



Role-specific psychological requirements in preparing public transportation staff for disaster response

Gesine Hofinger, Robert Zinke and Stefan Strohschneider
*Department of Intercultural Business Communication,
Friedrich-Schiller-University Jena, Jena, Germany*

Abstract

Purpose – Human behavior significantly determines the scale of impact of hazardous situations. If crisis situations are highly dynamic, they can only be managed successfully if both personnel and organization are well prepared. The purpose of this paper is to capture the specific demands disaster management staff are facing, from a psychological perspective.

Design/methodology/approach – General psychological statements based on action theory and organizational theory serve as the starting point for analyzing aspects of cooperation, especially in inter-professional communication and coordination. The analysis is based on data which were collected in structured expert interviews and observations within the domain of German emergency organizations and public-transportation companies.

Findings – The findings suggest shortcomings on different levels: individual (restricted routines, unprepared for “out of focus” events); organizational (regulations, training) and political (lack of public preparedness for disaster in underground traffic systems; and restrictions on large-scale training).

Research limitations/implications – Interviewees have not experienced “real” major disasters, so their answers are not derived from hands-on experience. Also, generalization to other traffic systems or companies may show different patterns.

Practical implications – Training emergency response staff in public transport systems should include psychological aspects of crisis management in addition to emergency management, e.g. building a shared mental model, and requirements of inter-professional communication.

Originality/value – Psychological demands of crisis situations in public transport have not yet been a focus of research or training.

Keywords Germany, Public transportation, Staff training, Disaster management, Crisis management, Preparedness, Response, Psychological requirements, Decision making, Human factors

Paper type Research paper

1. An observation

Imagine, for a moment, a dark and dusty tunnel. You are in an underground railway system, facing the sight of a derailed train. You hear the muffled cries of passengers in agony. On-site you are responsible for coordinating the rapid reaction teams, trying to rescue the wounded. Vision is impaired by smoke of an unknown source. Due to technical problems with the radio communication you are the interface for communicating with staff on the surface. Down in the tunnel, you collect and coordinate all the information available.

You repeat your call to a team leader for a status report via walkie-talkie – no response. Worried if he and his team might be injured, you decide to look after him yourself. This brings you away from your position and the passengers. Upon arrival, you find the squad leader heavily involved in giving orders to his team, all of them



being in good health. His uncomprehending reaction to your question “why in the world did you not answer my call” is: “I had more important things to do.”

The authors witnessed a situation like this; however, it was only an exercise. There was no real threat, so the rescue staff (who knew it was an exercise) experienced a stress level far below the one expected in a real crisis. Despite all of them being trained rescue staff, several members of the team behaved in a way that would threaten the life and health of passengers and staff in a real disaster. Most importantly, they violated communication rules, which led to a delay in the rescue process.

All of them agree with the safety rules they learned during their training. One important safety rule would be the adherence to communication standards ensuring coordination during operations. Professional staff involved in an exercise who are unable to manage the crisis is something often seen in major exercises (and, of course, in real disasters). We take this to indicate that professional training alone does not prepare staff sufficiently to adequately respond to a crisis. From a system perspective, psychological requirements of the situations have to be taken into account as well.

In this paper we outline some psychological requirements of crisis situations for response staff. We use the example of a major disaster in an underground transportation system, like a major accident or a terrorist attack.

In a first step, we ask for the general demands put on emergency staff using the theoretical perspective of human factors combined with the psychology of complex problem solving and natural decision making. We then describe a research project aiming at the identification of role-specific requirements. The empirical material suggests a differentiation of three roles in public transportation having different prerequisites and facing different challenges. We then discuss our findings and elaborate on the consequences for training of crisis management staff.

2. Psychological demands in disaster management

Crisis management in different types of disasters follows different rules. The command staff in an accident in underground transportation systems has to focus on other operations than teams who normally respond to airplane accidents, floods, or disaster sites discovered after a terrorist attack. Yet, looked at from a psychological perspective these events share some features: They start suddenly and often due to some external event, they are highly dynamical, and are a severe threat to life or the health of many people – emergency responders on-site and adjacent personnel alike.

In recent years, the challenges of such situations have been framed within the context of “human factors” in many high-risk domains. Also in the railway domain, the importance of human factors has been acknowledged in the last few years. Literature on human factors in rail systems (overview in Wilson *et al.*, 2005, 2007; Wilson and Norris, 2006) usually focuses on ergonomic questions (e.g. signaling, control room layout), human error (Baysari *et al.*, 2009), or organizational issues such as safety culture (e.g. Clarke, 1999) and violations of safety rules (Lawton, 1998). Emergencies planning or crisis management in rail systems are hardly addressed from a human factors perspective in scientific literature.

