included in the model.

There were, however, indirect relationships between these variables, mediated by other variables within the model.

As predicted, social identity variables (perceptions of responder legitimacy, and collective agency) performed a significant mediating role within the model. Perceptions of responder legitimacy significantly mediated the relationship between being in the theory-based communication group and identification with emergency responders, $b = .33$, BCa CI [.15, .52], $k^2 = .21$, 95% BCa CI [.10, .33], and being in the theory-based communication group and collective agency, $b = .17$, BCa CI [.02, .35], $k^2 = .14$, 95% BCa CI [.02, .27]. Collective agency significantly mediated the relationship between identification with other members of the public and willingness to help others during a real incident, $b = .20$, BCa CI [.10, .33], $k^2 = .23$, 95% BCa CI [.13, .40].

Qualitative questionnaire data

Results supported the findings from the quantitative questionnaire items, in showing that more participants in the standard practice and brief communication groups reported a need for increased communication and practical information, compared to those in the theory-based communication group (see Table 9.4).

When asked why they felt nervous or worried during the study, if at all, a far greater proportion of people in the standard practice (38%) and brief (21%) communication conditions reported anxiety due to a lack of communication from emergency responders, compared to those in the theory-based communication condition (0%). The difference between groups is significant, $\chi^2(2, N = 111) = 15.95, p < .001$.

Nearly a quarter of participants in the brief communication condition (24%) and over a third of participants in the standard practice communication condition (38%)

reported that they felt confused, or did not know what they were doing, during the decontamination process. In contrast, only 12% of people in the theory-based communication condition reported feeling confused. The difference between groups is significant, $\chi^2(2, N = 111) = 6.07, p = .05$.

Table 9.4 – Results of qualitative questionnaire data from each of the three different communication conditions.

Condition	N	Wanted more communication (%)	Wanted more practical info (%)	Anxiety – no communication (%)	Confusion (%)
Theory-based communication	42	5 (12)	15 (36)	0 (0)	5 (12)
Standard practice communication	32	24 (75)	26 (81)	12 (38)	12 (38)
Brief communication	37	24 (63)	26 (68)	8 (21)	9 (24)

0 cells (0%) have expected count less than 5.

Discussion

This study aimed to test the effectiveness of three different responder communication strategies for mass decontamination following a CBRN incident, by using both self-report and behavioural measures. Results support the initial hypotheses in showing that the theory-based communication strategy facilitated the quickest and most efficient progression of volunteers through the decontamination process. This is in line with previous findings in other domains (Proulx & Sime, 1991), and it is likely to be due to volunteers having a better understanding of what they were required to do during this condition. This is supported by the evidence from the qualitative data analysis and the observational analysis, which revealed that far fewer people in the theory-based communication condition reported feeling confused during the decontamination process, or exhibited confused behaviours, compared to those in the other two conditions. This could

have important implications during a real life incident, as confusion could lead to failure to complete the decontamination process successfully, and could result in secondary contamination of other people and places; this could cost lives during a real incident (Lillie, Mattis, Kelly, & Rayburn, 2006; Schulze & Lake, 2009).

Many of the hypothesised differences between the theory-based communication condition and the other two conditions were supported, as were predictions about the mediating role of social identity variables between effective responder communication and positive outcome variables (e.g. non-compliance, helping and cooperative behaviour, anxiety). However, there were no significant differences between those in the standard practice and brief communication conditions on any of the variables; possible reasons for this will be discussed in the limitations section below. Results will now be discussed in terms of their implication for each of the outcome variables: compliance; helping and cooperative behaviour; and anxiety.

Non-compliance. As predicted, results show that effective responder communication resulted in increased levels of compliance, as indicated by both the results from the observational analysis, which showed significantly fewer observations of non-compliant behaviours in the theory-based communication group, and the self-report measures, in which willingness to comply was highest in the theory-based communication condition. However, the increased level of willingness to comply in the theory-based communication condition was not significant. A possible reason for this is that the mean self-reported level of willingness to comply was quite high ($M = 5.6$).²⁸ This may have created a ceiling effect, in which it was not possible to determine a significant difference between the three

²⁸ The mean score for expected compliance was significantly higher than that recorded in previous similar research, $M = 4.8$, $t(110) = 6.86$, $p < .001$ (Carter et al., submitted: Chapter 8).

conditions. Possible reasons for the high level of willingness to comply are reported in the limitations section below.

Those in the theory-based communication group reported significantly higher perceptions of responder legitimacy, and identification with emergency responders, than those in either the standard practice or brief communication groups. Further, results from within-subjects tests revealed that perceptions of responder legitimacy, and identification with emergency responders, increased in the theory-based communication condition, but decreased in the other two conditions, from Time 1 to Time 2. Perceptions of responder legitimacy, and identification with emergency responders, are factors which have previously been found to be related to levels of compliance (cf. Stott et al., 2008; Stott et al., 2012) and which may have contributed to the reduced number of observations of non-compliant behaviours in the theory-based communication group in the current study. In line with this, path analysis revealed that perceptions of responder legitimacy and identification with emergency responders played a significant mediating role between effective responder communication, perceptions of privacy, and willingness to comply during a real incident. Increasing public compliance with decontamination is of critical importance during real life incidents involving mass decontamination. If members of the public fail to comply with responder instructions, or challenge the authority of emergency responders, this could delay the decontamination process; delayed or inefficient decontamination could result in lives being lost, through prolonged contact with the contaminant, or through secondary contamination of other people and places (Lillie et al., 2006; Schulze & Lake, 2009).

Helping and cooperative behaviour. Results from path analysis support the initial hypotheses relating to helping and cooperative behaviour, in showing that effective responder communication predicts increased helping and cooperative behaviour, mediated

by the social identity variables. Results from between-subjects tests also revealed that self-reported levels of willingness to help others during a real incident were higher in the theory-based communication condition than in the other two conditions, although this was not significant.

However, results from the observational analysis showed increased helping behaviours in the brief communication condition. It is possible that this is because the reduced input from emergency responders in this condition made it more necessary for participants to help each other; in a real incident, there would be far fewer emergency responders to members of the public, so it would likely be more necessary for members of the public to help each other. Further, in the current situation, compliance was very high (participants had all consented to undergo decontamination before the experiment), and therefore 'helping' behaviours were directed at helping others to undergo the decontamination process. In a real incident, if identification with other members of the public was high (as in all three groups in the present study), but identification with emergency responders was low (as in the brief communication group), helping among members of the public would still be expected, but this might take a different form. For example, if members of the public do not perceive responders to be behaving legitimately, and therefore do not identify with them, compliance with decontamination is likely to be low. In this case, members of the public might help each other to leave the scene, or challenge the authority of the emergency responders, rather than helping each other to undergo decontamination. It is therefore crucial not only that identification with other members of the public is high (to promote helping and cooperative behaviours), but also that identification with emergency responders is high (to ensure that helping and

cooperation among members of the public are directed towards undergoing decontamination).

Cooperative and helping behaviour among members of the public is likely to be important in order to facilitate the smooth-running of the decontamination process during a real incident involving mass decontamination; in an incident of this type, emergency responders will have limited time and resources, and it will therefore be crucial that members of the public cooperate with and help each other when necessary, in order to successfully undergo decontamination.

Anxiety. Results from the qualitative questionnaire measures reveal that nearly a quarter of participants in the brief communication condition, and over a third of participants in the standard practice communication condition, reported that they felt anxious due to a lack of communication from responders; in contrast, no volunteers reported that they felt anxious due to a lack of communication from responders in the theory-based communication condition. This is in line with results from small scale incidents involving decontamination, in showing that a lack of communication from responders contributed to increased anxiety (e.g. Hanley, 1999; U.S. Fire Administration, 1997). Results of within-subjects tests support this, in showing that those in the theory-based communication condition reported a significant reduction in expectations of anxiety during a real incident, from Time 1 to Time 2.

However, results from path analysis failed to show support for the predicted relationships between the social identity variables and anxiety. Measures were taken of both actual anxiety experienced during the process, and expected anxiety during a real incident. As in previous research (Carter et al., 2013c: Chapter 7), anxiety reported on the

quantitative self-report measure was very low ($M = 3.24$)²⁹, creating difficulty in establishing any relationships between actual anxiety and the other variables. In contrast, the mean for expectations of anxiety during a real incident was very high (5.50)³⁰. The fact that expectations of anxiety were so high, and that there was a large difference between actual anxiety and expected anxiety, suggests that it may be difficult for members of the public to accurately imagine how anxious they would feel during an incident of this type; there may be a tendency to automatically assume a very high level of anxiety. This may therefore explain why the expected relationships between anxiety and the relevant variables were not present in the self-reported quantitative measures.

Implications

Theoretical implications. Decontamination has traditionally been seen as a technical issue (Carter et al., 2013a: Chapter 2), with very little effort to understand how members of the public are likely to behave during such incidents. Where psychosocial issues have been considered, policy makers and planners have tended to rely on assumptions of ‘mass panic’; this has led to a focus on controlling, rather than communicating with, members of the public (Carter et al., 2013a: Chapter 2; in press: Chapter 4). Planning for incidents involving mass decontamination has therefore lacked an understanding of the likely psychosocial issues involved, and has been based on outdated assumptions, rather than evidence. By applying the social identity approach during a simulated incident involving mass decontamination, the current research has been able to test the effectiveness of three different responder communication strategies, and to show how and why the provision of

²⁹ The mean score for actual anxiety was significantly below the midpoint value of 4, $t(107) = 5.78, p < .001$.

³⁰ The mean score for expectations of anxiety was significantly higher than the mid-point value of 4, $t(105) = 12.16, p < .001$, and also significantly higher than actual anxiety, $t(105) = -16.57, p < .001$.

health-focused communication, and practical information, is so important during incidents involving mass decontamination.

The findings from this research provide support for the social identity model of collective resilience (Drury et al., 2009a; 2009b), by showing a significant relationship between identification with other members of the public, collective agency, and increased willingness to help others. The results also provide support for the elaborated social identity model (Drury & Reicher, 2000), in showing that effective responder communication results in increased perceptions of responder legitimacy, which in turn increases identification with emergency responders. This research therefore shows that aspects of the SIMCR and the ESIM are applicable during incidents involving mass decontamination, and that these two theories can be combined to create a model of likely crowd behaviour during incidents involving mass decontamination.

Practical implications. The results show that a communication strategy which includes honest information about the actions emergency responders are taking, health-focused information about decontamination, and sufficient practical information, results in improved outcomes in terms of both the perceptions, and the behaviour, of members of the public. The results suggest that such a communication strategy will result in increased speed and efficiency of the decontamination process, increased compliance, reduced anxiety, and increased cooperative behaviour among members of the public. These factors are likely to save lives during a real incident involving decontamination, as any delay in the decontamination process will result in the increased potential for adverse health effects from the contaminant. When managing an incident involving mass decontamination, emergency responders should therefore strive to: communicate openly and honestly with members of the public; provide health-focused information about decontamination,

including about the benefits of decontamination; and provide sufficient practical information during the decontamination process.

Limitations

There are several potential limitations of this research. First, it may be questioned whether the groups in which people underwent the decontamination process ($N < 45$) during this study were of a sufficient size as to represent ‘mass’ decontamination. However, it has been suggested that incidents of up to 50 victims may be defined as ‘small-scale mass casualty incidents’, indicating that the group sizes used during the current study were of sufficient size as to be termed ‘mass’ (Johnson & Calkins, 1999). Further, it is likely that the importance of effective responder communication strategies, and the mediating role played by social identity variables, would have been more evident, rather than less, had the groups been larger.

Second, the differences between the standard practice and brief communication conditions were not obvious enough to participants. While the theory-based condition was perceived as being significantly more effective than the other two conditions, there were no significant differences in perceptions of the standard practice and brief conditions. In the brief condition and the theory-based condition responders understood that they were either to provide no extra information (brief condition) or any extra information they felt was required (theory-based condition). However, responders were not clear about how much they were allowed to say to participants in the standard practice communication group, and as a result gave less information than expected, thus resulting in less difference between the brief and standard practice conditions than intended. It would therefore be beneficial to run a future study, in which emergency responders receive a more precise brief about the way in which they should communicate with participants in the standard practice condition. This

would enable conclusions to be drawn about the effectiveness of providing practical information alone, compared to providing both practical information and increased communication.

A third potential limitation is that the order of communication conditions (brief, standard practice, theory-based) may have had a confounding effect on the outcomes of the study, in terms of the effect of the order of conditions on the performance of emergency responders. The brief condition took place first, followed by the standard practice condition, and then the theory-based condition. Although responders were briefed on how to act during each condition, it is possible that the way in which they managed the incident might have improved slightly through practice over the three conditions (in addition to the intended improvements in communication from responders over the course of the three conditions). This potential confound should therefore be noted when interpreting the results.

A fourth possible limitation is that participants received information about decontamination (including why and how decontamination would be carried out), prior to taking part in the study. This may therefore have resulted in a greater willingness to comply, due to a greater understanding of the need for the process. This is supported by the fact that the mean level of compliance in this study was quite high. Future research should therefore provide less information to participants prior to the study about the importance of decontamination, whilst ensuring that participants still have enough information about the nature of the study to be able to give their informed consent.

A final possible limitation is that the observational data collected were not independent, as participants took part in the trial in small groups, rather than individually. Therefore this should be kept in mind when examining the results of the observational

analysis. However, mass decontamination inherently involves a crowd of people, in which each individual's behavior has the potential to impact on the behavior of others. In this way, the study was designed to be as close a reflection of a real life incident as possible.

Conclusion

Overall, this study shows that communication strategies which are perceived by members of the public as the most effective are those which include health-focused explanations about the decontamination process, information about the actions responders are taking, and sufficient practical information. A communication strategy which encompasses these aspects is likely to increase the speed and efficiency of the decontamination process, by improving both public willingness, and ability, to take recommended actions. Increasing the speed and efficiency of the decontamination process may result in lives being saved during a real life incident of this type.

References

- Abeel, B. (2006). *Multi-casualty mass decontamination guidance document for first responders*. California: Governor's Office of Emergency Services.
- Aguirre, B. E. (2005). Commentary on "Understanding mass panic and other collective responses to threat and disaster". Emergency evacuations, panic, and social psychology. *Psychiatry*, 68(2), 121-129.
- Aguirre, B. E., Torres, M. R., Gill, K. B., & Hotchkiss, H. L. (2011). Normative collective behaviour in the station building fire. *Social Science Quarterly*, 92(1), 100-118.
- Aguirre, B. E., Wenger, D. & Vigo, G. (1998). A test of the emergent norm theory of collective behaviour. *Sociological Forum*, 13(2), 301-320.
- Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckman (Eds.), *Action-control: from cognition to behaviour* (pp. 11-39). Heidelberg, Germany: Springer.
- Al-Damouk, M., & Bleetman, A. (2005). Impact of the Department of Health initiative to equip and train acute trusts to manage chemically contaminated casualties. *Emergency Medicine Journal*, 22(5), 347-350.
- Aldoory, L., & Van Dyke, M. A. (2006). The roles of perceived "shared" involvement and information overload in understanding how audiences make meaning of news about bioterrorism. *Journalism and Mass Communication Quarterly*, 83(2), 346-361.
- Alexander, D. E. (2007). Misconception as a barrier to teaching about disasters. *Prehospital and Disaster Medicine*, 22(2), 95-103.
- Alexander, D. A., & Klein, S. (2003). Biochemical terrorism: too awful to contemplate, too serious to ignore. *British Journal of Psychiatry*, 183(6), 491-497.

- Alexander, D. A., & Klein, S. (2006). The challenge of preparation for a chemical, biological, radiological, or nuclear terrorist attack. *The Journal of Postgraduate Medicine*, 52(2), 126-131.
- Amlôt, R., Lerner, J., Matar, H., Jones, D. R., Carter, H., Turner, E. A., Price, S. C., & Chilcott, R. P. (2010). Comparative analysis of showering protocols for mass-casualty decontamination. *Prehospital and Disaster Medicine*, 25(5), 435-439.
- Amos, J., Redman, T., Few, G., Findlay, D., & Dyer, J. (2010). *Major incident plan*. Oxfordshire, UK: South Central Ambulance Service NHS Trust.
- Auf der Heide, E. (2004). Common misconceptions about disasters: panic, the 'disaster syndrome', and looting. In M. O'Leary (Ed.), *The first 72 hours: a community approach to disaster preparedness* (pp. 340-380). Lincoln, Nebraska: iUniverse Publishing.
- Baker, D. (2010). Improving decontamination procedures: a priority for chemical incident management. *Prehospital and Disaster Medicine*, 25(5), 440-441.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioural change. *Psychological Review*, 84(2), 191-215.
- Baum, A., & Fleming, I. (1993) Implications of psychological research on stress and technological accidents. *American Psychologist*, 48(6), 665-672.
- Baum, A., Gatchel, R. J., & Schaeffer, M. A. (1983). Emotional, behavioral, and physiological effects of chronic stress at Three Mile Island. *Journal of Consulting and Clinical Psychology*, 51(4), 565-572.
- Beaton, R., Stergachis, A., Oberle, M., Bridges, E., Nemuth, M., & Thomas, T. (2005). The sarin gas attacks on the Tokyo subway – 10 years later/ lessons learned. *Traumatology*, 11(2), 103-119.

