Perspective Matters: Sharing of Crisis Information in Social Media

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Abstract

In this paper, we examined information sharing behavior in social media when one was taking the perspective of self versus other. We found that imagining self in a disaster center, Fukushima, Japan, increased the likelihood of sharing crisis information relative to imagining another person, John, in the same place. People's intention to share crisis information by default, without being asked to take any perspective, paralleled the intention to share when taking another person's perspective. Moreover, when the information was associated with negative feelings, such as worry or fear, it was more likely to be shared; when the information was perceived confusing or uninteresting, it was less likely to be shared.

1. Introduction

Today, social media is becoming increasingly important in our everyday lives: We read articles online and leave comments about social or technical issues on newspaper websites (e.g. *www.nytimes.com*), we post and repost the events surrounding us on micro-blogs (e.g. *www.twitter.com*), and we chat with our friends in social networking websites (e.g. *www.facebook.com*). In social media, we not only create content but also consume the information that other individuals create.

Past work on social media technologies such as Twitter proposed a conversational view of information posting (e.g. tweeting) and reposting (e.g. re-tweeting) [3, 16, 18]. Through our communication online, we influence each other more instantly and frequently. For example, by offering and spreading the information that is related to an event, such as a natural disaster, we can quickly gather information about the event. In addition to learning about the event, we are emotionally influenced by the information we gather in social media [2, 6]. What we learn and how we feel about the information influences whether we accept or reject the information and whether we share it.

Although communication through social media has been widely studied, how people share information in an emergency (e.g. a natural disaster) has not drawn much attention until recently, when a few severe disasters occurred worldwide, such as Red River Floods in the USA in 2009 [30], Yushu Earthquake in China in 2010 [24], and Great East Japan Earthquake in 2011 [31].

Past work has shown that, during crises, information grows explosively, which makes it difficult for individuals to filter out valid information that they can trust and make use of [1, 4]. Other research suggested that an individual would adopt or follow the information that many other individuals have previously followed in social media [26]. Similarly, it is more likely that an individual will re-tweet a tweet if a large amount of people have already re-tweeted it than if only a few have. This suggests that, if false information is included in a rumor message, which tends to be widely transmitted, individuals will perceive the false information as accurate and they might change their beliefs and opinions. Furthermore, false and negative information in social media can be harmful as it unnecessarily results in negative emotions, which can potentially lead to societal problems [22]. Given that social media is an important source of real time information, and it is a place where individuals interact with and influence each other [5, 8, 17, 22, 25, 27, 28], it is important to understand how people share information in social media.

In the current work, we examined how individuals share information related to the 9.0 magnitude earthquake, which hit northeastern Japan on March 11th, 2011. During responses to the disasters caused by the Great East Japan Earthquake, many people used Twitter to communicate with others, and rescuers also relied on Twitter to discover and save victims. Thus social media played a major role in sharing information and coordinating disaster response. On the other hand, social media like Twitter caused societal problems by facilitating the spread of inaccurate information, which could result in unnecessary panic. Although the Japanese government immediately called attention to

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the presence of false information in social media, false rumors did not disappear from social media. Thus, we need to better prepare citizens and officials for disaster response using social media technologies.

The current work contributes to this need by focusing on sharing of crisis information in social media. Specifically, we are interested in the effects of perspective taking – considering self or other – and location on individuals' intention to pass on information in a Twitter-like environment. To foreshadow our results, individuals were more likely to share crisis information (1) when they imagined that they were close to the disaster center, (2) when they were thinking about themselves, and (3) when they experienced negative emotions as a result of reading the information. For example, feeling *scared*, *worried*, *anxious*, *angry*, or *nervous* increased the likelihood that individuals would spread information. We offer suggestions for social media users including individuals and media agencies as well as government authorities and system developers to improve their practice of broadcasting and their use of information in social media.

2. Background

2.1. Physical distance

According to construal level theory, an event can be represented at a relatively higher or lower level [33, 34]. Individuals attend to either global or local cognitive processes when perceiving an object and making decision. Being physically distant from the location of an event, for example, will make individuals think more abstractly, and thus, can affect their judgment and decision-making [15]. Moreover, past work proposed that larger magnitudes of distance from an event reduce its relevance [19].

