



A Comparative Study on School Children's Risk Perception and Disaster Preparedness in Turkey and Japan

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Abstract

This study attempts to examine school children's disaster risk perception and level of disaster preparedness in relation to school disaster education programs. To discuss the effect of disaster education, the study compares the situation in two countries, namely Turkey and Japan. Two pilot sites were selected for the study: Istanbul City in Turkey and Toyohashi City, Aichi Prefecture, Japan. In order to understand school children's disaster risk perception and level of preparedness a questionnaire-based survey was conducted in both cities in 2015, asking about disaster education programs provided in school, disaster preparedness adjustment measures taken at home, how they evacuate when an earthquake occurs etc. 375 students from Istanbul and 558 students from Toyohashi responded to the questionnaire. The result clarified that Turkish and Japanese students take different actions at a time of disaster. During an earthquake, Turkish students drop down where they are and cover their heads, rather Japanese students climb under the table/desks. Turkish students are more aware of non-structural earthquake mitigations at home, while Japanese students were less prepared to take actions related to building/furniture preparedness. The differences stem from the education programs each underwent. These results indicate that actions deemed appropriate in one place are not taken in other place, and vice versa, thus, careful attention should be focused on providing disaster education.

Keywords: disaster education, risk perception, disaster preparedness

1. Introduction

Living in an area exposed to natural disaster risks does not mean that people are well prepared for these risks. A comparative study on people's seismic adjustment activity in highly seismic areas showed that although they are aware of their risks, few preparation measures are undertaken [1]. The substantial awareness of seismic risks or risk adjustment measures did not promote implementing risk mitigation activities. Then, what measures should be taken to enable people to prepare for disasters?

This study aims to answer this question focusing on the role of disaster education. A study on the successful tsunami evacuation behavior of school children during the Great East Japan Earthquake/Tsunami disaster in Japan in 2011 showed that practical disaster education motivates people to make appropriate decisions when facing risks [2]. The case showed that the quality of disaster education affects the risk mitigation behavior at the time of disaster.

This study attempts to examine school children's disaster risk perception and preparedness in relation to school disaster education. To discuss the effects of disaster education, the study compared two countries, namely Turkey and Japan. Two sites were selected for the study: Istanbul City in Turkey and Toyohashi City in Japan. Istanbul has a long history of earthquake/tsunami disasters, most recently sustaining both human and economic losses during the Kocaeli Earthquake (Mw7.4) in 1999. Toyohashi is located on the coast of the Pacific Ocean, and suffered damages in the Tonankai Earthquake/Tsunami (Mj7.9) in 1944 and Mikawa Earthquake (Mj6.8) in 1945. Annual probability of an M7+ earthquake for both Istanbul city and Toyohashi city is estimated at 2%. To understand school children's disaster risk perception and preparedness, a questionnaire based survey was conducted in both cities.

This paper first summarizes the main findings of existing studies on the risk perception and disaster behavior. It then explores in more in detail the connection to disaster education with reference to the case of the Great East Japan Earthquake. Next, it summarizes the result of the survey on school children's risk perception and disaster preparedness in Turkey and Japan. The findings of the survey are discussed in terms of the disaster education programs provided in each country. Finally, the paper explains how the study addressed the research question and future implications.

2. Risk Perception and Behavior

2.1 Risk perception and Evacuation Behavior during the Great East Japan Earthquake in 2011

When facing risks, people may take protective actions to reduce the threat to their lives. One of the most well-known seismic risk mitigation exercise drill is "Shakeout" which shows how to protect oneself during an earthquake. It comprises the simple terms "Drop," "Cover," and "Hold," which represent the actions to be taken -*Drop* to the ground, take *Cover* by getting under a table, *Hold* on to it until the shaking stops. If relocation to another place is needed because of a risk, people need to evacuate the area. *Evacuation* can be defined as "the mass physical movement of people, of a temporary nature, that collectively emerges in coping with community threats, damages, or disruption" [3].

Disaster risk mitigation behaviors are connected to risk perception. Listening to early warnings or tsunami alerts, watching the weather forecast, or directly perceiving the impact of a disaster (e.g., feeling strong earthquake tremors, seeing a tsunami approaching) are situational factors enabling people to recognize that they are facing a risk [4]. *Risk* is also a widely used term with no single definition [5,6]. However, here based on Joffe's discussion [6], we define risk as "an uncertain situation in which it is difficult to predict what will happen next." The degree of uncertainty may vary according to the level of people's knowledge on situational factors, accessibility to disaster information or previous disaster experiences. When perceiving a risk, people make choices on how to behave. Decision-making is the process by which information is received, confirmed, prioritized and utilized to result in some actionable choice such as evacuation or waiting for a family evacuation [3].

