Examination of the factors and psychological structure that lead individuals to undertake disaster risk reduction behaviors in Japan: A literature review

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Abstract
Aim: The purpose of this paper was to examine, based on the literature, the factors and psychological structures that lead individuals to undertake active disaster risk reduction (DRR) behavior and propose a conceptual framework for DRR behavior.

Methods: In the literature review, first the concepts affecting DRR behavior were reviewed in the nursing field in Japan and the definition and content of “Wagakoto-awareness” was examined. Next, theories were reviewed to explore the structure leading to DRR behavior. Finally, a conceptual framework for DRR behavior was developed using information gained from the literature review.

Results: Based on a literature review, a conceptual framework was developed to show what phases lead to individuals undertaking DRR behavior. This framework consists of the following four phases, provided in the order that they happen: (1) acquisition of DRR knowledge; (2) recognition of the importance of DRR behavior; (3) internalization of awareness; and (4) decision to take DRR action.

Conclusion: Although a DRR behavior conceptual framework was developed, it is necessary to verify that the four phases of this framework actually influence DRR behavior. This exploration will be presented in a future paper.

Key words: awareness, behaviors, disaster risk reduction, Japan

INTRODUCTION

In Japan, the limitation of the disaster prevention concept of Bosai for getting rid of the damage caused by disasters was recognized. It has been shifted to a new concept of disaster risk reduction (DRR) called Gensai for reducing disaster risks after many natural disasters such as the Great Hanshin Awaji earthquake (1995) and the Great East Japan earthquake (2011) in Japan (The Reconstruction Design Council in response to the Great East Japan Earthquake, 2011).

The Sendai Framework for Disaster Risk Reduction (United Nations International Strategy for Disaster Reduction, 2015), adopted at the Third United Nations World Conference on Disaster Risk Reduction, states that all people need to be involved in DRR. Besides, the importance of proactive disaster countermeasures taken by not only public organizations, but also by the citizens in their daily life, was mentioned.

People are aware of disaster prevention and mitigation, but they have yet to taken action (Japanese Cabinet Office, 2016; Nanki Trough Earthquake Countermeasures Division, Kochi Prefecture, 2016). For example, Kochi Prefecture has been predicted to suffer severe damage that will be caused by the Nankai Trough earthquake in the near future; although 97% of people are aware of the Nankai Trough earthquake, 81% expected their houses to be damaged by the earthquake, and 78% expected their furniture to fall. In contrast, 52% of people stored food...
for more than 1 day and 20% secured their furniture and home appliances. The reasons for not storing food include “not feeling necessary,” “takes time and effort,” and “costly,” and the reasons for not securing furniture and home appliances include “takes time and effort,” “costly,” and “I don’t know how to fix.” Hence, it has become clear that awareness of disaster prevention and DRR is not directly linked to people’s actions and why they do not prepare for disasters.

Najafi, Ardalan, Akbarisari, Noorbala and Jabbari (2015) summarized the influencing factors on disaster preparedness behavior as follows: risk perception; preparedness perception; critical awareness; optimistic and normalization biases; self-efficacy; collective efficacy; fatalism; locus of control; anxiety; social norms; sense of community; community participation and empowerment; social trust; perceived responsibility; responsibility towards others; coping style; available resources; and demographics.

Moreover, theories that lead to behavioral change in disaster prevention are often based on the Protection Motivation Theory (Rogers, 1983) and Theory Planned Behavior (Ajzen, 1991).

However, no studies have clarified the proactive individual factors and psychological structure that lead to DRR behavior. The author believes that elucidating the proactive individual factors and structure that lead to DRR behavior is important for enhancing active DRR behavior.

In addition, the International Council of Nursing (ICN) stated that nurses need to be actively involved in DRR during normal times (International Council of Nursing (ICN), 2009), and the nursing field in Japan has begun to involve in DRR activities during normal times (Nishigawa et al., 2018). Thus, this theme is important in the nursing field where people can be approached directly about DRR activities. The elucidation might result in a concrete approach in the future. Therefore, this paper examined the factors and structures that lead people to undertake DRR behavior, via literature review, and proposed a conceptual framework for DRR behavior.

