

## **Social Media and Group-Based Emotion:**

### **How Do Reddit Travel Communities Experience the COVID-19 Pandemic?**

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#### **Abstract**

This study aims to understand how engagement in a user-generated social media influences netizens' perception, experience, and emotions during the COVID-19 pandemic. Data was extracted from travel-related communities on Reddit, a social news aggregation, web content rating, and discussion website. We integrated text analysis, sentiment analysis, and timeline analysis innovatively COVID-19-related themes and emotions. We found that, as the pandemic evolved, the concern of three travel-related sub-Redditors shifted from context-related external issues to daily-life-related internal issues. Meanwhile, the concern for spatial mobility declined. Furthermore, the virtual community induced positive group-based emotions through emotional expression and interaction, which can be beneficial for restoring tourists' confidence to travel post the pandemic.

#### **Keywords**

*Social media; Online engagement; Disaster management; Group-based emotion; COVID-19 pandemic; Reddit*

## 1. Introduction

Since the tourism industry relies on human mobility, the outbreak of the coronavirus disease 2019 (COVID-19) has had a devastating impact (Nicola et al., 2020). As of March 17, 2021, approximately 120,745,792 cases in 215 locations and 2,671,764 deaths have been confirmed, with an increasing number of suspected cases (World Health Organization, 2020). Both travel supply and demand face an unpredicted and uncertain situation. Social distancing, self-isolation, and travel restrictions have resulted in the most severe economic crisis since World War II (Gössling et al., 2020), causing a decline in workforce and unemployment in the tourism industry (Nicola et al., 2020). By the end of May 2020, all global destinations enforced travel restrictions, and 75% have locked down borders entirely to international tourists. According to the World Tourism Organization (UNWTO) (2020), international arrivals dropped by 74% in 2020 and destinations welcomed 1 billion fewer international arrivals in 2020 than 2019, which leads to a loss of \$30 to \$50 billion in international tourism receipts. Whereas there are promising signs that the most disastrous phase of the anti-pandemic battle is easing in some parts of the world (Brownstein, 2020). The US continues to witness increasing cases of infections and death (National Center for Immunization and Respiratory Diseases (NCIRD), 2020).

Given the pandemic's potential to cause fundamental and incremental changes to the tourism industry (UNWTO, 2020), some scholars anticipated the negative impact on the tourism industry. For example, Yang et al. (2020) developed and calibrated a dynamic stochastic general equilibrium model to estimate the economic loss in the tourism industry. Moreover, Gössling et al. (2020) identified COVID-19 as analogous to the climate crisis and questioned the existing mass tourism model advocated by authorities. However, other scholars believe in the industry transformation and upgrade stimulated by the pandemic. For instance, Hao et al. (2020) foresaw

the COVID-19 will significantly and permanently change the hospitality and tourism industry in terms of multi-business and multi-channels, product design and investment preference, digital and intelligent transformation, and market reshuffle. Brouder (2020) analyzed variations in pathways for COVID-19-influenced tourism and proposed the pandemic as “reset redux” that stimulates prompt institutional innovations. Furthermore, Nepal (2020) perceived the crises as an opportunity for sustainable and mindful development practices. Similarly, Niewiadomski (2020) argued that COVID-19 effectively restrains the process of globalization and time-space compression, which counteracts the negative aspects of tourism, such as ecological degradation, economic exploitation, and overcrowding. Further, Higgins-Desbiolles (2020, p. 2) called for a community-centered tourism framework that redefines and reorients tourism counts for the rights and interests of local communities and local peoples. Thus, tourism could be re-centered on public good, sustainability, and social and ecological justice.

Against the above backdrop, social media influences how people experience disastrous events (Hjorth & Kim, 2011). Regarding COVID-19, Yu et al. (2020) analyzed pandemic-related online comments and identified major themes, including the dynamic risk perception of tourists, the service quality of tourism enterprises, quarantine issues during the pandemic, trustworthiness of media coverage, and racial discrimination. However, insight into how tourists experience and react to the pandemic within the virtual communities that shape public opinion and general emotions is scarce.

Therefore, this study investigates the relationship between engagement in social media and the experience of COVID-19 among tourist netizens<sup>1</sup> in the user-generated social network, Reddit. Specifically, this study answers what are the main COVID-19-related topics in selected tourism-

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<sup>1</sup> Netizen: a portmanteau of the words Internet and citizen to describe a person actively involved in online communities.

based virtual communities and how the group-based emotion of the posts/comments shifted over time. Hence, this study employs text analysis, sentiment analysis, and timeline analysis to capture and scrutinize themes and emotions from three travel-related virtual communities in Reddit. The study contributes to the existing literature on social media in disaster management and expands on the insight into the emotional contagion theory. Further, the novel integration of text analysis, sentiment analysis, and timeline analysis can be applied to investigate the reactions of netizens to major social events in a broader context. From a managerial perspective, tourism practitioners, policymakers, and scholars can use social media to understand the concerns, focus, and expectations of tourists, by which they can restore the confidence of tourists and anticipate the post-pandemic transformation of the tourism industry.

## **2. Literature review**

### *2.1. Social media engagement and disaster management*

Social media is an effective tool for disaster resilience and mitigation. Many studies have investigated the role of social media in a variety of disaster scenarios (Table 1), such as natural disaster (Acar & Muraki, 2011; Kaewkitipong et al., 2012; Kim & Hastak, 2018; Möller et al., 2018; Qu et al., 2011; Sano & Sano, 2019), technical disaster (Sutton, 2010), terrorism and crime (Griswold, 2013), and human-induced crisis in tourist destinations (Zhai et al., 2020; Zhai et al., 2019). Moreover, the theories applied include psychological theories such as the cognitive appraisal theory; the theory of emotional contagion (Zhai et al., 2019); sociological theories such as the social capital theory (Kim & Hastak, 2018), structuration theory (Kaewkitipong et al., 2012), and the theory of relative deprivation (Zhai et al., 2020); disaster management theories such as the social-mediated disaster resilience model (Möller et al., 2018); and the situational crisis

communication theory (Sano & Sano, 2019). Most studies analyzed online qualitative data via methods such as content analysis (Möller et al., 2018; Qu et al., 2011), text analysis (Acar & Muraki, 2011), network analysis (Kim & Hastak, 2018; Sutton, 2010) and sentiment analysis (Zhai et al., 2019). Notably, many studies integrated several methods for flexibility. Various social network platforms, such as Twitter (Acar & Muraki, 2011; Griswold, 2013; Kaewkitipong et al., 2012; Sutton, 2010), Facebook (Griswold, 2013; Kaewkitipong et al., 2012; Kim & Hastak, 2018; Möller et al., 2018), and Mainland Chinese-based Weibo (Qu et al., 2011; Zhai et al., 2020; Zhai et al., 2019) were explored. Notably, Griswold (2013) called attention to emerging social networks, such as Reddit, which has not seen much exploration in the hospitality and tourism context.