Figure 1 shows people's evacuation behavior during the Great East Japan Earthquake [7]. The Great East Japan Earthquake caused widespread damage leaving 18,456 persons dead or missing. The Cabinet Office of Japan conducted a survey on disaster evacuation in three severely impacted Prefectures, namely Iwate Prefecture, Miyagi Prefecture and Fukushima Prefecture. Of the 870 respondents, 496 people (57%) responded that they had evacuated immediately after the tremor, 267 (31%) did not evacuate immediately after the tremor or did something else before evacuating, 94 (11%) did not evacuate immediately after the tremor although tsunami moved closer while they were doing something else, and 13 (1%) did not evacuate. Areas severely damaged in the 2011 tsunami had repeatedly suffered damages in earthquake/tsunami throughout their histories. Based on previous disaster experiences, various measures to mitigate earthquake/tsunami risks were adopted in the area. For example, huge tsunami protecting walls were constructed along the coast of the Pacific Ocean, monuments with notes on lessons learned in previous disasters were constructed, tsunami hazard maps were prepared and distributed to all residents by the local government, and a tsunami early warnings systems with an alert siren was implemented. Within eight seconds of the first tremor, an earthquake early warning was transmitted to the public through televisions, radios, or mobile telephones. Tsunami evacuation orders were issued to the public three minutes after the tremor through television, radio and the siren. Disaster mitigation measures taken functioned well, however, the study indicated that only 57% of the residents evacuated immediately.

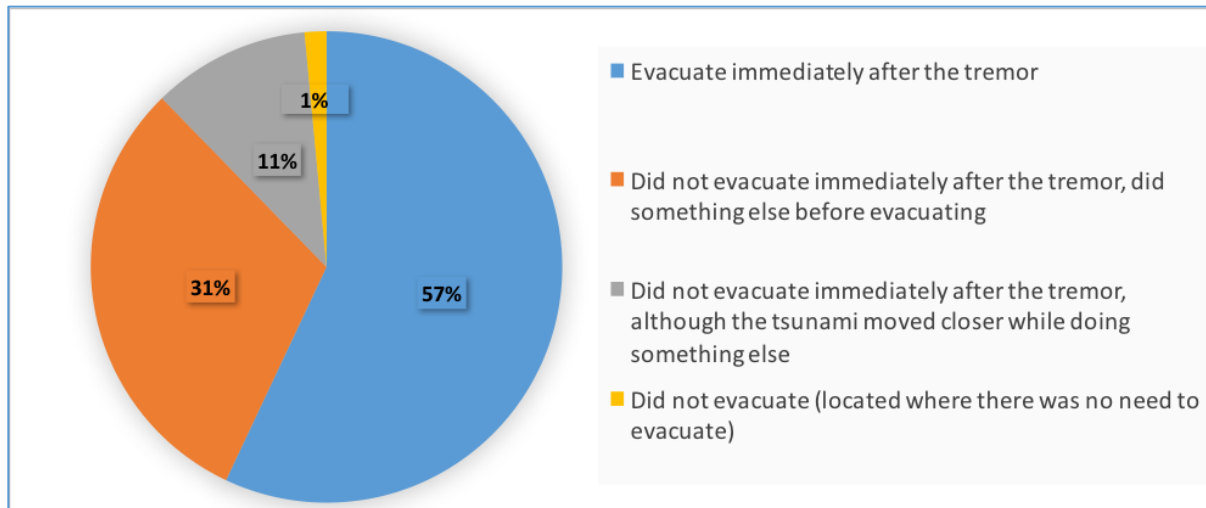


Figure 1 – Evacuation behavior after the earthquake tremor (n=870) [7]

What affected evacuation behavior? Figure 2 illustrates the result of the survey conducted in Hirota Town, a small municipality located in the Hirota Peninsula, Rikuzen Takata City, Iwate Prefecture. The survey was conducted from February to April 2013 on all residents of Hirota Town to understand their evacuation behavior during the 2011 earthquake/tsunami and 1,272 people responded. Figure 2 shows the reasons a decision was made after they felt a tremor. In total, 807 people (63%) responded that they evacuated after they saw tsunami, meaning that direct perception was the reason for evacuation. Interview with the residents to identify the reasons they did not evacuate revealed that many people first tried to support others' evacuation before evacuating themselves, as evident in the following statements. "I put my bedridden family in truck with the help of others." "I climbed the hill behind my house pushing my grandmother by the back." "It was difficult to evacuate with my mother as she was a senior." "First, I tried to evacuate my parents, then I evacuated."

