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Title	Media Preference, Information Needs, and the Language Proficiency of Foreigners in Japan after the 2011 Great East Japan Earthquake
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Citation	International journal of disaster risk science, 9(1), 1-15 https://doi.org/10.1007/s13753-018-0159-8
Issue Date	2018-03
Doc URL	https://hdl.handle.net/2115/70116
Rights(URL)	https://creativecommons.org/licenses/by/4.0/
Type	journal article
File Information	10.1007_s13753-018-0159-8.pdf

Hokkaido University Collection of Scholarly and Academic Papers : HUSCAP

Int J Disaster Risk Sci (2018) 9:1–15
https://doi.org/10.1007/s13753-018-0159-8

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ARTICLE

Media Preference, Information Needs, and the Language Proficiency of Foreigners in Japan after the 2011 Great East Japan Earthquake

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Published online: 6 February 2018
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Abstract After the 2011 Great East Japan Earthquake, the Japanese government identified the lack of proficiency in the Japanese language as one characteristic of foreigners that should be considered in disaster prevention planning. This article seeks to understand how proficiency in a local language affects disaster information gathering behavior by using the results of a questionnaire survey conducted after the 2011 Great East Japan Earthquake. Respondents were categorized based on their Japanese and English language abilities. Their media mode, language preferences, information importance, and information-gathering difficulties also were examined. It was found that foreigners skilled in Japanese demonstrated similar information gathering behavior as Japanese respondents, but foreigners unskilled in Japanese showed little usage of Japanese-language media. This group also encountered difficulties due to a lack of Japanese proficiency, but many members were able to acquire some level of Japanese-language information through Internet-based methods. To address language proficiency in disaster prevention planning, information provision in languages other than Japanese should be increased, and Japanese information should be shared in a way that facilitates translation. Although this survey was significant in its scope, the results should be considered within the limitations of the Internet-based response collection and focus only on the less-affected area of Japan.

Keywords 2011 Great East Japan Earthquake · Disaster information · Foreign population · Internet-based media · Language proficiency

1 Introduction

The 2011 Great East Japan Earthquake highlighted critical issues in Japan regarding the dissemination of disaster information and its collection by populations not fluent in the Japanese language. This introductory section briefly reviews the news reporting and disaster response of foreign governments and foreigners in Japan after the disaster, as well as the Japanese government's efforts to address the disaster needs of foreigners in Japan, before establishing the positioning and significance of this research focusing on the language proficiency of foreigners as a problem for disaster prevention planning.

1.1 Background and Objectives

At 14:46 on 11 March 2011, a magnitude 9.0 earthquake with a hypocenter in the Pacific Ocean occurred off the eastern seaboard of the northeastern region of Japan. This earthquake was not only the largest ever recorded in Japan, but also caused a massive tsunami that hit the eastern and northeastern regions, and triggered a nuclear crisis at the Fukushima Daiichi nuclear power plant (Fig. 1), which included core meltdown and the release of radioactive material. This triple disaster is collectively referred to as the 2011 Great East Japan Earthquake disaster.

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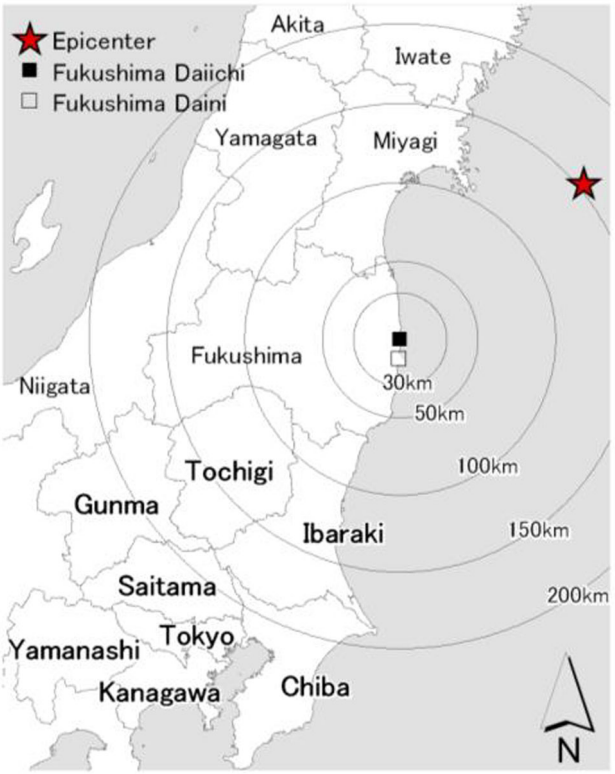


Fig. 1 Map of eastern and northeastern regions of Japan

News of the disaster was immediately delivered all over the world. Five minutes after the earthquake struck, Bloomberg Television, which reports 24-h financial information and news internationally in English, made the first announcements about the huge earthquake in Japan; this was followed by CNN International's report 21 min later (Elliott 2011). Differences in the reported urgency level of the crisis and disagreements and contradictions between the contents of international and domestic (Japanese) media after the earthquake soon emerged, with foreign media more sensational and focused almost exclusively on the nuclear crisis, rather than relief and recovery efforts (Sanchanta 2011). The response of foreign governments also varied widely. Kawasaki et al. (2013b) reported that within 1 day of the earthquake 10 countries issued official evacuation advisories to and travel restrictions on their citizens already resident in or planning to travel to Japan. This number grew somewhat in the aftermath of the earthquake and as the nuclear crisis unfolded, but the level of urgency of the advisories varied. A large majority of foreign governments issued no specific advisory to their citizens in Japan, thus adding to confusion about the actual urgency level of the crisis.

In the month following the disaster, roughly 10% of the foreign resident population in Japan left the country (Ministry of Economy, Trade and Industry 2011). While much attention was paid to this flight in both domestic and international media, only later did discussion turn to the issue of how to provide proper support for the foreign community in Japan in a post-disaster situation. Questions arose related to deficiencies in the dissemination of disaster information to non-Japanese people, such as the dearth of English-language information from official, primary sources. This is not the first time such problems have been exposed. Inadequate information dissemination for foreigners was previously observed in the wake of the 1995 Great Hanshin-Awaji Earthquake in Kobe, Japan (Sasaki 1995), but no comprehensive actions were implemented thereafter.