For a natural disaster, individuals who are geographically closer to the event should be more involved and more concerned about the details of related information; however, individuals who are geographically distant are less likely to be as interested in such information as local residents. Other researchers found that it was more likely that individuals would spread information when the event is more relevant [14]. In particular, for some rapidly emerging events, there should be knowledge gap between local agencies and distant agencies, so that they should respond to related-information differently. This suggests that the physical distance to the disaster center can be a factor that affects an individual's decision to share information in social media.

2.2. Social distance

Besides physical distance, social distance can also determine how closely or distantly one thinks about an event, and thus can affect how one interacts with others in social media. As an extension of construal level theory, a focus on self vs. other has effects on decision-making in social contexts. For example, considering the benefit to self vs. other has an impact on information deception behavior in groups [20].

In the current work, we take a perspective taking approach to investigating the behavior of information sharing in social media. This line of research examines how taking the perspective of self vs. other can help adjust one's personal belief and eliminate individual differences in perception [10]. Given that the knowledge level of local residents would be much different from distant citizens, taking other's perspective can motivate an individual to seek more information to fill knowledge gap or to organize detailed information to make sense of the world. Moreover, perspective taking can elicit positive emotions or mitigate negative emotions that an individual would experience in the presence of controversial stories. In a disaster situation, thinking about self can especially increase distant individuals' empathy and their involvement in the event, thereby increasing the likelihood of sharing related information [14, 29]. This suggests that the social distance between self and other can be a factor that affects an individual's decision to share information in social media.

2.3. Feelings

In online communication, messages deliver emotions [9, 11, 13, 21, 23, 32]. The emotions that one expresses by generating some content can influence other individuals who read the information. The readers are potential spreaders who can share the information online, depending on how they perceive and feel about the information exposed.

Decision-making literature proposed that different types of feelings (e.g. anxiety, worry, or anger) would focus individuals' attention on different aspects of information, and thus influence various types of judgments and decisions [36]. Similarly, emotion literature proposed that individuals would not use positive and negative emotions equally [35]. Relevant to the current research, individuals tend to pass along messages of negative valence more than those of positive valence [14]. Past work also found that individuals experiencing strong emotions tended to interact more interpersonally [7]. In a disaster situation,

although people hear both good and bad news, the information is generally associated with negative themes. This suggests that an individual's positive vs. negative feelings caused by reading some information in social media can affect the decision to share information.

3. Hypotheses

Based on the past work we reviewed, here we propose that individuals' information sharing decision can be influenced by (1) their imagined proximity, being close to or distant from the disaster center, (2) the perspective that they take, thinking about self or other, and (3) how they feel about the information that they are exposed to in social media, positive, negative or neutral. Specifically, we test the following three hypotheses:

H1: Individuals are more likely to pass on information when they are asked to imagine themselves as being close to the disaster center than when they are not asked to do so.

