Chapter 15

The Science of Human Behavior

Field of expertise: Cognitive Neuroscience

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Summary

The 2011 Great East Japan Earthquake and Tsunami disaster has prompted a change in consciousness from conventional disaster prevention education, which focuses on preparing for anticipated situations and disseminating knowledge, to the development of human resources with multifaceted capabilities necessary to cope with a variety of unexpected situations. We have identified eight factors of the "power to live with disaster" from the experiences of disaster survivors, and are pioneering a new science of human behavior, from basic research to elucidate the nature of this power to field applications in disaster prevention education.

Keywords: unexpected, recovery, resilience, personality, disaster prevention, psychology, brain science

Introduction

The damage caused by disasters is greatly affected by the behaviors of the people involved. Even if the hazards of natural disasters such as earthquakes and tsunamis are the same, the extent and nature of the damage will vary greatly depending on how individuals and society prepared in advance and how they acted in response to the hazard. The 2011 Great East Japan Earthquake and Tsunami disaster has shed light on the importance of the science of human behavior toward hazards in disaster prevention education.

1: Problems Revealed by the Great East Japan Earthquake

What happened?

The Great East Japan Earthquake was unexpected in both scale and nature of the damage. It changed the way we think about disaster prevention in Japan and around the world. The "quality of disasters" has expanded from single disasters to complex disasters that are unpredictable, and the "phase of disasters" has expanded from disaster onset and emergency response to include recovery (Figure 15-1).

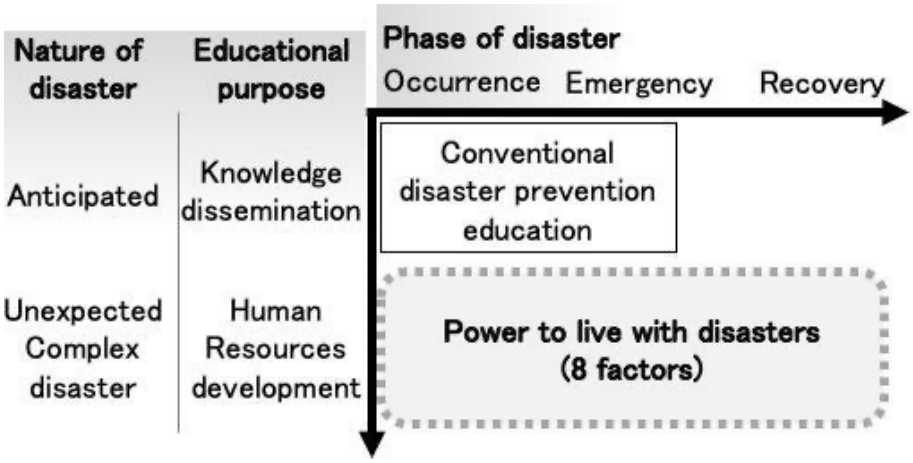

Figure 15-1. The expanded perspective on disaster prevention. The eight factors of power to live with disasters, which are expected to be multifaceted strengths necessary for coping with unpredictable complex disasters and for better community recovery.

The reality of the damage

An earthquake of an unexpectedly large scale, originating from an unexpectedly large epicentral region on the Pacific side of eastern Japan, generated a tsunami of an unexpected height. The tsunami reached areas outside the expected inundation range of the hazard map and killed many residents. The damage caused by the earthquake and tsunami spread over a wide area of eastern Japan, and the emergency response scenario that had been envisioned did not work. In addition, an unexpected nuclear power plant accident complicated the situation, and the impact spread throughout the country and the world. Reconstruction is still in progress in many areas.

2: Paradigms Destroyed by the Earthquake

Conventional wisdom and necessary responses

This change in the way we think about disaster prevention has required disaster education to adopt a completely new perspective (Figure 15-1). In the past, disaster prevention education aimed to prepare people for possible disasters and to disseminate knowledge about emergency preparedness and response. However, the Great East Japan Earthquake taught us that this approach alone is not enough to confront unexpected disasters. Unexpected events are inevitable. We must start from the premise that we will suffer the damage and think about how to recover from it. The tide of the society has changed drastically, and what has been emphasized is the importance of proactive self-determination

3: A New Approach

Disaster prevention education today needs to consider the development of human resources with the capacity to take initiative in responding to the diverse situations and contexts of disasters (Figure 15-1). For this multifaceted power to live with disasters, we decided to learn from the experiences of the victims of the Great East Japan Earthquake. We conducted a social survey on the power that disaster victims demonstrated in avoiding various crises and overcoming difficulties in various contexts of the Great East Japan Earthquake. We interviewed people about

these experiences during the period from the onset of the disaster to the recovery period about two years later, and extracted the personality traits, ways of thinking, and daily habits (psychological and behavioral characteristics) that worked in their favor. Eight factors were identified through a large-scale questionnaire survey (n=1412) (Sugiura et al., 2015). Each factor was given a name based on the text of the question items it contained and analyzed for its relationship to tsunami evacuation, various problems experienced immediately after the disaster, and the state of recovery (housing reconstruction and physical and mental health) (Table 15-1).

