



The Influence Paths of Emotion on the Occupational Safety of Rescuers Involved in Environmental Emergencies- Systematic Review Article

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(Received 26 July 2014; accepted 11 Sep 2014)

Abstract

A detailed study and analysis of previous research has been carried out to illustrate the relationships between a range of environmental emergencies, and their effects on the emotional state of the rescuers involved in responding to them, by employing Pub Med, Science Direct, Web of Science, Google Scholar, CNKI and Scopus for required information with the several keywords “emergency rescue”, “occupational safety”, “natural disaster”, “emotional management”. The effect of the rescuers’ emotion on their occupational safety and immediate and long-term emotional behavior is then considered. From these considerations, we suggested four research propositions related to the emotional effects at both individual and group levels, and to the responsibilities of emergency response agencies in respect of ensuring the psychological and physical occupational safety of rescuers during and after environmental emergencies. An analysis framework is proposed which could be used to study the influence paths of these different aspects of emotional impact on a range of occupational safety issues for rescue workers. The authors believe that the conclusions drawn in this paper can provide a useful theoretical reference for decision-making related to the management and protection of the occupational safety of rescuers responding to natural disasters and environmental emergencies.

Keywords: Environmental emergency, Natural disaster, Occupational safety, Emotion management

Introduction

In recent years, natural or man-made environmental emergencies and disasters have occurred quite frequently, taking the Earth as a whole. They cause tremendous damage, not just to the ecological balance but also to social and economic development. The 2004 Indian Ocean tsunami killed nearly 300,000 people, while millions more victims suffer serious drinking water salinization and pollution issues (1). The Ivory Coast toxic waste pollution incidents in 2006 caused only 15 deaths and 69 people were hospitalized, yet almost 10,000 people were directly or indirectly affected by the toxins for seeking medical treatment after the in-

cident (2). The 2011 incident at Japan's Fukushima nuclear power plant resulted in one third of involved rescue workers are being subjected to high levels of nuclear radiation, facing a higher lifetime risk of cancer, while hundreds of thousands had to be evacuated from the Fukushima area (3). The incident also sparked concerns and anti-nuclear protests in neighboring countries. During and immediately after environmental emergencies, various professional and volunteer rescue workers collaborate to implement emergency rescue procedures. However, environmental emergencies are typically accompanied by high

levels of pollution and significant continuing personal risk and pressure as the rescue workers are subjected to an extremely harsh and dangerous environment and frequently to scenes of horrific carnage. The resulting high levels of stress can affect their effectiveness in implementing the emergency rescue procedures, as the behavior of the rescuers under such conditions may not be entirely rational (4). The rescue workers' emotions, such as fear, irritability, frustration and their level of drive may change, depending on the immediate rescue environment. In particular a worker's emotional state is influenced by his/her subjective perception and experience of the stimuli from the surroundings (5), and this can impact on the occupational safety of the rescuers themselves and the work they are conducting (6-7). However, this impact pathway exists as an implicit "black box" and academic circles have yet to reach a consensus about the mechanisms and influence of emotions on the safety of rescue workers. Therefore, in order to prevent the occurrence of secondary or derived disasters resulting from the methods of application of rescue processes themselves, it is of particular importance to consider the issue of the impact of the emotional condition of rescue workers on their own occupational safety and behavior.

Literature Review

Recently the study of the occupational safety of rescuers has become a hot topic of research at home and abroad for scholars from different fields (8-10). Such researchers have discussed systems for management of the occupational safety of rescue workers and its effects. These include consideration from the perspective of a systematic project management approach to develop new standards of NFPA and OSHA in the fields of fire fighting and medical rescue (11). Researchers have explored the feasibility of greater use of technology, especially in the case of disasters involving serious environmental pollution. Thus, the use of robots for conducting rescues (12), of unmanned aerial search vehicles (13), and of protective equipment rescues (14) have been investigated from the point of view of transferring them from pilot

studies into practical applications. However these studies place more emphasis on providing technical assistance to the rescuers than on directly improving their occupational safety (15). Numerous successful cases of disaster rescue have proved its operability at a practical level (16). Although establishing a sound occupational safety management system combining with advanced technology, can effectively protect the occupational safety of rescue workers from an objective view, but the previous studies showed that disaster-nursing skills training can also effectively enhance the ability and efficiency of rescuing work (17-18). Empirical studies have also shown that, improving the professional knowledge and practical experience of rescue workers is beneficial to eliminate and mitigate the adverse psychological at the scene of disaster rescuing, can effectively avoid the occurrence of secondary and derived disasters, and protect the physical and psychological safety of rescue workers (19-20).