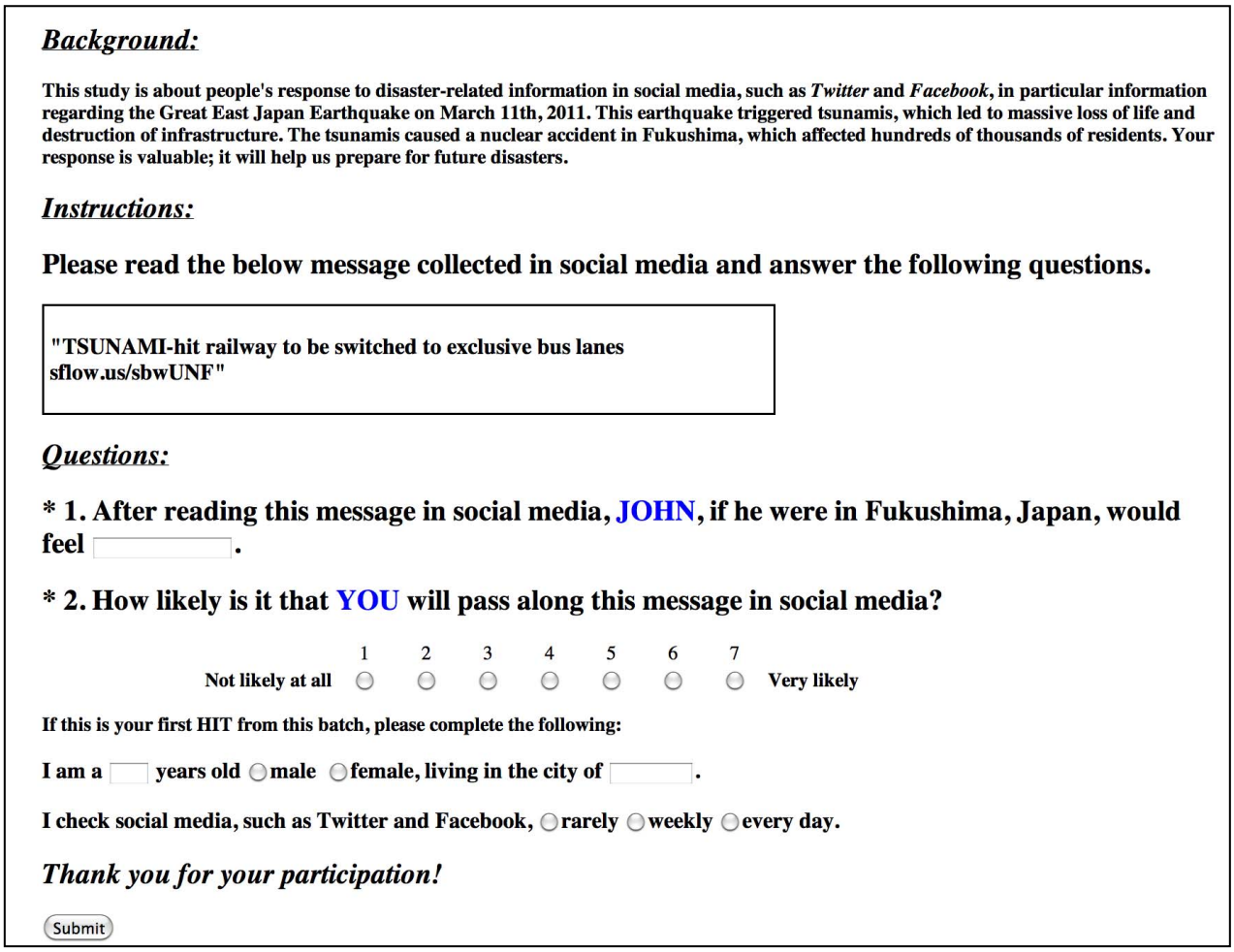
H2: Individuals are more likely to pass on information when they think about self than when they think about other.

H3: Individuals are more likely to pass on information when they experience negative feelings than when they experience positive or neutral feelings.

4. Method and results

4.1. Subjects and materials

We recruited 468 workers from Amazon's Mechanical Turk (*https://www.mturk.com*) to complete our experiments for a nominal fee. All workers resided in the USA.



Background:

This study is about people's response to disaster-related information in social media, such as *Twitter* and *Facebook*, in particular information regarding the Great East Japan Earthquake on March 11th, 2011. This earthquake triggered tsunamis, which led to massive loss of life and destruction of infrastructure. The tsunamis caused a nuclear accident in Fukushima, which affected hundreds of thousands of residents. Your response is valuable; it will help us prepare for future disasters.

Instructions:

Please read the below message collected in social media and answer the following questions.

"TSUNAMI-hit railway to be switched to exclusive bus lanes sflow.us/sbwUNF"

Questions:

*** 1. After reading this message in social media, JOHN, if he were in Fukushima, Japan, would feel _____.**

*** 2. How likely is it that YOU will pass along this message in social media?**

	1	2	3	4	5	6	7	
Not likely at all	○	○	○	○	○	○	○	**Very likely**

If this is your first HIT from this batch, please complete the following:

I am a ____ years old ○male ○female, living in the city of _____.

I check social media, such as Twitter and Facebook, ○rarely ○weekly ○every day.

Thank you for your participation!

Submit

Figure 1. A screenshot of the stimuli presented in the condition of "John in Fukushima"

We used keywords "earthquake", "tsunami", "nuclear", "Fukushima", and "radiation", to collect tweets about the Great East Japan Earthquake by two major news agencies and five individuals, posted on Twitter between March 11th 2011 and March 10th 2012. We collected tweets by media and individuals because we were interested in whether people would treat messages provided by these two sources differently. Then, we randomly sampled 100 tweets produced by media and 100 produced by individuals, resulting in a sample of 200 tweets.

