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Research Article

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Data literacy and disaster: information access and evaluation skills of earthquake survivors in Turkey

Abstract

This study investigates the information access, reliability, scientific data accessibility, and data literacy skills of individuals affected by the 2023 Turkey earthquake. Using qualitative methods, 14 earthquake survivors participated in semi-structured interviews. Varied perceptions highlighted the importance of how communication sources are perceived, emphasizing the need to address information gaps. Evaluating media effectiveness, including social media, television, and radio, revealed the influential role of social media and the importance of reliable sources. Trust in accessing scientific data underscored the significance of renowned scientists. The study emphasized the urgency to enhance disaster communication, media effectiveness, scientific data access, and data literacy skills, with a focus on scientists and reliable sources to mitigate the impacts of disasters.

Keywords: earthquake, disaster communication, information and education, social capital, data literacy

Volume 8 Issue 1 - 2024

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Received: February 02, 2024 | **Published:** February 20, 2024

Introduction

In societies affected by natural disasters like earthquakes, access to accurate information is crucial for decision-making and survival. Quick and reliable information, trusted from sources such as scientists and authorities, is vital during these events.[1–4] The trust of earthquake victims in scientific data, politicians, and local authorities is pivotal for effective disaster management.[5–7] This research explores earthquake survivors' data literacy skills and trust in information, contributing to better preparedness and response during natural disasters. Emphasizing decisions based on scientific knowledge is integral to disaster management and preparedness. Science plays a crucial role in comprehending, predicting, and preparing for natural disasters, yet navigating the information remains complex.[8–10] Understanding how earthquake survivors respond to scientists' data and recommendations is pivotal. The transparent nature of science, with open processes and rigorous methods, ensures the reliability of results. Hence, pre and post-earthquake data literacy is vital in shaping survivors' trust in scientific data. This research aims to uncover insights into the interplay between the nature of science and earthquake survivors' information and data approaches, contributing to more effective disaster mitigation strategies. Today, data literacy is integral to effective decision-making processes.[11–14] For earthquake survivors, overcoming challenges relies on their ability to comprehend, interpret, and use data effectively. However, these skills may not be uniformly accessible. Therefore, cultivating and reinforcing data literacy is crucial, particularly for individuals in disaster-prone areas. Accurate data interpretation plays a key role in mitigating disaster impacts and ensuring public safety. Understanding the data literacy levels of earthquake survivors and the role of these skills in disaster preparedness and response is essential. This knowledge empowers survivors to respond in an informed and knowledgeable manner, contributing to the creation of more resilient communities.

Elevating the quality of education, teaching, and learning stands as a paramount goal for building a more resilient society in the face of disasters and earthquakes. Utilizing data to enhance educational quality highlights the pivotal role of data literacy as a significant facilitator or barrier. To fully unlock the potential of data utilization, it is imperative to identify incentives for facilitators and eliminate barriers, ensuring sustained data use. Data literacy, defined as the capacity to understand, interpret, critique, and effectively use vast data in the information age,[14] plays a central role. In the contemporary era, characterized by widespread visual abilities and personal computing, the importance of physical and psychomotor skills has diminished, emphasizing the significance of cognitive, social, and affective dimensions, particularly in skills such as data literacy.[15,16] Data literacy holds paramount importance across various fields today, encompassing fundamental skills.[17–20]

1. **Data Collection:** Proficiency in acquiring data from diverse sources, including surveys, observations, interviews, and online databases.
2. **Data Understanding:** Capability to interpret various data types, such as numbers, graphs, tables, and text. This involves comprehension of data collection, processing, and presentation methods.
3. **Data Curation:** Competence in evaluating the reliability and accuracy of data, questioning its sources and collection methodologies.
4. **Data Utilization:** The skill to make informed decisions based on collected data. This involves problem identification, analysis, and solution development through data.
5. **Data Visualization:** Ability to effectively communicate data using visual tools like graphs, tables, or maps, serving as a crucial method for conveying data to a broader audience.

For earthquake survivors, data literacy is a crucial skill that aids in evaluating information before, during, and after an earthquake, enabling informed decision-making in crisis situations. This skill is particularly significant in addressing global challenges such as climate change, sustainability, and disaster literacy,[21–23] which represent some of the most pressing issues of our time. Natural disasters, notably earthquakes, have profound effects on human life and the environment, requiring swift and effective responses based on accurate information. However, the challenges of information pollution and misinformation during and after disasters can hinder survivors' access to reliable sources and erode trust in information. Additionally, the data literacy