**METHODS**

First, the author examined the factors related to disaster prevention behavior that have been identified in the nursing field in Japan. In recent years, research on awareness and behaviors related to DRR has been conducted in the field of nursing in Japan, therefore a literature review was undertaken. The author searched for articles using the keywords “disaster risk reduction” and “behavior” in PubMed and found 1,235 articles (search date was January 10, 2022); however, there were no Japanese papers on factors that influence individual preparedness for natural disasters. Therefore, the author next searched using the keywords “disaster prevention” and “behavior” in the Ichushi-Web (Japanese Medical Database) and found 154 articles (search date was June 11, 2016, excluding meeting minutes). The title, abstract and text were read and those that did not specifically describe the individual’s preparedness for disasters in normal times and the factors that influence this were excluded. As a result, four papers were found. From these four papers, a literature review was conducted to extract the factors that influence DRR behavior and related factors.

Next, the author searched for a definition of “Wagakoto-awareness” in the Ichushi-Web, J-stage (Japanese database), and books, as this has recently been positioned as an important concept leading to DRR behavior in Japanese society. As a result, seven articles and one book were found, of which four articles and one book described the definition and content of “Wagakoto-awareness”. The author examined the content of these articles and books.

After analyzing the factors and the concept that lead to DRR behavior, as described above, the author searched for theories in the fields of health care, disaster prevention, and social psychology in Japan, in order to examine the structure of factors that lead to DRR behavior. Based on these steps, a conceptual framework was developed for the factors and structures that lead to DRR behavior.

**Operational definition of terms**

For this paper, DRR behavior was defined as an individual’s daily efforts to mitigate the damage caused by disasters.

**RESULTS**

**Literature review**

*Factors related to DRR behaviors in nursing in Japan*

The four references reviewed were all original papers and tested for DRR behavior and its influencing factors. The following is a summary of the factors affecting DRR behavior identified in the literature review.

Fujimura, Ishii, Sakaguchi, Murakawa and Akihara (2013) found that the following factors affect DRR behavior: gender, knowledge (“knowing about past disasters in the community you live,” “knowing the
disaster prevention measures. They also found the following factors related to DRR behavior: recognition of disaster risks; prediction of occurrence of huge disasters in the community you live in; prediction of physical damage affecting you because of the disaster; anxiety and safety about disasters; interests in disaster prevention; willingness to participate in the disaster drills; and the idea that residents are the center of disaster prevention measures.

Haraoka et al. (2009) found that the following factors were significantly associated with disaster preparedness: “having checked a hazard map”, “knowing residents’ association which has made a hazard map,” and “understand self-help, mutual help, and government help.” They also found that abundant knowledge rather than crisis awareness leads to disaster preparedness.

Kobayashi et al. (2015) identified the following relevant factors of interest in disaster preparedness: “male”, “health awareness”, “knowledge related to disasters”, “disaster experience of family or friend”, and “hope to participate in volunteer activities”. They described the relevance of knowledge and interest in disaster preparedness.

In summary, it has been reported that the following factors are related to DRR behavior: gender; disaster experience; knowledge of disaster and disaster preparedness; risk perception; anxiety; interest; and awareness that disasters have something to do with you. This paper considers these factors in examining the structure and the components leading to DRR behaviors.

Concepts that influence DRR behavior

The above details of the literature review summarized the factors that are related to DRR behaviors mentioned within the field of nursing in Japan. These factors included interest in disasters and awareness in which disasters are related to oneself. In Japan, there is a concept called “Wagakoto-awareness” that is said to be important for disaster reduction. A review of “Wagakoto-awareness” is summarized below.

In recent years in Japan, the importance of considering a disaster as your own problem to enhance disaster preparation or DRR behavior among residents has been mentioned. The Japanese Cabinet Office (2008) stated that it is important to have a sense of urgency that a natural disaster is not at all someone else’s problem, but a possible problem for yourself, namely, “Wagakoto-awareness”, so that people will take actions for DRR.

As a result of the literature review on “Wagakoto-awareness” in this paper, four articles and one book were extracted that described “Wagakoto-awareness”. These were all about Kimura’s definition. Kimura (2015) defined “Wagakoto-awareness” as “to be aware of a matter as if it were their own thing, even if it does not relate directly to them” and “think of it as an event that is familiar to you and that you can relate to”. Kimura also explains that there are three influences on “Wagakoto-awareness”: reality, community, and humanity.

The concept of “Wagakoto-awareness” was also included in the factors related to DRR behavior in the nursing field, as reviewed in the literature above. For example, the study on the relationship between knowledge, awareness, and behavior against disasters among residents (Fujimura et al., 2013) reported that the important factor affecting DRR behavior is thinking that a disaster will happen to you. The study on DRR awareness and influencing factors among nursing students (Matsukiyo et al., 2009) reported that the important factor affecting DRR behavior is thinking that the key people carrying out DRR measures are the residents themselves.