4.2. Design and procedure

In three experiments, subjects were introduced to background information about the Great East Japan Earthquake, and then they read a message and answered questions, as shown in Figure 1.

We manipulated location by either specifying the disaster center – Fukushima, Japan (in Experiment 2 and Experiment 3) or not mentioning any location (in Experiment 1) so that subjects would most likely consider their default locations in the USA. We manipulated perspective taking by instructing subjects to imagine either how they felt when they were in Fukushima, Japan (in Experiment 2) or how John felt when he was in the same place (in Experiment 3).

In Experiment 1 ("Control" condition), subjects only rated the likelihood of passing along the message. In Experiment 2 ("You in Fukushima" condition) and Experiment 3 ("John in Fukushima" condition), subjects were first asked to describe the feelings of either themselves or John, and then answered the likelihood question identical to Experiment 1. Figure 1 shows a screenshot of our stimuli presented to subjects in the "John in Fukushima" condition.

Subjects were allowed to work in one experiment repeatedly; each time a different tweet and identical questions were presented. However, a subject was allowed to complete only one experiment. Likelihood of passing along the message was self-reported in a 7-point scale. For each tweet, we collected responses from 10 subjects.

4.3. Hypotheses testing

H1 predicts that information is more likely to be shared by individuals in a location that is closer to the earthquake, and ***H2*** predicts that information is more likely to be shared by individuals when they think about themselves as opposed to others.

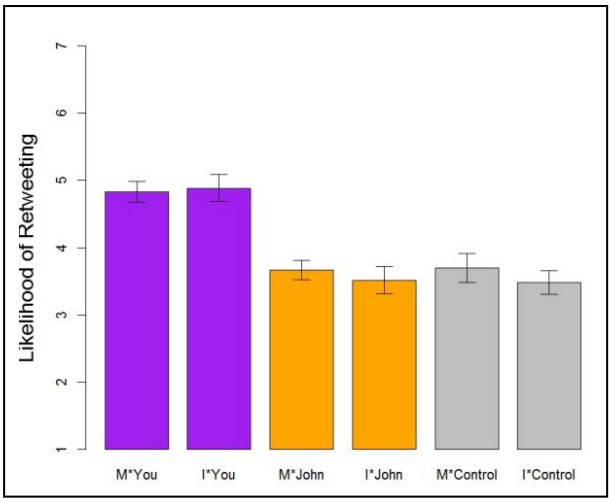


Figure 2. Likelihood of information sharing (You vs. John vs. Control, Media vs. Individual)

Figure 2 visualizes the mean likelihood of information sharing in each of the three conditions (You in Fukushima vs. John in Fukushima vs. Control), grouped into two source types (Media vs. Individual). The error bars indicate 95% confidence intervals. We found no effect of source type ($F < 1$), so in the following analyses and discussion we will combine tweets produced by media and those by individuals.

One-way ANOVA, with three conditions as independent variable and likelihood of sharing as dependent variable, revealed that the likelihood of sharing was higher in the "You in Fukushima" condition than the "John in Fukushima" or "Control" condition (You vs. John vs. Control: 4.86 vs. 3.59 vs. 3.59, $F(1, 594) = 122.14$, $p < 0.001$). When subjects took the perspective of John in Fukushima, there was no effect of physical distance on information sharing relative to control condition (3.59 vs. 3.59, $p > 0.1$), somewhat inconsistent with ***H1***. In contrast, when subjects took the perspective of self in Fukushima, information was more likely to be shared than control condition (4.86 vs. 3.59, $p < 0.001$), lending support to ***H1***. Moreover, we found a significant difference in information sharing between the "You in Fukushima" condition and the "John in Fukushima" conditions (4.86 vs. 3.59, $p < 0.001$), supporting ***H2***.

In Experiment 2 and Experiment 3, we collected subjects' affective responses to the messages they read, with 10 responses for each of 200 messages, resulting in a list of 2000 self-reported feelings. First, we analyzed the sentiment of messages we tested based on word frequency. Figures 3 and 4 show the words that were frequently used ($n > 5$) to describe how John or they themselves felt in either condition (You in Fukushima vs. John in Fukushima), respectively.