skills of disaster survivors play a crucial role in their ability to cope with the aftermath of the disaster. This study explores the role of data literacy in addressing the complex issues of climate change, sustainability, and disaster management, utilizing the experiences of earthquake survivors. It investigates how survivors access and trust scientific information, warnings, and provided information. The research aims to enhance understanding of the impact of data literacy skills in addressing challenges related to disasters and contribute to better disaster preparedness and crisis management. The findings are expected to offer valuable insights for policymakers and educators, providing recommendations on improving data literacy during and after disasters. The study emphasizes the problem of earthquake survivors' access to data, their trust in data, and their utilization of data literacy skills before and after the disaster. It aims to provide evidence-based suggestions to help societies better prepare for disasters, effectively manage post-disaster processes, and underscore the importance of data literacy in navigating complex disaster scenarios. This research holds significance for disaster management and supporting earthquake survivors, emphasizing the need for improved data literacy in disaster-prone areas. The overarching goal of this research is to comprehend the information access, reliability, access to scientific data, and data literacy skills of earthquake survivors both before and after the disaster, aiming to propose enhancements in these domains. Aligned with this overarching objective, the specific sub-objectives of the research are outlined as follows:

1. Assessing the perceived accuracy and reliability of information received by earthquake survivors during or after the event, along with gauging the extent to which they questioned the information.
2. Investigating how earthquake survivors appraise the effectiveness of information obtained from media sources, including social media, television, or radio post-earthquake, and identifying which media sources garner more trust.
3. Identifying the preferred sources or individuals that earthquake survivors turn to for understanding and interpreting scientific data following the earthquake.
4. Understanding the actions taken by earthquake survivors to enhance their data literacy skills both before and after the disaster.

Method

A qualitative approach was adopted in the study and data were collected through semi-structured interviews with earthquake survivors. The data were interpreted through content analysis.

Study group

The study was conducted with 14 earthquake survivors who survived the February 6, 2023 earthquake in Hatay, Turkey. Nine earthquake survivors escaped from heavily damaged buildings, two from moderately damaged buildings and three from slightly damaged buildings and survived. The reason for the selection of the study group from Hatay is that Hatay is the province where the earthquake caused the most destruction, and the proportion of buildings built before 2001 in Hatay is 46.1% and the proportion of buildings built after 2001 is 50%.[24] The decision to focus on Hatay was influenced by its status as the province with the highest levels of destruction and loss of life.[25,26]

Data collection

The interview form developed by the researchers was used for the qualitative data needed in the study. Expert opinion was taken for the reliability and validity of the interview form. Data were collected by asking the earthquake survivors the questions in the semi-structured interview form consisting of nine questions. Some of the questions in the interview form were prepared as probing questions to provide more detailed and in-depth information. No scaling was made for the answers given to these questions. The questions are as follows in order:

1. How accurate and reliable was the information you received during the earthquake? Did you question this information?
2. How effective was the information you received from media sources such as social media, television or radio after the earthquake? Which data and news sources do you trust more?
3. Which sources or people did you prefer to understand and interpret scientific data after the earthquake?
4. What can we do to improve your data literacy skills before and after the earthquake?
   a. What do you think data literacy is?
   b. Which resources or trainings would you prefer to improve your data literacy before and after the earthquake?

Data analysis

In this study, qualitative data obtained from interviews with 14 earthquake survivors were analyzed using a content analysis approach. The analysis involved coding and categorization, following the fundamental steps of content analysis. Themes were identified to systematically analyze and comprehend the data, aligning with the research questions and establishing a framework for interpreting the interview data. The coding process began with a meticulous examination of each interview, identifying keywords or phrases associated with the themes. These codes encapsulated the essence of each interview. After the coding phase, the frequencies of each code were computed, offering insights into the occurrence rates and emphasizing prevalent themes. Frequency analysis facilitated the summarization of data and extraction of key findings. Tables were subsequently generated to visually represent the results of the frequency analysis, serving as a valuable tool in presenting and interpreting the research data.

Findings

In order to determine how accurate and reliable earthquake survivors found the information they received during or after the earthquake and how much they questioned the information, earthquake survivors were asked the question "How accurate and reliable did you find the information you received during the earthquake? Did you question this information?" Based on the data obtained from the interviews, the themes and codes related to how accurate and reliable earthquake survivors found the information they received during the earthquake and how much they questioned this information are given in Table 1.

Analysis of the qualitative data in Table 1 reveals diverse perspectives among earthquake survivors regarding the reliability of information received. While some found the information partially accurate, others lacked trust entirely, highlighting varied perceptions of information sources and communication methods. The awareness among survivors to question information is evident, particularly when faced with contradictory details. This underscores the need for more consistent and clear information strategies. Reports of a lack of information during the earthquake emphasize the necessity for more effective emergency information planning by communication and information teams. Expressed distrust in statements from politicians and the government emphasizes the importance of ensuring trustworthy and politically independent crisis communication processes. The

Citation: Karacaoglu OC, Ozkaya A. Data literacy and disaster: information access and evaluation skills of earthquake survivors in Turkey. *Sociol Int J.* 2024;8(1):28–37. DOI: 10.15406/sij.2024.08.00373

impact of social media on survivors' trust is notable, with a cautious approach indicating the need for careful handling of social media platforms in disaster information strategies. In conclusion, these insights suggest measures to enhance disaster communication and information processes, ensuring information reliability and integrity. This understanding of survivors' trust and questioning tendencies can guide the improvement of crisis communication strategies during and after earthquakes.