Social media engagement plays various essential roles in disaster management (Chair et al., 2019; Kim & Hastak, 2018; Sano & Sano, 2019; Zhai et al., 2020; Zhai et al., 2019). Specifically, Sutton (2010) noted that social media could propagate time-sensitive information and connect geographically dispersed individuals during a disaster. By investigating the 2011 Japan earthquake, Acar and Muraki (2011) found that disaster-affected people expressed their insecurity and uncertainty, such as providing warnings, sending help requests, and giving situational updates on social media. Qu et al. (2011) explored the role of microblogging during and after the 2010 Yushu Earthquake in China. It included situational updates (e.g., information-sharing, seeking, gathering, and integration), opinion expression (e.g., criticizing, suggesting, appraising, and commenting), emotion comfort (e.g., emotion expression and support), and action request (e.g., appealing for help, searching for missing people, proposing relief actions, and coordinating relief efforts). From the investigation of Japan's earthquake and tsunami in 2011, Hjorth and Kim (2011) revealed that the engagement in social media extended civic engagement and generated greater affective personalization in disastrous events. Based on the flood in Thailand between 2011 and

2012, Kaewkitipong et al. (2012) proposed a social-media-based crisis management framework from the project management perspective to manage disasters before, during, and after its occurrence. Griswold (2013) reviewed the altruistic roles of social media in multiple disaster scenarios, where social media has been effective in searching for victims, detecting criminals, gathering unaffiliated or spontaneous volunteers, alleviating anxiety, improving psychological resilience, offering shelter and supplies to the affected population, raising donations, and providing perspectives on disaster management agencies. During the 2016 flood in Louisiana, Kim and Hastak (2018) found that social networks were engaged in activities such as generating a disaster map, marking emergency shelters, providing medical services, and eradicating debris.

Regarding tourism, Möller et al. (2018), by examining the 2016 Tropical Cyclone in Fiji, revealed that social media was effective in raising funds and donations. From an experimental study of imaginary volcano eruptions in Japan, Sano and Sano (2019) indicated that consumer-to-consumer disaster communication could effectively influence tourists' safety perception and willingness to travel in a low-risk situation after the disaster. Zhai et al. (2019) suggested that there was a turning point of negative emotion in a human-induced tourism crisis. However, positive and detailed responses could alleviate the negative sentiment, failure of which meant that destination marketing organizations (DMOs) should respond sustainably and consistently to restore the destination image. Given the reputation crisis in China's Snow Town, for instance, Zhai et al. (2020) investigated the cognitive, emotional, and behavioral mechanisms of tourists' secondary crisis communications.

**Table 1**  
A review of engagement in social media in disaster management

Study	(Sutton, 2010)	(Qu et al., 2011)	(Acar & Muraki, 2011)	(Hjorth & Kim, 2011)	(Kaewkitipong et al., 2012)	(Griswold, 2013)	(Kim & Hastak, 2018)	(Möller et al., 2018)	(Sano & Sano, 2019)	(Zhai et al., 2019)	(Zhai et al., 2020)
Context	Technological disaster, USA	Earthquake, China	Tsunami, Japan	Earthquake, Japan	Flooding, Thailand	General disaster & crisis	Hurricane Sandy, USA	Tropical cyclones, Fiji	Volcano, Japan	Tourism crisis, China	Tourism crisis, China
Theory				Effective and affective models	Structuration theory		Social capital theory	Social-mediated disaster resilience (SMDR) model	Situational crisis communication theory	Cognitive appraisal theory, Emotional Contagion Theory	Theory of relative deprivation
Methods	Virtual sociocultural analysis	Content analysis, trend analysis	Text analysis	Case study, focus group	Case study	Case study	Social network & text analysis	Content analysis, timeline analysis	Scenario experiment	Agent-based modeling (ABM) & sentiment analysis	Structural equation modeling (SEM)
Social media platform	Twitter	Sina blog	Twitter	Twitter	Twitter, Facebook, YouTube	e.g., Twitter, Reddit, Facebook	Facebook (city)	Facebook (hotel)	TripAdvisor	Weibo	Weibo
Focus	Distributed Networks & Collaboration	Role of social media	Crisis communication	Emotion expression	Crisis management	Altruistic behaviors	Emergency information propagation	Disaster resilience	Consumer-to-consumer crisis communication	Collective emotion recovery	Tourists' secondary crisis communications

**Table 1**

A review of engagement in social media in disaster management (Continued)

Study	(Sutton, 2010)	(Qu et al., 2011)	(Acar & Muraki, 2011)	(Hjorth & Kim, 2011)	(Kaewkitipong et al., 2012)	(Griswold, 2013)	(Kim & Hastak, 2018)	(Möller et al., 2018)	(Sano & Sano, 2019)	(Zhai et al., 2019)	(Zhai et al., 2020)
Anticipation, preparation & warning			√		√						
Information & communication	√	√	√	√	√	√	√	√			
Social capital	√			√	√		√	√			
Collective competence	√	√			√	√		√			
Emotion expression & support		√		√	√					√	√
Donation & economic aid		√				√		√			
Victim location & detection						√					
Virtual volunteers		√		√	√	√					
Supply provision			√	√	√	√					
Prohibit misinformation					√	√					
Safety perception & willingness to travel									√		



## *2.2. Social media engagement and group-based emotion in tourism disaster management*

Group-based emotion, the “emotions felt and expressed or communicated on behalf of one’s group membership” (De Vos et al., 2013, p. 1044), plays a vital role in tourist communication and gathering affective netizens in disastrous scenarios (Perelló-Sobrepere, 2017). Social media provides an open space for netizens to express individual emotions and interact with others (Luo & Zhai, 2017). Based on the emotional contagion theory, netizens influence each other’s emotions through continuous interaction (Farrell & Twining-Ward, 2005; Xiong et al., 2018). Netizens obtain information from friends, key opinion leaders, DMOs, and crisis management organizations via social networks. When netizens’ group identity is generated, those individuals’ emotion can escalate to a group-based emotion (Smith et al., 2007). Based on community feedback, netizens can adjust their emotions and, in turn, influence followers (Perelló-Sobrepere, 2017). Netizens with a close bond were found to demonstrate similar sentiment towards the same event (Hu et al., 2013). Consequently, individual emotions become group-based and further fuel the media perspective and response strategies of DMOs (Zhai et al., 2019).