According to these examples, considering a disaster as your problem might be important step to taking DRR actions. However, because there are very few references to and descriptions of “Wagakoto-awareness” in the literature, the concept has not been analyzed fully and its structure remains unclear. In the introduction, the author mentioned that it is clear that people find it difficult to show DRR behavior; however, the author conjectured that acquiring “Wagakoto-awareness” can lead to one taking active DRR actions. Thus, this paper develops a framework that includes the concept of “Wagakoto-awareness”.

Factors and structure leading to DRR behavior

So far, this paper reviewed the literature on the factors and the concept related to DRR behavior. The following section describes the review of its structure.

Health behavior theory and theories related to DRR
behavior were searched for in the literature to examine the components and the structure leading to DRR behavior among residents. For example, Protective Motive Theory, which states that ‘‘fear appraisal’’ and ‘‘coping appraisal’’ generate ‘‘protective motives’’ and lead to ‘‘action’’ (Rogers, 1983) and Theory of Planned Behavior, which states that ‘‘attitude toward the behavior’’, ‘‘subjective norm’’ and ‘‘perceived behavioral control’’ lead to ‘‘behavioral intentions’’, and then to ‘‘behavior’’ (Ajzen, 1991) are often used in the field of disaster prevention.

In addition, in the health field, a typical health behavior theory is the health belief model, which shows that six main constructs ‘‘perceived susceptibility’’, ‘‘perceived severity’’, ‘‘perceived benefits’’, ‘‘perceived barriers’’, ‘‘cure to action’’, and ‘‘self-efficacy’’ influence behavior. However, none of the theories included the factors and the concept that this paper reviewed. Therefore, the author searched for other fields and focused on environmental issues in which awareness and behavior toward risks among residents are as important as disasters.

Koike et al. (2003) developed a model of behavioralization for environmental problems from a social psychological perspective in the research on psychological processes and behaviors for environmental problems. He proposed a model of a series of psychological processes starting from ‘‘knowledge’’, ‘‘interest’’, ‘‘motivation’’, and ‘‘behavioral intention’’ to ‘‘knowledge’’ and ‘‘behavior’’ on environmental problems. Koike et al. (2003) also adapted the following influencing factors: perception of environmental risks; perception of responsibility attributions; perception of coping effectiveness; cost-benefit evaluation, evaluation of feasibility, and evaluation of social norms to environmental problems, by referring to the environmental-friendly behaviors (Hirose, 1994).

Hirose (1994) defined ‘‘perception of environmental risks’’ as: to perceive the severity of environmental pollution and the probability of occurrence; ‘‘perception of responsibility attribution’’ is to perceive the cause of environmental pollution and environmental destruction; ‘‘perception of coping effectiveness’’ is to perceive the possibility of a solution by coping. Hirose (1994) also defined that ‘‘cost-benefit evaluation’’ is to assess the cost-effectiveness of the action; ‘‘evaluation of feasibility’’ is to assess whether the action is feasible; and ‘‘evaluation of social norm’’ is to assess whether the action is following social norms and public expectation.

This paper aimed to examine the components and the structure from the recognition of disasters to take DRR action. The literature review revealed that there are similarities in the processes from the recognition of environmental problems to the action with disasters. Therefore, it was found that the psychological process leading to the action on environmental issues found by Koike et al. (2003) and the environmental-friendly factors proposed by Hirose (1994) could be adapted to the framework that leads to DRR behavior. Based on the literature review, to this point, a conceptual framework for DRR behavior was developed by using this theory as a foundation and applying the factors and concepts that have been identified as leading to DRR behavior.

Development of a DRR behavior conceptual framework

Based on the literature review so far, a hypothesis for a conceptual framework leading to DRR behavior was developed. The conceptual framework (Figure 1) was developed based on environmentally friendly behavior serving as the psychological structure of people’s DRR behavior, along with the factors related to disaster mitigation that have been identified in previous studies.

In this paper, DRR awareness is defined as the psychological factors that led people to consider disasters as their own problems and led them to take active DRR behavior. The components consisted of four parts: (1) acquisition of DRR knowledge; (2) recognition of the importance of DRR behavior; (3) internalization of awareness; and (4) decision to take DRR action. The relationship between these components was hypothetically indicated based on psychological processes for environmental issues. The thick line in Figure 1 is the main hypothesis, and the thin line is the supplementary hypothesis. Each component is described below.

Acquisition of DRR knowledge

The association between knowledge and DRR behavior has been identified in previous studies reviewed earlier. Based on the psychological process for environmentally friendly behavior proposed by Koike et al. (2003), this paper suggests that knowledge acquisition triggers DRR behavior. Knowledge acquisition then leads to recognition of the importance of DRR, internalization of awareness, and the decision to take DRR action.