Table 15-1. The eight factors of the power to live with disasters

	Factor	Exemplar items	Behavioral expression
F1	**Leadership**	To resolve problems, I gather together everyone involved to discuss the matter; In everyday life, I often take the initiative to gather people together.	Proactive tsunami evacuation; Housing reconstruction
F2	**Problem solving**	When I am fretting about what I should do, I compare several alternative actions; Before taking action, I think of a plan and the order of priority	Helping others during evacuation; Solving problems by oneself
F3	**Altruism**	I like it when other people rely on me and are grateful to me; When I see someone having trouble, I have to help them.	Helping others during evacuation; Solving problems by mutual aid
F4	**Stubbornness**	I am stubborn and always get my own way; I unhesitatingly say whatever it is I want to say.	Self-arrangement or self-reconstruction of housing; Physical health
F5	**Etiquette**	On a daily basis, I take the initiative in greeting family members and people living in the neighborhood; In everyday life, I take care of myself as much as possible.	Helping others during evacuation
F6	**Emotion regulation**	During difficult times, I endeavor not to brood; During difficult times, I endeavor to think positively, telling myself that this experience will benefit me in the future.	Physical and mental health
F7	**Self-transcendence**	I am aware that I am alive, and have a sense of responsibility in living; I am aware of the path and teachings I should follow as a person	Helping others during evacuation
F8	**Active well-being**	In everyday life, I have habitual practices that are essential for relieving stress or giving me a change of pace; In everyday life, I have habitual practices that are essential for maintaining my physical health	Proactive tsunami evacuation; Physical and mental health

4: Achievements and the Future

A new approach to disaster science

Using this questionnaire, the scores of the eight factors of the power to live with disasters can be measured for each individual, which makes it possible to conduct various empirical studies. For example, this questionnaire has been used by various schools (junior high schools, high schools, universities), local governments, and NPOs to evaluate the effectiveness of disaster education programs such as classes and drills (see Sato et al., 2017 for an example). Not only are the effects fed back in the form of numerical values, but also the design of the program itself changes as the purpose of the program becomes more specific. There is also an ongoing attempt to make the eight factors themselves an educational theme. Students answer questionnaires in class, and their scores are visualized on the spot (Figure 15-2). By sharing their scores, comparing them, and expressing relevant opinions, students can virtually experience what kind of skills are required in times of disaster. In addition to the original 34-item version for adults in Japanese, we have also developed an easier-to-use shortened 16-item version in order to further promote the use of such questionnaires. A pediatric version and an English version are also under development.