- Bendersky, J. W. (2007). 'Panic': the impact of Le Bon's crowd psychology on U.S. military thought. *Journal of the History of the Behavioural Sciences*, 43(3), 257-283.
- Bhardwaj, J. R. (2010). Chemical, biological, radiological, and nuclear disaster management. *Journal of Pharmacy and Bioallied Sciences*, 2(3), 157-158.
- Bleich, A., Dycian, A., Koslowsky, M., Solomon, Z., & Wiener, M. (1992). Psychiatric implications of missile attacks on a civilian population: Israeli lessons from the Persian Gulf War. *Journal of the American Medical Association*, 268(5), 613-615.
- Bowler, R. M., Murai, K., & True, R. H. (2001). Update and long-term sequelae of the sarin attack in the Tokyo, Japan subway. *Chemical Health and Safety*, 8(1), 53-55.
- Cabinet Office. (2010). *Exercises*. Available at:
<http://www.cabinetoffice.gov.uk/ukresilience/preparedness/exercises.aspx>
 (accessed 20 April 2011).
- Carmeli, A., Liberman, N., & Mevorach, L. (1991). Anxiety-related somatic reactions during missile attacks. *Israeli Journal of Medical Science*, 27(11-12), 677-680.
- Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (2013c). Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise. *Basic and Applied Social Psychology*, 35(6), 575-585.
- Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (Submitted). Effective responder communication, perceived responder legitimacy and group identification predict public cooperation and compliance in a mass decontamination visualisation experiment.

- Carter, H., Drury, J., Amlôt, R., Rubin, G. J., & Williams, R. (In preparation). Applying crowd psychology to improve policy and practice in the management of mass decontamination.
- Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2012). Public experiences of mass casualty decontamination. *Biosecurity and Bioterrorism*, 10(3), 280-289.
- Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2013a). Communication during mass casualty decontamination: highlighting the gaps. *International Journal of Emergency Services*, 2(1), 29-48.
- Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2013b). The effect of communication on anxiety and compliance during mass decontamination. *Disaster Prevention and Management*, 22(2), 132-147.
- Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (In press). Emergency responders' experiences of and expectations regarding decontamination. *International Journal of Emergency Services*.
- Chertkoff, J. M. & Kushigian, R. H. (1999). *Don't panic: the psychology of emergency egress and ingress*. Westport, CT: Praeger.
- Clarke, L. (2002). Panic: myth or reality? *Contexts*, 1(3), 21-26.
- Clarke, S. F. J., Chilcott, R. P., Wilson, J. C., Kamanyire, R., Baker, D., & Hallett, A. (2008). Decontamination of multiple casualties who are chemically contaminated: a challenge for acute hospitals. *Prehospital and Disaster Medicine*, 23(2), 175-181.
- Cocking, C., & Drury, J. (in press). Talking about a tragedy: 'panic' as discourse in survivors' accounts of the 1989 Hillsborough disaster. *Journal of Community and Applied Social Psychology*.

- Cocking, C., Drury, J., & Reicher, S. (2009). The psychology of crowd behaviour in emergency evacuations: results from two interview studies and implications for the Fire and Rescue Services. *The Irish Journal of Psychology*, 30(1-2), 59-73.
- Cole, T. B. (2000). When a bioweapon strikes, who will be in charge? *Journal of the American Medical Association*, 284(8), 944-948.
- Cornish, P. (2007). *The CBRN system: assessing the threat of terrorist use of chemical, biological, radiological and nuclear weapons in the United Kingdom*. London: Chatham House.
- Cornwell, B. (2001). Panic or situational constraints? The case of the M/V Estonia. *International Journal of Mass Emergencies and Disasters*, 19(1), 5-25.
- Cornwell, B. (2003). Bonded fatalities: relational and ecological dimensions of a fire evacuation. *The Sociological Quarterly*, 44(4), 617-638.
- Covello, V., & Sandman, P. M. (2001). Risk communication: evolution and revolution. In A. Wolbarst (Ed.), *Solutions to an environment in peril* (pp. 164 – 178). Baltimore, Maryland: John Hopkins University Press.
- De Zwart, O., Veldhuijzen, I. K., Elam, G., Aro, A. R., Abraham, T., Bishop, G. D., Voeten, H. A. C. M., Richardus, J. H., & Brug, J. (2009). Perceived threat, risk perception, and efficacy beliefs related to SARS and other (emerging) infectious diseases: results of an international survey. *International Journal of Behavioural Medicine*, 16(1), 30-40.
- Deegan, A., & Donald, G. (2012). Police and fire response to a CBRN incident. In: Holdsworth, D., Bland, S., & O'Reilly, D. CBRN response and the future. *Journal of the Royal Army Medical Corps*, 158(1), 58-63.

Devon and Somerset Fire and Rescue Service. (2010). *Mass decontamination exercise*.

Available at

<http://www.dsfire.gov.uk/newsdesk/ViewPressRelease.asp?ReleaseID=483>

(accessed 20 February 2011).

Diamond, T. (2010). *CBRN plan: procedure for management of patients from a haz-mat or C.B.R.N. incident*. Manchester, UK: Trafford Healthcare NHS Trust.

DiGiovanni, C. (1999). Domestic terrorism with chemical or biological agents: psychiatric aspects. *American Journal of Psychiatry*, 156(10), 1500-1505.

Dodgen, D., Norwood, A. E., Becker, S.M., Perez, J. T., & Hansen, C. K. (2011). Social, psychological, and behavioural responses to a nuclear detonation in a US city: implications for health care planning and delivery. *Disaster Medicine and Public Health Preparedness*, 5(S1), S54-S64.

Donald, I., & Canter, D. (1990). Behavioural aspects of the King's Cross disaster. In D. Canter (Ed.), *Fires and human behaviour* (2nd ed.) (pp. 15-30). David Fulton Publishers: London.

Drury, J. (2002). 'When the mobs are looking for witches to burn, nobody's safe': talking about the reactionary crowd. *Discourse and Society*, 13(1), 41-73.

Drury, J. (2009). Crowd dispersal. *CBRNe World*. Spring, 40-42.

Drury, J. (2012). Collective resilience in mass emergencies and disasters: a social identity model. In J. Jetten, C. Haslam & S.A. Haslam (Eds.), *The social cure: identity, health, and well-being*. Hove, UK: Psychology Press.

Drury, J., Cocking, C., & Reicher, S. (2009a). The nature of collective resilience: Survivor reactions to the 2005 London bombings. *International Journal of Mass Emergencies and Disasters*, 27(1), 66-95.

- Drury, J., Cocking, C., & Reicher, S. (2009b). Everyone for themselves? A comparative study of crowd solidarity among emergency survivors. *British Journal of Social Psychology*, 48(3), 487-506.
- Drury, J., Cocking, C., Reicher, S., Burton, A., Schofield, D., Hardwick, A., Graham, D., & Langston, P. (2009c). Cooperation versus competition in a mass emergency evacuation: a new laboratory simulation and a new theoretical model. *Behaviour Research Methods*, 41(3), 957-970.
- Drury, J., Novelli, D., & Stott, C. (2013). Representing crowd behaviour in emergency planning guidance: 'mass panic' or collective resilience? *Resilience: International Policies, Practices and Discourses*, 1(1), 18-37.
- Drury, J., Novelli, D., & Stott, C. (in press). Psychological disaster myths in the perception and management of mass emergencies. *Journal of Applied Social Psychology*.
- Drury, J., & Reicher, S. (2000). Collective action and psychological change: the emergence of new social identities. *British Journal of Social Psychology*, 39(4), 579-604.
- Drury, J., & Reicher, S. (2009). Collective psychological empowerment as a model of social change: researching crowds and power. *Journal of Social Issues*, 65(4), 707-725.
- Dynes, R. R. (1990). *Community emergency planning: false assumptions and inappropriate analogies*. Delaware: University of Delaware Disaster Research Center.
- Dynes, R. R. (1994). Community emergency planning: false assumptions and inappropriate analogies. *International Journal of Mass Emergencies and Disasters*, 12(2), 141-158.

Dynes, R. R. (2003). Finding order in disorder: continuities in the 9-11 response.

International Journal of Mass Emergencies and Disasters, 21(3), 9-23.

Edwards, N. A., Caldicott, D. G. E., Eliseo, T., & Pearce, A. (2006). Truth hurts - hard

lessons from Australia's largest mass casualty exercise with contaminated patients. *Emergency Medicine Australia*, 18(2), 185-195.

Elder, K., Xirasagar, S., Miller, N., Bowen, S. A., Glover, S., & Piper, C. (2007).

African Americans' decisions not to evacuate New Orleans before Hurricane Katrina: a qualitative study. *American Journal of Public Health*, 97(Supplement 1), S124-S129.

Emery, R. J., Sprau, D. D., & Morecook, R. C. (2008). Risk communication

considerations to facilitate the screening of mass populations for potential contamination with radioactive material. *The Radiation Safety Journal*, 95(Supplement 5), S168-S174.

Emery, R. J., Sprau, D. D., Morecook, R. C., & Herbold, J. (2009). Surge capacity

volunteer perspectives on a field training exercise specifically designed to emphasise likely roles during a disaster response. *The Radiation Safety Journal*, 97(Supplement 3), S155-S160.

Federal Emergency Management Agency. (2003). *Don't be a victim! Medical*

management of patients contaminated with chemical agents. Tennessee: Oak Ridge National Laboratory.

Feinberg, W. E., & Johnson, N. R. (2001). The ties that bind: a macro-level approach to

panic. *International Journal of Mass Emergencies and Disasters*, 19(3), 269-295.

- Fertel, B. S., Kohlhoff, S. A., Roblin, P. M., & Arquilla, B. (2009). Lessons from the 'Clean Baby 2007' pediatric decontamination drill. *American Journal of Disaster Medicine*, 4(2), 77-85.
- Fischhoff, B. (1995). Risk perception and communication unplugged: Twenty years of process. *Risk Analysis*, 15(2), 137 – 145.
- Fischhoff, B. (2013). *Risk analysis and human behaviour*. Oxford, UK: Earthscan.
- Fischhoff, B., Gonzalez, R. M., Small, D. A., & Lerner, J. S. (2003). Evaluating the success of terror risk communications. *Biosecurity and Bioterrorism*, 1(4), 255-258.
- FitzGerald, D. J., Sztajnkryce, M. D., & Crocco, T. J. (2003). Chemical weapon functional exercise - Cincinnati: observations and lessons learned from a 'typical medium-sized' city's response to simulated terrorism utilizing weapons of mass destruction. *Public Health Reports*, 118(3), 205 - 214.
- Fontana, G. T. (1998). *Fire service operations involving civilian decontamination at hazardous material incidents: executive analysis of fire service operations in emergency management*. Boston, MA: Boston Fire Department.
- Ford, E., & Ayres, S. (2009). Stressful events and support during birth: the effect on anxiety, mood and perceived control. *Journal of Anxiety Disorders*, 23(2), 260-268.
- Fritz, C. E., & Williams, H. B. (1957). The human being in disasters: a research perspective. *ANNALS of the American Academy of Political and Social Science*, 309(1), 42-51.
- Furedi, F. (2008). Fear and security: a vulnerability-led policy response. *Social Policy and Administration*, 42(6), 645-661.

- Galea, E. R., & Blake, S. J. (2004). *Collection and analysis of human behaviour data appearing in the mass media relating to the evacuation of the World Trade Centre Towers of 11 September 2001*. London: Building Disaster Assessment Group of the Office of the Deputy Prime Minister.
- Gannt, P., & Gannt, R. (2012). Disaster psychology: dispelling the myths of panic. *Professional Safety*, August 2012, 42-49.
- Glass, T. A., & Schoch-Spana, M. (2002). Bioterrorism and the people: how to vaccinate a city against panic. *Confronting Biological Weapons*, 34(2), 217-223.
- Glik, D., Harrison, K., Davoudi, M., & Riopelle, D. (2004). Public perceptions and risk communications for Botulism. *Biosecurity and Bioterrorism*, 2(3), 216-223.
- Grant, W. D. (2007). Joint civilian/National Guard mass casualty exercise provides model for preparedness training. *Military Medicine*, 172(8), 806-811.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough?: An experiment with data saturation and variability. *Field Methods*, 18(1), 59-82.
- Guten, S., & Allen, V. L. (1972). Likelihood of escape, likelihood of danger, and panic behaviour. *Journal of Social Psychology*, 87(1), 29-36.
- Hanley, C. (1999, December 7). Residents sickened by pesticide cloud; ag officials insider changing rules. *Latino News*. Retrieved 7 October, 2010, from http://wearcam.org/decon/decon_like_rape_dec99.html
- Haslam, S. A., Jetten, J., O'Brien, A., & Jacobs, E. (2004). Social identity, social influence and reactions to potentially stressful tasks: support for the self-categorization model of stress. *Stress and Health*, 20(1), 3-9.
- Haslam, S. A., Jetten, J., Postmes, T., & Haslam, C. (2009). Social identity, health and well-being: an emerging agenda for applied psychology. *Applied Psychology: An International Review*, 58(1), 1-23.

- Haslam, S. A., Jetten, J., & Waghorn, C. (2009). Social identification, stress and citizenship in teams: a five-phase longitudinal study. *Stress and Health*, 25(1), 21-30.
- Haslam, S. A., O'Brien, A., Jetten, J., Vormedal, K., & Penna, S. (2005). Taking the strain: social identity, social support and the experience of stress. *British Journal of Social Psychology*, 44(3), 355-370.
- Haslam, S. A., & Platow, M. J. (2001). The link between leadership and followership: how affirming social identity translates vision into action. *Personality and Social Psychology Bulletin*, 27(11), 1469-1479.
- Haslam, C., & Reicher, S. (2006). Stressing the group: social identity and the unfolding dynamics of responses to stress. *Journal of Applied Psychology*, 91(5), 1037-1052.
- Haslam, C., & Reicher, S. (2007). Identity entrepreneurship and the consequences of identity failure: the dynamics of leadership in the BBC prison study. *Social Psychology Quarterly*, 70(2), 125-147.
- Hayes, A. (2010). Mass decontamination drill run at Police centre in Colindale. *The Times*, 23 March, available at http://www.times-series.co.uk/news/5078404.Decontamination_run_at_Peel_Centre_site/ (accessed October 2010).
- HM Government. (2010a). *Securing Britain in an age of uncertainty: the strategic defence and security review*. London, UK: HM Government.
- HM Government. (2010b). *The United Kingdom's strategy for countering chemical, biological, radiological and nuclear (CBRN) terrorism*. London, UK: HM Government.

- Hochbaum, G. M. (1958). Public participation in medical screening programs: a socio-psychological study. *Public Health Service Publication No. 572*. Washington, DC: United States Government Printing Office.
- Holdsworth, D., Bland, S., & O'Reilly, D. (2012). CBRN response and the future. *Journal of the Royal Army Medical Corps*, 158(1), 58-63.
- Holloway, H. C., Norwood, A. E., Fullerton, C. S., Engel, C. C., & Ursano, R. J. (1997). The threat of biological weapons: prophylaxis and mitigation of psychological and social consequences. *Journal of the American Medical Association*, 278(5), 425-427.
- Home Office. (2004). *The decontamination of people exposed to chemical, biological, radiological or nuclear (CBRN) substances or material (2d ed.)*. London, UK: Home Office.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.
- International Atomic Energy Agency. (1998). *The radiological accident in Goiania*. Vienna, Austria: International Atomic Energy Agency.
- Jackson, J., & Bradford, B. (2010). What is trust and confidence in the Police? *Policing*, 4(3), 241-248.
- Jackson, J., Bradford, B., Stanko, B., & Hohl, K. (2013). *Just authority? Trust in the police in England and Wales*. Oxford, UK: Routledge.
- Jetten, J., Haslam, C., & Haslam, S. A. (Eds.) (2011). *The social cure: identity, health and well-being*. New York and Hove: Psychology Press.
- Jiang, X., Elam, G., Yuen, C., Voeten, H. A. C. M., De Zwart, O., Veldhuijzen, I. K., & Brug, J. (2009). The perceived threat of SARS and its impact on precautionary

- actions and adverse consequences: a qualitative study among Chinese communities in the United Kingdom and the Netherlands. *International Journal of Behavioural Medicine*, 16(1), 58-67.
- Johnson, N. R. (1987). Panic at "The Who concert stampede": an empirical assessment. *Social Problems*, 34(4), 362-373.
- Johnson, N. R. (1988). Fire in a crowded theatre: a descriptive investigation of the emergence of panic. *International Journal of Mass Emergencies and Disasters*, 6(1), 7-26.
- Johnson, G. A., & Calkins, A. (1999). Prehospital triage and communication performance in small mass casualty incidents: a gauge for disaster preparedness. *American Journal of Emergency Medicine*, 17(2), 148-150.
- Jones, E., Woolven, R., Durodie, B., & Wessely, S. (2006). Public panic and morale: Second World War civilian responses re-examined in the light of the current anti-terrorist campaign. *Journal of Risk Research*, 9(1), 57-73.
- Kelley, H. H., Condry, J. C., Dahlke, A. E., & Hill, A. H. (1965). Collective behaviour in a simulated panic situation. *Journal of Experimental Social Psychology*, 1(1), 20-54.
- Klein, O., Spears, R., & Reicher, S. (2007). Social identity performance: extending the strategic side of SIDE. *Personality and Social Psychology Review*, 11(1), 28-45.
- Koenig, K. L., Boatright, C. J., Hancock, J. A., Denny, F. J., Teeter, D. S., Kahn, C. A., & Schultz, C. H. (2008). Health care facility-based decontamination of victims exposed to chemical, biological, and radiological materials. *American Journal of Emergency Medicine*, 26(1), 71-80.
- Kuhar, A., & Bomm, C. (2009). Mass decontamination:- there ain't no easy way! *CBRNe World*, Winter, 78-80.