In this paper, we want to complement the classical human factors approach that focuses on human error and ergonomics with theoretical notions taken from research on complex problem solving under time pressure (Dörner, 1996; Frensch and Funke, 1995; Dörner and Schaub, 1994; Strohschneider, 2003) and “naturalistic decision making” (Todd and Gigerenzer, 2001; Zsombok and Klein, 1997; Klein *et al.*, 1993). Most

importantly, in addition to being a complex problem, this kind of event also puts emotional and sometimes ethical burdens on those dealing with it.

2.1 *Psychological characteristics of disaster*

Some situative characteristics of disasters and the psychological consequences are:

- (1) Threat for life and health, the environment, or other important goods: the importance for action is high – while not acting is usually not an option. A high level of importance increases the stress level because of the anticipated consequences of wrong decisions. Stress, has limiting effects on the individual's cognitive capabilities, in consequence fostering suboptimal decisions being made: "Ambiguity of cause, effect, and means of resolution [...] will lead to disillusionment or loss of psychic and shared meaning, as well as to the shattering of commonly held beliefs and values and individual's basic assumptions" (Pearson and Clair, *Reframing Crisis Management*, in Bojn, 2008, p. 10).
- (2) High dynamics leading to time pressure: decisions have to be made quickly and the situation may change while responders are busy thinking. Time pressure easily leads to a lack of action control and adds to the individual stress level (Dörner, 1996).
- (3) Uniqueness of the situation: even with the best emergency plans there will always be features of the situation that have not been planned for. This uniqueness brings a need for problem solving and decision making, but these cognitive activities are slow and easily impaired by stress and anxiety.
- (4) Uncertainty: not all aspects of the situation are known. This may be due to a lack of data or due to lack of time for processing the data available. Also, the reliability of information is often disputable. Decisions have to be taken without an adequate basis of information. However, not knowing enough contradicts the human need for control and thus leads to uncertainty (Dörner, 1996; Langer, 1983; Glasser, 1986).
- (5) Alternation of information overflow and a lack of urgently needed information: while basic features of the situation may still be uncertain, messages, status reports, and other bits of information keep coming in while the individual's ability to take in new information is diminished due to stress. Information must be prioritized and evaluated constantly.

All these features of disasters add to stress due to the threat to the individual's life, health, or feeling of competence (Lazarus, 1999; Dörner, 1996). The typical stress reaction is a "fight or flight" tendency, which means that the organism is prepared for quick and strong action.

This tendency impairs the rather slow processes of conscious thinking and problem solving. Analysis – weighing different options for action, asking critical questions – is nearly impossible while a strong tendency toward *ad hocism* can be observed (Dörner, 1996). This term refers the behavior of individuals striving for immediate action just to do something at all.

2.2 *Generic, non-technical skills needed in disaster management*

If disaster management staff is to meet those challenges, they need skills beyond technical knowledge about fire, floods, injuries, etc. The necessary skills are known as

“non-technical skills” (e.g. Flin *et al.*, 2008). In aviation, their importance has been acknowledged for more than 20 years under the label of crew resource management (e.g. Salas *et al.*, 2006).

Non-technical skills in disaster management are generic competencies in the fields of problem solving, strategic thinking, and communication and team management (Strohschneider, 2008). The term “generic” indicates that these skills can be applied to any structurally similar situation regardless of situational factors. In contrast to domain-specific skills (first-order techniques, Borodzicz, 2004) that can be drilled in exercises and applied nearly without conscious thinking, the non-technical skills (second-order techniques) involve higher cognitive activities and are needed whenever a situation was not foreseen or prepared for. Some of the most important generic competences are:

(1) Problem solving and strategic thinking

- Building strategic and tactical goals: weighing importance and identifying what can be achieved in a given situation; not being driven by urgency or the loudest team member.
- Prioritizing tasks: in a crisis situation there are always more tasks and problems than time or staff. Therefore, setting priorities in a crisis involves the unpleasant challenge of declining requests and ignoring information.
- Maintaining situation awareness (e.g. Endsley, 1995) at all times: knowing the elements of the situation, understanding their meaning and being able to anticipate their development – in short “knowing what’s going on so you can figure out what to do” (Endsley, 1995).
- Flexibility: to adapt emergency plans and procedures to the actual situation (McMaster and Baber, 2009; Borodzicz, 2004).
- Information management: as the ability to take information in quickly, to distribute it correctly if necessary, to keep track of status changes and to decide quickly if and how to react. For a crisis management team, an input of several relevant communications per minute over several hours is normal.
- Insight in one’s own reaction to stress and an ability to cope with emotion and pressure: this is an important skill, especially for team leaders (e.g. Zinke *et al.*, 2009).