To assess the effectiveness of information received after the earthquake, survivors were asked about their perceptions of media sources such as social media, television, or radio. They were also queried about their trust in these sources, with the question: "How effective was the information you received from media sources such as social media, television or radio after the earthquake? Which data and news source do you trust more?"

Based on the data obtained from the interviews, the themes and codes related to how accurate and reliable earthquake survivors found the information they received during the earthquake and how much they questioned this information are given in Table 2.

Table 2 qualitative analysis reveals diverse perceptions among earthquake survivors regarding the impact and trustworthiness of information from media sources. Some participants find social media deeply affecting, while others express concerns about information pollution and misinformation, indicating a lack of trust in these platforms. Traditional media sources like television and radio are acknowledged for their influence, albeit some participants report increased concerns from the content they provide. Trust is placed in scientists, official media like TRT News, and scientifically based information, emphasizing the significance of expert opinions. However, a notable distrust towards social media persists, highlighting the ongoing perception that it is not a reliable post-earthquake information source. This analysis illuminates the varying influences and trust levels associated with media sources among earthquake survivors. The impact of social media and credibility concerns are crucial considerations for optimizing disaster communication and information strategies. Insights from this information can guide media and authorities in developing more effective communication strategies during and after disasters.

In order to determine which sources or people earthquake survivors preferred to understand and interpret scientific data after the earthquake, earthquake survivors were asked the question "Which sources or people did you prefer to understand and interpret scientific data after the earthquake? " was asked. Based on the data obtained from the interviews, the themes and codes related to how accurate and reliable earthquake survivors found the information they received after the earthquake and how much they questioned this information are given in Table 3.

Table 3 qualitative analysis unveils earthquake survivors' strategies for accessing scientific data and their preferences in understanding and interpreting such information. Post-earthquake, participants heavily favored the internet for its quick information access capabilities. Some chose to watch scientists like Prof. Dr. Naci Görür on television, reinforcing the role of television in disseminating scientific information. Emphasizing trust, participants singled out specific scientists such as Prof. Dr. Naci Görür and Prof. Dr. Celal Şengör. The high confidence placed in these experts underscores the significance of well-known scientists in shaping perceptions. Respondents expressed a preference for scientists' own explanations, highlighting the pivotal role of scientists in comprehending and interpreting scientific data. This data provides crucial insights into effectively communicating scientific data on disasters to the public, emphasizing the importance of renowned scientists and reliable scientific sources. Understanding these preferences can enhance public awareness and ensure access to accurate information during and after earthquakes.

In order to determine what earthquake survivors did to improve their data literacy skills before and after the disaster, the questions "What can we do to improve your data literacy skills before and after the earthquake?", "What do you think data literacy is?", "What resources or trainings would you prefer to improve your data literacy before and after the earthquake?" were asked. Based on the data obtained from the interviews, the themes and codes related to what earthquake survivors did to improve their data literacy skills before and after the disaster are given in Table 4.

Table 4 qualitative analysis unveils earthquake survivors' actions to enhance their data literacy skills and awareness on this matter. The majority state they haven't undergone specific data literacy training, signaling a potential lack of widespread training or low awareness. Participants express a limited understanding of data literacy and reveal little effort in addressing this gap. Some define data literacy as "collecting data and turning it into information," while others admit to having no knowledge of the concept. Those aiming to boost their data literacy prefer scientific publications, statements from scientists, and information from universities, showcasing an inclination toward reliable sources. Some participants seek improvement by following publications and journals of geological engineers, highlighting the importance of trusting scientific authorities' opinions. These findings underscore the overall lack of awareness among earthquake survivors regarding data literacy, indicating a need for education in this area. The interest in scientific resources and experts suggests a promising avenue for data literacy education and awareness-raising initiatives. Developing data literacy skills before and after earthquakes emerges as a crucial aspect for accessing and understanding accurate information.

Table 1 Views of earthquake survivors on the accuracy of the information received during and after the earthquake

Themes	Codes	Opinions
Information Reliability	Reliability of information	I found the information we received during the earthquake to be partly accurate and reliable.
	Insecurity of information	I never found the information during the earthquake reliable.
Questioning Information	Questioning information	We questioned the information we received.
	Questioning due to conflicting information	The constant inconsistent information caused us to question the information we received.
Lack of Information	Lack of information	There was no information provided to us during the earthquake.
Distrust of Political Statements	Distrust of political statements	The statements made by politicians and the government were in no way convincing or satisfactory to us. As someone who lived through the earthquake, their statements created distrust.
Impact of Social Media	Impact of social media	I found 50% of the information we received reliable. I was following them on social media. That's why I didn't find it completely reliable.