- Kuttschreuter, M. (2006). Psychological determinants of reactions to food risk messages. *Risk Analysis*, 26(4), 1045-1057.
- La Piere, R. (1938). *Collective behaviour*. New York: McGraw-Hill.
- Lake, W., Schulze, P., & Gougelet, R. (2009). *Guidelines for mass casualty decontamination during a HAZMAT/ weapon of mass destruction incident: volume II*. Aberdeen Proving Grounds, MD: U.S. Army Edgewood Chemical Biological Center.
- Le Bon, G. (1895). *The crowd: a study of the popular mind*. London: Ernest Benn.
- Lemyre, L., Johnson, C., & Corneil, W. (2010). Psychosocial considerations for mass decontamination. *Radiation Protection Dosimetry*, 142(1), 1-7.
- Lenz, M., & Richter, T. (2009). Disaster response to the release of biohazardous agents: instrument development and evaluation of a firefighter's exercise. *Prehospital and Disaster Medicine*, 24(3), 197-203.
- Levine, M., Cassidy, C., Brazier, G., & Reicher, S. (2002). Self-categorization and bystander non-intervention: two experimental studies. *Journal of Applied Social Psychology*, 32(7), 1452-1463.
- Levine, M., Prosser, A., Evans, D., & Reicher, S. (2005). Identity and emergency intervention: how social group membership and inclusiveness of group boundaries shape helping behaviour. *Personality and Social Psychology Bulletin*, 31(4), 443-453.
- Levine, M., & Thompson, K. (2004). Identity, place, and bystander intervention: social categories and helping after natural disasters. *The Journal of Social Psychology*, 144(3), 229-245.
- Lillie, S. H., Mattis, J. N., Kelly, J. M., & Rayburn, B. B. (2006). *CBRN decontamination: multi-service tactics, techniques, and procedures for*

chemical, biological, radiological, and nuclear decontamination. Fort Monroe, Virginia: US Army training and Doctrine Command; Quantico, Virginia: Marine Corps Combat Development Command; Newport, Rhode Island: Navy Warfare Development Command; and Maxwell Air Force Base, Alabama: Headquarters Air Force Doctrine Center.

Lind, E. A., & Tyler, T. (1988). *The social psychology of procedural justice*. New York: Plenum Press.

London Emergency Services Liaison Panel. (2007). *Major incident procedure manual (7th edition)*. London, UK: London Emergency Services Liaison Panel.

London Emergency Services Liaison Panel. (2012). *Major incident procedure manual (8th edition)*. London, UK: London Emergency Services Liaison Panel.

Longstaff, P. H., & Yang, S-U. (2008). Communication management and trust: their role in building resilience to “surprises” such as natural disasters, pandemic flu, and terrorism. *Ecology and Society*, 13(1).

MacIntyre, A. G., Christopher, G. W., Eitzen, E., Gum, R., Weir, S., DeAtley, C., Tonat, K., & Barbera, J. A. (2000). Weapons of mass destruction events with contaminated casualties: effective planning for health care facilities. *Journal of the American Medical Association*, 283(2), 242-249.

Marsh, H. W., Hau, K-T., & Wen, Z. (2004). In search of golden rules: comment on hypothesis testing approaches to setting cut-off values for fit indexes and dangers in overgeneralizing Hu and Bentler’s (1999) findings. *Structural Equation Modeling*, 11(3), 320-341.

Mason, B. W., & Lyons, R. A. (2003). Acute psychological effects of suspected bioterrorism. *Journal of Epidemiology and Community Health*, 57(5), 353-354.

- Mawson, A. R. (2005). Understanding mass panic and other collective responses to threat and disaster. *Psychiatry*, 68(2), 95-113.
- Mazzone, A. (2013). The use of CBRN weapons by non-state terrorists. *Global Security Studies*, 4(4), 23-30.
- McDougall, W. (1920). *The group mind*. New York: GP Putnam's Sons.
- McPhail, C. (1991). *The myth of the madding crowd*. New York: de Gruyter.
- Mintz, A. (1951). Non-adaptive group behaviour. *The Journal of Abnormal and Social Psychology*, 46(2), 150-159.
- Mulilis, J-P., & Lippa, R. (1990). Behavioural change in earthquake preparedness due to negative threat appeals: a test of protection motivation theory. *Journal of Applied Social Psychology*, 20(8), 619-638.
- National Patient Safety Agency. (2010). *Defining research*. London: National Patient Safety Agency. Available from http://www.d-toolkit.ac.uk/routemaps/station.cfm?current_station_id=382
- NATO (2009). *Psychosocial care for people affected by disasters and major incidents*. Brussels: NATO.
- Neuwirth, K., Dunwoody, S., & Griffin, R. J. (2000). Protection motivation and risk communication. *Risk Analysis*, 20(5), 721-734.
- New Dimension Regional Team. (2003). *National guidance document: fire service mass decontamination*. London, UK: New Dimension Regional Team.
- O'Brien, L. B. (2011). The evolution of terrorism since 9/11. *FBI Law Enforcement Bulletin*, September 2011. Retrieved on 3rd October 2012, from <http://www.fbi.gov/stats-services/publications/law-enforcement-bulletin/september-2011/the-evolution-of-terrorism-since-9-11>

- Okumura, T., Kondo, H., Nagayama, H., Makino, T., Yoshioka, T., & Yamamoto, Y. (2007). Simple triage and rapid decontamination of mass casualties with colored clothes pegs (STARDOM-CCP) system against chemical releases. *Prehospital and Disaster Medicine*, 22(3), 233-236.
- Okumura, T., Seto, Y., & Fuse, A. (2013). Countermeasures against chemical terrorism in Japan. *Forensic Science International*, 227(1-3), 2-6.
- Okumura, T., Suzuki, K., Fukuda, A., Kohama, A., Takasu, N., Ishimatsu, S., & Hinohara, S. (1998). The Tokyo subway attack: disaster management, part 2: hospital response. *Academic Emergency Medicine*, 5(6), 618-624.
- Page, L. A., Keshishian, C., Leonardi, G., Murray, V., Rubin, G. J., & Wessely, S. (2010). Frequency and predictors of mass psychogenic illness. *Epidemiology*, 21(5), 744-747.
- Pangi, R. (2002). Consequence management in the 1995 sarin attacks on the Japanese subway system. *Studies in Conflict and Terrorism*, 25(6), 421-448.
- Pastel, R. H. (2001). Collective behaviors: mass panic and outbreaks of multiple unexplained symptoms. *Military Medicine*, 166(12), 44-46.
- Paton, D. (2003). Disaster preparedness: a social-cognitive perspective. *Disaster Prevention and Management*, 12(3), 210-216.
- Pearce, J. M., Rubin, G. J., Amlôt, R., Wessely, S., & Rogers, M. B. (2013a). Communicating public health advice after a chemical spill: results from national surveys in the United Kingdom and Poland. *Disaster Medicine and Public Health Preparedness*, 7(1), 65-74.
- Pearce, J. M., Rubin, G. J., Selke, P., Amlôt, R., Mowbray, F., & Rogers, M. B. (2013b). Communicating with the public following radiological terrorism:

- results from a series of focus groups and national surveys in Britain and Germany. *Prehospital and Disaster Medicine*, 28(2), 1-10.
- Perry, R., & Lindell, M. K. (2003). Understanding citizen response to disasters with implications for terrorism. *Journal of Contingencies and Crisis Management*, 11(2), 49-60.
- Pope, C., Ziebland, S., & Mays, N. (2000). Analysing qualitative data. *British Medical Journal*, 320(7227), 114-116.
- Postmes, T., Haslam, S. A., & Swaab, R. I. (2005). Social influence in small groups: an interactive model of social identity formation. *European Review of Social Psychology*, 16(1), 1-42.
- Proulx, G., & Fahy, R. F. (2003). Evacuation of the World Trade Centre: what went right? *Proceedings of the CIB-CTBUH international conference on tall buildings*, October 20-23, Malaysia.
- Proulx, G., & Sime, J. D. (1991). To prevent 'panic' in an underground emergency: why not tell people the truth? *Fire safety science – proceedings of the third international symposium*, 843-852.
- Quarantelli, E. L. (1954). The nature and conditions of panic. *The American Journal of Sociology*, 60(3), 267-275.
- Quarantelli, E. L. (1960). Images of withdrawal behaviour in disasters: some basic misconceptions. *Social Problems*, 8(1), 68-79.
- Quarantelli, E. L. (2001). The sociology of panic. In N.J. Smelser & P.B. Baltes (eds.). *International encyclopedia of the social and behavioural sciences* (pp. 11020-30). New York: Pergamon.
- Rachman, S. J. (2013). *Anxiety (Clinical Psychology: a modular course)*. New York: Psychology Press.

- Regis, E. (2001). Evaluating the threat: does mass biopanic portend mass destruction? *Scientific American*, 285(6), 21-23.
- Reicher, S. (1984). The St Pauls 'riot': an explanation of the limits of crowd action in terms of a social identity model. *European Journal of Social Psychology*, 14(1), 1-21.
- Reicher, S. (1996). 'The Battle of Westminster': developing the social identity model of crowd behaviour in order to explain the initiation and development of collective conflict. *European Journal of Social Psychology*, 26(1), 115-134.
- Reicher, S. (2001). The psychology of crowd dynamics. In M.A. Hogg and R.S. Tindale (Eds.), *Blackwell handbook of social psychology: group processes*. Oxford: Blackwell.
- Reicher, S., Cassidy, C., Wolpert, I., Hopkins, N., & Levine, M. (2006). Saving Bulgaria's Jews: an analysis of social identity and the mobilisation of social solidarity. *European Journal of Social Psychology*, 36(1), 49-72.
- Reicher, S., & Haslam, C. (2009). Beyond help: a social psychology of collective solidarity and social cohesion. In S. Sturmer and M. Snyder (Eds.), *The psychology of prosocial behaviour: group processes, intergroup relations, and helping*. Walden, MA: Wiley-Blackwell.
- Reicher, S., Hopkins, N., Levine, M., & Rath, R. (2005). Entrepreneurs of hate and entrepreneurs of solidarity: social identity as a basis for mass communication. *International review of the Red Cross*, 87(860), 621-637.
- Reicher, S., Spears, R., & Haslam, S. A. (2010). The social identity approach in social psychology. In M.S. Wetherell & C.T. Mohanty (Eds.), *Sage identities handbook*. London: Sage.

- Reicher, S., Stott, C., Cronin, P., & Adang, O. (2004). An integrated approach to crowd psychology and public order policing. *Policing: An International Journal of Police Strategies and Management*, 27(4), 558-572.
- Reicher, S., Stott, C., Drury, J., Adang, O., Cronin, P., & Livingstone, A. (2007). Knowledge-based public order policing: principles and practice. *Policing*, 1(4), 403-415.
- Rinchiuso-Hasselmann, A., Starr, D. T., McKay, R. L., Medina, E., & Raphael, M. (2010). Public compliance with mass prophylaxis guidance. *Biosecurity and Bioterrorism*, 8(3), 255-263.
- Ripley, A. (2008). *The unthinkable: who survives when disaster strikes – and why*. New York: Crown Publishers.
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *Journal of Psychology*, 91(1), 93-114.
- Rogers, M. B., Amlôt, R., Rubin, G. J., Wessely, S., & Krieger, K. (2007). Mediating the social and psychological impacts of terrorist attacks: the role of risk perception and risk communication. *International Review of Psychiatry*, 19(3), 279-288.
- Rubin, G. J., Chowdhury, A. K., & Amlôt, R. (2012). How to communicate with the public about chemical, biological, radiological, or nuclear terrorism: a systematic review of the literature. *Biosecurity and Bioterrorism*, 10(4), 383-395.
- Rubin, G. J., & Dickmann, P. (2010). How to reduce the impact of “low risk patients” following a bioterrorist incident: lessons from SARS, anthrax and pneumonic plague. *Biosecurity and Bioterrorism*, 8(1), 37-43.
- Saito, T. (2010). Tokyo drift? *CBRNe World*, Autumn, 20-24.

- Schleipman, A. R., Gerbaudo, V. H., & Castronovo, F. P. (2004). Radiation disaster response: preparation and simulation experience at an academic medical center. *Journal of Nuclear Medicine Technology*, 32(1), 22-27.
- Schneidmiller, C. (2012, August 1). Nuclear smuggling shows terrorist WMD threat persists: State Department. *Global Security Newswire*. Retrieved 3rd October 2012, from <http://www.nti.org/gsn/article/state-report/>
- Schulze, P., & Lake, W. A. (2009). *Guidelines for mass casualty decontamination during a HAZMAT/ weapons of mass destruction incident: volume I*. Aberdeen Proving Grounds, MD: U.S. Army Edgewood Chemical Biological Center.
- Seeger, M. W. (2006). Best practices in crisis communication: an expert panel process. *Journal of Applied Communication Research*, 34(3), 232-244.
- Sheppard, B., Rubin, G. J., Wardman, J. K., & Wessely, S. (2006). Terrorism and dispelling the myth of a panic prone public. *Journal of Public Health Policy*, 27(3), 219 – 245.
- Sherif, M. (1936). *The psychology of social norms*. New York: Harper.
- Siegrist, M. (2000). The influence of trust and perceptions of risks and benefits on the acceptance of gene technology. *Risk Analysis*, 20(2), 195-203.
- Siegrist, M., & Cvetkovich, G. (2000). Perception of hazards: the role of social trust and knowledge. *Risk Analysis*, 20(5), 713-719.
- Siegrist, M., Keller, C., Kastenholz, H., Frey, S., & Wiek, A. (2007). Laypeople's and experts' perception of nanotechnology hazards. *Risk Analysis*, 27(1), 59-69.
- Sime, J. D. (1983). Affiliative behaviour during escape to building exits. *Journal of Environmental Psychology*, 3(1), 21-41.
- Sime, J. (1990). Escape behaviour in fires and evacuations. In D. Canter (Ed.), *Fires and human behaviour* (2nd ed.). David Fulton Publishers: London.

- Sime, J. D. (1995). Crowd psychology and engineering. *Safety Science*, 21(1), 1-14.
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280 – 285.
- Smelser, N. J. (1963). *Theory of collective behaviour*. Glencoe, Ill: Free Press.
- Smith, J. A., & Osborn, M. (2008). Interpretative phenomenological analysis. In J.A. Smith (ed) *Qualitative psychology*. London: Sage. (2nd ed).
- Snyder, M. L., & Sobieski, T. J. (2008). Decontamination operations in a mass casualty scenario: observations from ardent sentry 2007. *Army Chemical Review*, Summer, 10-15.
- Solnit, R. (2009). *A paradise built in hell: the extraordinary communities that arise in disaster*. New York: Viking.
- South Western Ambulance Service NHS Trust. (2010). *Major incident plan*. Exeter, UK: South Western Ambulance Service NHS Trust.
- State Government of Victoria. (2007). *Decontamination guidance for hospitals*. Melbourne, Victoria: State Government of Victoria.
- Sternberg, P. (2005). *The management of pediatric victims during hazmat decontamination: practical considerations for communication*. Illinois: University of Illinois.
- Stokes, J. W., & Banderet, L. E. (1997). Psychological aspects of chemical defense and warfare. *Military Psychology*, 9(4), 395-415.
- Stone, F. P. (2007). *The "worried well" response to CBRN events: analysis and solutions*. The Counterproliferation Papers Future Warfare Series No. 40. Alabama: Air University.
- Stott, C. (2003). Police expectations and the control of English soccer fans at “Euro 2000”. *Policing: An international Journal of Police Strategies & Management*, 26(4), 640-655.

- Stott, C., Adang, O., Livingstone, A., & Schreiber, M. (2008). Tackling football hooliganism: a quantitative study of public order, policing and crowd psychology. *Psychology, Public Policy, and Law*, 14(2), 115-141.
- Stott, C., & Drury, J. (2000). Crowds, context and identity: dynamic categorisation processes in the 'poll tax riot'. *Human Relations*, 53(2), 247-273.
- Stott, C., Hoggett, J., & Pearson, G. (2012). 'Keeping the peace': social identity, procedural justice and the policing of football crowds. *British Journal of Criminology*, 52(2), 381-399.
- Stott, C., Hutchison, P., & Drury, J. (2001). 'Hooligans' abroad? Inter-group dynamics, social identity and participation in collective 'disorder' at the 1998 World Cup Finals. *British Journal of Social Psychology*, 40(3), 359-384.
- Stott, C., & Reicher, S. (1998a). Crowd action as inter-group process: introducing the Police perspective. *European Journal of Social Psychology*, 28(4), 509-529.
- Stott, C., & Reicher, S. (1998b). How conflict escalates: the inter-group dynamics of collective football crowd 'violence'. *Sociology*, 32(2), 353-377.
- Strauss, A. L. (1944). The literature on panic. *Journal of Abnormal Social Psychology*, 39(3), 317-328.
- Tajfel, H., & Turner, J. (1979). An integrative theory of intergroup conflict. In W.G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations*. Monterey, CA: Wadsworth.
- Tang, C. S-k., & Wong, C-y. (2004). Factors influencing the wearing of facemasks to prevent the severe acute respiratory syndrome among adult Chinese in Hong Kong. *Preventive Medicine*, 39(6), 1187-1193.

Taylor, K. M., Balfanz-Vertiz, K., Humrickhouse, R., & Jurik, C. (2009).