(2) Communication and team management

- Shared mental models: that are regularly updated among all involved staff seem to be one of the critical factors for team success in complex situations (e.g. Lim and Klein, 2004; Stout *et al.*, 1999; Cannon-Bowers and Salas, 2001). Sharing mental models – that is, knowledge and interpretations – of the tasks, the environment, available resources, and the team itself is vital for a smooth coordination. This is especially true when continuous communication is not possible and every team member acts alone for some time.
- Clear and explicit communication: when everyone is under stress and communication is impaired (e.g. by noise), a clear and explicit communication style is even more important than in “normal” teamwork. Furthermore, redundant communication, read-back procedures, reporting back, and other aspects are critical for the quality of communication (e.g. Horn and Strohschneider, 2005; Hofinger, 2005).

- Leadership and delegation in collaborative work processes: including the ability to self-reflect workload distribution and dealing with uncertainty (e.g. Buerschaper and Starke, 2008; Paris *et al.*, 2000). Team leaders in disaster management need to be able to delegate tasks and responsibilities to team members in order to secure the availability of own cognitive resources for strategic thinking and leading.
- Assigning and taking responsibility and a “unity of command” (Sloper, 2004): when roles and responsibilities are defined clearly, everyone knows what is expected of them and of others.
- Ensuring cooperation: the commitment of leaders to cooperate is decisive for the management of crisis. In disaster, a joint leadership across organizational borders of all agencies involved is helpful (e.g. McMaster and Baber, 2009; Kapucu, 2008).

Of course, situational demands are different depending on the role and task of the individual. For example, emergency responders need more first-order or technical skills and must be willing to adhere to procedures while crisis management teams need to be able to decide flexibly according to the development of the situation.

What seems essential for any crisis responder is resilience (e.g. Hollnagel *et al.*, 2006; Reich, 2006). Resilience implies the “ability to bounce back and even to grow in the face of threats” (Reich, 2006). Reich describes three core principles of resilience: control, coherence, and connectedness. At the same time, the three C’s summarize the non-technical skills listed above; taken together, all these skills potentially lead to resilience in the face of disaster.

3. Study design

3.1 Background

OrGaMIR, a joint research project funded by the German Federal Ministry for Education and Research, concentrates on the domain of public transportation, where emergencies potentially affect large numbers of passengers and adjacent edifice. The acronym stands for “Cross-organizational hazard prevention to protect human life and critical infrastructures by optimized prevention and reaction.”

The focus is on crisis management in major accidents and acts of terrorism involving toxic substances. The ultimate goal of this project is an integrated system for evaluating the present and expected contamination of underground systems with hazardous substances by means of substance detection and analysis, the calculation of the spread of such substances, and the targeted dissemination of consolidated, context-sensitive information to all organizations involved. Once the spreading behavior is known, targeted commands and information for passengers, rescue personnel, and operators can be provided. All players can take decisions, which might save lives, on a more reliable basis. Another goal is to optimize the cooperation between fire brigades, rescue personnel, and underground railway operators. The development of the system is complemented by the consistent integration of psychological aspects, such as information processing and decision making under stress.

In opposition to, for example, fire fighters, the police, or other public institutions, public transportation is not a domain whose core competence lies in the field of crisis response. Within this context, the authors’ psychological project deals mainly with the

analysis of intra- and inter-organizational cooperation and communication in emergency and crisis situations. Of special importance here is the coordination of the transport agency with professional crisis response organizations. A second focus is the investigation of individual actions in critical situations. In a first step we analyzed the processes and procedures for emergencies and crisis in four German public-transport companies. A second part is the conception of a training setup for civil crisis management staff in public-transport systems. As crisis management is not their daily business, they have specific training needs.

3.2 Method

In Germany, the public-transport system in major cities is partly serviced by private companies, partly by regional public services receiving public funding. The 18 major cities have either underground rail systems or different types of light rail underground systems and thus are relevant for our study. The regulatory responsibilities of rail companies in terms of safety are identically strict regardless of their organizational form. Among other regulations, all companies providing transport for large amounts of people have to have emergency plans including general guidelines for employee behavior and specific procedures for evacuation. All companies have emergency managers, either full-time or in addition to being, for example, part of the control room staff. All of these companies also have to have designated crisis management staff for certain events.

In 2008, we conducted a case study of one German public-transport company (company A) running an underground railway system. For triangulation purposes further field data were gathered through interviews and document analyses in three other companies (B-D) across Germany.

Due to the relevance for security and the small number of underground systems in Germany, anonymity and confidentiality are essential. Therefore, they are named companies A-D and no further details about the agencies or the participants of the study can be given here.

Following standards of qualitative social research, a triangulation of methods (Mayring, 2000; Taylor and Bogdan, 1998) was chosen. A combination of document analysis, expert interviews, and observations allows insights in emergency procedures, plans for crisis management, action requirements, and behavior.