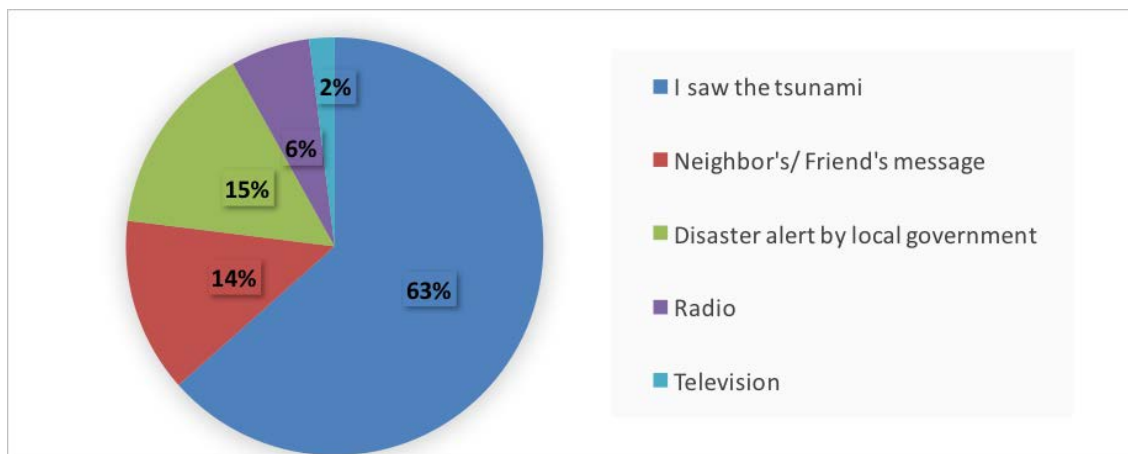


Figure 2 – Reason for making decision to evacuate (n=1,272)

2.2 Disaster Education and Evacuation Behavior of School Children

The Great East Japan Earthquake occurred at during school hours, and schoolteachers and children had to make decisions regarding evacuation. Unpredictable events continuously occurred, however they appropriately assessed the situation and adapted their prepared evacuation plan. One case of a successful evacuation was the school children of Kamaishi City, Iwate Prefecture. The earthquake occurred at 14'46 when some students were still at school, but others had already begun going home. There were nine schools in Kamaishi: five elementary schools and four junior high schools. In six schools, students were in classes, while in three others, classes had already finished and a few students were playing in the schoolyards. After the strong tremor, teachers found that the school alert system was not functioning because of a power failure, furthermore, the phone was not working and it was difficult to collect disaster information.

Students at Kamaishi Higashi Junior High School started running immediately after the tremor to an evacuation site located on higher place as they did in evacuation exercises. On their way to the evacuation site, they passed through Unosumai Elementary School, where students had evacuated onto the roof of the school building, which was considered safe from the tsunami. However, junior high students advised students at elementary school to evacuate to designated evacuation site instead. Listening to the junior high school students' advice, elementary school children evacuated to designated evacuation site. When they reached at the first designated evacuation site, residents advised them to proceed to even higher ground, thus, they decided to head to secondary evacuation site. When they reached at the secondary evacuation site, they saw tsunami approaching the coast so they climbed hill behind. Thanks to junior high school student's evacuation behavior, lives of elementary school children were safe.

Why did Kamaishi Higashi Junior High School students evacuate immediately after the earthquake? One reason was that students had received practical disaster education on how to evacuate. After 2006, the Kamaishi City Board of Education started to develop and to implement a practical disaster education program. They selected schools close to the Pacific Coast as pilot schools for tsunami disaster education. To develop their own disaster education program, a Disaster Education Working Group Committee was established, which included four subcommittees for the lower grades (1st-2nd grade), middle grades (3rd-4th grade), upper grades (5th-6th grade), and junior high school. Within each subcommittee, teachers had studied and developed the Teaching Guide for Tsunami Education according to each subcommittee's education curriculum. The Guide was prepared considering each subcommittee's course curriculum and utilized according to their learning progress.

Kamaishi Higashi Junior High School was one of the pilot schools. They began implementing their own disaster education program entitled EAST Rescue in 2009. The program comprised three main pillars: "be responsible for protecting your own life," "from rescued to rescuer," and "transferring past disaster experience." They developed a unique education program that allowed students to feel the impact of a disaster for themselves. For

example, in coastal areas, a tsunami can reach at a speed of 36 km/hr. To feel the velocity of a tsunami, students in the Physical Education class competed with cars running at the speed of an oncoming tsunami (36 km/hr.). Despite the speed at which students could run, the car easily caught up with them, letting them experience how difficult it is to evacuate once the tsunami hits the shore. In addition, they conducted evacuation drills under different circumstances such as in the classroom, during break time, and on their way to school/home. The students provided several new ideas for disaster preparedness, some of which were incorporated into municipal disaster preparedness programs. The example of Kamaishi showed the practical disaster education enables appropriate decision making even under an unpredictable situation.