Decontamination with at-risk populations: lessons learned. *The Internet Journal of Rescue and Disaster Medicine*, 9(1).

Turner, J. C., Hogg, M. A., Oakes, P. J., Reicher, S. D., & Wetherell, M. S. (1987).

Rediscovering the social group: a self-categorization theory. Oxford, UK: Blackwell.

Turner, L., Jewkes, F., Amlôt, R., & Simpson, J. (2007). Exercise Young Neptune: mass

decontamination of children field exercise, 2nd of December 2006. *Chemical Hazards and Poisons Report*. London, UK: Health Protection Agency.

Turner, R. H., & Killian, L. M. (1957). *Collective behaviour*. Englewood Cliffs, NJ:

Prentice-Hall.

Turner, R. H., & Killian, L. M. (1972). *Collective behaviour*, 2nd ed. Englewood Cliffs,

NJ: Prentice-Hall.

Turner, R. H., & Killian, L. M. (1987). *Collective behaviour*, 3rd ed. Englewood Cliffs,

NJ: Prentice-Hall.

Turner, J. C., Oakes, P. J., Haslam, S. A., & McGarty, C. A. (1994). Self and collective:

cognition and social context. *Personality and Social Psychology Bulletin*, 20(5), 454-463.

Tyler, T. R. (2006). *Why people obey the law*. Princeton, NJ: Princeton University

Press.

Tyler, T. R. (2011). Trust and legitimacy: Policing in the USA and Europe. *European*

Journal of Criminology, 8(4), 254-266.

United States Fire Administration. (1997). *Fire department response to biological*

threat at B'nai B'rith headquarters. Washington, DC: United States Fire Administration.

- U.S. Army Soldier and Biological Chemical Command (SBCCOM). (2003). *Guidelines for cold weather mass decontamination during a terrorist chemical agent incident*. Maryland: SBCCOM.
- Voeten, H. A. C. M., de Zwart, O., Veldhuijzen, I. K., Yuen, C., Jiang, X., Elam, G., Abraham, T., & Brug, J. (2009). Sources of information and health beliefs related to SARS and avian influenza among Chinese communities in the United Kingdom and The Netherlands, compared to the general population in these countries. *International Journal of Behavioural Medicine*, 16(1), 49-57.
- Vogt, B. M., & Sorensen, J. H. (2002). *How clean is safe? Improving the effectiveness of decontamination of structures and people following chemical and biological incidents*. Tennessee: Oak Ridge National Laboratory.
- Weiseth, L. (1989). A study of behavioural responses to an industrial disaster. *Acta Psychiatrica Scandinavica*, 80(Supplement 355), 13-24.
- Wessely, S. (2005). Don't panic! Short and long term psychological reactions to the new terrorism: the role of information and the authorities. *Journal of Mental Health*, 14(1), 1-6.
- Wester, M. (2011). Fight, flight or freeze: assumed reactions of the public during a crisis. *Journal of Contingencies and Crisis Management*, 19(4), 207-214.
- Wikipedia. (2013). *Mass decontamination*. Available at: http://en.wikipedia.org/wiki/Mass_decontamination (accessed 12th May 2013).
- Williams, R., & Drury, J. (2010). Psychosocial resilience and its influence on managing mass emergencies and disasters. *Psychiatry*, 8(8), 293-296.
- World Health Organization. (2007). *Mass casualty management systems: strategies and guidelines for building health sector capacity*. Geneva, Switzerland: World Health Organization.

Wray, R. J., Kreuter, M. W., Jacobsen, H., Clements, B., & Evans, G. (2004).

Theoretical perspectives on public communication preparedness for terrorist attacks. *Family and Community Health*, 27(3), 232-241.

Wray, R., Rivers, J., Whitworth, A., Jupka, K., & Clements, B. (2006). Public

perceptions about trust in emergency risk communication: qualitative research findings. *International Journal of Mass Emergencies and Disasters*, 24(1), 45-75.

Appendix 1: Lancet abstract

Reference: Carter, H., Drury, J., Rubin, G. J., Williams, R., & Amlôt, R. (2012). Public communication needs during incidents involving emergency decontamination. *The Lancet*, 380, S28.

Background: The threat of chemical, biological, radiological, nuclear and explosive (CBRNE) incidents has increased because of technological advancements and the willingness of terrorists to use unconventional weapons. Emergency responders can use interventions such as decontamination and quarantine during such incidents. However, when emergency responders do not communicate effectively, public anxiety could increase and compliance with decontamination could be poor, reducing the efficacy of decontamination and creating a secondary contamination hazard for receiving hospitals. There is a need to examine whether current procedures sufficiently acknowledge public communication needs.

Methods: First, a systematic review of published decontamination guidance for responders was undertaken. Second, semi-structured telephone interviews were carried out with a convenience sample of 13 responders from the UK Fire and Rescue Service who had similar training but different amounts of decontamination experience. A thematic framework was developed to analyse the findings for previously identified issues, such as perceptions of public compliance with the need for decontamination, excessive public anxiety, and orderly behaviour. Relevant passages were coded into one or more of the themes. Care was taken to document the full variety of responses given; contradiction in interview accounts was actively sought. The potential for interviewer bias was reduced with a semi-structured interview schedule and telephone interviews,

thereby eliminating the effect of non-verbal cues. Finally, data from five emergency preparedness exercises involving decontamination were analysed. All participants who underwent decontamination during these exercises ($n = 402$) completed questionnaires. Numbers of men and women were roughly equal; ages ranged from 18 years to 85 years. Quantitative data were analysed with correlational and path analysis, and qualitative data with the framework approach. A second researcher coded a subsection of the data, producing an inter-rate reliability rate of 89%.

Findings: The systematic review showed poor planning for communication with members of the public. The interview study established that responders who had previous experience of decontamination perceived communication with the public to be important. Responders who did not have experience of decontamination did not recognise the role of communication, and instead emphasised the importance of controlling members of the public who were said to be vulnerable to ‘mass panic’. Analysis of qualitative data from emergency preparedness exercises showed that most participants felt that they had not been given adequate communication from responders. A path model based on the results from the quantitative data had good overall fit (χ^2 test, $p = 0.607$). Poor perceived communication contributed to decreased levels of reassurance ($r = 0.28$, $p = 0.006$) and willingness to comply with decontamination ($r = 0.31$, $p = 0.007$).

Interpretation: Effective communication is a key intervention through which emergency responders can contribute to the successful management of decontamination. The small number of responders in the interview study could reduce the ability to generalise results. However, 12 interviews is usually enough for data saturation and hence an understanding of common perceptions and experiences in homogeneous sample groups. Additionally, exercises attempt to replicate a real situation, but some

variables (especially anxiety) can differ significantly in real incidents. However, the relation between variables should not be different; successful communication would probably be even more important during a real incident than in exercises.

Appendix 2: Social Psychology Section blog post

Understanding public behaviour during mass decontamination – the role of social psychology

“Scenes of mass contamination are often scenes of collective hysteria, with hundreds of thousands of victims in a state of panic. Therefore, mass decontamination may require police, security, or rescue supervision to help control panic and keep order.” (Wikipedia, 2013). This is the popular view of public behaviour during incidents involving mass decontamination. Worryingly, it is a view shared by many policy makers and emergency responders.

My research was designed to understand how members of the public are really likely to behave during incidents involving decontamination, and how social psychological theories can aid this understanding. Decontamination is an intervention used by the emergency services in the event of a chemical, biological, radiological, or nuclear (CBRN) incident. It involves anyone who has potentially been contaminated being asked to remove their clothes and undergo a shower, to remove any potential contaminant from their skin.

I carried out a literature review of small-scale incidents involving decontamination, which showed that communication from emergency responders to members of the public was essential for the smooth-running of the decontamination process; failure to communicate effectively resulted in public non-compliance and anxiety. Non-compliance during an incident involving mass decontamination could have extremely serious consequences; it may result in increased spread of any contaminant (Edwards et al., 2006), and therefore increased numbers of dead and

injured. Despite this, decontamination guidance documents for responders do not contain any guidance on communicating with members of the public! And emergency responders do not receive any training on how to communicate with members of the public. Instead, a 'control' management strategy is often emphasised, based on the idea that members of the public will necessarily 'panic', and behave in a 'disorderly' way.

Following this, I examined several theories which could inform the development of recommendations for the management of mass decontamination, including health behaviour theories, crowd behaviour theories, and the social identity approach. The social identity approach is particularly useful, in highlighting that crowd events are typically intergroup encounters, in which the actions of one group can impact on the experiences and behaviour of another group.

We applied the social identity approach to develop some specific hypotheses and recommendations for incidents involving mass decontamination. Based on the elaborated social identity model (ESIM: Drury & Reicher, 2000), we hypothesised that effective responder communication would increase perceptions of legitimacy, which would increase identification with emergency responders, and consequently increase public compliance. We also hypothesised, based on the social identity model of collective resilience (SIMCR: Drury, Cocking, & Reicher, 2009), that increased identification with other members of the public would increase collective agency, thus increasing normative co-operative behaviour. Further, we suggested, based on research into social identity and stress (e.g. Haslam et al., 2005; 2006; 2009) that identification with other members of the public, and collective agency, would result in reduced anxiety during mass decontamination.

Testing these hypotheses presented a challenge, as these types of incidents have thankfully been rare in the UK. To overcome this, we used a variety of methods,

including: large scale mass decontamination field exercises, which involved over 100 people being decontaminated, often in city centres and other public areas, in full view of onlookers; a visualisation experiment; and a mass decontamination field experiment. The field exercises and the visualisation experiment provided support for several of our hypotheses, showing that effective responder communication predicted increased public compliance and cooperative behaviour, mediated by relevant social identity variables. This quote from a field exercise volunteer sums up how a lack of communication impacted on reduced compliance and reduced co-operation: “Communication was severely lacking/ inadequate throughout the event. People would’ve felt calmer/ cooperated more readily if comms had been better.” However, both the field exercises and the visualisation experiment study designs had limitations: while the field exercises had high ecological validity, they employed a purely correlational design; in contrast, the visualisation experiment allowed different communication strategies to be tested, but lacked ecological validity. The mass decontamination field experiment aimed to overcome these limitations, by employing an experimental design but maintaining high ecological validity. During the experiment, participants actually went through the decontamination process, as they would during a real incident (except that they wore swimwear, rather than being naked). This also enabled behavioural measures such the length of time taken for participants to complete the process, and observations of non-compliance, co-operative behaviour, and confusion, to be carried out alongside self-report measures.

During the experiment, participants received one of three responder communication strategies: “good” (health-focused information about decontamination, updates about actions responders were taking, sufficient practical information); “standard practice” (no health-focused information, no updates about actions responders

were taking, sufficient practical information); and “poor” (no health-focused information, no updates about actions responders were taking, very basic practical information). Results showed that the “good” communication strategy was perceived as being significantly more effective than either of the other two strategies. The decontamination process progressed most efficiently in the good communication condition, and non-compliance and confusion were observed least often in this condition. Further, results from self-report measures supported our hypotheses, highlighting the importance of effective responder communication, and the mediating role of social identity variables, for increasing public compliance and co-operative behaviour during mass decontamination.

Overall, our programme of research provides long-overdue evidence that a consideration of psychosocial factors is essential to facilitate the successful management of incidents involving mass decontamination; failure to consider such factors could delay the decontamination process, which could cost lives. We suggest four specific recommendations for managing incidents involving decontamination: 1) emergency responders should communicate openly with members of the public about actions they are taking; 2) emergency responders should communicate in a health-focused way about decontamination; 3) emergency responders should provide members of the public with sufficient practical information; and 4) emergency responders should respect public concerns about privacy.

Our findings underline the importance of training for emergency responders on ‘soft skills’ (such as communication, and the need to respect public needs for privacy); this has been neglected until now in favour of technical solutions, and hence technical preparation and training.

Appendix 3: Response to reviewers' comments on Paper 5 (Chapter 6)

Response to first set of reviewer comments: 26th April 2012

Dear Dr. Briggs,

Thank you very much for considering our manuscript (AJDM12-379) for publication within the American Journal of Disaster Medicine. We have now revised the manuscript, based on the comments of the reviewers.

Comments from the first reviewer

At over 5,000 words, the length of the manuscript is unwieldy long.

We agreed with the comment that the paper was too long, and as such we have shortened the paper from over 5,000 words to just under 3,500 words. This was achieved by re-organising the results section, including introducing an extra table, and tightening up the other sections.

Throughout the article reference is made frequently to findings in one or several of five separate exercises, causing considerable confusion for the reader: phrasing on the order of, "finding X was significant in Exercise C but not in Exercise A or E," made it difficult to determine which of the study hypotheses were borne out or unsupported.

We also agreed that the way in which the results section was worded, with findings being reported from each exercise separately, was confusing for the reader, especially in the section describing the results from the correlational analyses. We have therefore created a table containing the results from these exercises, and in the text have simply described the hypotheses which were supported across all exercises. We feel that this section is now more reader-friendly and less confusing.

The citation of the literature is quite weak - only 24 references, and about one-quarter are publications by various permutations of identical collaborators. The relevant literature on decontamination with a focus on behavioral issues is much more extensive and needs thorough citation.

We had deliberately focused on the most relevant literature, rather than including wider literature which may be of less relevance. However, we appreciate that 24 references may be seen as insufficient, and as such we have re-examined the literature, and have included a further 7 references which are relevant to the aims of the paper. We feel that we have carried out a thorough literature review of papers discussing behavioural issues associated with decontamination, but we would be grateful to see any papers which we have not included, and which the reviewers feel relate directly to the concepts discussed in this paper.

This paper appears to present a post-hoc analysis that is tangential to the primary aims of the exercise drills. Beginning on line 570: "...the measures used in this research were not originally designed to test the current hypotheses, or indeed any theoretically derived hypotheses. Rather, they were primarily designed to inform the evaluation and

reporting of the exercise outcomes by the respective exercise planning teams, and to examine the technical, rather than the behavioural, aspects of the decontamination process."

The reviewer highlights the fact that the measures we have used were not originally designed to test any theoretically derived hypotheses, and suggest that this is sufficiently serious to cast doubt on the findings from the study. However, whilst we recognise that there is a limitation, we feel that the fact that the measures were not designed with any specific hypotheses in mind does not necessarily preclude them from being used as successful measures of the relevant variables. The items were designed to measure relevant aspects of public feeling and behaviour during the decontamination process, and as such they provide valuable insights into public experiences of decontamination. We feel that there is a good *prima facie* case for interpreting each of the measures in the way we have in the analysis. We realise that we have not explained this clearly enough within the first draft of the paper, and so have clarified this point in the most recent version.

The authors have been completely forthright and honest regarding the limitations. What this means in practice, however, is that the measures are actually contrived. For example, one of the key outcomes mentioned in the title of the article, "anxiety," is not assessed with one of the validated anxiety scales, but rather, it is inferred from the single item, "I felt reassured by the staff who were attending to me during the exercise." The other key outcome mentioned in the title, "compliance" is more far-fetched, as assessed by the single item, "I would be willing to be naked inside the decontamination showers."

The major predictor variable, "communication," is measured by either 3 or 4 items that generally hold together and appear to assess aspects of communication. Again, authors did not use a validated scale but rather a cluster of apparently-related items that hovered on the theme of communication.

Given these limitations, the findings, from the path model, that "communication," as measured in this study, appears to be related to "reassurance" of decon clients (reduction of anxiety is not really measured), willingness to go naked through decon in a future real event, and likelihood of reporting feeling "clean" at the end is exploratory and suggestive. The findings suggest that future robust studies using validated measures of risk communication and client interaction in relation to validated measures of anxiety, compliance, and other variables could be fruitful.

Again, while we recognise the above limitations, we do not feel that they are sufficiently serious to cast doubt on the findings from the study. The communication items were designed to capture public experiences of the decontamination process. While they were not based on an established psychometrically-derived scale, the 3-4 communication items nevertheless had good scale reliability in all of the exercises, and in three of the five exercises, had excellent reliability (Cronbach's Alpha above 0.8). The communication measure also interacted in the same way with the relevant variables across the five different exercises, and we therefore believe this to be a reliable measure of casualty perceptions of communication during the decontamination process. We agree that having the other variables measured by a single item is not ideal. However, we disagree that using a single item necessarily makes the measure an invalid one. The

item should be judged on its merits. The reviewer describes the item 'I would be willing to be naked' as 'contrived' and 'far-fetched', but the willingness of those involved to be naked during a real life incident involving decontamination is precisely one of the most important factors affecting the successful management of the incident. If people refuse to disrobe to undergo the decontamination process during a real life incident, this could seriously delay the process, and could therefore result in increased numbers of casualties. The fact that the measures of responder communication and confidence in responders show a significant relationship with willingness to comply with the need to be naked during decontamination could therefore have important implications for real incidents involving decontamination. We do agree that the reassurance measure is not an ideal measure of reduced anxiety. As such, we have now made it clear that we are talking about increased reassurance, rather than necessarily reduced anxiety, although we do feel the two concepts to be related.

The other major limitation, also noted candidly by the authors, is that findings are from an exercise involving simulated patients who were briefed on the incident and knew they would undergo decontamination. They knew there was no real hazardous material and no risk for personal harm. They were given roles for which compliance with instructions was an expectation (or alternatively they were coached to be problematic and non-compliant). Since these actors were willing to strip down to underwear or swim gear for the exercise, the "compliance" question of their future willingness to doff their last articles of clothing in a real decontamination event was not a great leap.