- (1) Document analysis: as a first step, we analyzed all documents of one public-transport company (company A) concerning emergencies and crisis management. The results were compared with the documents from three further companies, consolidating our knowledge about the nominal reporting channels, flow of information, etc. For company A the results were structured as flow-charts for the company's procedures for several types of events (incident, emergency, crisis, and catastrophe). Based on this knowledge, 12 semi-structured expert interviews were conducted within company A and one in each of the other companies. All interviewees worked in different safety-related functions. The interviewees in company A were representatives of the main stakeholders listed in the findings below (former train drivers, operations center staff, emergency managers, crisis management staff). In companies B-D, all interviewees were emergency managers that would become part of the crisis management staff if such an event would occur. Due to their position within and knowledge of the guidelines and procedures, all of them

were qualified to answer for their companies. The questions they were asked in general dealt with the regulations and responsibilities for different scenarios, the courses, and materials the company provided for the different roles/key holders, and the experiences they had made. Each interview lasted one to three hours, was transcribed and later analyzed for a comparison of actual with nominal emergency processes and the demands put on staff.

- (2) Workplace observations and additional short interviews in three control centers allowed for insights into the normal working conditions and into the control center staff's knowledge of critical situations by means of short additional interviews.
- (3) Observations were done in a joint emergency exercise for firemen and subway drivers in company A. The exercise lasted two hours and was recorded in parts. Two observers on site, simultaneously noted down any action of the key holders involved. The analysis of the video recordings showed actual behavior in a (simulated) emergency and was used to verify findings by the observers afterwards.

Focus of the analysis was to describe typical stakeholders with their roles and their role-specific requirements for action. We found typical roles for crises management in all four public-transportation companies. The main findings were gleaned from the document analysis, the interviews, as well as the observations in company A. These are summarized and generalized as prototypical roles in a table. We will report some of the findings here and discuss possible problems due to psychological constraints of crisis.

4. Findings concerning role-specific demands

Apart from the general psychological demands that can be identified for efficient crisis management (see Section 2), the skills needed depend on the type of event and on the role of the individual. Therefore the aim was to identify psychological requirements and specific skills needed for different roles found in emergencies and crisis management.

In our analysis, roles and procedures reported for "normal operations" and minor incidents were contrasted to those in emergencies or crises. As the project focuses on fire and gas accidents or attacks, these were used as scenarios in the interviews.

In everyday internal processes we found a varying number of persons responsible for safe operations (stakeholders) in the different public-transportation agencies. To name but a few: passengers, driver, control center staff, rail manager, controller/scheduler, section managers, or several (external) members of the supervisory board.

In an emergency, crisis, or disaster additional staff, e.g. special action committee staff, becomes involved. Not all of them are trained emergency staff: some persons have to take on new roles, i.e. additional tasks and responsibilities. For example, the train driver in company A temporarily becomes a local emergency manager responsible for evacuating the train; asking for communication and leadership skills not necessary for his/her regular task. Such changes to the routines, on top of the unfamiliar menacing situation, may be a potential source of staff not showing expected behavior.

Based on our field investigation in four public-transportation agencies, a first finding is that certain prototypical roles in emergency and crisis can be identified. In all the companies existed standard processes and expected behavior for emergencies for

all those roles. For means of special limitation, only three of them are further specified here: the underground train driver, the control-center staff, and finally the emergency manager. Table I lists responsibilities, required skills, and the expected behavior based on the various rules and regulations by the transportation agencies. Additionally, the behavior actually observed, potential sources of employee behavioral deviance and the psychological constraints are contrasted.

The drivers are rather isolated in the cabin in regular job routine. In a crisis they are expected to do several things synchronously, above all to lead passengers to a safe exit. For that action, drivers are not trained regularly and thus lack routine. Their emotional state may challenge judgment and decision making. During exercises, some drivers gave insufficient information to the control center or did not contact the special division responsible for non-routine events. Others forgot to inform the control center before leading the passengers away through tunnels from the source of danger.

The emergency manager on site has to take over from the driver, quickly assess the given situation and adapt further action. Once the fire department arrives, emergency managers have to hand over responsibility while still being in charge of the evacuation process. Keeping track with events and maintain situation awareness at all times while communicating with the fire brigades, may be difficult.

5. Discussion

The roles identified here existed in all included companies. Although further roles differed to varying degrees, the tasks described were similar. For example, in the face of a large-scale event, there is always a need to contact organizations like police, fire departments, or local governments. Thus, the topic of inter-organizational communication and cooperation should receive equal attention in training-specific personnel. Equally, special action committee members of any company will have to cope with a great variety of similar topics in addition to their routine tasks.