Several studies have explored social media engagement and group-based emotion in tourism disaster management. For instance, Qu et al. (2011) noted that social media is adopted to express personal feelings such as anxiety, sadness, anger, pride, and confusion and provide support in terms of mourning, blessing, comforting, encouraging, and expressing concerns for victims. In the digital era, social media cultivates new affective cultures, thus simultaneously expanding on earlier forms of intimacy and co-presence (Hjorth, 2005). Moreover, social networks can publicize the intimacy and affection of netizens and thus help the disaster-affected population to ease post-traumatic stress by offering alternative channels for psychological counseling (Hjorth & Kim, 2011).

The dynamic 'group-based emotion may impact the progress of disaster management. Without appropriate and prompt crisis management, however, a human-induced tourism crisis caused by managerial failure can progress into a secondary crisis. During this process, an individual's emotional expression can evolve into a group-based emotion and escalate the disastrous impact (Zhai et al., 2019). Thus, tourists will develop negative emotions and take group-based actions against the destination (Zhai et al., 2019). Luo and Zhai (2017) employed sentiment analysis to explore how the Occupy Central Movement transformed from a political event to a tourism boycott due to rising negative sentiment from political conflict. Similarly, Zhai et al. (2020) found that tourists' perceived deprivation would induce a group-based irritation, suspicion of the destination, online group-based action, and reduced willingness to travel.

### **3. Methods**

#### *3.1. Study context*

Web 2.0 applications that enable social interaction on the web gave birth to a variety of mega web-based services, such as Facebook, Twitter, and Reddit (Subrahmanyam et al., 2008). Reddit is a US social news aggregation, web content rating, and discussion website. Reddit's core content is organically generated by its users (often referred to as Redditors), who are endowed with the autonomy to customize their front pages (Spinks, 2014). Reddit is divided into smaller communities called subreddits, where a few eligible Redditors voluntarily act as moderators who establish the community-specific rules and oversee the subreddit communities. Other Redditors can join subreddits freely to post their personal opinions or news relevant to the topic, rate posts, and comment on other posts. Reddit is one of the fastest-growing social websites, especially among the Gen Z users in the US (Clement, 2020a). In May 2020, more than 64.8% of Redditors in the

US were aged between 10 to 30 years old (Clement, 2020a). Notably, Reddit surpassed Facebook and became the third most popular website in the US, with 330 million monthly active users in 2018 (Garg & Kim, 2019). However, the utilization of Reddit for academic research and marketing are often over-looked (Hutchinson, 2017).

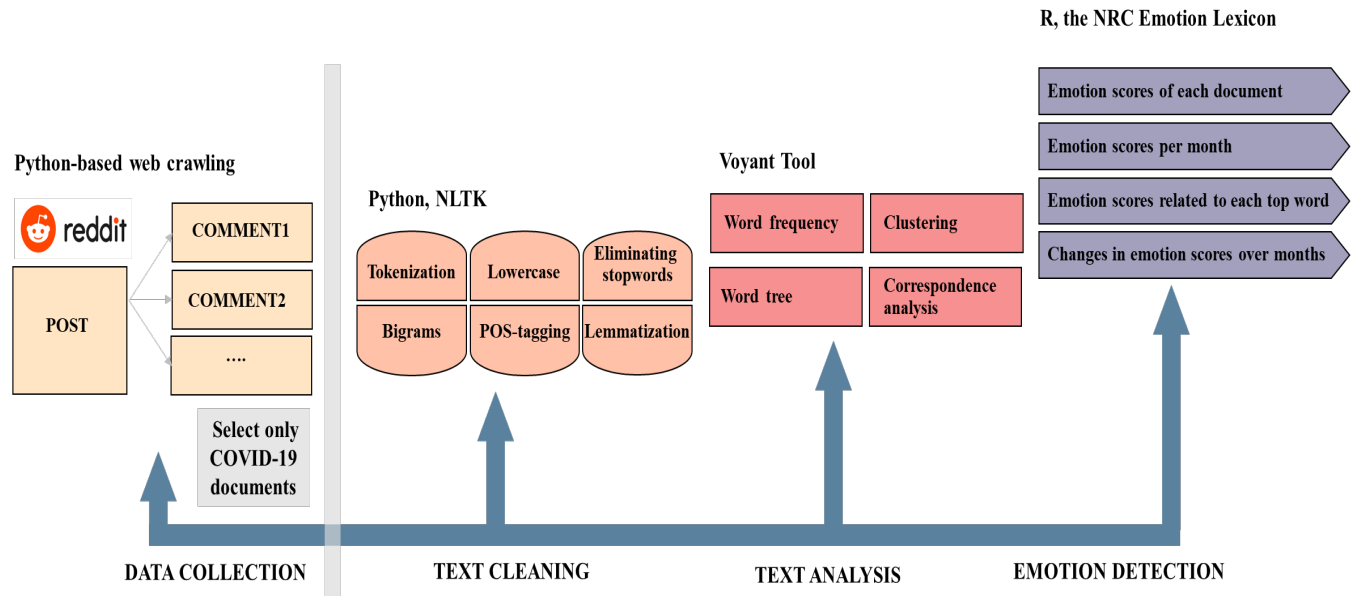
The rationale for selecting Reddit as the main data collection platform is as follows. 1) The main function of Reddit is to share opinions and encourage discussions among Redditors, which generates more situation-sensitive dialogues than websites that focus on social network building (e.g., Facebook). 2) Reddit enables its users to share their in-depth opinions in various forms (including photos, videos, links, and text-based posts), which can assist researchers in detecting perceptions and sentiments accurately. In comparison, although Twitter has a massive number of users and is relatively convenient for data collection, the word limit per each Tweet can be a challenge for analyzing perceptions and sentiments. 3) The anonymity environment of Reddit facilitates more neutral and authentic conversations, which makes Reddit an effective channel for understanding the experience of netizens. As Reddit's co-founder and CEO Steve Huffman explained, "when people detach from their real-world identities, they can be more authentic, more true to themselves" (Gutman, 2018). Reddit can be an effective channel to facilitate disaster resilience and mitigation and understand netizen's experience of a disaster (Griswold, 2013). Thus, we selected the three largest travel-based subreddits to retrieve COVID-19 related themes and emotions.