After the 2011 Great East Japan Earthquake, however, the Japanese government began to take action regarding the deficiencies in disaster support and planning for foreigners in Japan. In 2014, the Ministry of Land, Infrastructure, Transport, and Tourism published the "Guidelines for Preparing Initial Response Countermeasures for Foreign Travelers Visiting Japan when a Natural Disaster Occurs." This document was intended to support the owners and operators of tourist spots and lodgings, whereas the "Guidelines for Assuring the Safety of Foreign Travelers Visiting Japan" targeted the development of concrete measures to support foreigners in regional disaster prevention planning (Ministry of Land, Infrastructure, Transport, and Tourism 2014a, 2014b). These guidelines outlined the special traits of foreigners that should be considered in disaster prevention planning, including: the wide variety of nationalities and their different levels of disaster experience and knowledge; the lack of basic knowledge regarding disaster response and evacuation that Japanese people take for granted; the lack of familiarity with the local terrain during evacuation; the lack of Japanese language proficiency; and the lack of a common mindset for collective behavior due to cultural differences. These guidelines provide one example of how the Japanese approach to addressing the needs of foreigners tries to acknowledge the diversity of this group while still, ultimately, using the catchall label of "foreigner."

This research is focused specifically on the issue of language proficiency. Although guidelines in Japan acknowledge language proficiency as a problem for disaster support and mitigation planning, it is not clear how proficiency in a local language, or lack thereof, affects disaster information-gathering behavior and how this should be addressed in disaster prevention planning. The objective of this article, therefore, is to understand the information gathering behavior and needs—examined by media mode, language preferences, information importance, and information-gathering related difficulties—of foreign residents in Japan from the perspective of language proficiency by analyzing the results of a questionnaire

survey conducted in Japan after the 2011 Great East Japan Earthquake.

1.2 Research Significance

The foreign population in Japan comprises less than 2% of the total population (Ministry of Justice 2013), but the importance of establishing support for foreigners can be understood in the context of past, present, and future socioeconomic changes and policies in Japan. Although still very small, the foreign population in Japan nearly doubled from 1990 to 2012 (Ministry of Justice 2013); the annual number of foreign tourists, a growing economic industry, also more than tripled over the same period (Japan National Tourism Organization 2012). Furthermore, in 2013, the 2020 Summer Olympics was awarded to Tokyo, and the Japanese government announced plans to double the number of foreign tourists to 20 million by 2017 (Prime Minister of Japan and His Cabinet 2013). These announcements were followed by reports, in 2014, that the government might also consider accepting more foreign immigrants to counteract Japan's shrinking population (Cabinet Office 2014).

The foreign population in Japan is concentrated in only a few areas: Tokyo (approximately 400,000 foreign residents), Osaka (200,000), Aichi (200,000), Kanagawa (160,000), and Shizuoka (80,000) prefectures. These areas also represent most of the major tourist destinations. The probability that great earthquakes, such as the projected Tokyo metropolitan, Tokai, or Tonankai Earthquakes, might occur in these same areas is very high (Maki et al. 2009; Cabinet Office 2012). It is therefore of critical importance to prepare disaster response capabilities for a more diverse population in response to demographic changes. The results obtained in this study may serve as a basis for further research on and development of support systems in Japan, as well as in other disaster-prone countries with diverse populations.

2 Literature Review

To provide context to this research on the disaster information seeking behavior of foreigners in Japan with varying levels of Japanese language proficiency, this section reviews the existing literature on information seeking and media usage, disaster information dissemination and gathering after the 2011 Great East Japan Earthquake, and the disaster information needs of unique populations.

2.1 Information Seeking and Media Usage

In times of disaster, individuals seek information in order to assess risk and inform decision making (Spence et al. 2005). Their understanding of risk and subsequent actions are dependent on the breadth and depth of information obtained, and multiple types of media and information sources may be utilized in the information collection process (Mileti and O'Brien 1992). Television, local radio, newspapers, and interpersonal networks are examples of commonly used media modes for gathering information during disaster situations (Piotrowski and Armstrong 1998; Bracken et al. 2005; Spence et al. 2007a; Burke et al. 2010). The preferred medium may be affected by a variety of factors, such as when the disaster occurs (Bracken et al. 2005; Spence et al. 2005), the type of disaster (Spence et al. 2007a), or individuals' characteristics (Spence et al. 2007a, b; Burke et al. 2010; Spence et al. 2010; Henry et al. 2017). Research has suggested that the utility of media modes also varies. Television reports, which are visual, short, and occur frequently, tend to provoke emotional responses; conversely, printed media are longer and more in-depth, and thus may be more effective for the dissemination of facts (Piotrowski and Armstrong 1998). Interpersonal networks, on the other hand, have been shown to be useful for validation of information among trusted relationships (Spence et al. 2007b).

Online information seeking and the utilization of social media in disaster situations have been growing as access to the Internet becomes more widely available, and literature has demonstrated that online resources have been effective for people seeking information (Boyle et al. 2004; Lu et al. 2007). Online geographic information systems (GIS) represent one example of a technology that has emerged as an important tool in disaster situations (Butler 2006; Goodchild 2010). Response to the 2005 Hurricane Katrina revealed the importance of publicly available satellite images and other geographical data, and is considered the starting point of online disaster response integrating community-sourced data with Google Maps and Google Earth (Laituri and Kodrich 2008). The 2010 Haiti Earthquake is considered the first disaster that demonstrated the potential of geospatial technologies with open source and web-mapping tools, such as OpenStreetMap (Zook et al. 2010; Kawasaki et al. 2013a).

Social media, on the other hand, has been shown to provide a forum for people to disseminate and discuss disaster issues, experiences, and information, and to build strong personal connections for coping with disaster effects and loss (Palen 2008; Shklovski et al. 2008; Qu et al. 2009). This last aspect—connecting to other people with local concerns—is important considering that people experience the need for emotional support and

companionship while suffering from a disaster (Perez-Lugo 2004). Internet-based social media can help people stay connected regardless of physical separation. It has been suggested, however, that social media may be more effective for emotional release than for information gathering (Lachlan et al. 2014a, b).

2.2 Disaster Information During and After the 2011 Great East Japan Earthquake

Some studies on disaster information dissemination and collection were carried out in Japan after the 2011 Great East Japan Earthquake. NHK Broadcasting Cultural Research Institute empirically analyzed how the 2011 Great East Japan Earthquake disaster was reported by TV news programs both inside and outside Japan. Tanaka and Hara (2012) analyzed all visual and audio TV coverage by the three major channels in Japan, including NHK (Japan Broadcasting Corporation, Japan's only public broadcaster), for 72 h after the quake. They found that the most reported information within the first 24 h after the quake was on the tsunami, but gradually shifted to the nuclear power plant accident, which became the most-reported topic after 24 h. There were some differences in the coverage approaches among the three domestic television stations. Kowata et al. (2012) compared the news broadcast contents of eight news programs in seven foreign countries, and showed that all news programs they investigated had extensive coverage on the Tohoku Earthquake, with the most-covered story being the Fukushima Daiichi nuclear power plant accident. They revealed that most news content and the approach toward news coverage were generally reliable, but even major news programs included some false information, as well as sensational and exaggerated expressions with inadequate images and sounds, particularly related to the nuclear crisis.