Although the relevant research literature is very complicated and fruitful, there is still no consensus regarding how to improve the safety coefficient of rescue workers in rescuing work and extract its core affecting factors. However, systematically speaking, the relevant theories and practices have consistently pointed out that, by strengthening the professional knowledge and skills training of emergency rescuing, we can effectively protect the occupational safety of rescue workers (21). Extended this analysis method, later explorations by scholars to the question make the answer more distinct. From the perspective of the evolutionary sequence of the emergency rescuing, Rogers B. (22) found that medical rescue training and preparation during pre-disaster can reduce the occurrence of derived incidents and the risk of occupational exposure involving emergency rescue issues through related emergencies survey, a comprehensive rescue system should focus on the training of rescue workers from three stages in disasters: before, during and after, including establishment of disaster medical rescue system, training and exercises of professional team, establishment of plans, and R&D of equipment; the search and rescue, triage, etc; the cleaning and disinfection of the en-

vironment, disease prevention, psychological assistance, institutional reconstruction (23). From the level of subjective (psychological) and objective (physiological) occupational safety, in recent years, scholars from different disciplines analyzed physiological and psychological occupational safety of rescue workers from the views of stress management, post-traumatic stress disorder (Abbreviated as PTSD), psychological diagnosis and rescue, psychological reconstruction (22, 24-25). Studies have shown that 75.5% of the post-disaster relief workers have mild symptoms of psychological trauma, so the psychological trauma of rescuers cannot be ignored (26-27). Regarding the psychological reconstruction problems in Wenchuan earthquake on 12th May, 2008, Wu S (28) proposed a new psychological intervention model with "512 Psychological Intervention Mode (Method)" (Known as "512 PIM"). Based on the compared analysis to debrief on symptoms of PTSD, anxiety and depression of Chinese military rescuers in relation to a control group that had no intervention, the results showed that, 512 PIM mode is an effective way of psychological interventions to alleviate disaster rescue workers PTSD, anxiety and depression symptoms. Overall, numerous studies have shown that, there is of great significance for rescue workers to have not only plentiful experiences in the rescue, but also professional skills of coordination, communication and risk management skills are needed. Especially for the fluctuation of rescue workers in mental and behavior, which are caused by the psychological trauma, promptly and long-term psychological interventions should be taken.

It should be pointed out that, in recent years, many scholars have noted the impact of emotion as a specific variable on occupational safety of rescue workers (29-31), taking 410 firefighters as the research object in Kaohsiung, Taiwan, used the 36-item Short-Form Health Survey (SF-36) and the Disaster-Related Psychological Screening Test (Abbreviated as DRPST) to investigate the relationship among firefighters' quality of life, PTSD and occupational depression from the view of disaster psychology. The results indicated that firefighters were particularly vulnerable to PTSD, and

basic, professional emotional adjustment and mental intervention should be taken to the firefighters who are subjected to be poisoned by toxic chemicals and emotional trauma, so that their quality of life can be improved. Through emotion management, the negative effects caused by implicit memory can be eliminated. Other scholars conducted the researches by taking 267 rescue workers who participated in 2005 in northern Pakistan earthquake reconstruction as a sample, after discriminating the difference between the two stages of emergency rescue and disaster recovery/reconstruction, the authors assessed their emotional problems within 24 months after the disaster. The results documented that the problems with depression, anxiety and other emotional disorders existed not only in the stage of pre-disaster preparation and emergency rescuing, but also a high percentage of emotional disorder incubated at the stage of post-disaster recovery and reconstruction (32).

Through the literature review, we can obviously see that although many works and discussions have been conducted both in China and elsewhere regarding the occupational safety management system and its impact factors considering the rescue workers by scholars all over the world, especially analyzing the influence mechanism of emotion as an independent variable on occupational safety of the rescue workers has become a hot topic in recent years for academia and industry. However, the correlation among emotion, occupational safety of the rescue workers and their component factors were just analyzed in most current studies, and failed to fully consider the difference in the influence of different constituent dimensionalities of emotions on different kinds of occupational safety, meanwhile rarely studies were involved in-depth consideration of the specific influence path that emotions had on occupational safety of rescue workers.