Our observation showed usually acceptable performance in the technical skills. Nevertheless, Table I focuses on inadequate behavior also observed. We filtered for negative examples here (e.g. Heath and O'Hair, 2008; Bojn, 2008), because we wanted to find out about psychological demands of crisis situations.

Our findings suggest shortcomings on different levels. On an individual level we find individuals unprepared for "out of focus" events. Such an event could be anything that does not occur in the individual daily job routines. More generally, on the lower hierarchical levels only technical and operational skills are practiced, while strategic competences are restricted to leaders. A different perspective is taken by German military: officers are trained to be able to operate on the level of their immediate superior and to understand action taken two levels above their current position. An analogy for the public transportation would imply the training of operational staff, e.g. drivers, to be able to see the bigger picture relevant for the emergency manager of the company.

On the organizational level regulations are often very narrowly defined, scenario based without room for flexible action adapted to the respective situation. If trainings are done at all, they often do not reach all levels of the company; they are not recurring and focus on easily manageable incidents. In company A, lots of emergency exercises are done. But procedures for crisis or catastrophes are not practiced. None of the companies in our study has so far practiced management of a terrorist attack scenario. Some managers fear negative impacts of large-scale exercises as customers might become afraid of using underground trains. Together with a reluctance to

Table I.
Role-specific
requirements, behavior,
and constraints in crisis,
observed in German
railway companies

	Driver	Control center staff	Emergency manager
Responsibilities	Mainly emergency management with respect to material and humans involved	Point of intersection and coordination of communication	Emergency management in the further evacuation
Required skills	Work for some time under extreme conditions he/she is not trained for stress management	Accept and handle responsibility Identify stakeholders and talk to persons from other organizations	Ability to lead in emergency Quickly gain and maintain situational awareness
Expected behavior	Ability to lead in emergency/crisis Assess situation quickly and react accordingly Report to superior coordination instance Take a decision, inform passengers, lead the evacuation into safety Report to/hand over responsibility to emergency manager after arrival	Aggregating and refining information and distributing selected information to predefined staff according to alarm procedures Anticipating the development and scope of the event with regards to the stakeholders to be informed and their priorities Acting according to SOPs without own judgment	Taking over responsibility on site and leading people and action in the evacuation process Ongoing assessment of the situation and reporting changes of state internally to higher levels Identify relevant personnel on site, deliver status information and subordinate as liaison representative of the public transportation agency for the search and rescue process
Behavior observed	Wrong assessment (underestimation the scope of the event) Blind actionism without gaining an overall picture or paying attention to changes Difficulty/unability to prioritize and abiding by the various or conflicting tasks (e.g. due to insufficient training)	Insufficient knowledge of specific organs to be informed (in- and external) Conflicting procedures for various classifications of events cause uncertainty and delay Insufficient or incomplete information is delivered Different control centers with overlapping responsibilities slow down process of fighting a crisis	Blind actionism without gaining an overall picture or paying attention to changes Difficulty/unability to prioritize and abide by the various or conflicting tasks Difficulty in order to communicate with other organizations in a meaningful way (giving the right amount of information, mutual misunderstanding of "vocabulary"/parlance)

(continued)

	Driver	Control center staff	Emergency manager
Potential sources of employee deviance	Physical conditions, (fitness, smoke/gas causing bad sight, and dyspnea) Acceptance as authority and ability to lead Technical limitations (keep passengers locked up inside train until track is circuit/voltage free; give orders) Ability to transfer knowledge quickly from training to practice Limited knowledge of the general site and situation	Technical limitations: fit of technical systems/software to exchange status reports with in-~/external stakeholders Forced to violate constraints in existing SOPs, inappropriate for the situation confronted with Unclear responsibilities result in loss of info or in redundant double or insufficiently filtered information	Acceptance as authority and shift of super and subordination, after handing over responsibility Knowledge about how to identify leaders of external organizations on site, knowledge about their structure and strategies and requirements for information and modes of communication Technical limitations for wireless communication with other organizations Extend of knowledge of the general site and the general strategy Ability to handle uncertainty Following daily routines vs acting according to special procedures Trust in checklists Decision making influenced by personal fear to make mistakes Extend of situational awareness and ability to think in processes
Psychological constraints	Capability to handle stress and impressions of wounded and corps on-site Following daily routines vs acting according to special procedures Trust in checklists Decision making influenced by personal fear to make mistakes Fear of own death vs strive to helping people	Following daily routines vs acting according to special procedures Trust in checklists Decision making influenced by personal fear to make mistakes Impressions of wounded and corps from the surveillance cameras – greater ability to bear the fact of not being able to help or interfere on site	Decision making influenced by personal fear to make mistakes Extend of situational awareness and ability to think in processes

Table I.

discuss topics like terrorist attacks or major disaster in politics and the society, this results in staff not being adequately prepared for underground disaster.