3. Comparative Study on Disaster Education Programs

3.1 Status of Disaster Education Programs

3.1.1 Japan

This section summarizes the education systems in Turkey and Japan. The disaster education programs for school children in Kamaishi described in the previous section indicate that disaster education programs in Japan are developed in collaboration with the education boards of local governments. While the Ministry of Education, Culture, Sports Science and Technology Japan (MEXT) sets education policy and develops guides, local governments develop the detailed programs.

Japan has a history of disaster education. Disaster recovery education began after the Kanto earthquake in 1923, which brought severe damage on the Tokyo metropolis. In 1934, the Muroto Typhoon, the largest typhoon ever landed in Japan, attacked the Kinki (West) Region at the time when school classes began for the day. Strong winds destroyed many schools and students and teachers studying in school buildings lost their lives. Following the tragedy, the Minister of Education at that time mandated that governors to include disaster-related education content in school education programs and implement disaster evacuation drills at schools. In 1936, the first content related to earthquakes was integrated into a school textbook.

The current disaster education program is based on the disaster education policy “Safe Education at School to foster Zest for Living,” which was launched by MEXT in 2010 [8]. The objectives of disaster education were as follows (Table 1):

- To understand the situation, causes, and preventive skills of accidents, incidents, and crimes, and to be able to make decisions and choose actions that appropriately consider or judge ongoing or future risks.
- To predict risks hidden in daily life, take necessary action while paying attention to oneself and others, and to be able to improve the risk environment oneself.
- To respect the life of oneself and others, recognize the importance of creating a safe and secure society, and participate or collaborate in dedicating oneself to safety activities at school, with family, and in the community.

However, the Great East Japan Earthquake imparted large lessons indicating that current disaster education programs were not sufficient in reducing disaster risks. In the Great East Japan Earthquake/Tsunami, some schools such as those described in the previous section appropriately judged the situation and evacuated effectively, while others failed to do so. In a disaster, situations may be difficult to predict; thus, it is important to foster the capacity to predict risk on their own, make a decision, and take quick responsive action. Furthermore, it is important to integrate recovery education focusing on mutual collaboration with regard to the rights and dignity of oneself and others.

There are two main pillars for disaster safety at school: “Disaster education” and “School Disaster Management.” Regarding Disaster Education, MEXT developed a policy to integrate disaster education with education progress (Primary Education, Secondary Education, and High Education). They also emphasized the integration of disaster education into the course syllabus, as shown in Table 1. Based on their policy, Elementary

School textbooks were revised in 2014, and those for Junior High School in 2015. Currently, education content related to disasters is integrated into all course syllabus.

Regarding school disaster management, MEXT prepared the Guide for School Disaster Management. Based on the Guide, it is expected that all schools prepare the School Disaster Management Manual, which explains how to secure students' safety during a disaster by identifying the roles and procedures teachers should follow. It also describes the importance of disaster preparedness, disaster drills, and how to hand children over to their parents.

Table 1-The Objective of Safe Education [8]

on which to live a safe life, and contribute to the promotion of a safe and secure society.		
ster the foundation		
Knowledge, Thinking, Judgement	Risk Prediction/Proactive Action	Social Contribution/Foundation to support others
Related Subject		

3.1.2 Turkey

In Turkey, there was no serious effort on public disaster awareness and education activities until 1999. The Marmara-Düzce earthquakes in 1999 provided acceleration to considerably improve the enabling environment for Disaster Risk Reduction. Disaster Preparedness Education Project of Boğaziçi University (BU/DPEU) is the first comprehensive activity that aimed at raising the disaster awareness of society, local preparedness and first response skills of organizations. Within this project various training modules and materials on disaster preparedness were prepared both for students, teachers and community. Today Disaster Preparedness Education Unit of Boğaziçi University (BU/DPEU) continues to organize informal trainings to about 100 secondary school students per week.

In 2003, the Ministry of National Education (MoNE) reformed their education plan, and disaster education became one of eight focused components for primary-middle education [9]. Contents related disasters is incorporated in various school subjects. Within the textbooks prepared by MoNE in 2005, disaster education was mostly focused on in *Life Science* (1st-5th grades) and *Science and Technology* (6th-8th grades). The textbooks included disaster related chapters such as “My Enthusiasm for School” “My Unique Home,” and “Yesterday-Today-Tomorrow”. In the *Social Sciences*, chapters include “People, Places and Environments: Place where We Live (4th grade),” “Places and Environments: Let’s Learn Our region (5th grade)”. In the *Science and Technology* there are chapters such as “World and Cosmos/ Our Planet World (4th grade),” “Life Beings and Life/Human and

Environment,” “Physical Events/ Electricity in Our lives (7th grade)”, and “World and Cosmos/ Natural Events (8th grade)”.