According to a survey on trends in media usage carried out by the Nomura Research Institute (2011), television was the highest-ranked source for acquiring important information, followed by newspaper and portal sites on the Internet. A different survey on information gathering after the disaster found a similar result (My Voice Communications 2011), thus demonstrating the utility of television as a primary tool for information acquisition.

For online disaster response after the earthquake, a wide range of mapping activities was identified, including integrated geospatial information such as remote sensing data, Google Maps and Google Earth, and voluntarily provided crowd-sourced spatial data, called VGI (volunteered geographic information) (Zhang et al. 2015). Social media was also found to be highly useful for facilitating communication between individuals, governments, organizations, and media, and for general information sharing and gathering (Jung and Moro 2014).

2.3 Disaster Information Needs of Unique Populations

Information needs and media usage in times of disaster are not uniform across society, but, rather, vary depending on the characteristics of the impacted populations. Spence et al. (2007a) and Burke et al. (2010), in similar studies conducted after Hurricanes Katrina and Ike, found that television and interpersonal networks were important for disaster information gathering and verification among marginalized people, such as the disabled and minorities. Other studies have demonstrated how gender and income affect information-seeking behavior. After the collapse of a highway bridge in the United States, women more actively utilized the Internet than men and found television more useful (Spence et al. 2010). An investigation by Henry et al. (2017) on the effect of income disparity on information gathering during the 2011 Chao Phraya River flood in Thailand found that, although television was widely used, poorer people were more likely to use lower-level technologies for information gathering, such as radio and loud speakers, be unaware of a government hotline, and have less access to information resources in general.

Research focusing on the information needs of nonnative (foreign) populations during or after a disaster is limited. One study examined the role of community radio in the wake of the 1995 Great Hanshin-Awaji Earthquake, and found that it was important not only for disseminating information in a variety of languages to the affected local foreign communities in the Kobe area but also for building and strengthening the communities themselves (Hibino et al. 2012). Hasegawa et al. (2005) tackled the language barrier issue for people who cannot understand the Japanese language by developing a web-based multilingual disaster information system for quickly translating and disseminating information to mobile phones. In the aftermath of the 2011 Great East Japan Earthquake, however, more attention began to be paid to the disaster information needs of foreigners in Japan (Kimura 2012). A study on the post-disaster response of international students at Tohoku University in Sendai, Japan—the largest city nearest the epicenter of the earthquake—found that students, despite having access to the Internet and information resources, were passive in their demand for disaster information, and tended to rely on secondary sources of information, such as their families, their university research group, and friends of the same nationality (Gomez 2013). Yonekura (2012), in contrast, after the earthquake conducted a survey of foreign residents from four countries (China, South Korea, Brazil, the Philippines) that revealed nearly all respondents used

television, but demonstrated usage of the Internet and newspapers varied depending on nationality.

Although a lack of language proficiency can contribute to increased disaster vulnerability due to inability to acquire relevant information in a timely manner, it is not clear how language proficiency affects disaster information gathering, especially among nonnative populations. Through analysis of the information-gathering behavior of foreigners in Japan after the 2011 Great East Japan Earthquake from the perspective of language proficiency, this study expands the existing knowledge on information seeking in times of disaster, and proposes actions for the improvement of disaster information dissemination and disaster mitigation planning.

3 Methodology

The research methodology section consists of the survey design and distribution, categorization by language proficiency, extracted sample characteristics, survey result analysis methods, and limitations of the adopted methodology and research.

3.1 Survey Design and Distribution

An anonymous, Internet-based questionnaire survey was conducted that targeted people in the eastern region (Tokyo metropolitan area and Tochigi, Gunma, Ibaraki, Saitama, Chiba, Yamanashi, and Kanagawa prefectures) of Japan. The survey contents focused on in this article are given in Table 1, and details of the survey design and distribution are summarized in Table 2.

Due to the broad scope of the 2011 Great East Japan Earthquake disaster, the survey treated disaster information as information related to any of the three events—the earthquake, tsunami, and nuclear crisis. The media modes chosen for the survey were selected based on a review of previous literature, with certain modes grouped together under a single category (for example, printed media, interpersonal). In contrast to most previous studies, several types of Internet-based media were included to reflect the diversity of ways in which the Internet is currently utilized for information gathering. Respondents were also asked to indicate what types of information were important for their decision making during the first day, the first week, and the second week after the earthquake. These information-collection periods were selected based on a review of previous literature, as well as through assessment of post-disaster news reports. The sources of information-gathering-related difficulties were selected based on a review of experiences shared in person, among online communities, and through news reports in the aftermath of the disaster.

The survey was prepared in nine languages to collect responses from the major nationalities residing in the Kanto area. To ensure translation quality, the survey contents were prepared via a three-step process. First, English and Japanese contents were developed by native English and Japanese speakers, respectively. Based on these forms, native speakers of the other seven languages, who are fluent in either English or Japanese, translated the contents into their native language. The contents were then checked by a second native speaker in each language and revised appropriately.

The survey was distributed via the snowball method. This approach was chosen as the most viable means for obtaining results, as there are no standardized means or services available for directly contacting large numbers of foreigners residing in the Kanto area. The distribution consisted of several stages, such as sending direct requests for cooperation to embassies, universities, business communities, and so forth, as well as requests sent through the authors' professional and social contacts. Responses were gathered for 6 weeks, beginning roughly 10 weeks after the earthquake occurred, with a total of 1357 responses collected representing 74 countries.

3.2 Categorization by Language Proficiency

Data on the respondents' language proficiency were gathered by self-assessment using five levels: Native, Advanced, Intermediate, Basic, and None. To investigate how language proficiency affected information gathering behavior, the respondents were categorized based on their Japanese (speaking and listening) and English proficiency. As this analysis aimed to examine the difference between high and low proficiency, the categorization focused only on respondents at the opposite ends of the proficiency spectrum. English proficiency was included due to its widespread use as the secondary language for communication in Japan.