In our analysis we found that the classification of a situation is important for staff as required skills (both non-technical and technical), roles, and responsibilities of one person often depend on the type of situation. In an incident (usually a technical malfunction), staff use routines and well-trained procedures. Emergencies – events with an inherent threat to human lives, but restricted to a location and managed on an operational level – are usually trained for in exercises, and role-specific tasks are known to most of the staff. Crisis and catastrophes, on the other hand, threaten a large number of human lives and are most demanding for staff, while procedures are only vague and flexibility is needed.

Limitations of data

In our explorative study, we had limited access to emergency exercises. As there were no crisis management exercises in the companies during the time of the study, we cannot compare procedures as derived from documents and interviews with behavior in (simulated) crisis. Of course, observation data from real disasters would be very helpful to identify crisis management behavior, but we hope not to witness such an event.

Also, most interviewees have not experienced major disasters, so their answers are not derived from hands-on experience. They had to rely on their procedural knowledge and on extrapolations from emergencies to crisis.

Since the data were gathered mainly in one company their representativeness is limited. Yet, the companies in this sector have to abide by identical rules and regulations. Interviews, document analysis, and the observations in the companies mentioned showed in large parts identical phenomena. As the authors would argue, these facts allow for generalizations made with respect to prototypical roles in the table. Yet, generalization to other traffic systems or other companies may show different demands.

6. Consequences and conclusions

The analysis of role-specific requirements could be used for the setup of training programs in order to prepare staff for the requirements of crisis response. Trainings need to include role-specific technical and non-technical skills, and the training of generic competencies, e.g. building a shared mental model and requirements of inter-professional communication.

While the companies included in our study have focussed on technical skills and standard operating procedures for role-specific training, examples from other domains show a broader approach. Training of generic competencies for crisis management has been in the focus for the last 15 years, especially the training of crew resource management skills in aviation (Salas *et al.*, 2006).

While individual and team skills are decisive for disaster management, we want to point out the role of the organization for the development of those skills: Is the organization prepared for emergencies and crisis? Are there emergency procedures that reduce stress for the individuals by giving them a frame for their actions? Are teams allowed to decide according to their insight on site (local allocation of competence, e.g. Weick and Sutcliffe, 2007)? Does the organization allow flexible restructuring if planned structures are not sufficient (McMaster and Baber, 2009)? Are there periodic trainings for emergency staff?

Besides the individual and the organization also the political or societal level is important: Do organizations get help in preparing for disaster? For example, are there political restrictions to disaster exercises?

Although major crisis exercises in public-transport systems are lacking, the companies in our study show increasing awareness of the need for role-specific exercise and training of disaster beyond emergency training (which is very advanced). An increasing awareness of the importance of non-technical skills for disaster – preparedness would be equally desirable.

Summarizing our findings with respect to emergency responders in the domain of public transportation, the general abilities for problem solving, effective decision making, and taking command were identified as most critical for successful crisis management. As highlighted above, on the individual level these non-technical competencies are influenced by emotional and physical conditions and by basic psychological mechanisms of self-regulation.

Situational requirements meeting psychological and human characteristics are a main source of inadequate behavior in crisis situations. Training programs, therefore, should focus not only on technical skills, but also on generic competencies in order to meet psychological requirements of crisis.

References

- Baysari, M.T., Caponecchia, C., McIntosh, A.S. and Wilson, J.R. (2009), "Classification of errors contributing to rail incidents and accidents: a comparison of two human error identification techniques", *Safety Science*, Vol. 47 No. 7, pp. 948-57.
- Bojn, A. (Ed.) (2008), *Crisis Management. Vol. II*, Sage Publications Ltd, Los Angeles, CA.
- Borodzicz, E.P. (2004), "The missing ingredient is the value of flexibility", *Simulation & Gaming*, Vol. 35 No. 3, pp. 414-26.
- Buerschaper, C. and Starke, S. (Eds) (2008), *Führung und Teamarbeit in kritischen Situationen [Leadership and Team Work in Critical Situations]*, Verlag für Polizeiwissenschaft, Frankfurt am Main.
- Cannon-Bowers, J.A. and Salas, E. (2001), "Reflections on shared cognition", *Journal of Organizational Behavior*, Vol. 22 No. 2, pp. 195-202.
- Clarke, S. (1999), "Perceptions of organizational safety: implications for the development of safety culture", *Journal of Organizational Behavior*, Vol. 20 No. 2, pp. 185-98.
- Dörner, D. (1996), *The Logic of Failure: Recognizing and Avoiding Error in Complex Situations*, Metropolitan Books, New York, NY.
- Dörner, D. and Schaub, H. (1994), "Errors in planning and decision making and the nature of human information processing", *Applied Psychology: An International Review*, Vol. 43 No. 4, pp. 433-53.
- Endsley, M.R. (1995), "Toward a theory of situation awareness in dynamic systems", *Human Factors*, Vol. 37 No. 1, pp. 32-64.
- Flin, R., O'Connor, P. and Crichton, M. (Eds) (2008), *Safety at the Sharp End. A Guide to Non-technical Skills*, Ashgate, Aldershot.
- Frensch, P.A. and Funke, J. (Eds) (1995), *Complex Problem Solving. The European Perspective*, Lawrence Erlbaum Associates, New York, NY.
- Glasser, W. (1986), *Control Theory in the Classroom*, Harper and Row, New York, NY.
- Heath, R.L. and O'Hair, H.D. (Eds) (2008), *Handbook of Risk and Crisis Communication*, Routledge, New York.