Recognition of the importance of DRR behavior

Koike et al. (2003) argued that ‘‘recognition of environmental risk’’ and ‘‘recognition of responsibility attribution’’ affect the psychological process—from knowledge to motivation—that leads to environmentally friendly behavior. In addition to these two factors, this paper also included concern and fear, which have been identified as
related factors in previous studies. These three cognitive factors: (1) recognition of disaster risks; (2) affective involvement; and (3) recognition of responsibility attribution was collectively labeled “Recognition of the importance of DRR”.

“Recognition of disaster risks” refers to recognizing your risks that are caused by a disaster, and its content is to recognize what type of disaster or damage might occur to yourself and your community. “Affective involvement” is an emotion that arises from knowing about disasters and disaster risks. The content includes fear, anxiety, and interest, which have been recognized in previous research. “Recognition of responsibility attribution” is to recognize that everyone has a responsibility for showing DRR behavior, based on the premise that the social atmosphere influences what DRR behaviors should be taken.

**Internalization of awareness**

In the psychological process leading to environmentally friendly behavior proposed by Koike et al. (2003), motivation is positioned as a component of the process that leads from knowledge to action. This paper considers that having “Wagakoto-awareness” is an important quality that people need to have in order to take proactive DRR behavior. Therefore, “internalization of awareness” is positioned as one of the components of this conceptual framework.

Internalization of awareness in the process of taking DRR behavior is defined as “the awareness that people consider themselves to be the victim of disasters and that people will take active DRR actions to reduce the disaster risks”. This paper assumes that internalization of awareness is a key component of this framework.

**Decision to take DRR action**

In the psychological process leading to environmentally friendly behavior, as proposed by Koike et al. (2003), “evaluation of coping effectiveness”, “cost-benefit evaluation”, “evaluation of feasibility”, and “evaluation of social norm” affect the motivation-to-action process.

This paper considers that these four factors influence actual DRR behavior after internalization of awareness. “Evaluation of coping effectiveness” is to evaluate the effectiveness of what type of damage mitigation is expected and how much is expected by taking DRR behavior. “Cost-benefit evaluation” is to evaluate how much cost is expected as a result of taking DRR behavior. The cost includes not only money but also time and physical effort. “Evaluation of feasibility” is to evaluate whether you can actually take DRR behavior from a financial, knowledge, and technical perspective. “Evaluation of social norm” is to evaluate whether the DRR behavior is in line with social norms and expectations based on the assumption the social flow that DRR behavior should follow.

**DISCUSSION**

Based on the literature, the author aimed to propose a conceptual framework for DRR behavior based on the proactive factors and structures that lead individuals to undertake DRR behavior.

In comparison to the existing theories, Protective Motivation Theory (Rogers, 1983) explains that two cognitive appraisals, ‘threat appraisal’ and ‘coping appraisal’, arouse protective motivation that leads to relevant behavior, whereas Planned Behavior Theory (Ajzen, 1991) explains that three influencing factors, ‘attitude toward behavior’, ‘subjective norm’, and ‘sense
of control’ arouse behavioral intention that leads to relevant behavior. In the framework developed in this paper, ‘emotional involvement’, ‘evaluation of coping effectiveness’, ‘cognitive attribution of responsibility’, and ‘social norms’ are included as components, which are common in existing theories. In contrast, a unique feature of this DRR behavior conceptual framework is that when individuals view disasters as affecting their own lives, it leads to them adopt DRR behavior, which is a factor that was not included in previous theories.

The importance of “Wagakoto-awareness” in DRR behavior has been noted in Japan in recent years; therefore, this concept was adopted in this paper. The other components of the framework were developed with reference to the psychological model of environmentally friendly behavior (Koike et al., 2003).

It is important to note that the framework proposed in this paper is a hypothesis based on a literature review that has not been tested; therefore, it is necessary to verify whether the proposed framework influences people’s DRR behavior, the components of the conceptual framework, the relationships between the components, and the structures that lead to DRR behavior, which will be presented in the author’s future paper. Moreover, it is necessary to examine in the future what type of people this conceptual framework applies to, the demographics and regional characteristics of the subjects, and the type of disasters.

ACKNOWLEDGMENTS

The author would like to express sincere gratitude to the supervisor, the President of Kobe City College of Nursing, Hiroko Minami for her thoughtful guidance in this study.

DISCLOSURE

The author declares no conflicts of interest associated with this manuscript.

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