We agree that the fact that participants knew that no harm was going to come to them during the exercise could result in higher levels of compliance, and reduced levels of anxiety, compared to real incidents, and as such we highlighted this as a limitation within the paper. However, given this expectation, it is even more interesting that even though this was an artificial exercise situation, mean values for reassurance (3.09) and compliance (3.26) across the five exercises were still quite low. We argue that the rates of compliance and reassurance may be even lower during a real incident, which makes our findings relating to the role of communication in increasing reassurance and compliance even more important.

Second reviewer comments

I am surprised that there was no reference to the 1990's Tokyo sarin subway gas attack in the introduction. That was an event which would seem to be ideal to talk about in this paper because it was a large scale attack which involved hundreds but not millions of people. So it was possible to actually try and do decontamination. In addition it highlights real world elements such as asking people to disrobe in a cultural know for privacy, environmental concerns (attack was in late fall or early spring(?) when still cold and people would not want to be naked), and it was a real live event where information was not always known (e.g. initially the agent used). I think talking about this event in one or two paragraphs would help to put the rest of the paper in some practical context.

It is true that the Tokyo sarin attack is relevant to the concepts discussed in this paper, as it involved an incident which could potentially have triggered a mass decontamination response. However, due to delays in identification of the causative agent, as well as a general lack of preparedness for a large scale chemical incident, there

was no mass decontamination carried out during this incident. Any decontamination which did take place was carried out on an individual basis by the local hospitals. If the Tokyo sarin attack were to happen now, we feel that this type of attack would involve mass decontamination of the type we are discussing within this paper. As such, the incident is of interest, and we have made reference to this in the updated version of the paper. However, we disagree that the incident is as important as suggested by the reviewers, based on the fact that prehospital decontamination was very limited during this incident.

We hope that we have been able to address all of the concerns raised by reviewers in the updated version of the paper, and we look forward to receiving feedback on this.

Response to second set of reviewer comments: 9th July 2012

Dear Dr. Briggs,

Thank you very much for considering our manuscript (AJDM12-379R) for publication within the American Journal of Disaster Medicine. We have now revised the manuscript, based on the comments of the reviewers.

Comments from reviewers

We acknowledge the first reviewers comments that we ‘have been very receptive and responsive to the initial critique and have taken actions to shorten and revise the manuscript in a manner that has increased both clarity and flow’ and that publication is now recommended. Since the reviewer made no further suggestions to amend the manuscript, we address the rest of this rebuttal letter to the comments made by the second reviewer.

The article does read better since being shorten [sic] but I still don't think the authors understand the topic. There [sic] take seems to be very optimistic and simplistic that communication will solve all without taking into account the "fog of war" which occurs with these situation which inherently always limits what is known and what can be communicated.

The ‘Fog of War’ is used to describe military situations in which commanders have to make decisions and act based on limited information. This is often the case during armed conflict situations, when there are deliberate attempts on all sides to withhold information from others for strategic purposes. However, this analogy is inappropriate to describe an event in which emergency responders are responding to an incident involving members of the public. Lkening the response to CBRN incidents to a ‘war’ is not only inappropriate, but potentially harmful. We appreciate that the reviewer is pointing to the uncertainty which would arise during these types of situations, and we agree that this would play an important role in the management of the incident. However, we are concerned at the use of the term ‘fog of war’, because it relies on military assumptions which are inappropriate for the management of incidents involving members of the public.

We would argue that a focus on the ‘fog of war’ provides a rationale for not communicating with members of the public (not enough information is known, people

will not respond in a rational way etc), and hence is actually a harmful way to view these types of situations. While this terminology might be appropriate to military situations, where one military group is dealing with another, it is inappropriate to assume that this will automatically apply to incidents involving members of the public. The review evidence shows that members of the public want to receive as much information as possible during disasters and emergencies, even if this means responders communicating their uncertainty to them. Members of the public will respond far better to honest communication about the uncertainties which responders face, than to information being withheld from them.

The method section does not describe any thing about what the participating responders in the scenario knew or did not know, how concern for privacy was balanced against need for speed of decontamination, and how communication was done.

We agree with the reviewer that it might help the reader to know more about the information which emergency responders had prior to the exercise, and we have therefore added this information into the method section in the revised version of the manuscript. The added text reads:

“The exercise was then initiated at a set time. Emergency responders were told beforehand that the exercise would involve a CBRN threat, but did not know the exact nature of the scenario. Responders therefore arrived at the scene, and used the information and equipment available to them to determine the nature of the incident. The exercise then progressed as if it were a real incident, and was terminated at a set time.”

However, we do not feel that we can generalise on the way in which communication was conducted during these exercises, as each one was different. Indeed, there was often a difference in the way in which individual responders communicated during an exercise. We don't feel that this information would add anything to the readers understanding, as the aim of the paper is to show the potential consequences of responders not communicating effectively, rather than to conduct an analysis of the different communication methods used. We also feel that we are unable to comment on any decisions which responders made in terms of balancing the need for speed against the need for privacy, as these decisions would have been taken internally within the Fire and Rescue Service and Ambulance Service, and any attempt to describe these would be speculation, and would not be based on evidence.

They also fail to take into account that when people are stressed or concerned for their safety that a certain level of paranoia normal [sic] not seen will be displayed in a percentage of people being decontaminated especial in the ones who are actually ill or seen people who are ill. People in real situations will ask questions which likely the authorities will not be able to answer at the time (e.g. what is the agent?, if agent is not known then how do you know what to do?, what are the symptoms to be on watch for if exposed, how do I know you are telling me the truth?).

We appreciate that emergency responders will not have all the facts at this time, and so will not be able to communicate all the facts to members of the public. However, we would like to reiterate that members of the public want to receive as much information as possible during disasters and emergencies, even if this means responders communicating their uncertainty to them, which can serve to build trust (or, put

differently, to be seen to withhold information undermines trust) (Lemyre, Johnson, & Corneil, 2010). In short, members of the public will respond far better to honest communication about the uncertainties which responders face, than to information being withheld from them.

The first reviewer tried very hard to point out short comings in the paper and the authors reply seemed to miss some of the points and to be honest seemed dismissive of the concerns raised.

We have responded to all of the points raised by the first reviewer in our initial response, and by making changes within the paper, but would be happy to revisit these if the reviewer highlights which particular points they feel we have missed.

The second reviewer I think tried to give them a softball on how to make the paper more applicable to real word [sic] situation by bringing up the Tokyo attack and allowing them a way to discuss limitations and real world experience. Again the authors seemed to miss the point of the "fog of war", the important of real world situations, and the fact that rarely is the agent known. The lack of inclusion of really world situation also address the first reviewers concerns about the limited references which I also agree with and feel has not been adequately addressed. Depending on the sources cited the Japanese officials identified the agent with in 1-4 hours which is actually incredibly fast not slow. The authors don't seem to understand that often decontamination occurs when the agent is not known and that is part of the problem with communication.

We appreciate that we may not have made it clear in the paper that communication with members of the public should take place, whether or not precise factual information about the contaminant used is available. We have therefore tried to clarify this in the revised version of the paper. To achieve this, we have added the following paragraph to the introduction, on page 5:

“Indeed, it has been suggested that members of the public want to know as much information as possible, even if this means responders communicating any uncertain aspects to them (Lemyre, Johnson, & Corneil, 2010). Attempts to withhold information until all the facts are known has been shown to reduce public trust in the authorities, and increase public anxiety (Glass & Schoch-Spana, 2002).”

Instead of acknowledging the reality of how these situations really tend to unfold the authors made statements in their responses that the Tokyo sarin attack was antiquated and would not occur that way today.

We did not mean to imply that the response to the Tokyo sarin attack was antiquated; rather that planning and preparedness for incidents of this type has increased greatly in the 17 years since this incident occurred. We also feel that the reviewer may have slightly misunderstood our description of this incident. In highlighting the fact that the nature of the substance was not known for several hours, we were presenting an explanation for why prehospital mass decontamination did not take place, not an explanation for why communication could not occur. Given the improvement in planning for and responding to these types of incidents (for example, evidenced by the creation of New Dimension mass decontamination units and Detection Identification and Monitoring teams in the UK), we do feel that in some countries, a co-ordinated response and the identification of the substance would be quicker if an incident of this

type occurred today. However, regardless of this, we would argue that communication needs to begin immediately, not once the decontamination process has started. If it takes one hour to identify the contaminant, emergency responders should be communicating with members of the public throughout this time, whilst any decontamination units are being set up. The reviewer seems to suggest that only hard and fast facts can be communicated to members of the public during these types of incidents. However, evidence from real life incidents involving decontamination shows that it is essential to engage with members of the public from the outset, by communicating any information which is known honestly and openly, including explaining any unknown or uncertain aspects, and thus treating them with respect (Hanley, 1999). Any uncertainty should be communicated in order to maintain trust and good relations. On the whole, members of the public appreciate that not all the facts can be known immediately, and will appreciate responders honesty about this. In contrast, withholding information until the facts are known is likely to result in public perceptions that responders are not being open and honest, and hence a lack of trust may develop between responders and members of the public, which will in turn undermine any future attempts by responders to manage the event. Again, we appreciate that we may not have made it clear in the paper that communication with members of the public should take place, whether or not information about the contaminant is available. We have therefore tried to clarify this in the revised version of the paper, by adding a paragraph into the introduction (see previous response for the additional text).

At this time I would have to recommend against publication of this paper I don't think the authors understand the complexity of the topic, I think their conclusions are very simplistic, there is no particle [sic] recommendations on how to communicate, and I don't think this paper adds any thing new to the literature.

We feel that the paper does add to the literature, being the only paper to our knowledge to quantitatively examine the effect of perceptions of responder communication on public anxiety and compliance. We appreciate that there are limitations to this research, which we highlight within the paper, but we do not feel that these are sufficiently serious as to cast doubt on the findings presented. We would like to add that we acknowledge that this paper is a preliminary analysis, intended to prompt further research in this area, and is not designed to be a definitive work on the subject. We feel that there are currently too many assumptions about the way members of the public will behave during these types of incidents, and the way in which these types of incidents will need to be managed (as evidenced by a reliance on the 'fog of war' terminology). What we are aiming to do is to develop an evidence-base for emergency responders to use as a guide when managing incidents involving decontamination, in order to facilitate a move away from a reliance on assumptions. Finally, we feel that the fact that this paper has received such conflicting reviews suggests that it is a topic of interest, and as such, the paper is worthy of publication.

Appendix 4: Response to reviewers' comments on Paper 6 (Chapter 7)

Response to first set of reviewer comments: 30th May 2013

Dear Dr. Wohl,

Thank you very much for considering our manuscript (HBAS-2013-0084) for publication within Basic and Applied Social Psychology. We have now revised the manuscript, based on your comments, and the comments of the reviewers.

Point-by-point response to comments

Introduction

1. The introduction was well written, but a little long. I would like you to hit the main points and reduce redundancies. As I note below in the section on your discussion section, BASP gets picked up by main stream press (there was recently a commentary on one of your papers in the NY Times). The introduction needs to be written so that, at the onset, the reader knows why doing this research is important – how will this research contribute to basic social psychological theory, but also how it can be applied to the real world.

We have tried to re-structure the introduction, so that the reader knows within the first couple of paragraphs what the aims of the research are, and why it is important. We have also tried to reduce any redundancies in the introduction, which has resulted in the introduction being reduced by over 200 words. We hope that the introduction now addresses the main points more clearly, and will give the reader an immediate understanding of the importance of the research.

2. Both reviewers mentioned places where the introduction can be improved. Like REV 2, I noted the stress and anxiety section of the introduction felt like an afterthought. Moreover, like this reviewer, I thought that assessing stress and anxiety as a central measure in a simulation exercise was odd. On this point, REV 2 states, “my immediate thought was that anxiety levels may have been low due to the fact that (a) the decontamination exercise was, after all, an exercise; and (b) participants had volunteered to take part in this exercise.” It might be best to remove this variable entirely as participants shouldn't experience anxiety during a simulation (and they don't as evidenced by the mean and as a result doesn't contribute to the model. I am not demanding that you do so, but at the very least a strong discussion of this issue (i.e., that simulations are a far cry from a real event and that people might react very differently) should be made in a limitation section.

We agree that the two paragraphs on anxiety at the end of the introduction did not flow as well as the rest of the introduction. We have therefore moved the material on anxiety so that it sits in the section on the consequences of social identity (e.g. cooperative behaviour, helping) on page 5. This allows us to more clearly show that reduced anxiety can be a consequence of shared social identity.

While we agree that anxiety is likely to be far lower during simulated incidents than during real life incidents, we do not necessarily agree that volunteers will not experience any stress or anxiety during simulated incidents. Results of qualitative volunteer feedback data from five different exercises reveals that a proportion of volunteers report experiencing increased anxiety during such simulated incidents. Reasons given for this are both the unfamiliar nature of the decontamination process itself, and a lack of communication from emergency responders (Carter et al., 2012). We therefore feel that the low mean score for anxiety in the present research may be an artefact of the measure used, rather than due to volunteers not experiencing any anxiety; the quantitative measure used may not pick up subtle increases in stress and anxiety, resulting in a low overall mean score for this variable. We have now included a discussion of this in the limitations section of the discussion.

We feel that it is important to include anxiety as an outcome measure in this research, since it has been shown to play such a key role in the way in which members of the public respond during real life incidents involving decontamination (e.g. Hanley, 1999; U.S. Fire Administration, 2002). However, we do agree that measuring anxiety following a simulated incident is likely to be more difficult than measuring anxiety following a real incident, and as such we have now included more discussion of this point in the limitations section.

3. Perhaps my greatest concern is how much this paper overlaps with another paper you have under review. On p. 8 you write, "Applied to incidents involving decontamination, this research indicates that anxiety is likely to be reduced by both shared identity among members of the public, and shared identity between responders and members of the public (Carter et al., submitted). Reduced anxiety about the decontamination process may in turn increase compliance, as the less afraid people are of the process, the less likely they are to refuse to comply (Carter et al., submitted)." Given this description of the Carter et al. submitted paper and your results; I worry the current paper is no different from the one you have submitted elsewhere? It would appear they are very similar. You will need to explicitly state how this paper builds on and is different from the Carter et al., submitted paper. Specifically, I need a guarantee from you that you are a) not using the same data twice and b) the papers are sufficiently different to warrant two separate papers. Perhaps you would be willing to share this other manuscript with me?

Having re-read the introduction section of the paper, we agree that we haven't made it clear how the two papers are different. The Carter et al., (submitted) paper is actually a review of the relevant literature, which involves applying the social identity approach to generate recommendations for incidents involving mass decontamination. However, this is purely a review of the existing literature, and contains no original data. We have now changed the section on page 6 so that it is clear that the paper makes suggestions about the role of social identity processes, but does not provide data in support of this. The sentence now reads "It has been hypothesised that showing respect for public concerns about privacy may also increase perceptions of responder legitimacy and hence increase compliance with the decontamination process, during incidents involving decontamination (Carter et al., submitted). We will be happy to share the manuscript, if this will help.

Method

1. On p. 10 you write, "Volunteers were members of the public who were recruited by the Red Cross in o Birmingham. In total, 115 volunteers were decontaminated during this exercise. Thirty eight r percent of the volunteers were male, and 62% were female. Their ages ranged from six to 69 years, with an average age of 31." Were there age restrictions on participating in this study? Did the six year old complete the study? If so, how might age influence results? If not, what were the age restrictions for participating in the study (and why) and how did this influence your N (and the sex composition). Indeed, one thing that was not assessed was possible sex differences. Please include a preliminary results section that accounts for sex.

We have now examined any potential differences between males and females. An independent samples t-test revealed that there were no significant differences between males and females on any of the variables. These findings are now reported in the paper, in a preliminary results section.

Twenty four volunteers (21%) were under the age of 16, and 3 volunteers (2.6%) were under the age of 12. There were no age restrictions on participating in the study, but all those under the age of 16 were accompanied by at least one adult, who could help to answer any questions which children had about the questionnaire. All children completed their questionnaires themselves, with guidance from parents/ guardians when necessary. To establish the effect of including those under the age of 16 in the analysis, we compared the variable means for the group as a whole (including the data from those under 16) with the variable means for the group of adult volunteers (excluding the data from those under 16). Results showed that removing those under the age of 16 from the analysis did not significantly alter the means of any of the variables. The decision was therefore taken to include the results of those under 16 in the overall analysis.

We have now added a preliminary results section to the paper, which includes all of the above findings relating to possible age and sex differences. We have also added the following sentences to the participants section of the method section "Twenty four volunteers (21%) were under the age of 16, and 3 volunteers (2.6%) were under the age of 12. There were no age restrictions on participating in the study."

Analysis

Both REV 1 and I have a number of questions about how you conducted your analyses.

1. Privacy perceptions do not feature in the model. Why is it mentioned in the manuscript if it is not included? Please fix this.

Perceptions of privacy are included in the model, which shows a significant relationship between perceptions of privacy, and perceptions of responder legitimacy.

2. We are concerned about your "co-operative behavior" variable. First, it is not clear what this variable is actually assessing. It is assessing willingness or intention to co-operate, which would make it a clear DV or it is assessing something else? A reading of the sample item makes it sound like it taps whether co-operative behavior was observed.

If the latter is true, a stronger case should be made for why this variable is a DV and not a mediator. Moreover, this variable should be discussed (in the introduction, results, and discussion section) as observed co-operative behavior as opposed to intention to co-operate.