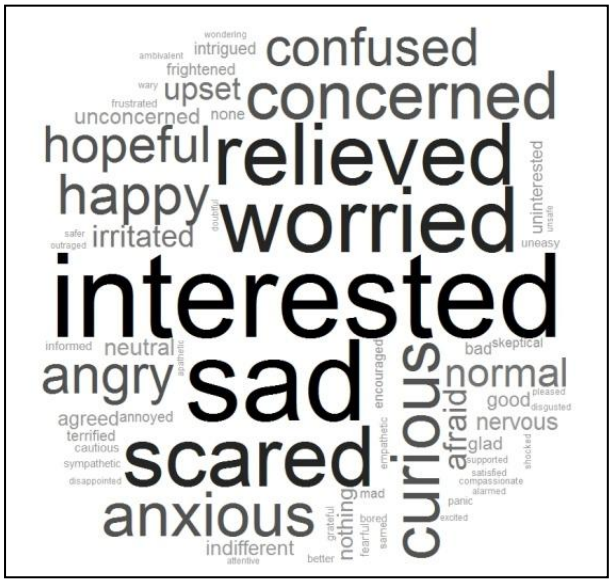


Figure 3. Word clouds that describe the feelings that John might have felt (word frequency *n*>5)

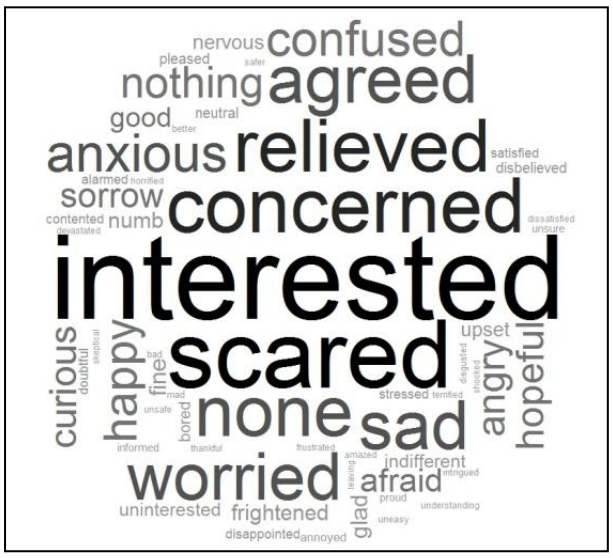


Figure 4. Word clouds that describe the feelings that subjects themselves might have felt (word frequency *n*>5)

Taken Figures 3 and 4 together, we can see that some feelings were frequently reported in both the "You in Fukushima" and "John in Fukushima" conditions, but a few types of feelings were unique in either condition. For example, subjects frequently predicted that John would feel "interested," "sad," "worried," "relieved," or "scared," while subjects indicated that they themselves felt "interested," "scared," "concerned," "relieved," "worried," or "sad" after seeing some messages. Some subjects thought that John would feel "hopeful" or "happy" more likely than those who thought about themselves in Fukushima. This suggests that subjects who thought about themselves were more likely to confront negative feelings than those who took John's perspective. In addition, in the "John in Fukushima" condition, subjects experienced more diverse feelings than in the "You in Fukushima" condition. This suggests that, when thinking about self, subjects were more likely to experience some dominating feelings than when thinking about John.

In order to find out the association between frequency of described feelings and the likelihood of sharing information, we divided all 200 messages into 3 groups according to the scores of likelihood of sharing – High, Moderate, and Low. For this analysis, we further excluded feelings that were mentioned 10 or fewer times. Table 1 shows the mean likelihood that one passes on the message (and *SD* and *N*) for each of the three groups (Low vs. Moderate vs. High) in two conditions (You in Fukushima vs. John in Fukushima).

Table 1. Descriptive statistics of information sharing (You vs. John, Low vs. Moderate vs. High)

Condition	Group	Mean	SD	N
You in Fukushima	Low	3.79	0.618	66
	Moderate	5.01	0.241	68
	High	5.76	0.295	66
John in Fukushima	Low	2.61	0.458	66
	Moderate	3.62	0.182	68
	High	4.53	0.545	66

Then we ran Chi-square analysis on each feeling and excluded feelings that did not vary significantly across the three groups in either condition. We produced a list of feelings that significantly differed in at least one condition. Table 2 shows the results of Chi-square analysis.