Table 2-The Objectives of Disaster Education by Grades [9]

1st and 2nd	3rd and 4th	5th and 6th	7th and 8th
			Can save themselves during a disaster Can help others Can participate in disaster management activities

From 2011 to 2014 MoNE had conducted “School-based Disaster Education Project” in collaboration with the Japan International Cooperation Agency (JICA). This project, through various types of training, enhanced the disaster education capacity of teachers from pilot schools of Marmara Region were enhanced by various trainings. The trainings were complemented by *Afet Eğitimi El Kitabı (Disaster Education Book)* for teachers [9]. Table 2 shows teaching objectives described in Disaster Education Book [9].

The ongoing MarDIM (Earthquake and Tsunami Disaster Mitigation in the Marmara Region and Disaster Education in Turkey) project between Turkey and Japan has enabled multidisciplinary engineering and educational researches. Earthquake training materials were improved with the new research findings and the first tsunami awareness education materials were produced. All educational materials have been currently used during informal trainings at BU/DPEU.

3.2 Survey methodology

The case on the successful evacuation of students discussed in previous sections indicates that practical education effectively ensures appropriate decision-making at the time of disaster. However, what is the status of disaster education in other places? To understand school children’s disaster risk perception and preparedness in relation to school disaster education programs, the study surveyed two different areas, namely Istanbul City in Turkey and Toyohashi City in Japan. The survey aimed to investigate the following questions.

- (1) How do school children prepare for an earthquake/tsunami?
- (2) What is the link between children’s preparedness and disaster education at school?

To understand these questions, a questionnaire-based survey was conducted. The content of the questionnaire was discussed in detail by the research team, which comprised researchers from Boğaziçi University (Turkey) and Nagoya University (Japan). Terminology used in the questionnaire was carefully selected considering the cultural differences between both countries.

The survey was conducted by each party from January to September 2015. The number of respondents in Turkey totaled 375 (male: 207; female: 168) and in Japan, 558 (male: 276; female: 277). The average age of respondents was 12 years in Turkey and 13 in Japan.

3.3 Survey Results

Figure 3 shows the media through which school children learn about natural disasters. In Turkey, 70% of students responded that they learn about disasters from the television/radio, followed by school (59%), the Internet (54%), and family (41%). In Japan, 75% responded that information was obtained from the Internet, television/radio (56%), family (34%), and school (25%). Television/radio or the Internet are the primary learning resources for school children. School is one of the main media for students in Turkey.

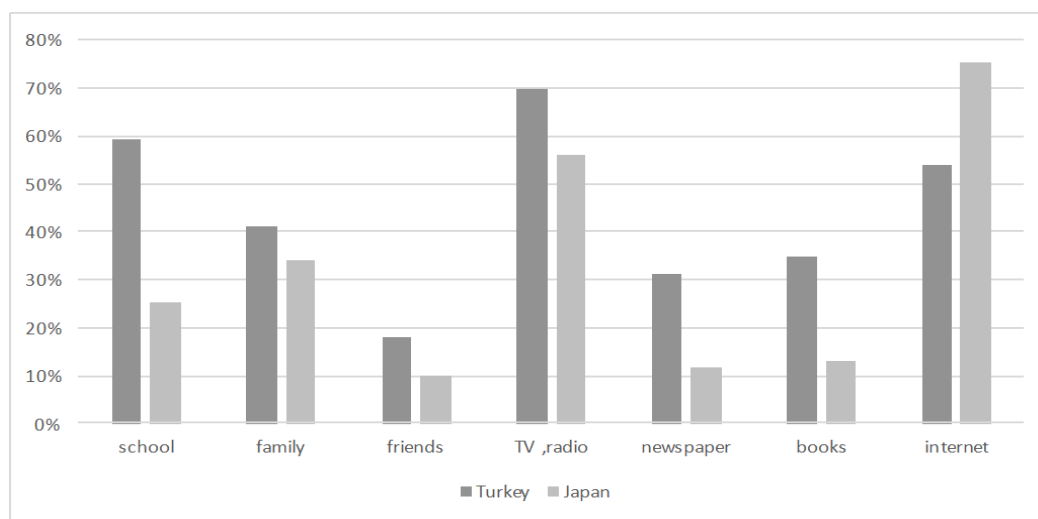


Figure 3 –Where do you learn about natural disasters?