Table 2 Earthquake survivors views on the effectiveness and reliability of the information they received from media sources after the earthquake

Themes	Codes	Opinions
Media Sources and Effectiveness	Social media impact	What I saw on social media affected me deeply.
	Television and radio effect	The television and radio images affected me and my anxiety increased.
	Information pollution and insecurity	I have no trust in social media in general.
Trust in Media Sources	Trust in scientists	I trust the statements of scientists and TRT News more.
	Trust in scientific knowledge	I trust scientific sources.
	Social media and insecurity	I didn't trust social media.

Table 3 Earthquake survivors views on which resources or people were preferred after the earthquake

Themes	Codes	Opinions
Ways to Access Scientific Information	Internet resources	I used mostly the information I obtained from the internet as a source.
	Television	After the speeches of scientists such as Naci Görür on TV, I searched on the internet.
Credibility of Scientists	Names of scientists	I follow Prof. Dr. Naci GÖRÜR and Prof. Dr. Celal Şengör.
	Don't trust scientists	I trust Prof. Dr. Naci Görür.
Meaning and Interpretation of Scientific Knowledge	Understanding and ınterpreting scientific data	I preferred the statements made by scientists themselves.

Table 4 Earthquake survivors' views on what was done to improve data literacy skills before and after the disaster

Themes	Codes	Opinions
Data Literacy Education and Awareness	Lack of education	I did not work on this issue before and after the earthquake.
	Lack of Information	I have not made any special efforts in this regard.
	Opinion uncertainty	I have no idea about this.
Definition of Data Literacy	Data literacy definition	What is data literacy? Being informed when you collect data.
	Information need	I have no idea.
Data Literacy Resources	Source preference	Scientific publications and statements by scientists, universities.
	Scientists and books	By following the journals and publications published by geological engineers.

Results and discussion

Based on the findings of the research, a number of important conclusions were reached about earthquake survivors' perceptions of and evaluations of the information they received during and after the earthquake. The results were discussed with the literature to determine how accurate and reliable earthquake survivors found the information they received during and after the earthquake and how much they questioned the information. Examining earthquake survivors in Erzincan, another city where data was collected, revealed a connection between damage expectations, perceived control, and trust in authorities. Contrary to predictions, past experiences did not consistently influence earthquake perception and preparedness.[27,28] Noting that the role of trust in natural disaster risk management has not yet been widely studied, shows that people with high trust in the government tend to perceive the consequences of possible earthquakes less and to prepare less. Trust in stakeholders and social support are fundamental but neglected factors that shape people's disaster protection behaviors such as mitigation and preparedness.[28] Emphasized that trust in government and external helpers is positively associated with perceived risk and adaptation of preparedness actions. Informal social support is negatively associated with self-reported preparedness and the perceived likelihood and consequences of potential earthquakes. Investigating information sources and communication methods, the study gauged their effectiveness and the trust survivors placed in them. The trustworthiness of communication sources influences the preparedness and reactions of survivors. Trust emerges as a crucial component in social cohesion during disasters, facilitating collective action. Research by Gero, et al.,[28] highlighted the importance of social interaction between old and new community residents to prevent the erosion of social cohesion after disasters.[29] Findings emphasized survivors' low quality of life and high trust in government work, underscoring the need for effective governance to enhance survivors' well-being. In summary, the study revealed diverse levels of trust among earthquake survivors, indicating the need for tailored communication strategies. Trust in authorities and social cohesion play pivotal roles, necessitating programs to foster meaningful interactions among community residents for enhanced disaster resilience. Effective government work remains crucial for improving survivors' quality of life and fostering increased trust. According to Bozkurt,[30] strong social solidarity was observed in the region after the February 6 earthquake in Turkey. Some anti-social behavior was observed in the first days, but was quickly brought under control. Psychological symptoms such as insomnia, anxiety, fear, nervousness, irritability and concentration problems were commonly identified in interviews among earthquake survivors. Women, children and the poor were more negatively affected than other groups. The meaning attributed to the earthquake varied according to the level of education, income and religious affiliation. While some participants attributed the cause of the earthquake to natural factors, lack of supervision and rotten buildings, the majority perceived the earthquake as a consequence of sins or a punishment from God.

The study reveals varied perceptions and trust levels among earthquake survivors, indicating individual differences in how information is evaluated and trusted. These differences may reflect how communication sources are perceived. The research emphasizes that earthquake survivors tend to question and carefully assess the accuracy and reliability of information. It also provides insights into how survivors perceive information sources and communication methods, influencing their preparedness and reactions. Recognizing

these intra-community differences is crucial for tailored disaster management and communication strategies.

Earthquake survivors' access to trustworthy information significantly impacts disaster preparedness. Thus, communication strategies should be designed based on the specific needs and perceptions of survivors.[27–28,31,32] The research outcomes offer valuable insights for enhancing disaster management and communication strategies, emphasizing the importance of aligning these strategies with the preferences and trust levels of earthquake survivors.