### *3.2. Data collection and purification*

From Figure 1, a Python script was developed to collect online posts and comments from the online travel communities. Since very few COVID-19 related posts were found in January, posts created from February to May 2020 were included in the dataset. Initially, 3,422 posts and

all associated comments were collected. Moreover, the date, score (represents the popularity), and URL links of each post were retrieved.

Multiple data filtering processes were performed to purify the dataset and select posts and comments related to COVID-19. First, we identified all posts related to COVID-19 using various keywords. However, several irrelevant posts and comments about other viruses or diseases were also detected. After a series of trials, posts that contained one of three keywords—COVID, corona, or pandemic—were selected. Thus, a total of 342 posts related to the pandemic were identified. Second, comments attached to each post were selected since they are a continuation of the COVID-19-related conversation. Third, the same purification process was applied to the comments not relevant to the COVID-19 posts. Finally, documents that contain less than 10 characters were dropped since they provided insufficient information for further analysis. Overall, 16,365 documents (i.e., 342 posts and 16,023 comments) were included in the final dataset.



**Fig. 1.** Process of text analysis and emotion detection

### 3.3. Text cleaning and analysis

Text cleaning procedures were performed with Python, including tokenization, lowercasing, and eliminating non-English characters, NLTK stop words, and custom stop words (e.g., also, another, without). Moreover, bigrams (e.g., south\_korea and mexico\_city) were included in the corpus, part-of-speech tagging was conducted, and noun, verb, adjective, and adverbs were lemmatized. The cleaned texts were used for further text analysis. Furthermore, to see the changes in people’s perceptions over time, the date each post was created was converted into a monthly system. Out of 16,365 documents, 1,099 documents were created in February, 9,934 in March, 3,708 in April, and 1,624 in May.

For the text analysis, first, a web-based text analytic software, Voyant Tools,<sup>2</sup> was used to process the large amount of text data. With this tool, the most frequent words were identified to discover influential events or opinions. Moreover, words that appear more distinctively in each

<sup>2</sup> <https://voyant-tools.org/>

month were detected to find the unique events that were prevalent during such months. Second, co-appearing words were discovered with top words, using Voyant, which is helpful in detecting the contexts and interests related to each top word. For example, the high frequency of the co-occurrence of two terms, “travel” and “risk,” reveals that many people associated “travel” to be “risky.” People’s thoughts related to each stimulus can be tracked by looking at the co-appearing words. Finally, correspondence analysis was performed to identify similarities among keywords and find terms that are highly associated with each month. Thus, a perceptual map visualized the correlations among the keywords. The distance between the keywords indicates the degree of closeness in a relationship between keywords.

### *3.4. Measuring emotion*

Further, to measure real-time emotions from the community texts, this study implemented the R-based lexicon sentiment analysis, the NRC Emotion Lexicon. It can detect eight emotion categories, such as anger, anticipation, disgust, fear, joy, sadness, surprise, and trust (Zhang & Fesenmaier, 2018). Emotion scores of each document were generated. Moreover, the results were aggregated by each month to estimate the changes in emotions over time.

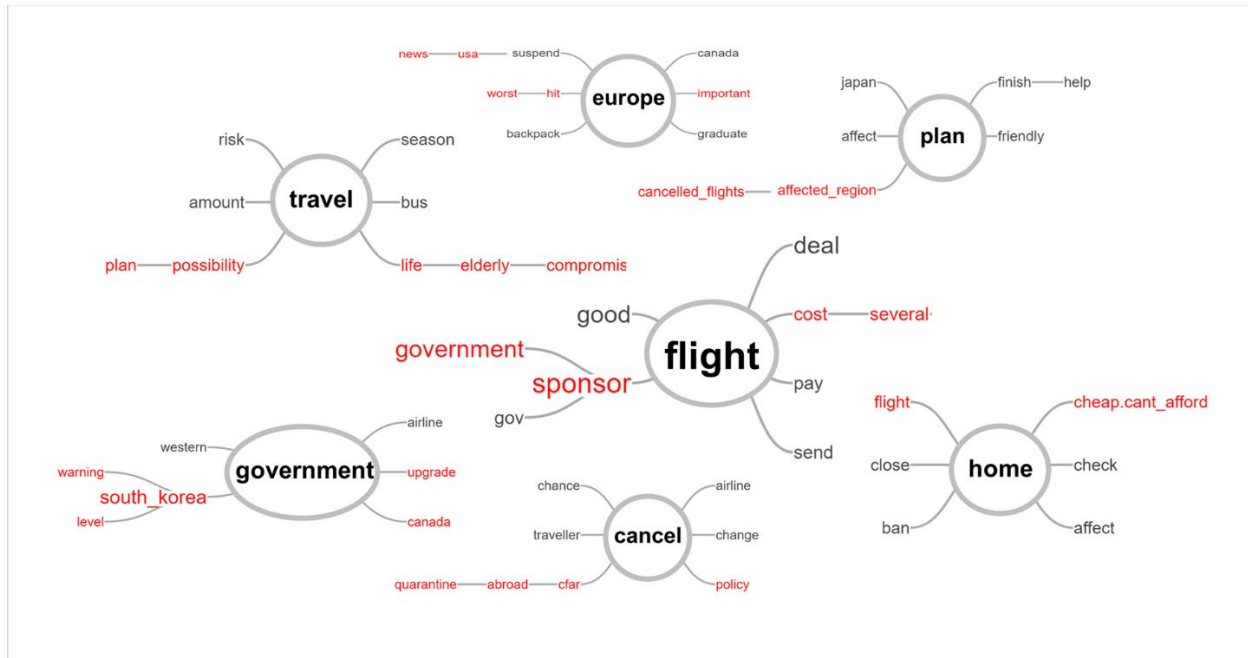
## **4. Results**

### *4.1. Findings from word frequency analysis and word co-occurrence*

A word frequency test was performed to capture latent topics related to COVID-19 among three travel-related sub-Redditors. The most frequent words include “flight,” “travel,” “home,” “government,” “Europe,” “plan,” and “cancel.” The word frequency indicates the main focus and concern of Three travel-related sub-Redditors but does not further elucidate their meaning

(Dickinger et al., 2017). Therefore, the terms co-appearing with these top words were examined so that the specific background relevant to each top word could be understood (Figure 2).