Figure 4 shows the contents of disaster education focusing on the type of natural hazard. In Turkey, disaster education focuses more on the earthquake education, followed by flood, tsunami and volcano. More than 90% children answered that they learn earthquake at school. In Japan, earthquake/tsunami education are almost same level, and less education opportunities are provided for other hazards.

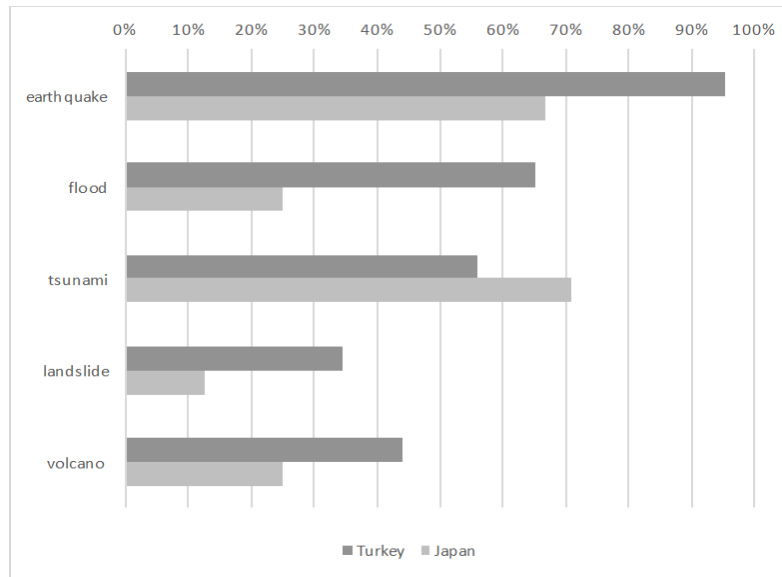


Figure 4–What kind of natural disasters do you learn about at school?

Figure 5 shows disaster preparedness adjustments in each household. Responses were classified into three categories: building/furniture preparedness, emergency supplies, and evacuation. Turkish students were more aware of physical preparedness for seismic preparedness. Japanese students were less prepared to take actions related to building/furniture preparedness. These responses may be related to the students' sense of control. Japanese students may consider it difficult to make their homes earthquake resistant on their own. On the other hand, Japanese students are more aware of emergency supplies, knowing the locations of evacuation sites.