Earthquake survivors exhibit a heightened awareness, questioning information, particularly when faced with contradictions. This underscores the need for more consistent and clear information strategies. Some participants highlighted a lack of information during the earthquake, emphasizing the necessity for communication teams to devise more effective emergency information plans. Regarding social media, participants approached information cautiously, expressing limited trust. This suggests a need for careful consideration of social media platforms in disaster information strategies. Hernandez-Suarez, et al.,[33] stress the role of social media in monitoring natural disasters, citing its potential to contribute vital information for relief efforts. Their study proposes a Twitter-based sensor to detect disaster-related data, showcasing the value of leveraging social media in disaster response. Highlighting the growing significance of online social networks, Hernandez-Suarez, et al.,[34] proposed an innovative method that utilizes Twitter as a social sensor system for disaster response. This method employs a kernel density estimation function to score the locations of social media posts related to different subtopics arising from natural disasters, mapping them to specific geographic areas. The development of such communication methods has the potential to save numerous lives. In the aftermath of catastrophic natural disasters, the "Golden 72 Hours" become crucial for emergency rescue operations. Quick and efficient rescue efforts are vital for those trapped under collapsed buildings or landslides. Survivors evacuated to shelters require life-support supplies and communication for various reasons. Unfortunately, the loss of communication systems and information networks poses significant challenges, often resulting in delayed rescue operations and tragic loss of lives.[35]

In our study, some participants expressed skepticism towards statements made by politicians and the government. This underscores the crucial need for crisis communication processes to be trustworthy and independent of political interference. Examining the aftermath of the devastating earthquake in Turkey on August 17, 1999, which claimed over 17,000 lives, Jalali[36] investigated the responses of various public and private organizations, including state institutions, non-governmental organizations, and the media, to the needs of earthquake victims. The research revealed that the state's response to the disaster underwent different stages, ranging from incompetence to effective management. The study credits the media and civil society organizations for acting as advocates for survivors and advocating for changes at the national level. It argues that an ideal response system meeting the needs of victims can only be achieved through cooperative and adversarial state-civil society relations. Notably, in the elections held on May 14, 2023, immediately following the earthquake on February 6, 2023, politicians in power both nationally and in the earthquake-affected zone received the highest number of votes. Similar trends have been observed in other countries, including China, Taiwan, Nepal, and Chile.[5–6,37] Research conducted by You et al.,[6] revealed a significant increase in public trust in government officials at all levels after the earthquake. This rise was attributed to the "rallying around the flag" effect and extensive media coverage. State media played a crucial role during the crisis, with citizens who received more coverage in official media expressing higher political trust. However, differences in the division of labor between local and state governments regarding disaster relief led to varying levels of trust growth. Local-level governments, directly responsible for rescue and post-earthquake relief, experienced the most substantial gains in political trust, while state-level officials saw comparatively smaller increases. The initial surge in political trust diminished over time, emphasizing the importance of sustained efforts to establish good and effective governance for consolidating political legitimacy.[5] Research suggested that the continuity of incumbent politicians is not unconditionally threatened by earthquakes; rather, it can be leveraged. Local governments with higher human capital endowments and better post-disaster assessments were more likely to be re-elected.[38] In contrast, argued that political trust is conducive to cooperation and is vital in emergency and disaster management. The impact of disasters on political trust, however, is complex. After the devastating earthquake in southwest China on May 12, 2008, where the national government's swift response was praised, local government confidence faced challenges. Political trust tended to polarize at the local level, influenced by factors such as role abandonment, pre-existing mistrust, the behavior of local officials, and the gap between public expectations and the local government's capacity to deliver disaster relief. Implementing easily accessible and widely covered disaster relief models emerged as a strategy to boost political trust in the aftermath of extreme tragedies. Addressing challenges in policy implementation at the local level and facilitating information exchange across governments are critical for building and maintaining public trust. The research results offer valuable insights for enhancing the effectiveness of disaster communication and information processes, ensuring information reliability and integrity, and providing better guidance for earthquake victims. Implementing the following measures can contribute to a more robust crisis communication strategy during and after earthquakes.

Wang and Li'[7]s findings emphasize the significance of survivors' social capital and perceived fairness of government relief policies in shaping post-disaster life satisfaction trajectories. High social capital among survivors is associated with initially higher life satisfaction and a more gradual rate of change. Additionally, the perceived fairness of government policies impacts life satisfaction, with survivors perceiving unfair policies showing lower satisfaction initially, but experiencing a faster rate of change in satisfaction over time. The fairness of government policies moderates the relationship between social capital and changes in life satisfaction, highlighting the importance of fair aid policies in mitigating the negative impact of individual social capital deficiencies on life satisfaction. To promote increased life satisfaction among survivors, enhancing social capital and ensuring fairness in aid policies are essential. Han, et al.,[39] research identifies significant correlations between responsibility attribution and risk perception, particularly concerning the perceived probability of earthquakes. However, variables such as disaster experience, family income, and education level consistently exert more substantial effects. Rayamajhee and Bohara[36] underscore the critical role of social capital in enabling self-governance and enhancing resilience in post-disaster scenarios. Collaborative efforts involving the private sector, citizens, and public institutions are pivotal in addressing the collective burden of reconstruction and recovery. Incorporating these findings into disaster management strategies can contribute to more effective communication and improved outcomes for earthquake survivors.