Two-way Chi-square analysis showed that a significantly larger proportion of subjects who reported that they would feel "*interested*" indicated a lower likelihood of sharing information. In contrast, among those who imagined John as feeling "*interested*", the likelihood of passing on the message – whether low, moderate, or high – was statistically evenly distributed. Moreover, a statistically larger proportion of subjects who thought themselves as being "*relieved*" indicated a higher likelihood of spreading the message; however, when subjects thought that John would feel "*relieved,*" there was no statistically significant difference of the proportion of subjects that would spread the information with low, moderate and high likelihood.

Table 2. Chi-square test results

Feelings of You (*top*) and John (*bottom*)	Low	Moderate	High	Chi-square significance	
				One way	Two way
Interested	79	45	35	*	*
	51	53	41	n.s.	
Scared	21	38	73	*	n.s.
	20	31	51	*	
Concerned	26	33	46	*	n.s.
	23	28	29	n.s.	
Relieved	11	37	49	*	*
	26	34	45	n.s.	
Worried	17	30	41	*	n.s.
	27	26	59	*	
Agreed	27	43	18	*	n.s.
	6	7	7	n.s.	
Anxious	18	18	32	*	n.s.
	12	30	32	*	
Confused	40	16	8	*	n.s.
	38	15	9	*	
Nothing	32	18	5	*	n.s.
	18	5	0	*	
Curious	20	18	10	n.s.	n.s.
	36	33	13	*	
Afraid	9	5	26	*	n.s.
	4	11	22	*	
Glad	11	14	2	*	n.s.
	6	7	5	n.s.	
Frightened	2	7	17	*	n.s.
	4	4	7	n.s.	
Numb	14	6	5	*	n.s.
	0	0	0	-	
Nervous	3	4	16	*	n.s.
	1	10	16	*	
Indifferent	14	5	1	*	n.s.
	12	9	0	*	
Uninterested	16	3	0	*	n.s.
	10	3	3	*	
Bored	14	0	2	*	n.s.
	0	0	0	-	
Neutral	9	4	1	*	n.s.
	17	6	1	*	
Alarmed	2	2	9	*	n.s.
	0	0	0	-	
Stressed	2	0	11	*	n.s.
	0	0	0	-	
Normal	0	0	0	-	n.s.
	25	14	7	*	
Unconcerned	0	0	0	-	n.s.
	14	6	2	*	
Terrified	0	0	0	-	n.s.
	0	2	11	*	

Note: For each category of feelings, we list the count number in the "You in Fukushima" condition (top) and the "John in Fukushima" condition (bottom), divided into Low, Moderate, and High groups.

The results of one-way Chi-square analysis further indicated that, for subjects who imagined themselves in Fukushima, the feelings of being "*interested*", "*concerned*", "*relieved*", "*agreed*", "*glad*", or "*frightened*" were not equally distributed across Low, Moderate, and High groups. In contrast, for subjects who imagined John in Fukushima there was no statistically significant difference in their responses across the three groups.

These results at least partially explain why the likelihood of sharing information is higher when subjects thought about self than when they thought about other.

According to ***H3***, negative feelings are associated with higher likelihood that an individual passes along a message in social media. Our results showed that more than a few types of feelings were consistently associated with the likelihood of information sharing in Experiments 2 and 3. As shown in Table 2, when subjects felt "*scared,*" "*worried,*" "*anxious,*" "*afraid,*" or "*nervous*" in a consideration of themselves or John, they were more likely to spread the information. This is consistent with ***H3***.

We also found that, when subjects felt or thought that John might have felt "*confused,*" "*nothing,*" "*indifferent,*" "*uninterested,*" or "*neutral,*" they were less likely to spread the information. This suggests that, whereas negative feelings are associated with higher likelihood to share information, neutral feelings are associated with lower likelihood to share information.