Construction of Influence Path Model

The basic questions proposed in the paper are as follows: what kind of influence emotion has on rescue workers' occupational safety? What are the influence paths? Based on previous literatures, we

discuss these questions in the followings taking the environmental emergency disaster as an example.

Environmental Emergency Disaster

An environmental emergency is a sudden-onset disaster or accident resulting from natural, technological or human-induced factors, or a combination of these, which will cause or threaten to cause severe environmental damage as well as harm to human health and/or livelihoods with the characteristics of occurrence unexpectedly, spread rapidly, serious damage and unknown contamination (33), including nuclear pollution accidents, toxic pesticides and toxic chemical spills, contamination accidents, such as the Ivorian toxic waste pollution disaster in 2006, the Japan nuclear disaster in 2011. Special rescuing environment will easily lead to generating tension, fear, helplessness, anxiety, depression and other negative or positive emotions from rescuers (34-35). Therefore, we put forward Proposition 1:

The consequences of environmental emergencies with urgency, high uncertainty and severity will affect emotion perception of rescue workers.

Factor of Rescuers

Rescue workers are usually treated as personnel who are engaged in rescuing others and guiding the masses to carry out self-help and mutual aid activities to reduce losses of life and property in the event of environmental pollution disaster and in the case of survival environment is threatened. Many countries have set up the occupational system, the same as rescue workers, such as Special Rescue Staff (Team) in Japan, Professional Rescue Workers in Australia and New Zealand, Public Security Staff (also known as Security Officer) in Hong Kong (36). But in environmental emergencies, not only professional rescue workers with professional education and vocational training, but also non-professional (volunteer) rescuers lacking of specialized knowledge are all involved in them. Moreover, recent studies demonstrated that both professional and non-professional rescue workers suffered emotional problems during emergency rescuing work (37). However, there are also studies through tracking survey analysis pointing out

that, whether or not gaining the specialized skills and experiences in urgent rescues will make professional rescue workers and non-professional rescuers show significant differences on self-regulation of emotional and psychological state, no matter which stage (i.e., the pre-disaster preparedness and training phase, the response and rescue phase in disaster, or post-disaster recovery and reconstruction phase) they are facing (38-39). In addition, owing to behavioral motivations of different personalities and the basic psychological needs of rescuers have unique individual responses to the situations they are in, and the degree of response preferences determines rescuer's sensitivity to certain aspects of the disasters, so these sensitive attentions consist of the sensitive sources which generate the rescuer's emotions, namely "emotional triggers" (40). For example, from the perspective of positive psychology, Michelle N. Shiota's exploration study regarding the difference between positive emotion dispositions and the Big Five personality along with their attachment style has enlightened later studies very significantly (41). Accordingly, we propose Proposition 2:

Individual factors of rescuers with personnel professional knowledge, occupational training, experience and personality traits, will affect the emotional perception of rescue workers.

Emotion

Emotion, including the complicated component with emotional experience, emotional behavior, emotional arousal, the cognition response to stimuli etc., is the attitude on the external events or objects accompanying the cognitive and conscious processes, and the response to the relationship between objective reality and subjective need (42). Researches on emotion from different disciplinary fields have increased significantly over the past three decades, such as the connotation of emotion (43), the compositional dimension and measurement (44), the function (45), the generation mechanism (46), etc. Although research topics and direction differ from each other, according to emotional component theory of Scherer, five crucial elements of emotion can be concluded as follows:

cognitive appraisal, bodily symptoms, feelings, expression and action tendencies (42). On this basis, according to the ABC theory of emotion and cognition & behavior theory, this paper divides these five basic elements of emotion into emotion perception and emotional labor, which refers to the process by which employees are expected to manage their feelings, and display required emotions in accordance with organizationally defined rules and guidelines (47). Empirical studies found that different types of emotion perception (including positive emotion perception and negative emotion perception) would influence emotional labor¹ (involving Surface Behavioral Acting which refers to individual only change their external performance like voice and expression when feeling the perceived emotion is inconsistent with organizational expression rules, while their internal feelings keep unchanged, and Deep Behavioral Acting which is defined as one consciously modifies their corresponding feelings in order to express the desired emotion) (50). Considering environmental emergency rescue is a group behavior, so each rescue worker will inevitably take part in the group rescue work. According to the Intergroup Emotion Theory, through emotional contagion, individual emotion from rescue workers, in compliance with the conditions of regulatory mechanisms within the group, will result in a cluster emotional convergence, and further play the role of regulating intergroup attitudes and intergroup behaviors (51). Accordingly, we propose Proposition 3:

Emotional perception of rescuers will affect their emotional labor, and this process is regulated by intergroup emotions and expression rules.