We agree that we haven't made it clear what the "cooperative behaviour" variable is actually assessing. To clarify this, we now refer to this variable as "perceptions of cooperative behaviour" throughout the paper.

This variable is presented as a DV as it is a measure of volunteers' perceptions of cooperative behaviour, rather than an objective measure of cooperative behaviour among volunteers. We argue, based on the social identity approach, that increased identification with other volunteers is likely to lead to increased perceptions that other volunteers are behaving cooperatively. In turn, increased perceptions that others are behaving helpfully are likely to increase own willingness to help others, during a real incident.

To clarify why a perception that other volunteers are behaving cooperatively is important, we have re-worded a sentence in the introduction. The sentence in question originally read: "In turn, a shared social identity can lead to the expectation that other crowd members will be supportive, and encourages people to co-ordinate with and help other crowd members". This sentence now reads: "In turn, a shared social identity can lead to the expectation that other crowd members will behave supportively and cooperatively, and in addition enhances own willingness to cooperate with and help other crowd members."

3. Like REV 1, I noted that your sample size is too low to conduct a Sobel test. The Sobel is only stable with an N of 400 or greater. Please use Preacher and Hayes' bootstrapping procedure. A macro to conduct this analysis is freely available on Andrew Hayes' website. A multiple mediation macro is also provided, which would appear most appropriate for your model.

We have now carried out the mediation analysis using bootstrapping, rather than a Sobel test. We have updated the results section of the paper to reflect this.

Discussion

1. REV 1 mentions that the relationship between 'Shared identity with responders' and 'Shared identity with the public' was unclear. This issue is also pertinent to the introduction and analyses section.

Reviewer 1 questions whether shared identity with members of the public is a mediator between identification with emergency responders and levels of compliance, or a moderator. We believe that identification with other members of the public is a mediator, rather than a moderator, for the reasons outlined below.

We suggest that shared identity with members of the public mediates the relationship between identification with emergency responders and compliance, rather than moderates it, because it explains the relationship between the two variables, rather than altering the direction of it. Therefore the direction of the relationship does not change

with different levels of identification with other volunteers, and thus we believe it to be a mediator, and not a moderator. Indeed, results of moderation analysis support the fact that identification with other members of the public does not moderate the relationship between identification with responders and compliance. Further, bootstrapping reveals that identification with members of the public mediates the relationship between identification with emergency responders and compliance.

We have updated the discussion section of the paper to make it clearer that we suggest that increased shared identification with emergency responders results in increased shared identity among volunteers, which in turn results in increased compliance. We have clarified this within the paper by changing the sentence “We suggest that this may be because decontamination is a potentially embarrassing situation for members of the public, and therefore identifying with emergency responders will not be sufficient to encourage members of the public to comply with the decontamination process” to “We suggest that this may be because decontamination is a potentially embarrassing situation for members of the public, and therefore identifying with emergency responders will be necessary, but not sufficient, to encourage members of the public to comply with the decontamination process; it will also be necessary for decontamination to be adopted by members of the public as a shared group norm.”

2. Like REV 2, “I found it odd that statistical copy was included in the Discussion section.” New results should not be presented in a discussion section.

As requested, we have now removed any results which were included in the discussion section.

3. I would like to see a more clearly defined, developed, and presented implications section. As mentioned earlier in this decision letter, this journal gets picked up by main stream press. A good implications section can go a long way in having the target audience understand the significance of the paper/results.

We have now created a separate implications section, presented on page 20, in which we have tried to clearly and concisely describe the main implications of the research.

Minor points

- *Exact p-values should be reported throughout, even for non-significant results*

The exact p-values are now reported throughout.

- *There are places in the results section where you include a ‘0’ before a decimal, but in other places a ‘0’ before a decimal is absent. Please be consistent.*

We have now changed this so that there are no zeros before any of the decimals in the results section.

Reviewer: 1

Comments to the Author

1. *Page 5 lines 27 -29 – sentence beginning ‘In turn...’. I’m not sure this follows in*

such an obvious manner and would suggest that the logic be spelled out a little more fully. Perhaps some of the material referred to later in relation to stress (bottom of page 7 to top of page 8) could be mentioned here?

We have now added a sentence prior to the sentence beginning ‘In turn...’, in order to spell out the logic more clearly. This reads: “Based on a perception of shared fate, those who are affected by a disaster categorise themselves as similar to one another, in terms of their relationship to the disaster, and thus shared identity develops.” We hope that the addition of this sentence clarifies the point we are making.

2. *In the model perceptions of privacy do not feature. Does adding such a variable improve the model? If not, do we need to know it was measured (in any case no means are presented for this variable – so it seems rather redundant).*

Perceptions of privacy are included in the model, which shows a significant relationship between perceptions of privacy, and perceptions of responder legitimacy.

3. *The path model makes sense. However I was not so sure about the outcome variable ‘Co-operative behaviour’. If this referred to intention to co-operate or to statements such as ‘I was motivated to co-operate with others in my situation’ (or whatever) it could be seen as an outcome variable. However, the items are of a different style: ‘I saw casualty volunteers co-operating with each other during this exercise’. Is a perception such as this easily conceived of as an outcome variable? I’m not sure. I could more easily imagine it as a mediator between shared identity and some other outcome (showing shared identity leads to co-operation which then leads to something else – e.g., reduced anxiety). I may well be wrong – it just looks an odd outcome to my eyes.*

We agree that we haven’t made it clear what the “cooperative behaviour” variable is actually assessing. To clarify this, we now refer to this variable as “perceptions of cooperative behaviour” throughout the paper.

This variable is presented as a DV as it is a measure of volunteers’ perceptions of cooperative behaviour, rather than an objective measure of cooperative behaviour among volunteers. We argue, based on the social identity approach, that increased identification with other volunteers is likely to lead to increased perceptions that other volunteers are behaving cooperatively. In turn, increased perceptions that others are behaving helpfully are likely to increase own willingness to help others, during a real incident.

To clarify why a perception that other volunteers are behaving cooperatively is important, we have re-worded a sentence in the introduction. The sentence in question originally read: “In turn, a shared social identity can lead to the expectation that other crowd members will be supportive, and encourages people to co-ordinate with and help other crowd members”. This sentence now reads: “In turn, a shared social identity can lead to the expectation that other crowd members will behave supportively and cooperatively, and in addition enhances own willingness to cooperate with and help other crowd members.”

4. *Page 13. It could be useful to have a table of correlations between the variables.*

We are not sure whether it would be beneficial for a reader to see a table of correlations between variables. The results presented in the path model show a series of regression analyses between variables, and therefore provide more information about the relationships between variables than would a table of correlations. However, we would be willing to include a table of correlations, if it is still felt that this would add value.

5. *Page 13 line 25. Add a sentence explaining what the correlation shows. At present the reader has to look back to check the direction of scoring.*

To clarify this, we have added the sentence “This indicates that the change in identification with other members of the public following the exercise increased as the change in identification with emergency responders following the exercise increased.”

6. *Page 13, line 48/9. ‘Data’ are plural... so ‘Some data were missing...’*

We have now changed this sentence to read “Some data were missing”, rather than “some data was missing”.

7. *Page 14. The text reports correlation coefficients or are these standardised Beta weights?*

The data reported in this section are standardised beta weights, and we have now changed the text in this section of the paper to reflect this.

8. *The reporting of the mediation on page 15 seems rather brief (in the sense that some of the steps to testing mediation are not reported). This saves space but it seems a little too brief. It may also be better to report mediation using bootstrapping (see Preacher and Hayes). Just a thought.*

We have now carried out the mediation analysis using bootstrapping, rather than a Sobel test. We have updated the results section of the paper to reflect this.

9. *I was a little unclear on the relationship between ‘Shared identity with responders’ and ‘Shared identity with the public’. This is discussed on page 17 where (top of the page) it is argued that identifying with responders is not enough for decontamination to be accepted. Rather, it is suggested that identification with the public (who would see one unclothed) is also important. This makes sense – but I was not so clear that this implies a mediating relationship. It sounds more like an interaction (such that when there is both, then there is more compliance etc.). In turn this suggests moderation rather than mediation. I may be missing something here – but the case for mediation seems a little unclear.*

As discussed above, we suggest that shared identity with members of the public mediates the relationship between identification with emergency responders and compliance, rather than moderates it, because it explains the relationship between the two variables, rather than altering the direction of it. Therefore the direction of the relationship does not change with different levels of identification with other volunteers, and thus we believe it to be a mediator, and not a moderator. Indeed, results of moderation analysis support the fact that identification with other members of the public

does not moderate the relationship between identification with responders and compliance. Further, bootstrapping reveals that identification with members of the public mediates the relationship between identification with emergency responders and compliance.

We have updated the discussion section of the paper to make it clearer that we suggest that increased shared identification with emergency responders results in increased shared identity among volunteers, which in turn results in increased compliance. We have clarified this within the paper by changing the sentence “We suggest that this may be because decontamination is a potentially embarrassing situation for members of the public, and therefore identifying with emergency responders will not be sufficient to encourage members of the public to comply with the decontamination process” to “We suggest that this may be because decontamination is a potentially embarrassing situation for members of the public, and therefore identifying with emergency responders will be necessary, but not sufficient, to encourage members of the public to comply with the decontamination process; it will also be necessary for decontamination to be adopted by members of the public as a shared group norm.”

Very minor points:

Page 4 line 6 – delete ‘directly’

We have deleted the word ‘directly’.

Page 11 drop ‘n/a’ from lines 13 and 32.

We have removed ‘n/a’ from lines 13 and 32.

Reviewer: 2

Comments to the Author

1. The section of the introduction relating to stress and anxiety, appearing quite late in the introduction, appears out of place because these variables have not been mentioned at all up to this point, and were not identified as variables of interest up until this point. I felt that the transition to talking about anxiety as a variable was not smooth. Overall the flow of the presentation of existing literature and the rationale was very good, but this aspect did not sit well with me.

We agree that the two paragraphs on anxiety at the end of the introduction did not flow as well as the rest of the introduction. We have therefore moved the material on anxiety so that it sits in the section on the consequences of social identity (e.g. cooperative behaviour, helping) on page 5. This allows us to more clearly show that reduced anxiety can be a consequence of shared social identity.

2. Sticking with this issue, but moving to later in the manuscript: it later becomes clear that anxiety was measured but was not significantly associated with any other variables, and the authors suggest this was because levels were low overall (p. 17). When I read this, my immediate thought was that anxiety levels may have been low due to the fact that (a) the decontamination exercise was, after all, an exercise; and (b) participants had volunteered to take part in this exercise. In fact, a note to this effect was made later in the discussion (p. 19), but this seems rather disjointed, so I’d recommend either

restructuring so this is only mentioned once, or at least flagging when you mention it this first time that this will be discussed further in the limitations section.

On reading this section again, we agree that this does appear slightly disjointed. We have therefore now only mentioned the lack of relationship between anxiety and the other variables briefly on page 17, and have included a note that this will be discussed further in the limitations section.

3. I found it odd that statistical copy was included in the Discussion section. Obviously it is for the journal's editors to decide if this is appropriate or not, but I felt I should flag this as something that is not common practice in psychological journal articles.

As suggested, we have now removed any statistical data which was included in the discussion section.

After discussion with the exercise organisers, we have now removed any specific references to the location and team that ran the exercise, but we are confident that this has not affected how the exercise is described and understood.

We would like to thank the reviewers for their detailed and constructive reviews, and we hope that we have been able to address all of the issues raised by reviewers in the updated version of the paper. We look forward to receiving your feedback.

Response to second set of reviewer comments: 1st July 2013

Dear Dr. Wohl,

Thank you very much for considering our revised manuscript (HBAS-2013-0084.R1) for publication within Basic and Applied Social Psychology. We have now revised the manuscript, based on your comments, and the comments of the reviewers.

Point-by-point response to comments

*1. I am concerned with the proposed and tested relationship between 'Shared identity with responders' and 'Shared identity with the public'. I, like the reviewer, am having difficulty understanding why shared identity with responders would impact the outcome variables to the extent that participants shared identity with the public. The issue here is that you are making the argument that shared identity with responders cause shared identity with the public, which in turn causes changes in the outcome variables. I agree it is hard to imagine *why* shared identity with responders would influence shared identity with the public. Unfortunately, resting on the results is not sufficient. Both the reviewer and I would like you to make a strong theoretical argument, ideally based on existing research, to suggest why one type of identity would impact another type of identity. In text you argue that identification with responders will help the public unite around a norm or cooperation. This, however, does not suggest that people will share a common identity with the public, only that the public will behave in accordance with the norm that result from identifying with the responders. It is entirely possible that both the review and I are missing something here. If so, please walk us and the eventual reader of this paper through it. Creating more confusion is that the sentence beginning with "in*

the second place" does suggest a moderated model whereby the shared identities interact to influence behaviour.

After re-reading the text which deals with the relationship between identification with emergency responders and identification with other members of the public, we agree that we haven't been clear enough about why we expect identification with responders to result in increased identification with members of the public. While it is not a generic social identity effect that identification with one group can strengthen identification with another, we suggest that it can occur under certain conditions; specifically, the relationship between identification with one group and identification with another is dependent on the content of their identities. Work on social identity and procedural justice suggests that if members of the public identify with a group who are perceived to be representing the norms and values of society as a whole (e.g. Police), then this will serve to strengthen identification among members of the public, who are also seen to share societal values which the Police represent (e.g. preventing crime and maintaining order) (Lind & Tyler, 1988). It is therefore the normative content of the identity shared with Police that determines whether identification with them serves to strengthen identification among members of the public. In the case of mass decontamination, we would argue that similar processes may be involved, but that the content of the identity shared between responders and members of the public in this case is one of protecting public health.

Empirical support for the idea that identification with one group can affect identification with another group can be found in studies examining the relationship between identification with Police and identification with other football fans (e.g. Stott et al., 2008). Stott et al. found that the relationship between Police and football fans changed over time, following football fans having contact with Police during a football tournament. The relationship between identification with members of the public and identification with Police became significantly more positive following the football tournament. While Stott et al. suggest that this change in relationship is the other way round to the finding in the present study (it was identification with fans which played a role in shaping identity with responders), it still shows how identification with one group can affect identification with another group. We have now added three paragraphs to the text in this section of the paper, in order to clarify why we would expect that identification with one group could affect identification with another group, dependent on the content of the identity. The text in this section of the paper now reads:

“While identification with emergency responders may have a direct positive effect on reduced anxiety and increased compliance, as noted above, it is also possible that the relationship between identification with emergency responders and the relevant outcome variables will be mediated by identification with members of the public. If members of the public share a common positive relationship with emergency responders, they may simply unite around a perceived shared norm for the situation (of cooperation and compliance with the decontamination process) (cf. Turner et al., 1987; Turner, Oakes, Haslam, & McGarty, 1994). In this situation, identification with emergency responders around a (superordinate) identity (i.e. one that responders and crowd are perceived to have in common), may in turn serve to further enhance the unity within the crowd – for their shared identification with responders is something that unites them as a group.

The idea that identification with one group can strengthen identification among members of another group is supported by research into social identity and procedural justice (e.g. Group Value Model: Lind & Tyler, 1988). This suggests that identification with a group who are seen to represent wider values of society (e.g. Police), can serve to strengthen identification among members of the public, who are also seen to share values which are relevant to the content of the identity which the Police represent (e.g. preventing crime and maintaining order). The impact of identification with one group on identification with another group is dependent on the content of the two groups' identity. In the case of mass decontamination, the content of the identity of the emergency responders is one of public health. If responders are seen to be legitimately upholding values of public health, this should serve to strengthen public identification with emergency responders. This unity with responders around the importance of promoting and protecting public health should serve to strengthen the shared social identity among members of the public who share these values, and who should therefore unite around this identity.

It is also possible that emergency responders may be able to actively promote increased shared identity among members of the public, as a level of shared identification between the public and responders may allow the latter to shape a norm of unity and cooperation through what and how they communicate when interacting with the crowd. Studies of leadership and social influence across a variety of group contexts have shown that leaders who are 'entrepreneurs of identity' are able to persuade others of their common identity and the legitimacy of their cause through the social categories and values they invoke (e.g. Klein, Spears, & Reicher, 2007; Reicher, Cassidy, Wolpert, Hopkins, & Levine, 2006). Thus by communicating effectively with a group whose support they are seeking, leaders can define aspects of shared social identity among that group, and hence strengthen the sense of shared social identity with the group as a whole.

No studies to date have explicitly examined the effect of identification with a relevant outgroup (e.g. emergency responders) on identification with other ingroup members (e.g. members of the public) in the context of mass emergencies. However, it is certainly possible that findings regarding the role of social identity in other contexts (e.g. procedural justice, leadership) may be equally applicable in the context of mass emergencies; this will be tested in the current study by examining the relationship, if any, between identification with emergency responders, and identification with members of the public. Based on the evidence above, it would be expected that if members of the public identify with emergency responders, around a norm of promoting public health, this will serve to strengthen the shared identity among members of the public, who will also unite around this norm; thus, we would expect a positive relationship between identification with emergency responders and identification with members of the public."

We have also re-written the paragraph in the Discussion which deals with this relationship, starting from the sentence previously beginning with 'If decontamination is not accepted a shared norm...'. The text in this section now reads:

"If members of the public do not identify with emergency responders (and therefore do not internalise responder norms of protecting public health), decontamination will not be accepted as a shared norm, and therefore the potential embarrassment of showering naked in front of a group of strangers could prevent members of the public from complying with responder instructions. However, if members of the public have a

shared social identity, based on their identification with emergency responders (around a norm of health protection), this may facilitate compliance and cooperation with actions which are seen to be in line with the norm of protecting public health (such as undergoing decontamination), and will hence reduce any social cost (in terms of embarrassment) associated with undergoing the decontamination process.”