The distribution of all respondents by their Japanese and English language proficiencies are shown in Table 3. For foreign respondents, three groups were created: respondents with high proficiency (Native or Advanced) in both English and Japanese; respondents with high proficiency in Japanese and low proficiency (Basic or None) in English; and respondents with high proficiency in English and low proficiency in Japanese. These groups were labeled Jpn + Eng, Jpn, and Eng, respectively. Japanese respondents were also categorized into two groups (high proficiency in both Japanese and English, and high proficiency in Japanese and low proficiency in English) to serve as control groups. The relationships between the categorized groups are illustrated in Fig. 2. Following this process, 767 Japanese (J) and foreign (F) respondents belonging to a

Table 1 Survey contents

Theme	Question items and response options	
Disaster information gathering	Media mode(s) for information gathering and the language in which those mode(s) were utilized[a]	
	Media mode options	*Language options*
	Television	Japanese
	Radio	English
	Printed media (magazines, newspapers, etc.)	Other
	Interpersonal (face-to-face, telephone, etc.)	
	Internet-based media	
	Traditional (Websites, information portals, etc.)	
	Direct communication (E-mail, video chat, instant messenger, etc.)	
	Social media (Social networking sites, blogs, etc.)	
	Crisis mapping (Google Crisis, Saigai Info, etc.)	
	Types of important information during the first day, first week, and second week[a]	
	Safety of family, friends, etc.	
	Earthquake and tsunami characteristics	
	Earthquake and tsunami damage	
	Radiation level and risk	
	Government response	
	Evacuation and shelters	
	Food and water supply	
	Electricity and other utilities	
	Transportation systems	
	School and business continuity	
	Source(s) of information gathering-related difficulties[a]	
	Unable to access information due to mobile congestion, power outage, etc.	
	Was confused by conflicting or differing information	
	Couldn't understand information due to lack of language comprehension	
	Couldn't understand information due to difficult or unfamiliar terminology	
	Unable to find the information due to difficulty in searching or locating it	
Demographics	*Country of origin, age, gender, income, Japanese and English language abilities*	
	Response options shown in Tables 3, 4 and 5	
Open response	Comments, thoughts, suggestions, and so forth regarding the survey or experiences and feelings during and after the earthquake and tsunami disaster	

[a]Respondents were allowed to select multiple responses

Table 2 Survey details

Method	Anonymous Internet-based survey
Period	End of May 2011–Early July 2011
Target	Japanese and foreigners residing in the eastern region of Japan at the time of the earthquake
Distribution method	Snowball method (Sent phone and E-mail requests to 99 embassies, 48 universities, and other communities in the eastern region of Japan, asking them to distribute the survey URL via their contacts and announce it on their homepage or via social media)
Languages	Japanese, English, Chinese, Korean, Portuguese, Nepalese, French, Thai, Vietnamese
Responses	1357 total (74 countries)

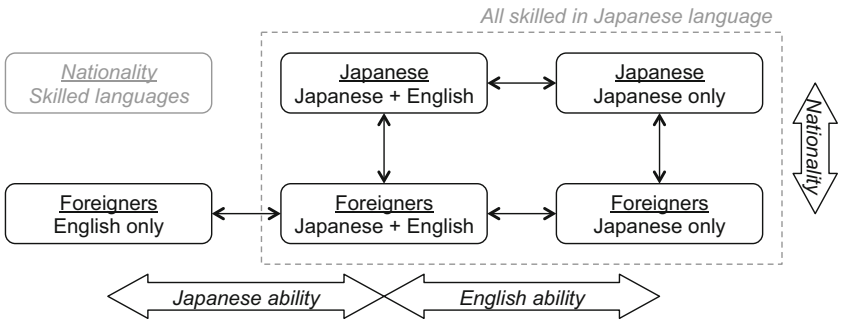


Fig. 2 Relationship between language groups based on language proficiency

Table 3 Categorization of respondents according to language proficiency

	English proficiency				
	Native	Advanced	Intermediate	Basic	None
Japanese proficiency					
Native	"Jpn + Eng"		F:74	"Jpn" F:42	
Advanced	F:198 J:76		J:135	J:236	
Intermediate	F:152		F:57 J:1	F:30 J:1	
Basic	"Eng"		F:56	F:9 J:1	
None	F:215				

total of five analysis groups were extracted from the overall sample.

3.3 Extracted Sample Characteristics

Japanese respondents made up 41% (312 people) of the total number of extracted respondents, with foreigners making up the remaining 59% (455 people). The distributions of foreign respondents by world region and nationality are given in Table 4. The largest number came from China (60 people), followed by the United States (42 people) and the United Kingdom (29 people). However, the Asian region represented the most respondents (46%, with 203 people), while Europe represented the largest number of unique nationalities (26 countries). Conversely, less than 3% of all respondents came from Africa (9 people) or the Middle East (2 people).

Other demographic characteristics of the Japanese and foreign respondents are given in Table 5. The distribution of foreigners skewed younger than the distribution of Japanese. The male–female distribution was relatively similar for both groups, although both had roughly twice the number of men than women. Finally, foreign respondents had a higher percentage of lower and higher income earners, whereas Japanese respondents had a higher percentage of middle-income earners.

Table 4 Region and nationality of extracted foreign respondents ($N = 455$)

Region/country	Freq.	Region/country	Freq.
Asia: 20 countries, n = 208 people (45.7%)		*North America: 2 countries, n = 51 people (11.2%)*	
China	60	United States	42
South Korea	23	Canada	9
Vietnam	21	*South America: 2 countries, n = 33 people (7.3%)*	
Indonesia	14	Brazil	24
Thailand	14	Argentina	9
Sri Lanka	13	*Oceania: 2 countries, n = 18 people (4.0%)*	
Other 14 countries	63	Australia	14
Europe: 26 countries, n = 134 people (29.4%)		New Zealand	4
United Kingdom	29	*Africa: 6 countries, n = 9 people (2.0%)*	
France	22	Tanzania	4
Switzerland	14	Other 5 countries	5
Germany	10	*Middle East: 2 countries, n = 2 people (0.4%)*	
Italy	10	Afghanistan	1
Other 21 countries	49	Israel	1

The percentages shown are relative to the number of foreign respondents only

3.4 Survey Result Analysis Methods

Analysis of the results consisted of both qualitative and quantitative approaches. Media mode and language preferences, important information types, and information difficulties were examined descriptively, along with the Chi-square test, which was carried out to confirm dependency on language proficiency and nationality. In some cases, the number of respondents was not high enough to

Table 5 Demographic characteristics of extracted Japanese and foreign respondents ($n = 767$)

	Japanese ($n = 312$)		Foreigners ($n = 455$)	
	Freq.	Valid %	Freq.	Valid %
Age (years)				
Under 20	2	0.7%	1	0.2%
20–29	102	34.6%	181	41.3%
30–39	95	32.2%	169	38.6%
40–49	57	19.3%	55	12.6%
50–59	29	9.8%	24	5.5%
60 or over	10	3.4%	8	1.8%
No response	17	–	17	–
Gender				
Male	201	67.9%	279	64.1%
Female	95	32.1%	156	35.9%
No response	16	–	20	–
Income level (million Japanese yen per annum)				
Less than 1.95	65	27.5%	99	33.2%
1.95–3.3	22	9.3%	33	11.1%
3.3–6.95	87	36.9%	81	27.2%
6.95–9	42	17.8%	24	8.1%
9–18	19	8.1%	34	11.4%
More than 18	1	0.4%	27	9.1%
No response	76	–	157	–

give valid results using the Chi-square test; these cases were not examined in further detail. The open responses of selected respondents were qualitatively analyzed by grouping the responses that focused on media mode and language preferences, information difficulties, and associated approaches and solutions, followed by identification of the relationship between these items.