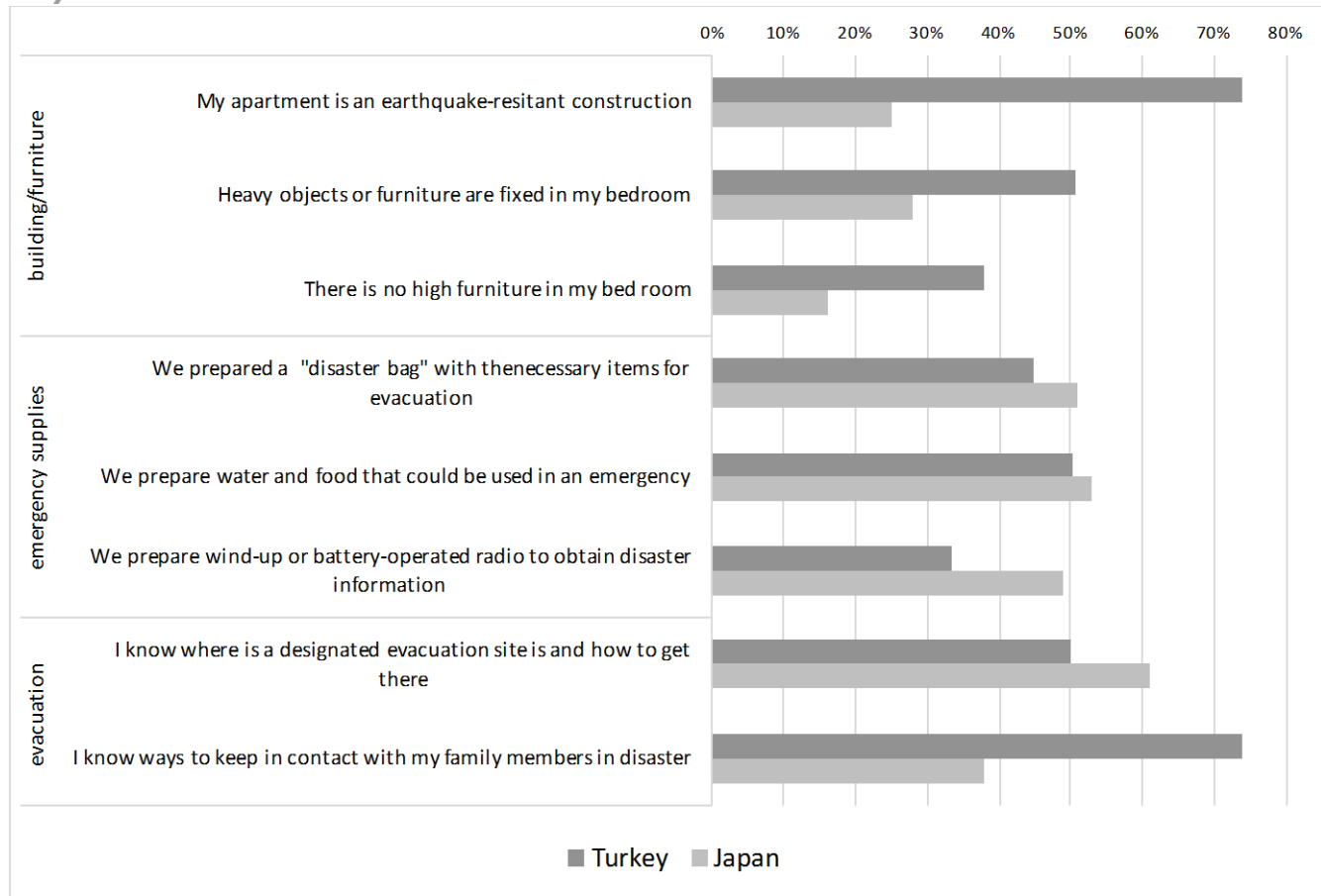


Figure 5 – What types of disaster preparedness measures are taken at your home?

Figure 6 shows actions to be taken in the classroom at the moment an earthquake occurs. Of the respondents, 86% of Japanese students stated that they climb under a table, while 43% responded as such in Turkey. In Turkey, the most frequent action to be taken during an earthquake was to drop down where you are and cover the head, as instructed in “Shakeout” exercise drills. These responses are related to school evacuation drills. In Japan, during earthquake drills, teachers instruct students to climb under tables and protect their heads. However, in some cases, students playing outside in the schoolyard tried to return to their classrooms to climb under the table, rather than taking protective measures.

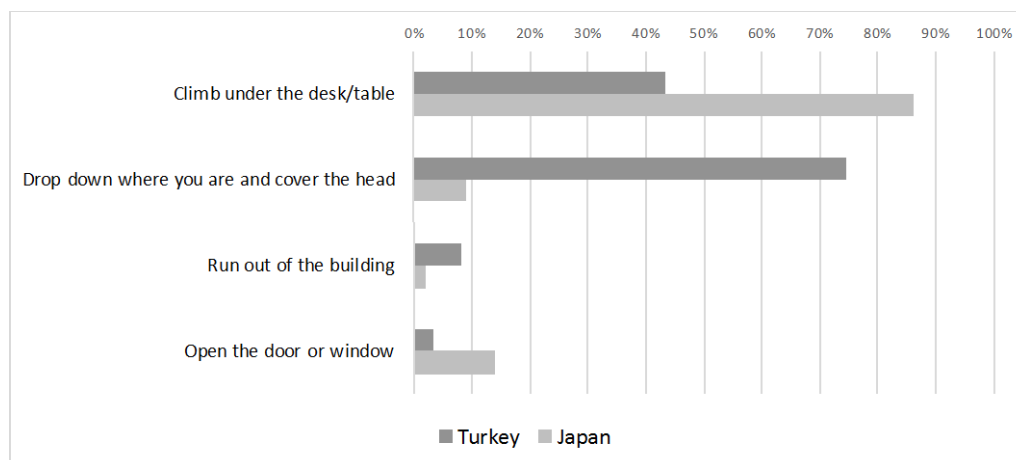


Figure 6—What do you do when do you feel a strong earthquake?

Figure 7 shows actions to be taken at the moment an earthquake occurs near to the ocean. Of the respondents, 92% of Japanese students answered that they evacuate to higher place. In contrast, fewer Turkish students answered similarly. In Turkey, there is not much emphasis on tsunami education, which makes it difficult for school children to take appropriate action at the time of a disaster.