The proposed relationship between identification with responders, identification with members of the public, and the relevant outcome variables is a mediated one, rather than a moderated one, because we suggest that as identification with responders increases, so identification with members of the public (around norms and values associated with protecting public health) will increase, and so the more positive outcomes (e.g. compliance and cooperative behaviour) will increase. Identification with members of the public therefore mediates the relationship between identification with emergency responders and the positive outcome variables.

We hope that we have now clarified why we expect there to be a positive relationship between identification with emergency responders and identification with members of the public, and how identification with members of the public could mediate the relationship between identification with emergency responders and the relevant outcome variables (increased compliance, reduced anxiety, and increased cooperative behaviour).

2. *Aside from the lack of clarity around the relationship between ‘Shared identity with responders’ and ‘Shared identity with the public,’ the introduction still lacks in terms of outlining the model you plan to test as well as the specific variables in that model and the relations between those variables. For example, although I am happy to see that you moved the material on anxiety, it is now buried in the introduction. I don’t think the BASP readership would understand that anxiety is a measure you will be testing based on a reading of the current introduction. Please make it explicitly clear that anxiety is a variable that will be examined in the study and where it is placed in your model. To be clear, all variables in your model are getting lost in the applied context you are laying out. It is important that the reader understands what variables you are testing, why you are testing them, and the proposed relations to other variables in your tested model before they get to the method section. So, please make sure that the model tested (and thus the variables in that model, where they are placed, and why) are sufficiently discussed in the introduction.*

We agree that we haven’t defined the expected relationships between variables clearly enough in the introduction. To rectify this, we have now added several sections of text, to clarify what the outcome variables are (compliance, anxiety, and cooperative behaviour), and the fact that we expect effective communication to have a positive impact on these, mediated by the relevant social identity variables. We have added the following text to the introduction on page 1, to explain why an understanding of anxiety and compliance during decontamination is important:

“High levels of public non-compliance and anxiety are therefore two factors which could hinder the successful management of the decontamination process during a real life incident; an understanding of the factors which affect non-compliance and anxiety will be crucial for generating recommendations for the management of incidents involving decontamination.”

We have also added the following text to the section of text immediately before the ‘Applying social psychological theories of crowd behaviour to mass decontamination’ section, where the aims of the paper are specified:

“In particular, the present study aimed to examine the role of effective responder communication in predicting three key outcome variables: public compliance; reduced public anxiety; and co-operative public behaviour, as well as how social identity variables can mediate these relationships.”

We have also added the following text to the section relating to the impact of social identity on reducing anxiety, to make it clear that this is a hypothesis in the current study:

“In the current study, it was therefore predicted that increased identification among members of the public, and between members of the public and emergency responders, would reduce levels of public anxiety.”

We have also explicitly stated that we are predicting a relationship between identification with emergency responders, and identification with members of the public:

“Based on the evidence above, it would be expected that if members of the public identify with emergency responders, around a norm of promoting public health, this will serve to strengthen the shared identity among members of the public, who will also unite around this norm; thus, we would expect a positive relationship between identification with emergency responders and identification with members of the public.”

Finally, we have written out the proposed relationships between variables, as well as including these in a path model:

“First, we hypothesised that perceptions of effective responder communication, provision of practical information, and levels of privacy would all predict perceptions of responder legitimacy. Second, we hypothesised that perceptions of responder legitimacy would result in increased identification with emergency responders. Third, we hypothesised that if members of the public identified with emergency responders around norms and values of protecting public health, this would serve to strengthen unity among members of the public around the same norms and values; we therefore predicted a positive relationship between identification with emergency responders and identification with members of the public. Fourth, we hypothesised that identification with members of the public would predict both co-operative behaviour and reduced anxiety among members of the public. Fifth, we hypothesised that identification with emergency responders would predict increased compliance, and reduced anxiety, among members of the public. Finally, we hypothesised that reduced anxiety about decontamination process would predict increased compliance with decontamination.”

We hope that we have now succeeded in clarifying the variables of importance within the model, and the expected relationships between them.

3. *On p. 4, please explain what “crushes” are (perhaps in parentheses) or delete its mention.*

As requested, we have now deleted the word “crushes”.

4. *On p. 4, you write, “More recently, the social identity approach to crowds (Reicher, 1984)...” The phrase “More recently” is inappropriate given the reference you provide is from 1984. I assume you are referring to the 2009 reference at the end of the sentence and the 1984 refers to the social identity of crowds, but it is confusing. Consider deleting the Reicher, 1984 reference.*

We have included the Reicher (1984) reference, because we feel it is important in being the first work to apply the social identity approach to the study of crowds. However, we agree that beginning the sentence with “More recently” is confusing. We have therefore deleted “more recently” from the beginning of the sentence.

5. *Please include a bivariate correlation table. In said table you could provide the M and SD for each measured variable on the diagonal or a separate column.*

We have now included a bivariate correlation table, which also includes the means and standard deviations for each variable.

6. *Your figures are not sufficiently labeled. There is no title give to the figures and no notation for what dotted lined or solid lines signify in Figure 2.*

We have now added a title to each figure, as well as an explanation for what the dotted and solid lines signify in figure 2. The footnote which previously contained an explanation about the dotted and solid lines in Figure 2 has been deleted, since this information is now captured in the title of Figure 2.

7. *It is confusing that the results of the regressions are reported as standardized coefficients, but the meditation analyses are done on unstandardized coefficients (as they need to be). Unstandardized coefficients with standard errors should be reported everywhere. I also agree with the reviewer that reference to ‘BCa’ and ‘K2’ is unusual. When I report the bootstrapping results I typically say something like the following: “The indirect effect through X was estimated to lie between .XX and .XX with 95% confidence.”*

We have now reported the unstandardised regression weights, rather than the standardised regression weights, as requested. We originally included the standardised regression weights purely because I was always taught to include these, rather than unstandardised regression weights, on the basis that it enables a clearer comparison between different variables, particularly if the variables used are based on scales which are not well known. However, having now done some reading around this topic, it seems that there are arguments both for and against using standardised regression weights. We are therefore happy to include the unstandardised regression weights instead, and have done so, as requested.

We included the kappa-squared results in the previous draft of the paper, as the reporting of kappa squared for mediation is recommended (Field, 2013). However, we

have removed these in the updated version of the paper, as requested.

Reviewer: 1

Comments to the Author

This revised manuscript is certainly an improvement upon the first submission and it seems that the authors have undertaken a good number of changes to improve its flow. The one issue that I still find difficult to understand is the relationship between 'Shared identity with responders' and 'Shared identity with the public'. In the introduction there is little discussion of the idea that the former would have an indirect effect through the latter. On page 7 (9-26) the explanation focuses on the direct effect of 'Shared identity with responders' to the outcome variables. In lines 28-39 another route is suggested and it may be that this gives some clues to why 'Shared identity with responders' should impact on the outcome variables via 'Shared identity with the public'. However, I think that this is rather unclear and needs spelling out in more detail. I found the text on line 28 onwards rather hard to grasp and did not come away with a sense of a mediated relationship (if that is indeed what the authors intended). Moreover, I still find the Discussion of this relationship (page 17, line 34 onwards) a little opaque and I'm still not 100% certain that the account implies mediation rather than moderation.

In the updated version of the paper, we have tried to clarify why we expect there to be a positive relationship between identification with emergency responders and identification with members of the public. Please see our response under point 1 (page 1) above, for full details of the changes we have made in response to this point.

More generally I found the predicted relationships rather vaguely specified. On page 8 line 34-39 the predictions are presented through reference to Figure 1 when I think they need more spelling out. This would make for a more powerful and persuasive piece.

We have tried to specify the predicted relationships between variables more clearly in the updated version of the paper. Please see our response under point 2 (page 4) above, for full details of the changes we have made in response to this point.

One minor point. In the reporting of indirect effects (page 15 onwards) there is reference to 'b', 'BCa' and 'K2'. I am sorry to say that I am unfamiliar with these: when I have used these analyses I have just reported the Confidence Intervals to show they do not include a zero. What does the BCa and K2 refer to? My ignorance - sorry.

As noted above, we included the kappa squared results in the previous version of the paper, as the reporting of kappa squared is recommended by Field (2013). However, we have removed the kappa squared results in the updated version of the paper, as requested.

We would like to once again thank both yourself and the reviewers for your detailed review of our paper. We feel that the paper has been strengthened significantly as a result of the changes we have made in response to these reviews. We hope that we have now been able to address all of the issues raised in the updated version of the paper, and we look forward to receiving your feedback.

Appendix 5: Interview schedule for interviews with emergency responders

Specific questions about the incident

1. Can you tell me what happened during the incident.
2. How many people were involved in the incident? – (how many decontaminated - check about nurses)
3. Which agencies were involved in the management of this incident? (e.g. fire, police etc)
4. As far as you understood it, which agency was in charge of managing this incident?
5. Could you describe your actions upon arrival at the scene?
6. Please describe any specific issues or concerns which you had whilst managing the decontamination process.
7. Did you have any difficulty in getting those who were decontaminated to comply with the recommended decontamination procedures?
8. If so, what action did you take to ensure compliance?
9. Did the group of affected people as whole accept the need to undergo decontamination showering?
10. How easy was it to communicate with those who were decontaminated during this incident?
11. Were members of the public naked during this incident?
12. Did members of the public show any concern about being naked/ wearing only underwear during this incident?
13. Did they request extra privacy?

Mass panic

14. How did those who were decontaminated (e.g. nurses, members of the public) behave during this incident?
15. Did you see anyone panicking during this incident?
16. If so, please describe what you mean by panicking.
17. Did you see anyone over-reacting during this incident?
18. Did you see anyone becoming overly emotional during this incident?

Global resilience

19. Did you see the people who were decontaminated helping each other during this incident?
20. Please describe any specific helping behaviour which you witnessed during this incident.

Fair treatment by emergency responders

21. How do you feel that you, and other members of the emergency services, treated those who were decontaminated during this incident?
22. Do you feel that you, and other members of the emergency services, treated those who were decontaminated fairly during this incident? Treated them with respect?
23. Do you feel that those who were decontaminated felt that you treated them fairly during this incident?

Empowerment

24. Did you feel that those who were decontaminated accepted the emergency services during this incident?
25. Did any of those who required decontamination refuse to comply with your instructions at any point during this incident?
26. Did any of those people who were decontaminated ever attempt to challenge the authority of the emergency services during this incident?

Routine civility

27. How do you feel that those who were decontaminated behaved during this incident?
28. Do you feel that the people who were decontaminated behaved in an orderly way during this incident?
29. If so, please describe any specific examples of this.

Safety/ danger

30. Did you feel that those who were decontaminated were scared during this incident?

Anxiety, stress and wellbeing

31. How anxious did you feel during this incident?

32. Did you find the incident stressful?

33. If you felt anxious or stressed during this incident, what would you say was the main cause of this?

Future large-scale incidents

34. Do you think a large-scale incident of this type would require a different management strategy to a smaller incident?

35. If so, in what way?

36. Please describe any potential issues which you feel might occur during larger-scale incidents involving decontamination.

37. Would you personally feel prepared to deal with a large-scale incident involving decontamination, if one were to occur?

38. Do you feel that the Fire and Rescue Service as a whole are prepared to deal with a large-scale incident involving decontamination?

39. How do you imagine members of the public might behave during a large-scale incident involving decontamination?

Thank you very much for taking part in this interview. The information which you have provided will be invaluable in helping us to learn more about the way in which incidents involving decontamination are managed. I will send you a debriefing statement about this research, which will explain a little bit more about the research aims, as well as providing contact information, in case you have any further questions or would like to make a complaint about the research.

Appendix 6: Pre-exercise questionnaire used during multi-agency mass decontamination field exercise.

Please complete this brief questionnaire before taking part in the exercise.

All responses will be treated in the strictest confidence and individuals will not be identified in any reporting. Following the exercise, this cover sheet will be removed and stored separately from your questionnaire, to ensure that your responses are not identifiable.

Name.....

Age.....

Gender: Male Female

1. I feel I have a lot in common with the other volunteers who are taking part in the exercise today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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2. I feel a sense of unity with the other volunteers who are taking part in the exercise today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

3. I feel I have a lot in common with the emergency responders who will be managing the incident during the exercise today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

4. I feel a sense of unity with the emergency responders who will be managing the incident during the exercise today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

5. Please describe any expectations you have about the way in which the emergency services will manage the incident today.

6. Please describe any expectations you have about the way in which other exercise volunteers will behave during the exercise today.

Thank you for completing this questionnaire. Please return it to a member of staff. If you have any further comments or queries about this questionnaire, please contact Holly Carter on 01980 616967, or email holly.carter@hpa.org.uk.

**Appendix 7: Post-exercise questionnaire used during multi-agency mass
decontamination field exercise**

In order to evaluate the exercise, we would like your feedback. Please answer the following questions as yourself, rather than from the point of view of your casualty character.

The following questions ask about your experience of participating as a volunteer during the exercise. Your feedback and opinions of the exercise are important to us, and will help the organisations participating in the exercise to improve their response to incidents of this kind. Please give a full and detailed account of your experiences when responding to the questions that follow. Thank you for taking the time to complete this questionnaire.

All responses will be treated in the strictest confidence and individuals will not be identified in any reporting. Following the exercise, this cover sheet will be removed and stored separately from your questionnaire, to ensure that your responses are not identifiable.

This questionnaire should only take 10-15 minutes to complete and will only be seen by the exercise evaluation team.

Name.....

Age.....

Gender: Male Female

1. Emergency responders explained clearly what was happening during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

2. I found it easy to communicate with emergency responders during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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3. I felt that emergency responders were open about what was happening during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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4. Emergency responders provided sufficient practical information about what we were supposed to do during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

5. I was clear about what I was supposed to do at each stage of the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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6. Please explain any ways in which you feel communication from emergency responders during the decontamination process could have been improved.

7. I felt confident that I was completely clean after going through the decontamination showers.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

8. I had sufficient privacy during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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9. I would be willing to undergo a decontamination shower during a real life incident of this kind.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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10. I would be willing to be naked inside the decontamination showers in a real incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

11. If you would not be willing to undergo a decontamination shower during a real incident, or would not be willing to be naked inside the decontamination showers in a real incident, please explain why.

12. I trusted that the emergency responders who took part in this exercise knew how to manage the situation appropriately.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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13. I feel confident that emergency responders are prepared to deal with a real incident of this kind.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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14. Emergency responders took appropriate and necessary actions to manage this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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15. Emergency responders behaved in a fair way during this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

16. Emergency responders treated us with respect during this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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17. Please describe any ways in which emergency responders could have dealt with the decontamination process better.

18. Sometimes casualty volunteers needed other casualties to help them during this exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

19. Casualty volunteers were courteous to each other during this exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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20. I saw casualty volunteers co-operating with each other during this exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

21. Please explain any instances during the exercise when you saw volunteers co-operating. Include any instances when you gave help to another volunteer, or received help from another volunteer.

22. I felt anxious during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

23. I felt stressed during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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24. I felt scared during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

25. If you felt anxious, stressed or scared during this exercise, please describe what the main reason for this was:

26. During the exercise, I felt that I had a lot in common with the other casualty volunteers who took part in this exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

27. I felt a sense of unity with other casualty volunteers who took part in this exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

28. I felt that I had a lot in common with the emergency responders who were managing this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

29. I felt a sense of unity with the emergency responders who were managing this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

30. I felt emotionally engaged during the exercise.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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31. I took this exercise seriously.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

32. I acted as if the exercise were a real incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

33. Please describe any ways in which you feel this exercise could have been improved:

Thank you for completing this questionnaire. Please return it to a member of staff. If you have any further comments or queries about this questionnaire, please contact Holly Carter on 01980 616967, or email holly.carter@hpa.org.uk.

Appendix 8: Scenario used in the mass decontamination visualisation experiment

Imagine you are waiting in a crowded lecture theatre for a lecture to begin. Whilst you are waiting, an announcement plays over the loudspeakers in the lecture theatre. You are told that a suspicious package has been delivered to the building. You are told that the package contains a suspicious substance, and you are asked to remain in the building until further notice. After some time, emergency responders wearing protective equipment enter the lecture theatre. They direct you and the others in the lecture theatre to move outside.

As you leave the building you hear sirens, and the Fire and Rescue Service arrive at the scene. You notice that all the emergency responders are wearing hazard protection suits. Fire and Rescue Service crew members move everyone into an area a little way away from the lecture building, and ask people not to leave the scene. Other members of the Fire and Rescue Service are setting up a decontamination shower a short way away, and are directing people towards it. As you are moved closer to the decontamination tent, you see others who were involved in the incident undressing as they are about to go through the decontamination shower. You realise that you will be expected to remove all of your clothes before going through the shower. A crowd has formed around the decontamination shower, and onlookers are watching the decontamination process take place.

Appendix 9: Communication intervention used during the mass decontamination visualisation experiment

a. Theory-based communication condition

You are directed by the emergency services towards the decontamination tent. You see emergency responders moving around the decontamination tent. You hear a message informing you that it is important that you undergo decontamination, as this will protect you, and others around you who may become contaminated. You are also informed that the decontamination process will begin as soon as possible, and are thanked for your co-operation. You are informed that responders are setting up the decontamination tent, and as soon as this has been completed, the decontamination process will begin. You wait for approximately half an hour, during which time you are kept informed about the actions of the emergency responders, and the importance of the need for decontamination is reiterated. You then hear a message telling you that the decontamination process will begin.