- Hofinger, G. (Ed.) (2005), *Kommunikation in kritischen Situationen [Communication in Critical Situations]*, Verlag für Polizeiwissenschaft, Frankfurt am Main.
- Hollnagel, E., Woods, D.D. and Leveson, N. (Eds) (2006), *Resilience Engineering Concepts and Precepts*, Ashgate, Aldershot.
- Horn, G. and Strohschneider, S. (2005), "Kommunikation im Krisenstab. [Communication in the crisis staff]", in Hofinger, G. (Ed.), *Kommunikation in kritischen Situationen. [Communication in critical situations]*, Verlag für Polizeiwissenschaft, Frankfurt am Main, pp. 101-20.
- Kapucu, N. (2008), "Collaborative emergency management: better community organising, better public preparedness and response", *Disasters*, Vol. 32 No. 2, pp. 239-62.
- Klein, G., Orasanu, J., Calderwood, R. and Zsombok, C.E. (1993), *Decision Making in Action: Models and Methods*, Ablex Publishing Co., Norwood, NJ.
- Langer, J.E. (1983), *The Psychology of Control*, Sage Publications, Beverly Hills, CA.
- Lawton, R. (1998), "Not working to rule: understanding procedural violations at work", *Safety Science*, Vol. 28 No. 2, pp. 77-95.
- Lazarus, R.S. (1999), *Stress and Emotion*, Free Association Books, London.
- Lim, B.-C. and Klein, K.J. (2004), "Team mental models and team performance: a field study of the effects of team mental model similarity and accuracy, Pennsylvania/Singapore, University of Pennsylvania/Ministry of Defense Singapore", available at: www.internationalmta.org/Documents/2004/2004062P.pdf (accessed August 12, 2011).
- McMaster, R. and Baber, C. (2009), "Multi-agency operations: cooperation during flooding", in DeWaard, D., Godthep, H., and Brookhuis, K. (Eds), *Human Factors, Security and Safety*, Shaker, Maastricht, pp. 13-27.
- Mayring, P. (2000), *Qualitative Inhaltsanalyse. [Qualitative content analysis]*, 7th ed., Deutscher Studien Verlag, Weinheim.
- Paris, C.R., Salas, E. and Cannon-Bowers, J.A. (2000), "Teamwork in multi-person systems: a review and analysis", *Ergonomics*, Vol. 43 No. 8, pp. 1052-75.
- Reich, J.W. (2006), "Three psychological principles of resilience in natural disasters", *Disaster Prevention and Management*, Vol. 15 No. 5, pp. 793-8.
- Salas, E., Wilson, K.A., Burke, C.S. and Wightman, D.C. (2006), "Does crew resource management training work? An update, an extension, and some critical needs", *Human Factors*, Vol. 48 No. 2, pp. 392-412.
- Sloper, P. (2004), "Facilitators and barriers for co-ordinated multi-agency services", *Child: Care, Health & Development*, Vol. 30 No. 6, pp. 571-80.
- Stout, R.J., Cannon-Bowers, J.A., Salas, E. and Milanovich, D.M. (1999), "Planning, shared mental models, and coordinated performance: an empirical link is established", *Human Factors*, Vol. 41 No. 1, pp. 61-71.
- Strohschneider, S. (Ed.) (2003), *Entscheiden in kritischen Situationen. [Decision-making in critical situations]*, Verlag für Polizeiwissenschaft, Frankfurt am Main.
- Strohschneider, S. (2008), "Human factors training", in Badke-Schaub, P., Hofinger, H. and Lauche, K. (Eds), *Human Factors: Psychologie sicheren Handelns in Hochrisikobranchen [Human Factors: Psychology of Safe Behaviour in High-Risk Domains]*, Springer Verlag, Heidelberg, pp. 289-306.
- Taylor, S.J. and Bogdan, R. (1998), *Introduction to Qualitative Research Methods: A Guidebook and Resource*, 3rd ed., John Wiley & Sons Inc, Hoboken, NJ.
- Todd, P. and Gigerenzer, G. (2001), "Putting naturalistic decision making into the adaptive toolbox", *Journal of Behavioral Decision Making*, Vol. 14 No. 5, pp. 353-84.