Based on the research results, several measures can be taken to make disaster communication and information processes more effective, ensure the reliability and integrity of information, and

provide better guidance in meeting the needs of earthquake victims. This analysis provides important insights on how to share information more effectively to develop a better crisis communication strategy during and after the earthquake. Similarly, a study by Wang and Li[7] examined the factors affecting survivors' life satisfaction. This study analyzed the relationships between social capital, perceptions of the fairness of government aid policy, and other variables. The results showed that social capital and the perception of fairness of the relief policy had significant effects on survivors' life satisfaction. This emphasizes the importance of developing social capital and ensuring the fairness of aid policy in post-disaster recovery processes. Improving communication strategies and ensuring effective information dissemination is crucial for disaster mitigation and survivor preparation. Additionally, enhancing social capital and implementing fair government policies positively impact post-disaster recovery and survivors' life satisfaction. These insights guide the development of effective disaster management and crisis communication strategies to better meet the needs of survivors.

The results of the study, which was conducted to determine how earthquake survivors evaluate the effectiveness of the information they receive from media sources such as social media, television or radio in the aftermath of the earthquake and which media sources they trust more, were discussed with the literature. Social media significantly impacts disaster information and interaction among earthquake survivors. Participants acknowledge its emotional and psychological effects, with content rapidly spreading. While some distrust social media due to concerns about information pollution and misinformation, the 2011 East Japan Earthquake highlights its positive role as a lifeline for affected individuals. Social media served critical functions such as safety determination, locating displaced persons, providing damage information, and supporting various relief efforts.[40] Social media's credibility may have waned in recent decades, with challenges highlighted by Gao, et al.,[41] for effective aid coordination, accuracy, and safety. Conversely, Yates and Paquette[42] stress that social media technologies show promise in enhancing public participation in disaster response, particularly within formal organizations. Properly used, social media supports faster decision cycles and provides more comprehensive information sources.

Some earthquake survivors in our study express greater trust in traditional media (television and radio), citing concerns raised by images and news from these sources. This underscores the crucial role of media organizations in informing and raising public awareness during disasters. Survivors lean towards televised explanations by scientists, highlighting television's vital role in providing widespread access and comprehension of scientific data. Television serves as a key platform for experts to convey scientific information to a broad audience. Budak[43] emphasizes the news media's responsibility in reducing natural disaster damages and providing accurate information to society. However, the success of the media in delivering science-based disaster journalism for the public good is a subject of debate. Our findings indicate that the Turkish media, in covering earthquakes, tends to approach them politically and emotionally, lacking a qualified, scientific, and in-depth understanding in disaster reporting.

In our research, we assessed the effectiveness of various media sources, including social media, television, and radio. While acknowledging the impactful role of social media in rapidly disseminating information, caution was stressed due to concerns about information pollution and the necessity of relying on reliable sources. Li and Rao's[44] study, specifically focused on Twitter, highlighted the superiority of social media over mainstream channels during the 2008 Chinese earthquake, even reporting the initial tremor before traditional news outlets. The research concluded that social media, particularly micro-blogging platforms, can effectively complement and, under specific conditions, replace traditional communication channels. Similarities exist between Li and Rao's[44] study and ours, as both emphasize the crucial role of social media, especially micro-blogging, in promptly and efficiently communicating disaster news. Both studies underscore the rapid responsiveness of social media in information dissemination and highlight concerns about information quality and credibility. Social media facilitates quick and accessible information flow, but both studies caution against information pollution and the potential circulation of irrelevant or false information on these platforms. This emphasizes the importance of users exercising caution and verifying information from reliable sources. Information pollution poses a significant challenge for earthquake survivors, emphasizing the need for careful evaluation of information in the post-earthquake period. Hall, et al.,[45] further found that specific types of media use and content are associated with posttraumatic anxiety disorder after natural disasters.

Earthquake victims need reliable information and sources. Trust in scientists' explanations and scientific sources is critical for crisis communication. These results emphasize the need to develop disaster communication and information strategies. Both social media and traditional media sources have the potential to provide effective and reliable information to earthquake victims, but these processes should be managed more carefully given the information pollution and the need for reliable sources. It is clear that scientists, official sources and expert opinions play a central role in disaster communication. Communication based on science-based information can help earthquake victims to be better informed.