3.5 Methodology Limitations

Although the survey is significant in its scope and collection of data on foreign population in Japan, there exist limitations related to representativeness and self-evaluation that must be considered when interpreting the results and discussions. A snowball method (introduced in Table 2) was utilized for gathering responses due to the difficulty in directly contacting the foreign population, and the survey itself was carried out only in an Internet environment. Only foreigners in the eastern region, which was not heavily damaged, were collected. The sample is thus skewed towards those who were proactive in participation, had relatively unaffected access to information, and who use the Internet on a regular basis. Additionally, the survey allowed for the self-evaluation of language proficiency, and there may have been bias in the evaluation of respondents' language proficiency. The survey, however, did not suggest any benefit to providing higher or lower self-evaluation, so this limitation is considered acceptable within the scope of the study.

4 Results

The survey results are reported and analyzed by language proficiency and nationality in this section. These cover the media mode and language preferences, information importance over time, sources of information gathering difficulties, and open responses.

4.1 Media Mode and Language Preferences

Media mode and language preferences for information gathering are shown in Fig. 3. Results are given in terms of the percentage of respondents from each group who utilized each media mode in each language. The average numbers of utilized media modes by language are summarized in Table 6.

Foreigners skilled in Japanese and English utilized the widest variety of media modes and languages. Japanese television was used the most by this group, followed by Japanese and English traditional Internet media. Foreigners skilled in Japanese and English tended to utilize Japanese more than English or other languages for non-Internet media modes such as television, radio, printed media, and interpersonal, but utilized English more for Internet media modes (except for traditional Internet media). On average, they utilized more media modes in Japanese than in English.

Foreigners skilled only in English strongly tended to use English more than either Japanese or other languages for all media modes. English-language traditional Internet media was used by 81% of respondents and English-language television was used by 64% of respondents. Among English-language media modes, the trend of foreigners skilled only in English was very similar to that of foreigners skilled in both English and Japanese, but a higher percentage of respondents skilled only in English tended to use the English-language modes.

For foreigners skilled only in Japanese, the most-used media mode and language was Japanese language television, followed by Japanese traditional Internet media. This group showed almost zero usage of English-language media modes, and generally preferred Japanese over other languages (except for interpersonal communication). In general, the trend of foreigners skilled only in Japanese was similar to that of Japanese skilled only in Japanese, although foreigners utilize more media modes in other languages, on average.

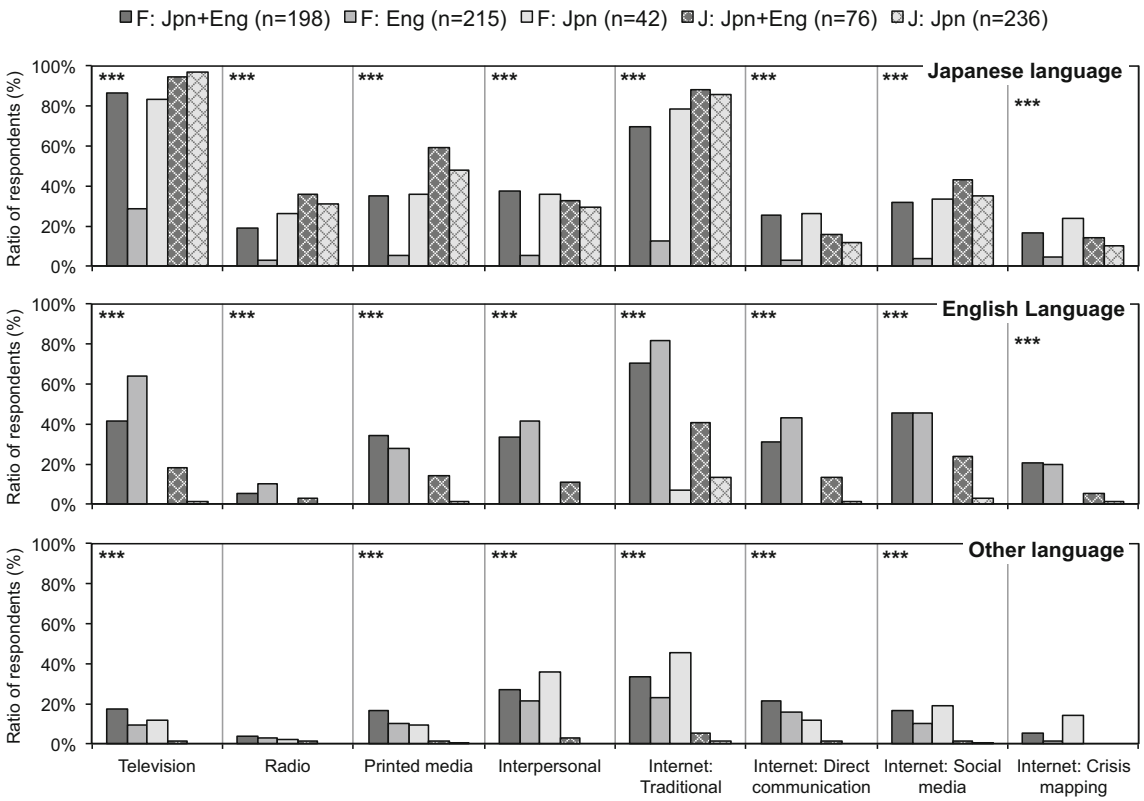


Fig. 3 Utilized media modes by media mode language. Chi square significance codes: $***p < .001$, $**p < .01$, $*p < .05$

Table 6 Average number of utilized media modes by language

	Foreigners			Japanese	
	Jpn + Eng	Eng	Jpn	Jpn + Eng	Jpn
Japanese	3.23	0.65	3.43	3.84	3.48
English	2.81	3.31	0.07	1.29	0.20
Other	1.42	0.93	1.50	0.14	0.02

Japanese respondents very strongly tended to use Japanese-language media modes regardless of their English language proficiency. The most-used media mode for both groups was Japanese television for Japanese skilled in both English and Japanese and those skilled in Japanese only, followed by Japanese traditional Internet media. Japanese skilled in both languages utilized more media modes in Japanese, on average, than those respondents skilled only in Japanese, as well more media modes in English.

4.2 Information Importance Over Time

Important types of information during the first day, first week, and second week after the earthquake are summarized in Fig. 4. The reported results are shown as the percentage of respondents from each group who indicated that a given type of information was important for their decision making.