- Weick, K. and Sutcliffe, K.M. (2007), *Managing the unexpected. Resilient Performance in an Age of Uncertainty*, 2nd ed., Wiley, San Francisco, CA.
- Wilson, J. and Norris, B. (2006), "Human factors in support of a successful railway: a review", *Cognition, Technology and Work*, Vol. 8 No. 1, pp. 4-14.
- Wilson, J., Norris, B., Mills, A. and Clarke, T. (Eds) (2005), *Rail Human Factors: Supporting The Integrated Railway*, Ashgate, Aldershot.
- Wilson, J., Norris, B., Mills, A. and Clarke, T. (Eds) (2007), *People and Rail Systems: Human Factors at the Heart of the Railway (Human Factors in Road and Rail Transport*, Ashgate, Aldershot.
- Zinke, R., Hofinger, G. and Strohschneider, S. (2009), "Requirements of crisis situations – an action psychology perspective", Human factors: a system view of human, technology and organization, Conference Proceedings of the Annual Meeting of the HFES Europe Chapter, Linköping.
- Zsombok, C.E. and Klein, G. (1997), *Naturalistic Decision Making*, Lawrence Erlbaum Associates, Mahwah, NJ.

Further reading

- Badke-Schaub, P., Hofinger, G. and Lauche, K. (Eds) (2008), *Human Factors: Psychologie sicheren Handelns in Risikobereichen [Human Factors. Psychology of Safety in High-Risk Domains]*, Springer, Heidelberg.
- Dietrich, R. and Jochum, K. (Eds) (2004), *Teaming Up: Components of Safety Under High Risk*, Ashgate, Aldershot.
- Entin, E. and Serfaty, D. (1999), "Adaptive team coordination", *Human Factors*, Vol. 41 No. 2, pp. 312-25.
- Heath, C. and Luff, P. (1992), "Collaboration and control: crisis management and multimedia technology in London underground control rooms", *Computer Supported Cooperative Work*, Vol. 1 Nos 1-2, pp. 69-94.
- Hofinger, G. (2009), "Kritische Faktoren der interorganisationalen Zusammenarbeit [critical factors of inter-organizational co-operation]", in Strohschneider, S. and Heimann, R. (Eds), *Kultur und Handeln*, Verlag für Polizeiwissenschaft, Frankfurt am Main, pp. 189-203.
- Juriado, R. and Gustafsson, N. (2007), "Emergent communities of practice in temporary inter-organisational partnerships", *The Learning Organization*, Vol. 14 No. 1, pp. 50-61.
- Marks, M.A., Sabella, M.J., Burke, C.S. and Zaccaro, S.J. (2002), "The impact of cross-training on team effectiveness", *Journal of Applied Psychology*, Vol. 8 No. 1, p. 3-13.
- Strohschneider, S. (2007), *Entscheiden in kritischen Situationen [Decision making in Critical Situations]*, 2nd ed., Verlag für Polizeiwissenschaft, Frankfurt am Main.

About the authors

Gesine Hofinger is a Human Factors Psychologist, working at the Department of Intercultural Business Communication at Friedrich-Schiller-University Jena, Germany. He is currently involved in the government-sponsored German research project OrGaMIR (www.orgamir.de). Together with public transportation agencies and technical designers, he investigates means for managing potential disasters, e.g. fire and terrorist attacks, in the domain of public transportation. Gesine Hofinger is the corresponding author and can be contacted at: www.iwk-jena.de

Robert Zinke, MA, is a PhD student investigating potentials and pitfalls of interorganizational cooperation and communication, working at the Department of Intercultural Business Communication at Friedrich-Schiller-University Jena, Germany. He is currently involved in the

DPM
20,4

government-sponsored German research project OrGaMIR (www.orgamir.de). Together with public transportation agencies and technical designers, he investigates means for managing potential disasters, e.g. fire and terrorist attacks, in the domain of public transportation.

412

Stefan Strohschneider, PhD, is Professor for Intercultural Communication, working at the Department of Intercultural Business Communication at Friedrich-Schiller-University Jena, Germany. He is currently involved in the government-sponsored German research project OrGaMIR (www.orgamir.de). Together with public transportation agencies and technical designers, he investigates means for managing potential disasters, e.g. fire and terrorist attacks, in the domain of public transportation.

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints

Reproduced with permission of copyright owner. Further reproduction prohibited without permission.