The research highlights the significant impact of social media on disaster information and interaction among earthquake survivors, despite concerns about mistrust and information pollution on these platforms. While social media is influential, there is a notable group of respondents who express greater trust in traditional media sources such as television and radio, emphasizing their crucial role in accessing and comprehending scientific data. Trust in scientists' explanations and scientific sources emerges as a critical factor in effective crisis communication. Both social media and traditional media have the potential to offer reliable information to earthquake victims, but the study underscores the importance of managing these processes carefully, considering the risks of information pollution and the imperative for dependable sources. The central role of scientists and official sources in disaster communication is emphasized, highlighting the significance of communication based on scientifically grounded information for better informing earthquake victims. The results obtained based on the research findings, which were obtained to determine which sources or people earthquake survivors preferred to understand and interpret scientific data after the earthquake, were discussed with the literature.

Earthquake survivors prefer the internet for accessing and understanding scientific data, benefiting from its fast access and abundant resources. The widespread availability of post-disaster information on online platforms underscores the critical role the internet plays in this context. Ruzek and Yeager[45] highlighted the potential of the internet and mobile technologies in offering mental health support, especially in resource-constrained settings. Despite challenges in deploying these technologies on a large scale, studies indicate their effectiveness in developing, evaluating, and delivering mental health services. In the aftermath of the 2008 Sichuan earthquake, netizens actively engaged in various disaster response activities, showcasing the internet's role in crisis situations. Qu,

et al.,[46] investigated a prominent Chinese discussion forum in the first week after the earthquake, employing both quantitative and qualitative approaches. They introduced a new message classification scheme to categorize 2,266 discussion threads. The study identified and examined four crucial roles played by the forum, drawing design implications for disaster response systems. Demonstrating the effectiveness of the internet and online platforms, the US Navy utilized an online discussion forum for coordination and information sharing with civil society organizations during the relief efforts following the Haiti Earthquake on January 12, 2010. This highlights the potential of forum-style technology in future crisis situations.[47]

Participants express trust in specific scientists, particularly well-known ones, which greatly influences their trust in scientific explanations. The prominence of scientists is crucial for access to reliable information, and they play a central role in communicating scientific data post-disaster. Trust in well-known scientists and reliable sources is emphasized, highlighting their importance in presenting scientific information in an accessible way for the public.[48] emphasized the vital role of scientists in disaster management, underlining the importance of their communication skills and credibility. The collaboration among research organizations enhances networking capacity for response and recovery, providing a valuable counterbalance to the blame attribution common after disasters. This collaborative approach fosters evidence-based disaster risk reduction policies by allowing a rigorous investigation of systemic factors contributing to the disaster.[49–,52]

Respondents express a strong need for reliable scientific sources, highlighting the crucial role of scientists and scientific publications in providing trustworthy information post-disaster. Birkland[53] emphasizes the importance of publishing scientific data after a disaster for effective learning. Fallou, et al.,[54] stress the need for stronger collaboration between citizens and scientific communities for efficient data sharing on disasters, considering the cultural context. The research results underscore the public's demand for access to and understanding of scientific data post-disaster. Scientists and reliable sources are central to information processes, with media tools like the internet and television playing key roles in reaching the public. The ability of scientists to convey scientific data clearly is critical for developing effective post-disaster information and awareness strategies.

According to the results of the research on the preferences of earthquake survivors for accessing and understanding scientific data, earthquake survivors especially prefer the internet to access and understand scientific data. The internet offers a great advantage in terms of fast access to information and a variety of sources, and the fact that post-disaster information is more widely available on online platforms shows that the internet plays a critical role. The statements of scientists and trust in scientific sources are also emphasized, especially trust in well-known scientists, leading to a great deal of confidence in the statements of these experts. The results emphasize the importance of scientists and reliable scientific sources in providing reliable information to people in the post-disaster period. It is noted that media tools such as the internet and television play an important role in reaching the public in this process. Scientists' ability to communicate scientific data in a clear and understandable way is critical to improve post-disaster information and awareness-raising strategies. These results should be taken into consideration to shape future disaster communication and information strategies. The results based on the research findings obtained to determine what earthquake survivors did to improve their data literacy skills before and after the disaster were discussed with the literature.