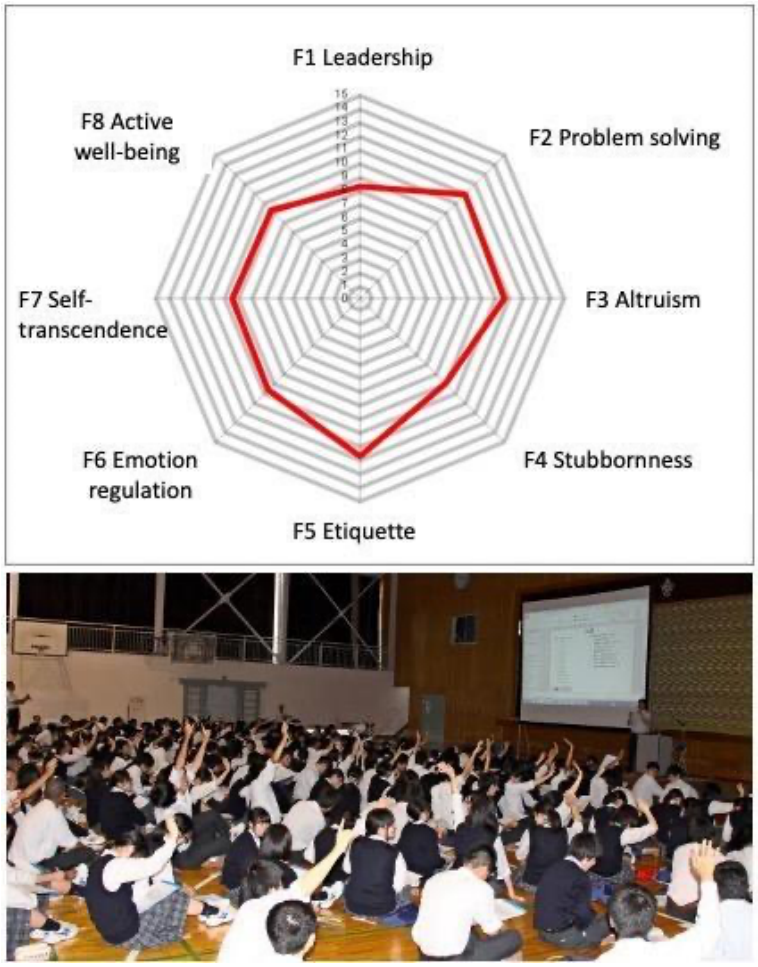

Figure 15-2. An example of the use of the "power to live with disaster" questionnaire. Students are asked to answer the questionnaire during a disaster prevention class, and their scores are visualized in an easy-to-understand manner.

In addition, the empirical research using this questionnaire is also intended to develop new concepts and techniques for disaster prevention education. In order to develop the power to live with disasters, it is necessary to think in totally different ways from conventional disaster prevention education. How does the power to live come about? Understanding the nature of the powers and their origin is expected to provide hints for new education. For this purpose, we are conducting various basic psychological and cognitive science research on the eight factors of the power to live. For example, we are attempting to clarify the relationship between the eight factors of the power to live and the knowledge of human psychological and behavioral characteristics that has been accumulated in various psychology-related academic fields (e.g., personality psychology, social psychology, organizational and managerial psychology, economics, ergonomics). If we can figure this out, we can utilize the existing wisdom in developing educational technologies for the power to live. In this kind of research, by examining the correlation between the scores of a certain factor measured by the power to live with disaster questionnaire and the scores of another questionnaire measuring personal characteristics, the relationship between the two can be inferred. We are also conducting neuroscientific research on the eight factors of the power to live with disasters, i.e., clarifying the mechanisms at the level of information processing in the brain (e.g., Miura et al., 2020; Figure 15-3). If each factor can be reduced to individual differences in how the brain processes information relating to perception, evaluation, judgment, and action in a certain

context, it is expected that ideas for the development of entirely new educational technologies will emerge from the concept of cognitive processing. In a study like this, the power to live factor scores of each experimental participant, measured by questionnaires, will be the key to exploring the brain region that explains this factor.

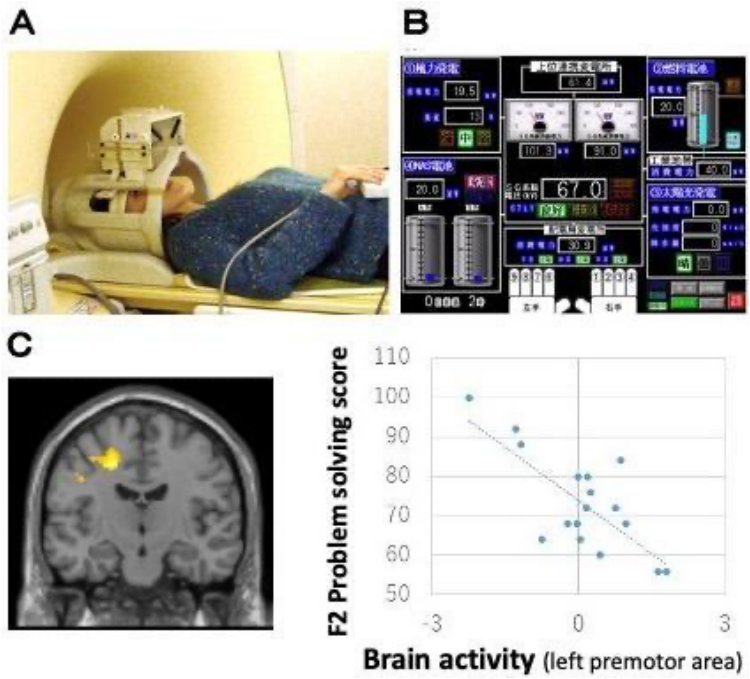

Figure 15-3. Example of brain science research on the power to live with disasters. Using magnetic resonance imaging (MRI) (A), brain activity was measured during a task of coping with an unexpected situation (B), and brain activity in the left premotor cortex was negatively correlated with F2 problem-solving scores in (C) (Miura et al., 2020).

Conclusion - from the author

Our approach to the new science of human behavior regarding the power to live with disasters is not confined to disaster prevention education or disaster science. Eight factors were given the name "the power to live" because we are keenly aware of the core concept of education in Japan, "zest for living" (the multifaceted qualities and abilities needed to live in the "rapidly changing society of the future"; Central Council for Education, 1996). The word "disaster" does not appear in any of the questions in our questionnaire (Table 15-1). Disasters are not an exceptional event. The power to live with disasters is not a special capacity that is not required in everyday life.

References

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