

Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise

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Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise

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Abstract

Emergency responders' failure to communicate effectively during decontamination following a chemical or biological 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 procedure 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, 2010; 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 incidents (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, through producing 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 aims 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, 2009b).

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 among members of the public (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 is therefore expected that increased identification among members of the public, and between members of the public and emergency responders, will 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, Stott, Drury, Adang, Cronin, & Livingstone, 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, submitted). 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). 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 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.

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 the norm 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; 2013). 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 decontamination process would predict increased compliance with decontamination. These hypotheses are illustrated in our path model in Figure 1.

Insert Figure 1 about here.

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 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 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 1, along with the means and standard deviations of each variable.

Table 1: Correlation matrix for all variables, along with mean scores and standard deviations.

	Effective comms	Practical info	Privacy	Legitimacy	Shared ID responders	Shared ID public	Compliance	Low anxiety	Co-operation
Effective comms	$M = 3.30$ $SD = 1.37$	$r = .72$ $p < .001$	$r = .30$ $p = .006$	$r = .63$ $p < .001$	$r = .44$ $p < .001$	$r = -.04$ $p = .70$	$r = .23$ $p = .03$	$r = .01$ $p = .93$	$r = -.06$ $p = .60$
Practical info	$r = .72$ $p < .001$	$M = 3.38$ $SD = 1.56$	$r = .38$ $p < .001$	$r = .62$ $p < .001$	$r = .46$ $p < .001$	$r = .006$ $p = .96$	$r = .21$ $p = .05$	$r = .08$ $p = .47$	$r = -.02$ $p = .83$
Privacy	$r = .30$ $p = .006$	$r = .38$ $p < .001$	$M = 3.72$ $SD = 2.0$	$r = .50$ $p < .001$	$r = .41$ $p < .001$	$r = .30$ $p = .006$	$r = .36$ $p = .001$	$r = .10$ $p = .37$	$r = .24$ $p = .04$
Legitimacy	$r = .63$ $p < .001$	$r = .62$ $p < .001$	$r = .50$ $p < .001$	$M = 4.53$ $SD = 1.50$	$r = .68$ $p < .001$	$r = .29$ $p = .007$	$r = .44$ $p < .001$	$r = .01$ $p = .92$	$r = .22$ $p = .05$
Shared ID responders	$r = .44$ $p < .001$	$r = .46$ $p < .001$	$r = .41$ $p < .001$	$r = .68$ $p < .001$	$M = 3.93$ $SD = 1.48$	$r = .43$ $p < .001$	$r = .30$ $p = .005$	$r = -.13$ $p = .24$	$r = .27$ $p = .01$
Shared ID public	$r = -.04$ $p = .70$	$r = .006$ $p = .96$	$r = .30$ $p = .006$	$r = .29$ $p = .007$	$r = .43$ $p < .001$	$M = 5.20$ $SD = 1.24$	$r = .44$ $p < .001$	$r = -.15$ $p = .18$	$r = .61$ $p < .001$
Compliance	$r = .23$ $p = .03$	$r = .21$ $p = .05$	$r = .36$ $p = .001$	$r = .44$ $p < .001$	$r = .30$ $p = .005$	$r = .44$ $p < .001$	$M = 5.90$ $SD = 1.65$	$r = .01$ $p = .91$	$r = .31$ $p = .004$
Low anxiety	$r = .01$ $p = .93$	$r = .08$ $p = .47$	$r = .10$ $p = .37$	$r = .01$ $p = .92$	$r = -.13$ $p = .24$	$r = -.15$ $p = .18$	$r = .01$ $p = .91$	$M = 4.45$ $SD = 1.77$	$r = -.15$ $p = .18$
Co-operation	$r = -.06$ $p = .60$	$r = -.02$ $p = .83$	$r = .24$ $p = .04$	$r = .22$ $p = .05$	$r = .27$ $p = .01$	$r = .61$ $p < .001$	$r = .31$ $p = .004$	$r = -.15$ $p = .18$	$M = 5.87$ $SD = 1.77$

Scores from the measures used at Time 2 were then entered into a path model, which is presented in Figure 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.

Insert Figure 2 about here.

The path model showed a good overall fit with the data $\chi^2(23df) = 27.10, p = .25$. 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 co-operative 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 $\chi^2(23df) = 45.74, p = .003, CFI = .91, RMSEA = .09$, 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 et al., 1998; Stott, Hutchison, & Drury, 2001). 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 & Reicher, 1998; Stott et al., 2001). 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). 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 strategies, 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.

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