Occupational Safety

The concept “occupational safety”, derived from the terminology “industrial safety”, also commonly refers to as “occupational health and safe-

ty” focusing on personal health and safety in the workplace whilst undertaking prescribed, is defined by the World Health Organization (52²) as all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards, especially concentrates in the fields of policy and practice, individual characteristics and social relationships, management control and employment relationships etc. (53). More and more research interests from scholars are being transferred into the exploration on the psychological (Subjective) occupational safety of workers compared with the traditional researches whose emphases are the physiological (Objective) occupational safety (35), including the assessment of psychological stress status of rescuers at the post-disaster phase (54), expression of negative emotions (30), intervention of psychological crisis (55). Moreover, as mentioned previously, positive emotions and negative emotions will directly or indirectly have a positive or negative forecast effect on mental health through active adaptation to the post-disaster environment and active psychological adjustment. Accordingly, we propose Proposition 4:

Emotional labor of rescuers will have an impact on both of their physiological and psychological occupational safety.

Combining the above 4 propositions, the paper build an analysis framework regarding the influence paths of emotion on occupational safety of rescuers as shown in Fig.1.

Conclusion

Based on two hypotheses that, any emergency rescue mechanism is not fully effective and rescuers are not fully rational, emotion as an independent variable is introduced in the paper to analyze the impact factor of the occupational safety of rescuers.

¹ Note: As Dieter Zapf pointed out in his papers (48-49), Emotion Labor is essentially emotional regulation behavior by individual as per to management goals of emotional behavior formulated by relevant organizations. Considering the difference of individual's effort, emotion labor can also be divided into Surface Behavioral Acting and Deep Behavioral Acting.

² Note: Actually, this term was firstly defined officially by the Joint ILO/WHO Committee on Occupational Health in 1950 and revised in 1995.

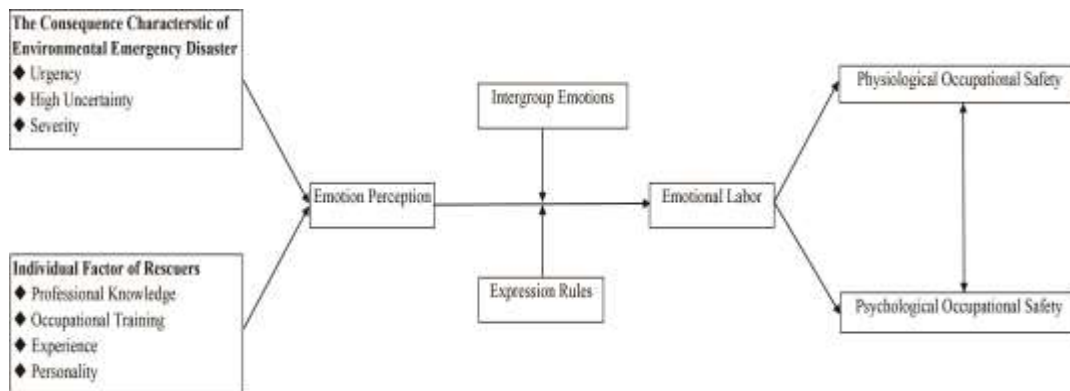


Fig. 1: Analysis framework of influence paths of emotion on occupational safety of rescuers

From the perspective of individual and organizational emotion management, the antecedents of emotion are mainly analyzed, accordingly, the specific influence path of the environmental disaster characteristics and the individual factors of rescuers to their psychological and physical occupational safety are outlined with four propositions. Lastly, related propositions are proposed.

Limitation and future directions

This review work did not follow any quantitative analysis methodologies, so it has its own limitations. However, at present, there is an increasing trend of researching the occupational safety of rescuers involving emergency disasters, the research perspective and methods are in gradual advancement and development, and a certain research achievements have initially been obtained, which can provide good analysis methods and theoretical reference for us to further study the environmental emergency disasters and formulate the intervention strategy for the occupational safety of rescuers. Further research can be conducted deeply from the psychology experiment, empirical study, case study and computer simulation (including Neural Networks) to verify the proposed framework (model).

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission,

redundancy, etc.) have been completely observed by the authors.

Acknowledgement

This work was supported by National Natural Science Foundation of China (No. 71171162). The authors declare that there is no conflict of interests.

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