Many earthquake survivors lack awareness and training in data literacy, as revealed by respondents who state they haven't received relevant training. This highlights the community's need for increased awareness regarding the significance of data literacy and what it entails. The varied definitions provided by participants suggest a general lack of awareness about data literacy. Efforts should be directed toward clearly defining and promoting awareness of data literacy education. Arruda[55] notes that some individuals, unaware of the multifaceted nature of data literacy, can be guided to learn it with encouragement. As technology advances, understanding data processes becomes more crucial, making data literacy comprising skills like reading, interpreting, and making decisions based on data—increasingly important. Stephenson and Schifter Caravello[56] underscore the growing demand for information and data skills in societal contexts, suggesting that teaching data literacy as a standalone course provides better opportunities for application and assessment. Individuals seeking to enhance their data literacy highlight the importance of relying on trustworthy sources such as scientific publications, statements from scientists, and information from universities. This underscores the critical role of scientific sources in promoting data literacy education. Notably, some participants specifically value publications and journals authored by geological engineers, suggesting that expert opinions within specific domains can contribute to improving data literacy skills. Research findings by Mufit,[57] reveal that traditional, teacher-centered learning is still prevalent in schools, with limited integration of data literacy and disaster literacy into the learning process and textbooks. There is a need to mainstream an approach that combines data literacy and disaster literacy in schools, aligning with the competencies required for 21st-century learning, including data literacy, technology literacy, and disaster literacy. Additionally Kesumaningtyas,[58] establish a significant relationship between disaster literacy and students' behavioral responses to reduce earthquake risk.

The findings underscore the importance of data literacy training in enhancing society's access to and understanding of information, particularly before and after disasters. Public awareness in this area needs to be heightened, and resources for data literacy training should be more widely accessible. Li, et al.,[59] highlight challenges in utilizing data collected through social sensing for emergency management decisions, emphasizing the need for advanced computing methods such as big data computing and deep learning. Similarly, Han, et al.,[60] stress that low awareness and literacy among citizens contribute to inadequate earthquake hazard preparedness, emphasizing the importance of efficiently developing earthquake risk reduction plans by addressing both audience characterization and potential risk zones.

The results indicate a low awareness of data literacy training among earthquake survivors, emphasizing the need for increased awareness and educational efforts. Data literacy is crucial in both pre- and post-disaster periods, and improving this skill can significantly mitigate the impacts of disasters. Respondents expressing a desire to enhance data literacy prioritize reliable sources, particularly scientific ones, underscoring the importance of scientific inputs in data literacy education. The findings highlight data literacy as a vital area for better information access and understanding, stressing the importance of awareness campaigns and educational initiatives in this domain.

Conclusion

The research yields crucial insights for enhancing disaster communication, emphasizing the necessity of robust crisis communication strategies, reliable information, and meeting the needs of earthquake survivors. Additionally, it underscores the impact

Citation: Karacaoglu OC, Ozkaya A. Data literacy and disaster: information access and evaluation skills of earthquake survivors in Turkey. *Sociol Int J.* 2024;8(1):28–37. DOI: 10.15406/sij.2024.08.00373

of social capital and perceptions of government relief policies on survivors' life satisfaction, highlighting the importance of justice and social solidarity in recovery. The effectiveness and reliability of media sources reveal the pivotal role of social media, albeit with concerns about information trustworthiness. Traditional media, particularly TV and radio, play a vital role in accessing scientific data, emphasizing scientists' central role in information processes. The study also highlights earthquake survivors' preference for internet access to scientific data, underscoring the importance of scientists in online outreach. Lastly, the identified lack of data literacy and awareness calls for increased community awareness and educational efforts in this domain, crucial for disaster preparedness and recovery. These findings offer essential guidance for organizations and decision-makers to enhance disaster management, crisis communication, and better serve the needs of earthquake survivors.

Recommendations

The study offers valuable recommendations for enhancing disaster communication, ensuring information reliability, and addressing the needs of earthquake victims, as well as improving data literacy skills. Key recommendations include:

1. Develop an effective crisis communication strategy emphasizing fast and reliable information sharing to prevent panic and misinformation during and after earthquakes.
2. Incorporate social media into disaster communication strategies, recognizing its significant impact, while addressing concerns of information pollution and mistrust.
3. Acknowledge the crucial role of traditional media (television and radio) in providing access to and understanding of scientific data, ensuring the dissemination of reliable and accurate information.
4. Emphasize the importance of trust in scientists and scientific sources for crisis communication, urging scientists to communicate complex data clearly and understandably.
5. Increase awareness of data literacy through widespread community initiatives, recognizing its pivotal role in understanding the impacts of disasters.
6. Foster social capital development within society and ensure fair implementation of government policies to support post-disaster recovery processes.

These recommendations aim to guide more effective disaster management and crisis communication strategies, better catering to the needs of disaster victims.

Acknowledgments

The study strictly adhered to ethical guidelines by obtaining informed consent, ensuring participant confidentiality, and handling sensitive data responsibly. Written consent was secured from participants, and their personal information remained confidential throughout the research process. The research received approval from the Izmir Institute of Technology Social and Human Sciences Scientific Research and Publication Ethics Committee (Decision Number: 10/1, Date: 27.10.2023).

Conflicts of interest

The authors declare that they have no conflicts of interest related to the present work.

Funding

No Funding.

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Citation: Karacaoglu OC, Ozkaya A. Data literacy and disaster: information access and evaluation skills of earthquake survivors in Turkey. *Sociol Int J.* 2024;8(1):28–37. DOI: 10.15406/sij.2024.08.00373