Specifically, the most frequent topic, “flight,” was repeatedly mentioned together with terms regarding the economic transaction (e.g., “deal,” “cost,” “pay,” and “send”) and institutional actors (e.g., “government” and “sponsor”). “Travel” co-appeared with terms such as “risk,” “life,” “elderly,” and “cancel,” which indicated that three travel-related sub-Redditors associate travels with threats of COVID-19. “Home” frequently co-occurs with terms such as “ban,” “close,” and “cant\_afford,” which implies challenges for stranded travelers to return home. “Government” is associated with “south\_korea,” “Canada,” “Western,” “airline,” “warning,” and “upgrading,” which presents three travel-related sub-Redditors’ expectations of the role governments must play. “Europe” is closely related to “suspend,” “worst,” “hit,” and “graduate,” which shows the Western-oriented Redditor community’s perception of the pandemic in Europe. “Plan” is co-present with “cancelled\_flights,” “affected\_regions,” “finish,” and “help,” which reflects three travel-related sub-Redditors’ impeded travel plans. Additionally, “cancel” is most related to “change,” “policy,” “airline,” “guarantee,” and “cancel-for-any-reason (CFAR),” which suggests the main reasons for cancellation and three travel-related sub-Redditors’ concern for company policy or insurance coverage.



**Fig. 2.** Top words that frequently appeared in the dataset and co-appearing terms

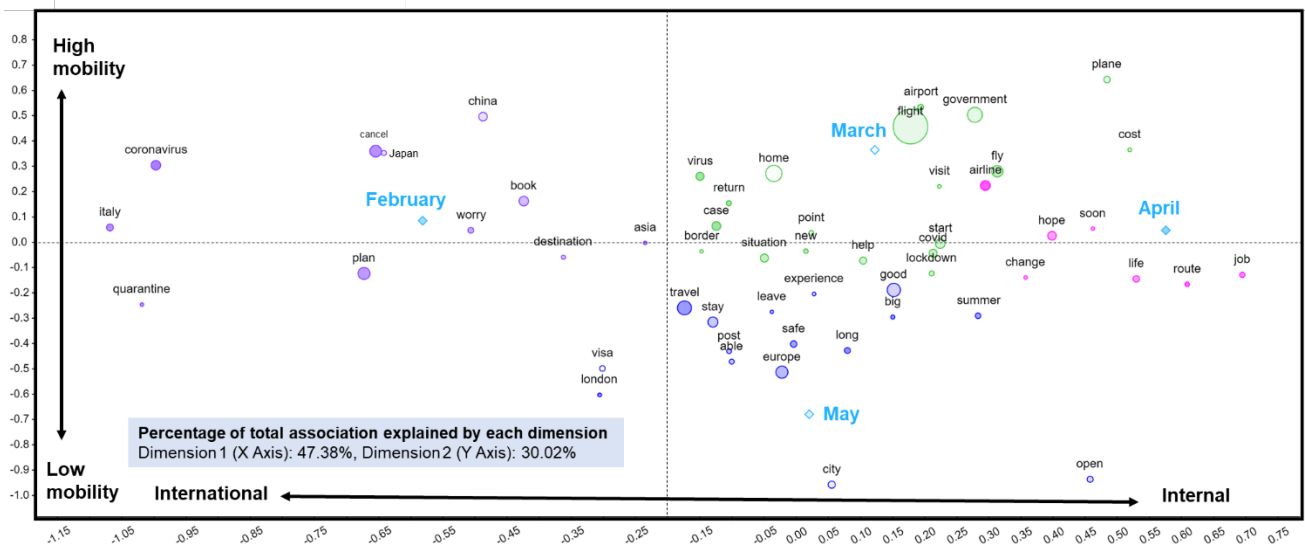
#### 4.2. Findings from timeline analysis

Two types of analyses (correspondence and content analysis) were employed to enhance the robustness of the findings. Correspondence analysis was performed to map keywords that share similarities (Figure 3). Moreover, the perceptual map displays the keyword similarities and differences among the months. We selected two dimensions (X- and Y-axis) that account for 47.5% and 30.0% of the total variances, respectively, and together explain 77.5% of the data. Next, keywords with high absolute values on the coordinates (at the end of the continuum) were found to be most critical in interpreting each dimension since they were unique keywords representing each dimension. For dimension 1 (X-axis), keywords on the left side from the centroid were mainly regarding international issues related to COVID-19. (e.g., Italy, China, Japan, and Asia), while keywords close to the right regarded internal country issues (e.g., job, life). Regarding dimension 2 (Y-axis), keywords plotted on the upper side likely represented high mobility, such trips (e.g.,



airport, flight), while keywords close to the bottom regarded low mobility, lockdown, and travel restrictions (e.g., city, stay).

From the centroid, February was located on the left side (i.e., the international issues) on the horizontal axis and upper side on the vertical axis (i.e., cross-border or inter-state travels with high mobility). Except for February, the rest of the months were more positively associated with dimension 1 on the X-axis, which implies that members began to discuss COVID-19-related to internal issues within their own countries, as compared to February. However, May was displayed on the bottom side on the vertical axis, signaling that issues regarding travel restrictions or lockdown were more frequently shared among travel community members.



**Fig. 3.** Perceptual map for keywords and months

Based on the insights from the correspondence analysis, additional manual content analysis was performed on the actual posts or comments. The documents containing the keywords for each month were reviewed to provide a more in-depth understanding of the issues that were popularly discussed in each month. Table 2 presents the actual quotes that represent the major topics and events by month.

In February, three travel-related sub-Redditors often talked about COVID-19 issues in the most affected countries, such as Italy, Japan, and China. The outbreak first hit Asian countries, such as China and Japan. Since February, Italy had the most reported cases of COVID-19 outside Asia (Schoenwalder, 2020). Accordingly, we found several posts on the amendment of trips to Asian countries. Moreover, many people paid close attention to changes in mega-events, such as the Olympics in Japan. As European countries began to record COVID-19 cases, many sought the opinion of others regarding their original travel plans to Europe or necessary reactions to the pandemic.