There were few significant differences by language proficiency during the first day after the earthquake. Safety of family, friends, and so on was the most-cited important information type for all groups, but the number of respondents indicating this type was higher for foreigners skilled in both Japanese and English and both Japanese groups than for foreigners skilled in English only or in Japanese only. Another difference by language proficiency could be seen for transportation systems, with less than 50% of foreign respondents indicating this type of data as important, compared to 64% or greater for the two Japanese respondent groups.

By the first week, the major important information types had shifted noticeably from the first day. Safety of family and friends became one of the least-cited types. Instead radiation level and risk became the most cited for all groups, but the percentage of respondents citing this information type varied significantly. Foreigners skilled in both Japanese and English, and foreigners skilled only in English, appeared more likely to cite this information type as important for their decision making relative to the other groups. These two groups were also similarly more concerned with information related to food and water supply than the other groups. Significant differences could be

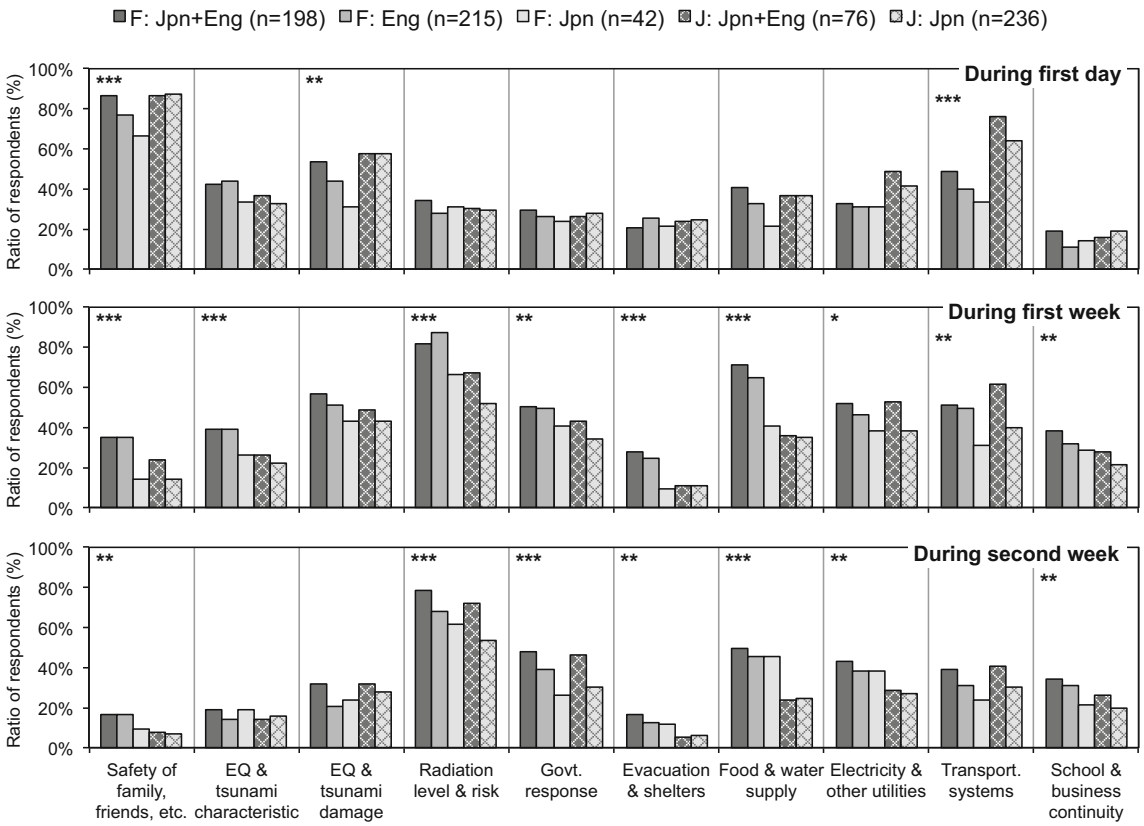


Fig. 4 Important types of information over time: first day, first week, and second week after the 2011 Great East Japan Earthquake. Chi square significance codes: ***$p < .001$, **$p < .01$, *$p < .05$

observed for other information types as well, but these were, in general, cited by a smaller percentage of respondents than the leading first day information types.

The percentage of respondents citing important information types dropped for nearly every information type, language proficiency, and nationality, from the first to second weeks. Radiation level and risk remained the most-cited information type for all groups, but while the percentage of respondents decreased for foreigners, it actually increased for Japanese respondents. No other information type was cited by more than half of the respondents in any of the language groups.

4.3 Sources of Information Gathering Difficulties

The sources of difficulties related to information gathering are shown in Fig. 5. The most-cited difficulty, on average, was: confused by conflicting or differing information. This was indicated by a similar ratio of respondents regardless of language proficiency. The largest disparity due to language proficiency was found for: couldn't understand (language ability). This obstacle was highly cited almost exclusively by foreigners skilled only in English. This was also the most-frequently cited difficulty for that group. Significant dependence of individual sources of difficulty on language proficiency were observed for the category: unable to access information, as well as couldn't understand (language ability) and unable to find information.

4.4 Open Response Analysis

In the previous section, the largest disparity between respondents occurred for foreigners skilled only in English. These respondents overwhelmingly cited the couldn't understand due to the language ability problem as a main source of disaster information-related difficulties, and they were the only group that did not utilize Japanese-language media modes. The open responses of these respondents were therefore analyzed to explore how foreigners skilled only in English tried to overcome the difficulties they encountered. It was found that they utilized three methods for understanding information that was originally available only in Japanese.

The first was via NHK (Japan Broadcasting Cooperation), Japan's only public broadcaster. For regular NHK General TV programs, two news programs are simultaneously translated into English using alternative audio. After the 2011 Great East Japan Earthquake, two additional news