You are asked to listen to an information message before entering the decontamination tent. The message informs you that: “When the light on the outside of the decontamination shower turns green, you should enter the first section of the decontamination shower in groups of five, and remove the clothes you are wearing. You should then place your clothes on the floor in the first section of the decontamination tent, and move forward into the showering section of the decontamination tent when the next light turns green. You will have three minutes to wash yourself in the showering section of the decontamination tent, and you should wash from head to toe. When the red light at the end of the showering section turns green, you should leave the showering section and move into the final section of the decontamination unit. Within this section you will find some clothing for you to get dressed into. When dressed you should leave the decontamination unit. Responders will meet you on the other side of the decontamination unit, and will explain what you should do next.” The light on the outside of the decontamination unit then turns green, and you begin the decontamination process.

b. Standard practice communication condition

You are directed by the emergency services towards the decontamination tent. You see emergency responders moving around the decontamination tent. You hear a message asking you to wait, and telling you that the decontamination process will begin as soon as possible. Several minutes pass, and you hear the same message again. You see emergency responders moving around the decontamination tent, but none of them attempts to speak to you. You hear the same message several minutes later, again asking you to wait, and telling you that the decontamination process will begin as soon as possible. Half an hour passes in total before you hear a message telling you that the decontamination process will begin.

You are asked to listen to an information message before entering the decontamination tent. The message informs you that: “When the light on the outside of the decontamination shower turns green, you should enter the first section of the decontamination shower in groups of five, and remove the clothes you are wearing. You

should then place your clothes on the floor in the first section of the decontamination tent, and move forward into the showering section of the decontamination tent when the next light turns green. You will have three minutes to wash yourself in the showering section of the decontamination tent, and you should wash from head to toe. When the red light at the end of the showering section turns green, you should leave the showering section and move into the final section of the decontamination unit. Within this section you will find some clothing for you to get dressed into. When dressed you should leave the decontamination unit. Responders will meet you on the other side of the decontamination unit, and will explain what you should do next.” The light on the outside of the decontamination unit then turns green, and you begin the decontamination process.

c. Brief communication condition

You are directed by the emergency services towards the decontamination tent. You see emergency responders moving around the decontamination tent. You hear a message asking you to wait, and telling you that the decontamination process will begin as soon as possible. Several minutes pass, and you hear the same message again. You see emergency responders moving around the decontamination tent, but none of them attempts to speak to you. You hear the same message several minutes later, again asking you to wait, and telling you that the decontamination process will begin as soon as possible. Half an hour passes in total before you hear a message telling you that the decontamination process will begin.

You are asked to listen to an information message before entering the decontamination tent. The message informs you that: “When the light outside the decontamination tent changes, you should enter the first section of the decontamination unit in groups of five, and remove the clothes you are wearing. Once you have removed your clothes, you should enter the decontamination shower. Wash yourself. Following this, you should leave the showering unit. Re-dress in the clothes provided.” You enter the decontamination unit as instructed.

Appendix 10: Pre-communication intervention questionnaire used during the online visualisation experiment

Questionnaire given to participants after reading the scenario, but before receiving one of the three different communication messages.

Imagining you were involved in the incident above, please now answer the following questions.

1. I understood what was happening during this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

2. I understood why decontamination was necessary during this incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

3. I felt that this situation was ambiguous.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

4. I imagined the emergency services to be forceful.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

5. I imagined the emergency responders to be respectful.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

6. I imagined the emergency responders to be fair.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

7. If this had been a real incident, I would have felt anxious.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

8. If this had been a real incident, I would have felt scared.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

9. If this had been a real incident, I would have felt stressed.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

10. If this situation had been real, I would have felt a sense of unity with other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

11. If this situation had been real, I would have identified with the other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

12. If this situation had been real, I would have felt a sense of unity with the Fire and Rescue Service personnel responding to the incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

13. If this situation had been real, I would have identified with the Fire and Rescue Service personnel responding to the incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

Appendix 11: Post-communication intervention questionnaire used during the mass decontamination visualisation experiment.

Questionnaire given to participants after receiving one of the three different communication interventions.

Imagining you were involved in the situation you have just read about, please now answer the following questions.

1. I imagined this event well.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

2. I felt emotionally engaged with the scenario.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

3. The scenario accurately resembled how I would imagine a real chemical or biological attack to be.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

4. I felt that emergency responders provided me with enough information about why decontamination was necessary.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

5. I felt that emergency responders gave an adequate explanation of what would happen during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

6. If this situation had been real, I would have understood why I was being asked to go through the decontamination shower.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

7. I felt that emergency responders provided me with sufficient information about what I needed to do during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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8. If this situation had been real, I think I would have understood what actions were expected of me during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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9. If this situation had been real, I think I would have had enough information to take appropriate actions.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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10. I imagined the emergency services to be forceful.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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11. I imagined the emergency responders to be respectful.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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12. I imagined the emergency responders to be fair.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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13. I imagined the emergency services to be open about the actions they were taking.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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14. I imagined the emergency services to be trustworthy.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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15. If this had been a real incident, I would have felt anxious.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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16. If this had been a real incident, I would have felt scared.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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17. If this had been a real incident, I would have felt stressed.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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18. If this situation had been real, I would have been confident that the emergency services would manage the situation appropriately.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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19. If this situation had been real, I would have trusted that the emergency responders knew how to manage the situation appropriately.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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20. If this situation had been real, I would have felt confident that emergency responders would take appropriate actions to manage the incident successfully.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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21. If this situation had been real, I would have complied with the instructions of the emergency responders.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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22. If this situation had been real, I would have been willing to undergo a decontamination shower.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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23. If this situation had been real, I would have been willing to be naked during the decontamination shower.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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24. If this situation had been real, I would have felt a sense of unity with other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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25. If this situation had been real, I would have identified with the other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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26. If this situation had been real, I would have felt a sense of unity with the Fire and Rescue Service personnel responding to the incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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27. If this situation had been real, I would have identified with the Fire and Rescue Service personnel responding to the incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

28. If this situation had been real, I would have felt able to work with others to take appropriate actions to reduce the danger we were in.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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29. If this situation had been real, I would have expected emotional support from other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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30. If this situation had been real, I would have expected to receive help from other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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31. If this situation had been real I would have been willing to help other survivors.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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Appendix 12: Scenario used during the mass decontamination field experiment

Imagine you are waiting in a crowded lecture theatre for a lecture to begin. Whilst you are waiting, an announcement plays over the loudspeakers in the lecture theatre. You are told that a suspicious package has been delivered to the building. You are told that the package contains a suspicious substance, and you are asked to remain in the building until further notice. After some time, emergency responders wearing protective equipment enter the lecture theatre. They direct you and the others in the lecture theatre to move outside.

As you leave the building you hear sirens, and the Fire and Rescue Service arrive at the scene. You notice that all the emergency responders are wearing hazard protection suits. Fire and Rescue Service crew members move everyone into an area a little way away from the lecture building, and ask people not to leave the scene. Other members of the Fire and Rescue Service are setting up a decontamination shower a short way away, and are directing people towards it. As you are moved closer to the decontamination tent, you see others who were involved in the incident undressing as they are about to go through the decontamination shower. You realise that you will be expected to remove your clothes before going through the shower. A crowd has formed around the decontamination shower, and onlookers are watching the decontamination process take place.

Appendix 13: Communication intervention used during the mass decontamination field experiment

Theory-based communication message

At the start:

As a precaution, we would like you to undergo a decontamination shower. This is important, as it will remove any contaminant which may be present on your skin. Before going through the decontamination shower, we would like you to remove the outer layers of your clothes, down to your swimwear. By removing your outer layers of clothing, you will be removing up to 90% of any contaminant which you may have come into contact with. Undergoing a decontamination shower will then remove any remaining contaminant from your skin. This will help to prevent you suffering any adverse effects from the contaminant.

Please take off your outer layers of clothes, down to your swimwear. Please then open the packs which are on the ground in front of you. Please change into the orange ponchos, and place the clothes you have taken off into the bag provided. Further instructions are provided within the packs.

After 5 minutes:

The decontamination process will begin as soon as possible. Please be patient while we finish setting up the decontamination tent. Thank you for your co-operation.

After 10 minutes:

The decontamination process will begin as soon as possible. During this time, please make sure you have changed into the orange poncho provided, and have placed the clothes you were wearing into the bag provided. This will remove 90% of any contaminant which you may have come into contact with. Thank you for your co-operation.

After 15 minutes:

We are now finishing the set up of the decontamination tent, and the decontamination process will begin in about 5 minutes time. It is important that you undergo a decontamination shower, as this will remove any contaminant which may remain on your skin. We appreciate your patience, and the decontamination process will begin as soon as possible. Thank you for your co-operation.

After 20 minutes:

We have now finished setting up the decontamination tent, and the decontamination showering process will now begin. Thank you for your patience.

During the decontamination process (repeat when each group is waiting to go through the decontamination process):

When the light on the outside of the decontamination shower turns green, and an audible signal is heard, you should enter the first section of the decontamination shower in groups of five. You should then remove the orange poncho you are wearing, and place it on the floor. When the light at the entrance to the next section of the tent turns green, move forward into the showering section of the decontamination tent. You will have three minutes to wash yourself in the showering section of the decontamination tent, and you should wash from head to toe. When the red light at the end of the

showering section turns green, you should leave the showering section and move into the final section of the decontamination unit. Within this section you will find some clothing packs containing clothing for you to get dressed into. When the red light changes to green, you should leave the decontamination tent. Responders will meet you on the other side of the decontamination unit, and will explain what you should do next.

Standard practice communication message

At the start:

We would like you to undergo a decontamination shower. Please take off your outer layers of clothes, down to your swimwear. Please then open the packs which are on the ground in front of you. Please change into the orange ponchos, and place the clothes you have taken off into the bag provided. Further instructions are provided within the packs.

After 20 minutes:

We have now finished setting up the decontamination tent, and the decontamination showering process will now begin.

During the decontamination process (repeat when each group is waiting to go through the decontamination process):

When the light on the outside of the decontamination shower turns green, and an audible signal is heard, you should enter the first section of the decontamination shower in groups of five. You should then remove the orange poncho you are wearing, and place it on the floor. When the light at the entrance to the next section of the tent turns green, move forward into the showering section of the decontamination tent. You will have three minutes to wash yourself in the showering section of the decontamination tent, and you should wash from head to toe. When the red light at the end of the showering section turns green, you should leave the showering section and move into the final section of the decontamination unit. Within this section you will find some clothing packs containing clothing for you to get dressed into. When dressed you should leave the decontamination unit. Responders will meet you on the other side of the decontamination unit, and will explain what you should do next.

Brief communication message

At the start:

We would like you to undergo a decontamination shower. Please take off your outer layers of clothes, down to your swimwear. Please then change into the orange ponchos provided.

After 20 minutes:

We have now finished setting up the decontamination tent, and the decontamination showering process will now begin.

During the decontamination process (repeat when each group is waiting to go through the decontamination process):

When the light outside the decontamination tent changes, you should enter the first section of the decontamination unit in groups of five, and remove the clothes you are wearing. Once you have removed your clothes, you should enter the

decontamination shower. Wash yourself. Following this, you should leave the showering unit and re-dress in the clothes provided.

Appendix 14: Pre-communication intervention questionnaire used during the mass decontamination field experiment

Please complete this brief questionnaire before taking part in the decontamination field trial.

All responses will be treated in the strictest confidence and individuals will not be identified in any reporting. Following the trial, this cover sheet will be removed and stored separately from your questionnaire, to ensure that your responses are not identifiable.

Name.....

Age.....

Gender: Male Female

Course (degree programme).....

1. I feel that I have a lot in common with the other volunteers who are taking part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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2. I feel a sense of unity with the other volunteers who are taking part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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3. I identify with the other volunteers who are taking part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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4. I think that the other volunteers who are taking part in the trial today identify with me.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

5. I feel I have a lot in common with the emergency responders who will be managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

6. I feel a sense of unity with the emergency responders who will be managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

7. I identify with the emergency responders who will be managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

8. I think that the emergency responders who will be managing the decontamination process today identify with me.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

9. I think that the emergency responders will treat people fairly during the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

10. I think that the emergency responders will treat people with respect during the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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11. I think that the emergency responders will be open about the actions they are taking during the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

12. I think that the emergency responders who are managing the decontamination process today will be trustworthy.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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13. If a real incident of this kind were to occur, I would feel nervous.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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14. If a real incident of this kind were to occur, I would feel worried.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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15. If a real incident of this kind were to occur, I would feel calm.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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16. Please describe any thoughts you have about the way in which the emergency responders will behave during the decontamination process today.

17. Please describe any thoughts you have about the way in which other volunteers will behave during the decontamination process today.

Thank you for completing this questionnaire. Please return it to a member of staff. If you have any further comments or queries about this questionnaire, please contact Holly Carter on 01980 616967, or email holly.carter@hpa.org.uk.

Appendix 15: Post-communication intervention questionnaire used during the mass decontamination field experiment.

In order to evaluate the study, we would like your feedback.

The following questions ask about your experience of participating as a volunteer in the decontamination field trial. Your feedback is important to us, and will help the organisations participating in the trial to improve their response to incidents of this kind. Please give a full and detailed account of your experiences when responding to the questions that follow. Thank you for taking the time to complete this questionnaire.

All responses will be treated in the strictest confidence and individuals will not be identified in any reporting. Following the study, this cover sheet will be removed and stored separately from your questionnaire, to ensure that your responses are not identifiable.

This questionnaire should only take 10-15 minutes to complete and will only be seen by the trial evaluation team.

Name.....

Age.....

Gender: Male Female

How many other volunteers did you know personally before taking part in the trial today (if any)?.....

1. The emergency responders explained clearly what was happening during the decontamination process* (*undressing, showering, and redressing).

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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2. I found it easy to communicate with the emergency responders during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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3. Sufficient information was given about why decontamination was necessary.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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4. I understood why I was being asked to go through the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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5. I was provided with sufficient practical information about what I was supposed to do during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

6. I was clear about what I was supposed to do at each stage of the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

7. I understood what actions were expected of me during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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8. Please explain any ways in which you feel communication/ information during the decontamination process could have been improved.

9. I felt that I had a lot in common with the other volunteers who took part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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10. I felt a sense of unity with other volunteers who took part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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11. I identified with the other volunteers who took part in the trial today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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12. I think that the other volunteers who took part in the trial today identified with me.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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13. I felt that I had a lot in common with the emergency responders who were managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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14. I felt a sense of unity with the emergency responders who were managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

15. I identified with the emergency responders who were managing the decontamination process today.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

16. I think that the emergency responders who were managing the decontamination process today identified with me.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

17. I felt that the other volunteers and I were all in the same boat.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

18. I felt a sense of common fate with the other volunteers who took part in this trial.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

19. I felt that I was completely clean after going through the decontamination showers.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

20. I had sufficient privacy during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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21. I would be willing to remain at the scene of this type of incident in order to undergo decontamination.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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22. I would be willing to undergo a decontamination shower during a real life incident of this kind.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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23. I would be willing to be naked inside the decontamination showers in a real incident.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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24. If you would not be willing to undergo a decontamination shower during a real incident, or would not be willing to be naked inside the decontamination showers in a real incident, please explain why.

25. I felt that the emergency responders behaved in a fair way towards us during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

26. I felt that the emergency responders treated us with respect during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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27. I felt that the emergency responders were open about the actions they were taking during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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28. I felt that I could trust the emergency responders who were managing the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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29. Please describe any ways in which emergency responders could have improved the way they dealt with the decontamination process.

30. Sometimes volunteers needed other volunteers to help them during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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31. Volunteers were courteous to each other during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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32. I saw volunteers co-operating with each other during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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33. Please explain any instances when you saw volunteers co-operating. Include any instances when you gave help to another volunteer, or received help from another volunteer.

34. I felt able to work with other volunteers to successfully undergo the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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35. I felt able to work with other volunteers to take any necessary actions during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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36. I felt nervous during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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37. I felt worried during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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38. I felt calm during the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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39. If this had been a real incident, I would have felt nervous.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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40. If this had been a real incident, I would have felt worried.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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41. If this had been a real incident, I would have felt calm.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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42. If you felt nervous or worried, please describe what the main reason for this was:

43. If this was a real incident, I would have felt able to work with others to successfully undergo the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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44. If this was a real incident I would have felt able to work with others to take appropriate actions to reduce the danger we were in.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
--------------------------	---	---	---	---	---	---	---	-----------------------

45. If this was a real incident, I would expect emotional support from other members of the public who were involved.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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46. If this was a real incident, I would expect to receive help from other members of the public who were involved.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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47. If this was a real incident, I would be willing to help other members of the public.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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48. If this was a real incident, I would want to seek further treatment following the decontamination process.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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49. I felt emotionally engaged during the trial.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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50. I took this trial seriously.

<i>Strongly disagree</i>	1	2	3	4	5	6	7	<i>Strongly agree</i>
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51. Please describe any ways in which you feel this trial could have been improved:

Thank you for completing this questionnaire. Please return it to a member of staff. If you have any further comments or queries about this questionnaire, please contact Holly Carter on 01980 616967, or email holly.carter@hpa.org.uk.