While many paid close attention to pandemic issues in other foreign countries in February, from March, interests were mainly centered on the COVID-19-related issues in their own countries. In March, the COVID-19 officially became a pandemic, which induced many discussions on returning home and government regulations on flights and lockdown. Although not reported in Figure 3, the terms that distinctively appeared in March were “repatriate,” “military,” “embassy,” and “evacuation,” indicating that many were interested in COVID-19 news on people returning to their home country.

In April, community members continued to focus on pandemic issues within their own countries, such as job security. People anticipated changes in the workplace. Moreover, those who went through such changes shared their own experiences. Furthermore, many people expressed strong desires to travel. More so, terms related to the airlines and oil (e.g., “Norwegian,” “Finnair,” and “oil”) distinctively appeared in April, representing people’s escalated concerns about the troubling issues surrounding airline companies and other tourism companies. In summary, the major themes in April were the detrimental impacts of the pandemic on the travel industry, related stakeholders, and the spillover effects on the citizens.

Finally, in May, many posts and comments were observed regarding changes in people's lifestyles given the lockdown. As the desire to travel remained high (or even growing), people shared their getaway plans and leisure activities during the lockdown (e.g., walking down the neighborhood or a road trip). Some shared their plans in anticipation of when government regulations will be lifted, which garnered many comments. Naturally, people were also concerned about "safety" issues since COVID-19 cases were still growing in the US. Notably, some talked about their experiences or opinions of "city" and "suburb" life. Accordingly, "suburb," "downtown," and "city" appear prominently in May.

In summary, major topics among three travel-related sub-Redditors varied across the months. Three travel-related sub-Redditors more actively shared their thoughts about external issues in February but talked more about daily-life-related internal issues in the other months. As the travel-related regulations became stringent, issues with lower spatial mobility were more shared among three travel-related sub-Redditors in the later periods.

**Table 2**

The major topics from actual quotes found in the Reddit travel communities from February to May

Month	February	March	April	May
Findings from the perceptual map	(left) International (Upper) High mobility	(Right) Internal (Upper) High mobility	(Right) Internal (Upper) High mobility	(Right) Internal (Bottom) Low mobility
Findings from content analysis	Growing concerns about the COVID-19 issues internationally	Travel to come back home and government regulations as the COVID-19 spread	Job security and issues related to the travel industries, such as airline	Changes in lifestyles and desires to have short getaways and travels without restriction
Actual quotes	<ul style="list-style-type: none"> <li>Countries reporting significant cases of coronavirus include <b>Japan</b>... there may be restrictions on transportation, <b>cancellation</b> of public gatherings... RIP Olympics. (Created on February 25, 2020)</li> <li>I am flying to Innsbruck, Austria today, and travelling by car to the <b>Italian</b> Alps for a skiing holiday. Will I have a risk? (Created on February 25, 2020)</li> <li>My plan for this summer was to take a study abroad trip to <b>Italy</b>. Was already accepted into the program, scholarships lined up, plane tickets bought, and an AWESOME group of students set to go. Then the virus hit and now it's all <b>cancelled</b>. (Created on February 25, 2020)</li> </ul>	<ul style="list-style-type: none"> <li>Alaska and Hawaii (USA) have issued orders mandating a 14-day quarantine for all arrivals via air (Created on March 25, 2020)</li> <li>Does anyone have precautionary tips for necessary air travel at the moment? The US Consulate in India has arranged <b>evacuation</b> flights for US citizens to <b>repatriate</b> this week, with my final destination being Dallas (Created on March 17, 2020)</li> <li>If virus spread does end up being correlated with season, then maybe virus prevalence will drop in the northern hemisphere as it enters summer. But no one knows. (Created on March 13, 2020)</li> </ul>	<ul style="list-style-type: none"> <li>If you're in a long-term <b>job</b> it may be hard to get a 2-year leave without risking the <b>job</b> or the promotion, etc. (created on April 29, 2020)</li> <li>I'm being paid most of my <b>wage</b> even though my workplace is closed which means this is absolutely the most perfect time to go abroad (created on April 29, 2020)</li> <li>I have an aviation degree and I haven't had a <b>job</b> outside of <b>aviation</b> in 15 years. My only option is probably to start another career at entry-level wages and try to build up again (created on April 29, 2020)</li> </ul>	<ul style="list-style-type: none"> <li>I came back to Fort William in March I was shocked to see the country had gone into <b>lockdown</b>. I'm getting really anxious about what to do next I've enjoyed my isolation up here and have only been going out once a day for exercise.</li> <li>USA Budget Road trip East to West: If you plan your trip right, you could make the drive down Highway 1 in California which is one of the most beautiful drives I've ever done.</li> <li>I'm more of a <b>city</b> traveller and it doesn't make sense for me to travel if there's gonna be loads of restrictions to socializing.</li> <li>For the duration of <b>isolating</b> at least, the suburb is actually great.</li> </ul>

### *4.3. The r/travel elicited group-based emotions*

With the application of the NRC Emotion Lexicon, general group-based emotions that prevailed in each month were identified. Thus, both prevailing emotions and changes in emotion over time were visualized. Moreover, emotions associated with top words that represent major topics during the pandemic were found (Table 3).

According to our findings, most three travel-related sub-Redditors remained positive rather than negative, as anticipation and trust were the most prevalent emotional responses to COVID-19. Among the negative emotions, the patterns of sentiment polarity over time were varied. For instance, anger and disgust tended to increase over time, while fear and sadness dropped in March and April and re-intensified in May. Some Redditors had very negative emotional reactions to several events. Interestingly, these negative emotions became positive in the later stages. The negative emotions did not simply fade away. Rather, other positive emotions surged to prevail over the negative emotions. For example, many people expressed their concerns and sadness about the “new normal” after the pandemic, and one Reddit had the following post:

“Am I going to be too old to do world travel once the coronavirus issues [are] over? After 15 years of working hard, I saved to travel the world in 2020, but now it may not be possible, and I am conscious my [life] is ticking [away].”

Members left many comments to provide emotional support, saying: “It's never too late bro. You're only as old as you feel” and “There are people in their 80s who travel around the world. You might need to put it off for a bit, but you have more than enough time left.”