Finally, we should note that, in the "You in Fukushima" condition, a larger proportion of subjects who felt "*numb*" or "*bored*" were associated with lower likelihood of sharing information. Moreover, in the "You in Fukushima" condition, subjects who reported themselves as being "*alarmed*" or "*stressed*" were tied to higher likelihood of sharing information. In the

"John in Fukushima" condition, more subjects who reported John as being "*normal*" were correlated with lower likelihood of sharing; in contrast, subjects who imagined John as being "*terrified*" were linked to higher likelihood of sharing.

It is likely that subjects experienced some feelings more extremely when thinking about self than when thinking about other. In other words, it might be possible that when subjects were considering self feelings were experienced more intensely than those who were taking John's perspective. However, in this experiment, we didn't ask subjects to rate the extremity of their feelings.

5. Discussion

In the current work, we examined information sharing behavior in social media when one was taking the perspective of self versus other, with or without specifying a location where one could consider. Table 3 summarizes our hypotheses and results. We found that people's intention to share crisis information by default, without being asked to take any perspective, paralleled the intention to share when they took another person's perspective. When people imagined themselves in a disaster center, their likelihood of sharing crisis information was higher than when people imagined another person in the same place. Moreover, people were more likely to share information associated with negative feelings, such as worry or fear.

Table 3. Summary of hypotheses and results

Hypotheses	Results
H1: Individuals are more likely to pass on information when they are asked to imagine themselves as being close to the disaster center than when they are not asked to do so.	***Partially supported.***
H2: Individuals are more likely to pass on information when they think about self than when they think about other.	***Supported.***
H3: Individuals are more likely to pass on information when they experience negative feelings than when they experience positive or neutral feelings.	***Supported.***

The result that taking John's perspective in Fukushima, Japan showed no difference in likelihood of sharing from the default mode suggests that people think about others when they decide whether or not to share information. Individuals would not automatically link themselves to Great East Japan Earthquake, especially for our subjects who resided in the USA. When individuals read news about a distant event, they may consider it as less relevant. Instead of thinking about self, they may imagine another person in the situation.

To further examine this, we can specifically instruct subjects to imagine themselves in the USA. It might also help if we test local residents with regards to their responses to the crisis information and the likelihood of sharing such information. Our subjects all resided in the USA and did not directly experience the crisis, which could be one limitation of the current work. Moreover, as we found strong effects of social distance on information sharing when subjects were imagining themselves or John in Fukushima, we can manipulate perspective taking in a different location, such as "You" or "John" in Melbourne, Australia, to tease apart the effects of perspective taking and location on information sharing in social media. In addition, besides collecting and analyzing people's emotional experiences after reading the messages including crisis information, in future research we can also analyze the content of perhaps a larger and more diverse sample of tweets [12]. By doing so, we can link the valence of messages prepared by "speakers" to the subjective responses of "listeners" through the communication in social media, and use the results to predict people's tendency to share crisis information.

6. Implications

In a disaster situation, false rumors abound in social media. People are spreading too much false information. The current work suggests that people are more likely to spread crisis information when they think about themselves in the disaster situation. During disasters, then, one recommendation we can give to citizens would be to think about others instead of self, and think about others who are not in the disaster center. Doing so might allow citizens to perceive the information in a different way, and reduce the likelihood of impulsively spreading any seemingly useful but false information.

Another finding is that people are more likely to share information associated with negative feelings. Officials can spread important messages by writing the messages in a way that induces negative feelings. A flip side of this is that officials can flood social media

with messages that are not associated with negative feelings so that people would no longer show negative feelings when they encounter false rumors.

Thus, we envision a social media system, in which we can incorporate priming, such as asking people to think about others in a remote place, and framing, such as surrounding negative messages with positive ones, into its design. In practice, designers need to devote significant efforts to understanding the effects of perspective taking and location, as shown in the current work, and develop techniques to mitigate negative influences of unproved information in social media. For example, system developers can present a series of messages that are relevant to crisis in a specific sequence, with positive ones prior to negative ones. Positive information will raise people's optimism (positive feelings) and reduce their pessimism (negative feelings), and eventually lessen their likelihood of spreading information that can unintentionally cause serious societal problems.

7. Final note

Communication during crises increasingly relies on social media technologies such as Twitter. Although social media can undoubtedly play an important role in coordinating disaster response, social media can also facilitate the diffusion of false messages, potentially creating widespread panic. To better prepare for disaster response using social media technologies, we need more studies on how people share information using these technologies.

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