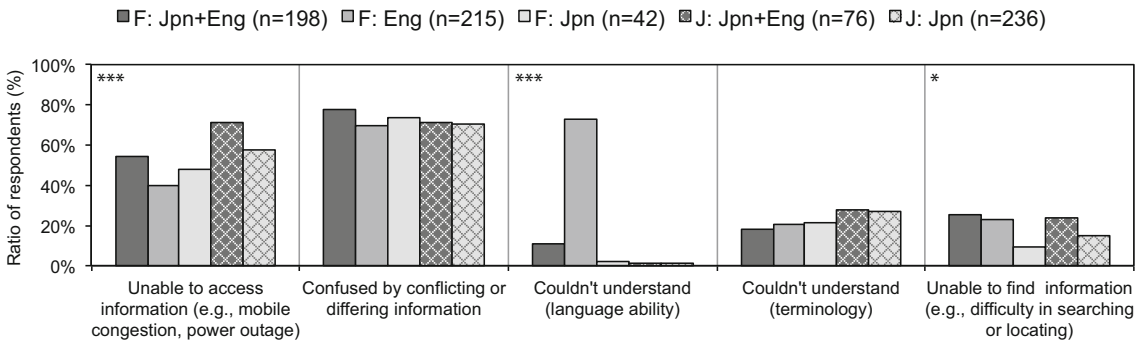


Fig. 5 Sources of information gathering-related difficulties encountered by survey respondents. Chi square significance codes: ***$p < .001$, **$p < .01$, *$p < .05$

programs were also translated into English simultaneously with extended airtime. In addition, NHK also broadcast the news briefings of the Tokyo Electric Power Company (TEPCO) and the press conferences of the Prime Minister with simultaneous English translation using alternative audio. NHK World, a 24-h English news program that normally can only be viewed outside Japan, was delivered after the earthquake via the Internet using sites such as Ustream, Nico Nico Douga (Niconico, an uploaded video-sharing service provided by Niwango), and Yahoo, as well as via cable TV in Japan through special arrangements with domestic cable TV companies. Through these supporting activities led primarily by the public broadcaster, there were a variety of Japanese news program choices that could be viewed in English for a period of time after the earthquake.

The second means was through the use of social media, such as Facebook, to collect or find domestic information that was translated into English by a third party. Several respondents cited the Fukushima Reactor Feed as a helpful and important information source after the earthquake. The Fukushima Reactor Feed was a Facebook page launched at noon on 12 March 2011, by a foreigner residing in Japan, with the intention of sharing information on the nuclear power plant crisis by translating news broadcasts and articles related to the situation in Fukushima. Some of this information included URLs referring back to the original information source, whereas some information was from other individuals' translation of domestic TV broadcasts and news articles. Similarly, some individuals and groups provided Japanese information by translating it into English on their blogs and websites. As a result, it was possible for foreigners skilled only in English to obtain domestic information originally in Japanese through informal translations by third parties, although the accuracy of these translations may have varied widely.

The third and final means was via automatic translation of Japanese text into English using translation software or translation applications within a web browser. In this case, it is difficult to obtain an exact translation of a Japanese sentence into an English one, but for some people it was possible to understand the approximate meaning by identifying keywords from the translation result.

5 Discussion

Building on the report and analyses of the survey results, this section examines the observed trends in media use and information importance in the context of the existing literature, and explores the effect of language proficiency on the information gathering behavior of foreigners. Implications and considerations for future improvement of disaster information dissemination are then discussed.

5.1 General Trends in Media Use and Information Importance

After the 2011 Great East Japan Earthquake, television and traditional Internet media were the most utilized media modes among the surveyed respondents, regardless of language proficiency and nationality. The widespread utilization of television falls in line with the previous literature, both inside and outside Japan, as well as for various types of disasters, and indicates that the social impact and expectation for TV as a primary information source remains high.

On the other hand, the usage rate of traditional Internet media was not much lower than that of television, which suggests that the utility of this media mode has increased, relative to recent disasters (Spence et al. 2008; Burke et al. 2010). Television, while visual and frequently occurring, is limited in its ability to disseminate localized and detailed information. Traditional Internet media may have played the role normally held by printed media, which was not as widely utilized by the respondents as television or traditional Internet media, by serving to disseminate facts and complement the general information available from

television. This result also must be considered in the context of the methodology; as the survey was distributed online, the sample group may be more inclined to use online information resources.

Media modes that do not rely on a steady supply of electricity, such as radio, printed media, and interpersonal, were noticeably less utilized than the aforementioned two media modes. The area surveyed in this study (the greater Kanto area) was not heavily damaged by the earthquake or the subsequent tsunami, and thus usage of electronic media (namely, television and Internet-based modes) could generally continue. Rotating blackouts, implemented in response to the energy supply shortage caused by suspension of nuclear energy generation, may have had some impact on information gathering behavior, as indicated by the common difficulty experienced by survey respondents, who were unable to access information (for example, due to mobile congestion and power outage). But the media mode preferences of respondent groups who more frequently indicated this difficulty were not notably different than other groups.

In the immediate aftermath of the earthquake, respondents were, generally, concerned with confirming safety and grasping the extent of damage, as well as the status situation of transportation systems. The importance of the first two information types in the day after the earthquake can be viewed as basic information-seeking behavior, and is consistent with previous studies. The importance of transportation systems should be examined in the context of the post-earthquake situation in the Kanto area. Despite limited direct damage in the Kanto area, train services—which are relied upon by millions of commuters—were suspended for hours or longer. Commuters working in the central business areas, but living in suburban areas, were forced to find alternative means of transportation home in the evening after the earthquake; anecdotal reports suggest that some people walked for hours just to return home. The reliance of millions of commuters on the extensive train system in the Kanto area, and the temporary suspension of services after the earthquake, thus led to many people relying on transportation-related information to direct their decision making on how to return home. Consequently, this may also have contributed to a high reliance on Internet-based media modes throughout the crisis, as these would have been the most reliable for obtaining updates on the transportation network.

Another notable trend could be seen for respondents in radiation level and risk, the importance of which increased dramatically after the first day. Although meltdown of the reactors at Fukushima Daiichi nuclear plant was not confirmed until several weeks later, explosions at Units 1 and 3 in the days following the earthquake led to immediate concerns about radiation exposure and the long-term safety of the affected populations. Concurrently, the situation at the nuclear power plant became the most-reported topic in the news 24 h after the earthquake. The increased importance of information on radiation level and risk is thus an indicator of the confusion and uncertainty regarding the situation at the nuclear power plant, and has been similarly observed after previous nuclear power plant disasters (Cutter and Barnes 1982).

5.2 Effect of Language Proficiency Among Foreign Respondents

The language skills of the foreign respondents were confirmed to be diverse, and media mode and language preferences were subsequently found to vary depending on their language proficiency. It can be concluded that the label of "foreigner" alone is not indicative of whether a foreign person in Japan has special needs for disaster information and support. Foreign respondents with Japanese language abilities similar to that of Japanese respondents shared similar preferences for Japanese-language media modes and similar information difficulties. Consequently, their needs may be more similar to the needs of Japanese citizens, and they may be covered by measures that target the general populace. Foreigners with both Japanese and English ability demonstrated the most diverse usage of media modes and languages, which suggests that they had access to the greatest amount of information resources. Even foreign respondents skilled in Japanese only used more media modes overall than Japanese respondents skilled in Japanese only.