Consistent with general emotions, anticipation and trust were most prevalent in the posts and comments related to each top word, except for “home” and “government.” Moreover, similar patterns of negative emotions (i.e., decreasing and increasing again) were found with most top

words. For example, from 2,297 posts and comments related to flight, anticipation was the most salient in March, and trust was most prominent in March, April, and May. It implies that people felt less fearful, sad, and disgusted in March than February. However, the negative emotions escalated again in April and May. The emotional changes over time demonstrated that public opinion related to events could be evolved.

Although positive emotions were the most common with most top words, negative emotions (i.e., fear) were the most salient in the documents associated with two top words, “home” and “government,” especially in the early stages of the pandemic. In the later stage, however, the negative group-based emotion became positive. Regarding documents associated with “home,” it is worth noting that the negative sentiments related to “home” did not disappear. Rather, it continued to grow in April and May. However, other positive emotions, such as anticipation and trust, grew to be more prominent than negative emotions. Discussions on “government” had similar patterns as those on “home.” While people remained fearful, trust grew even stronger in the later months.

**Table 3**

General emotion scores and emotion scores associated with top words

Name	Month	Anger	Anticipation	Disgust	Fear	Joy	Sadness	Surprise	Trust	Prevailing emotion
<b>The general state of emotions</b>										
General	Feb	0.37	<b>1.10</b>	0.26	0.89	0.59	0.75	0.59	0.98	Anticipation
	Mar	0.43	1.13	0.28	0.73	0.74	0.65	0.59	<b>1.16</b>	Trust
	Apr	0.50	1.35	0.34	0.71	1.03	0.70	0.70	<b>1.37</b>	Trust
	May	0.52	1.46	0.31	0.78	1.11	0.71	0.71	<b>1.59</b>	Trust
	Average	0.45	1.26	0.30	0.78	0.87	0.70	0.65	<b>1.28</b>	Trust
<b>Emotion scores associated with top words</b>										
Flight (N=2,297)	Feb	0.63	<b>1.73</b>	0.38	1.56	0.93	1.29	0.94	1.60	Anticipation
	Mar	0.63	1.66	0.36	1.13	0.98	1.04	0.89	<b>1.77</b>	Trust
	Apr	1.00	2.48	0.50	1.42	1.74	1.37	1.32	<b>2.59</b>	Trust
	May	1.00	3.12	0.51	1.74	2.43	1.57	1.72	<b>3.62</b>	Trust
	Average	0.69	1.85	0.39	1.23	1.15	1.12	0.99	<b>1.97</b>	Trust
Cancel (N=1,802)	Feb	0.54	<b>1.51</b>	0.30	1.34	0.70	1.38	0.92	1.38	Anticipation
	Mar	0.71	1.72	0.38	1.07	1.01	1.26	1.04	<b>1.88</b>	Trust
	Apr	1.08	<b>2.56</b>	0.57	1.36	1.60	1.84	1.47	2.51	Anticipation
	May	0.98	3.40	0.52	1.97	2.28	2.26	1.89	<b>4.02</b>	Trust
	Average	0.74	1.84	0.39	1.17	1.08	1.37	1.10	<b>1.96</b>	Trust
Plan (N=1,764)	Feb	0.60	<b>2.09</b>	0.39	1.42	0.87	1.26	0.94	1.74	Anticipation
	Mar	0.85	<b>2.53</b>	0.57	1.41	1.39	1.29	1.24	2.35	Anticipation
	Apr	0.96	3.33	0.61	1.34	2.17	1.51	1.54	<b>3.37</b>	Trust
	May	1.08	3.63	0.59	1.89	2.41	1.74	1.57	<b>3.99</b>	Trust
	Average	0.87	<b>2.75</b>	0.56	1.44	1.59	1.37	1.30	2.65	Anticipation
Travel (N=1,706)	Feb	0.69	<b>2.09</b>	0.47	1.79	1.17	1.32	0.92	2.04	Anticipation
	Mar	0.89	2.37	0.61	1.63	1.60	1.36	1.14	<b>2.41</b>	Trust
	Apr	0.89	2.84	0.63	1.41	2.17	1.43	1.39	<b>2.97</b>	Trust
	May	1.10	3.25	0.66	1.64	2.54	1.47	1.48	<b>3.57</b>	Trust
	Average	0.90	2.60	0.61	1.59	1.86	1.39	1.24	<b>2.70</b>	Trust
Home (N=1,463)	Feb	0.73	1.76	0.51	<b>1.89</b>	0.87	1.54	0.88	1.64	Fear
	Mar	0.81	<b>2.03</b>	0.59	1.50	1.35	1.32	1.02	1.97	Anticipation
	Apr	1.36	3.47	0.96	1.87	2.60	1.97	1.62	<b>3.54</b>	Trust
	May	1.18	3.28	0.63	2.03	2.25	1.79	1.59	<b>3.47</b>	Trust
	Average	0.92	<b>2.33</b>	0.65	1.61	1.59	1.47	1.15	2.30	Anticipation
Europe (N = 1,071)	Feb	0.55	<b>1.57</b>	0.41	1.17	0.76	1.02	0.94	1.45	Anticipation
	Mar	0.91	<b>2.25</b>	0.60	1.47	1.43	1.34	1.27	2.23	Anticipation
	Apr	0.88	<b>2.82</b>	0.60	1.23	1.98	1.33	1.41	2.81	Anticipation
	May	0.89	2.83	0.51	1.13	2.17	1.11	1.51	<b>3.02</b>	Trust
	Average	0.87	2.41	0.57	1.33	1.61	1.27	1.31	<b>2.42</b>	Trust
Government (N=444)	Feb	1.60	3.80	1.07	<b>5.07</b>	2.20	2.33	1.87	4.40	Fear
	Mar	1.03	2.16	0.65	<b>2.70</b>	1.16	1.48	1.01	2.48	Fear
	Apr	1.07	2.46	0.65	2.56	1.62	1.65	1.21	<b>2.81</b>	Trust
	May	0.79	3.25	0.58	2.96	1.67	1.71	1.08	<b>3.54</b>	Trust
	Average	1.05	2.33	0.66	<b>2.77</b>	1.31	1.55	1.08	2.66	Fear

Note. Bold characters were applied to the most prevailing emotions in each month

## **5. Discussion and conclusion**

### *5.1. Summary of the findings*

As Hjorth and Kim (2011, p. 199) revealed, “while new media don’t make revolutions happen, they do frame how they are conceptualized and experienced in different ways.” This study aims to understand how engagement in a user-generated social media influences netizens’ perception, experience, and emotions during the COVID-19 pandemic. By applying text analysis, sentiment analysis, and timeline analysis, changes over time of three travel-related sub-Redditors’ experiences with the travel-related disaster are captured by analyzing the discussions during the development of the pandemic in the period February – May 2020.