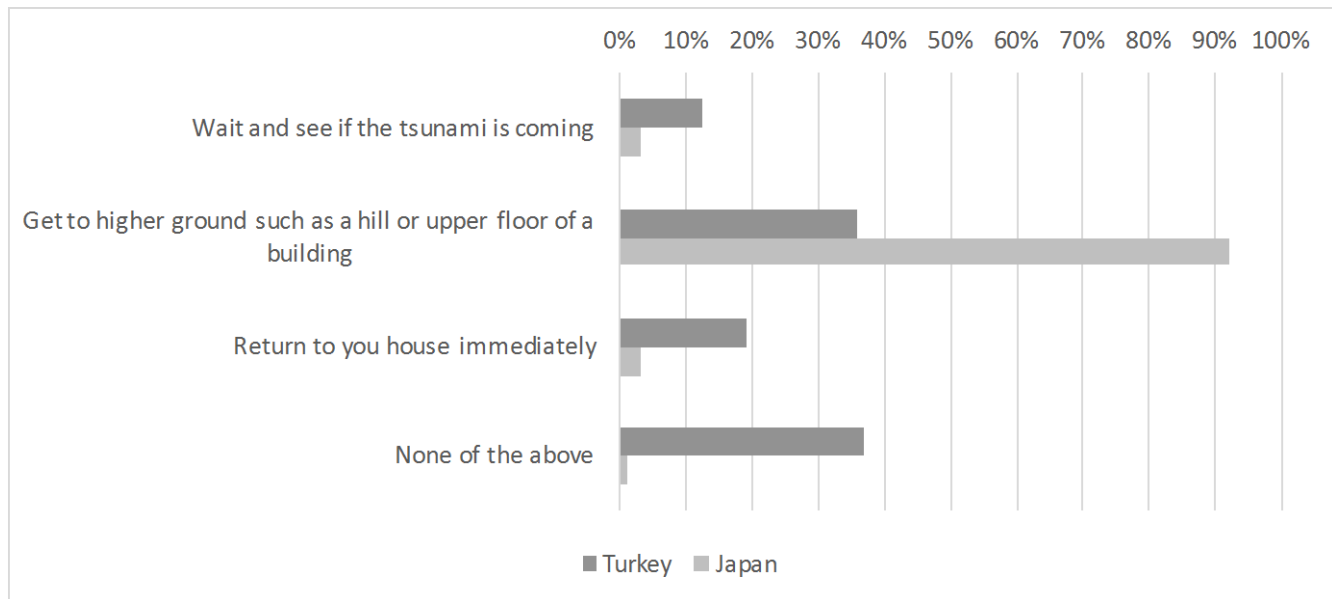


Figure 7– What do you do when do you feel an earthquake near the ocean?

3.4 Discussion on Survey Results

The survey clarified that actions taken at the moment a disaster occurs are different in Turkey and Japan. During an earthquake, 75% of Turkish students responded that they drop down where they are and cover their heads, compared to 9% of Japanese students. Rather, 86% of Japanese students responded that they climb under the table/desks. When an earthquake occurs near the ocean, 92% of Japanese students responded that they move to higher ground, while only 36% of Turkish students responded as such. These results indicate that actions deemed appropriate in Turkey are not taken in Japan, and vice versa.

There are several reasons for these differences. First, different material is taught at schools. In Turkey, disaster education programs focus mainly on earthquakes, emphasizing the importance of structural mitigation. Regarding actions to be taken when the earthquake occurs, dropping down and protecting life at the place one is at are highlighted. Compared to earthquakes, less education is provided on tsunamis. In Japan, education programs focusing on earthquakes and tsunamis are conducted almost in parallel. For example, when teaching about the Great East Japan Earthquake, tsunamis are also covered.

Second, the role of the central government is to make decisions related to the content of education programs. In Turkey, disaster education programs are developed and conducted through a MoNE initiative. MoNE also develops guides and conducts training for teachers. In Japan, MEXT determines the policy and develops guides for disaster education, although the detailed programs and content of disaster education programs are decided on and developed by the education boards of local governments. The education system is more standardized in

Turkey. However, natural disasters differ according to location. Oceanside locations are exposed to tsunamis, while mountain areas are vulnerable to landslide risks. Therefore, it is more practical to prepare education programs considering geographical location.

Third, education programs are influenced by recent disasters, not historical ones. Disaster education in Turkey was developed after the Kocaeli earthquake in 1999, when further earthquake disasters occurred after it. However, looking at history, the country has been continuously affected by both earthquake and tsunami disasters. In Japan, disaster education focuses on earthquakes rather than tsunamis after the Hanshin-Awaji earthquake in 1995. However, experiencing the tsunami disaster in 2011 brought about the realization to also learn from historical disasters.

4. Conclusion

This study attempted to discuss effective measures for risk mitigation action by focusing on risk perception and disaster behavior. The experience of the Great East Japan Earthquake showed that practical education enables people to take action at the moment of disaster. An examination of school children's disaster risk perception and preparedness in Turkey and Japan clarified that Turkish and Japanese students might take different actions at the time of a disaster. The differences stem from the education programs each underwent. This means that more careful attention should be focused on providing education on disaster response behavior. What seems appropriate in one cultural context is not sufficient in another. It is important to compare disaster preparedness in different cultural contexts and improve the quality of education.

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