On the other hand, it was found that foreign respondents without Japanese proficiency experienced unique challenges—they could not obtain information easily due to language difficulties. Foreigners skilled only in English tended to use similar English language media modes as foreigners skilled in both Japanese and English. These modes, however, may have played a much different role for foreign respondents skilled in English only—particularly Internet-based media modes. New information technologies proved to be highly beneficial to this group in the effort to overcome their language-related difficulties, because they were able to obtain some disaster information through translated broadcast contents or through an Internet environment that provided them with access to informal English translations of Japanese information as well as the tools to translate information themselves. Although the quality of these translations is uncertain, and thus it is unclear whether they could actually acquire the original information, the responses found in this survey indicate that the Internet played a strong role in their information-gathering activities. This may also represent a change in the utility of social media in disaster situations—from

merely serving as a forum to build personal connections and providing an outlet for emotional release, to helping people bridge the knowledge gap that forms due to a lack of skill in the local language.

Foreigners unskilled in Japanese may have had access to fewer information resources than respondents with Japanese language proficiency, but this did not have an impact on whether they were more or less likely to be confused due to conflicting or differing information. It may be expected that increasing information resources would increase the chances of encountering, and thus being confused by, conflicting or differing information, but the results found here showed little difference in the ratio of respondents who cited this information-gathering difficulty, regardless of nationality or language proficiency. Examination of information importance shows that, after the first day, concerns about radiation level and risk were predominant among all groups. Considering that respondents skilled in Japanese only were just as confused as respondents completely unskilled in Japanese, who were obtaining Japanese-language information through various means of unknown quality, then it stands to reason that this information gathering-related difficulty was not caused by the media mode or language used, but that the original information was the source of confusion and conflict. Previous nuclear disasters have demonstrated the need for accurate, timely, and transparent information dissemination during a crisis (Lester 1983). In the case of the 2011 Great East Japan Earthquake, failure to meet these standards may have further compounded the difficulties faced by foreigners residing in Japan.

5.3 Implications for Improving Disaster Information Dissemination

The analysis presented here showed that language proficiency clearly affected the information collection behavior of foreigners in Japan after the 2011 Great East Japan Earthquake. In particular, foreigners who were not skilled in the Japanese language experienced difficulties unique to their situation, but they were able to somewhat overcome these difficulties through a variety of media modes. Based on this understanding of how media modes were utilized for information gathering, the following points should be considered by organizations responsible for information dissemination to the foreign population in times of disaster.

First, although it seems self-evident, many disaster information issues observed during the 2011 Great East Japan Earthquake disaster may have been mitigated if there simply had been greater availability of official information from primary sources in English. As the de facto language for international communication, information dissemination in English is necessary, and the importance of providing the latest information in English is increasing, even in normal (nondisaster) times. Official information in English is useful not only for foreigners residing in Japan, but also for foreign news organizations. After the 2011 Great East Japan Earthquake, there were cases where foreign news organizations reported the situation in Japan by collecting comments from non-Japanese Facebook users residing in Japan, or by interviewing foreigners who were evacuated from Japan. These situations occurred due to the shortage of English information available to foreign media from domestic sources, and contributed to damaging reputations as a result of misleading or inaccurate reports by foreign media. Disseminating official English information can provide an important source for foreign media, as well as foreigners residing in Japan, and lead to more reliable information dissemination overseas by reducing or preventing the delivery of incorrect or sensational information.

Platforms such as social media and translation applications were used by foreigners unskilled in Japanese to obtain access to translated Japanese information. Because translated information was distributed through the Internet (mainly on social media) after the earthquake, information in Japanese may still be disseminated to those unskilled in Japanese, in some form, if the information is frequently delivered in an appropriate and clear manner on an official website. Such information should be: (1) aware that it will be used for translation by third parties; (2) in clear Japanese and avoiding circumlocution; and (3) containing not only facts but also links to content on decision making and concrete response actions. Previous studies have suggested that information providers tailor their disaster messages to consider the differences in socioeconomic characteristics of their intended audience (Lachlan et al. 2010), and the results found here suggest that language proficiency is another factor that should be considered. The observed information translation activities after the 2011 Great East Japan Earthquake were mainly in English. But the population of foreigners in the Kanto region contained many speakers of Chinese, Korean, Portuguese, and Tagalog. These other major languages represent major communication opportunities into which disaster information could be translated. Provision of clear and appropriate Japanese information in multiple languages would thus enable people of many more nationalities to utilize the various tools available to translate Japanese information into their own language, although the accuracy of said translation may still be unclear.

Secondary sources of information—such as universities and research institutes—served an important role in the aftermath of the earthquake, both for students of those universities and for the general public (Gomez 2013). In the future, they may be expected to actively provide information not only within Japan but also outside Japan.

For example, secondary publishing of reliable, translated information in English via the Internet could be an effective means of information dissemination, if university and research institutions were to coordinate information provision from the main Japanese organizations. Such a multilingual disaster information service was provided by the Center for Multilingual Multicultural Education and Research, Tokyo University of Foreign Studies, for 3 months after the 2011 Great East Japan Earthquake. Broader announcement of such activities may have been necessary in future disaster events, because no foreign respondents in the sample mentioned this service in their open response.

6 Conclusion

Although there is a body of literature focusing on populations with unique needs in times of disaster, the findings presented here offer a new perspective by focusing on language proficiency, and how proficiency in a local language, or lack thereof, may affect disaster information gathering behavior and needs, through an investigation conducted after the 2011 Great East Japan Earthquake. The survey found that foreigners proficient in Japanese demonstrated similar information gathering behavior as Japanese respondents, and thus their needs may be covered by conventional disaster mitigation planning that focuses on the general Japanese population. On the other hand, foreigners unskilled in Japanese encountered more difficulties due to the language barrier, although they found unique utility in the employment of Internet-based methods for overcoming that barrier. The simplest method to improve future policy and planning for disaster information management would be to increase the provision of information in English or other languages. When only Japanese-language information is shared, then the information provider should be aware that people unskilled in Japanese may use various methods to obtain that information in another language, and prepare their information accordingly to facilitate that translate.

Many barriers to disaster information collection and decision making still remain for foreign populations—both in Japan and in other disaster-prone countries with more diverse populations. Although this study has several limitations, the results form a starting point for future consideration and research by demonstrating how lack of local language proficiency may be a potential source of difficulty during disasters.

Acknowledgements This investigation was partially supported by the Japan Society for the Promotion of Science (Challenging Exploratory Research, "Investigation on disaster information dissemination to foreigners after the great earthquake in the Tokyo metropolitan area," Project No. 25560161). The authors would like to express their gratitude to all those who assisted and cooperated with the preparation, distribution, analysis, and discussion of the survey investigation and its results. In particular, the authors would like to thank Mr. Takuya Iyama (formerly of the Graduate School of Engineering, The University of Tokyo) for his assistance in summarizing the questionnaire results and Dr. Takanobu Tanaka (NHK Broadcasting Research Institute) for providing information about NHK's broadcasting activities in foreign languages during disasters.

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