First, the findings from the word frequency analysis indicate that the most popular topics among three travel-related sub-Redditors during COVID-19 include “flight,” “travel,” “home,” “government,” “Europe,” “plan,” and “cancel.” Further, using word co-occurrence analysis, the main concerns of three travel-related sub-Redditors and their circumstances were found to be related to topics such as the risk of travel (e.g., health concern, travel restrictions, quarantine, and economic reasons), changes in the original travel plan (e.g., economic cost, insurance claims, government policies, and company policies), the risk of being stranded in other countries (e.g., accessibility and affordability), and expectations on government action (e.g., the prohibition of the pandemic, safeguards to protect travelers, and up-to-date travel-related policies).

Moreover, findings from the timeline analysis reflect the evolution of Redditors’ focus during different phases of the pandemic. In February, three travel-related sub-Redditors focused on the forecast, preparation, and warning of the upcoming pandemic. In March, three travel-related sub-Redditors began to worry about the threat of COVID-19 to travel plans and the efficiency of



government to repatriate stranded citizens. In April, three travel-related sub-Redditors' concern about the pandemic spread from tourism to everyday life as concerns about daily arrangement, job, and cost of living emerged. In May, three travel-related sub-Redditors' hope and confidence in travel were kindled. As the pandemic evolved, three travel-related sub-Redditors' concern transformed from more context-related external issues to more daily life-related internal issues. Furthermore, the concern about access to spatial mobility declined with diminishing travel possibilities.

Findings from the sentiment analysis generally suggest that three travel-related sub-Redditors' engagement in social media induced more positive group-based emotions than negative ones. Anticipation and trust were the most prevalent emotions related to COVID-19. On average, positive emotions increased over time to outweigh the negative ones. Interestingly, previous studies on online engagement regarding tourism-related disaster management, such as the study of Luo and Zhai (2017) and Zhai et al. (2020), suggested that interactions between netizens escalated negative emotions, which, in turn, transformed a human-induced tourism crisis into a secondary crisis. Contrarily, this study found that three travel-related sub-Redditors adopted the social medium to reveal their emotions, encourage each other, and convey emotional support to those who are suffering from the disastrous impact of the pandemic. As an alternative channel for traditional post-disastrous psychological counseling, social media helped netizens to cope with difficulties such as health threats, social distancing, self-isolation, and travel restrictions.

## *5.2. Theoretical and methodological implications*

This study is the first to comprehensively investigate the impact of engagement in tourism-related social media on group-based emotion in the context of COVID-19. This work contributes to the existing literature on social media and extends the application of the emotional contagion

theory in disaster management. Social media served as an emotional coping mechanism for people impacted by the disaster (Hjorth & Kim, 2011). It can be not only an effective and prompt channel for communication and information-sharing but also an important channel to express emotion and provide mutual support (Kaewkitipong et al., 2012). Three travel-related sub-Redditors provided mutual help and encouragement to each other. Thus, a vast majority of three travel-related sub-Redditors stayed positive during the pandemic and regained confidence for travel during the post-COVID-19 era. As Hjorth and Kim (2011) argued, social media creates new channels for affective cultures via mobile intimacy and, thus, simultaneously expands on earlier forms of intimacy and co-presence (Hjorth, 2005). Regarding tourism, engagement in social media triggered emotions that play a vital role in enhancing tourist's perceived safety and willingness to travel (Sano & Sano, 2019), which is essential for the industry activation and revitalization post-pandemic.

This study analyzes the user-generated content available on Reddit to target netizens who are committed to travel. Unlike other social media platforms (e.g., Facebook, Twitter), Reddit allows members to build on public opinions through free discussions and communication. This freeness allows for capturing changes in the topics and sentiment within the community. Moreover, the integration of text analysis, sentiment analysis, and timeline analysis is employed to explore netizens' experience and reaction to a disastrous event efficiently. These methods are beneficial for summarizing group-based opinion and emotions while minimizing subjectivity.

### *5.3. Practical implications*

From a managerial perspective, social media should be integrated into the standard operating procedure of disaster management to combat the crisis, understand tourists' experience during the pandemic, and address tourists' new expectations post-pandemic. Thus, tourism practitioners, policymakers, and scholars can alleviate the devastating impact, reassure tourists,

and forecast the industrial transformation promptly and effectively. Specifically, when the pandemic hit Western societies in February, people had high expectations of policymakers regarding their role of proposing more timely solutions on the compensation or rescheduling of flight, hotel, and travel cancellation, which may not only protect travelers from economic loss but also reduce non-essential travel. Moreover, when the pandemic escalated in March, various governing bodies announced their plan to repatriate stranded travelers, which attracted the attention of netizens. As social media serves as a tool to gather real-time responses to government policies and the evolution of the phenomenon, understanding the public opinion and emotions can be helpful for the government to generate optimal and necessary solutions. In April, people observed that the shift in focus spread from travel to daily life. Big businesses, including tourism firms, may have acknowledged these issues and strived to ensure employee safety, income, and position. As people begin to adjust to the “new normal,” as observed since May, industry practitioners should be sensitive to the sentiment of tourists towards traveling to understand their new demands. Moreover, tourism practitioners, policymakers, and scholars should utilize social networks adequately to cultivate positive sentiment and reduce negative emotions by encouraging emotional and social support among netizens.

As Hao et al. (2020) noted, the COVID-19 pandemic crisis may offer an opportunity for the tourism and hospitality industry toward a better future. Government and disaster response professionals should evaluate the risk of social media usage in disaster management and establish a team equipped with skills and knowledge of social media to combat the disaster and protect the infected population, both physically and psychologically (Kaewkitipong et al., 2012). Further, disaster management professions should adopt state-of-the-art technologies to develop a system, which integrates real-time analysis, event detection, sentiment analysis, and visualization

recommendation (Chair et al., 2019). Moreover, the disaster management team should make full use of the system to understand netizen's public opinions and group-based emotion, ascertain the most discussed events and concerns to be addressed, streamline information distribution to facilitate mutual help, and propose suggestions to sustain netizen's well-being (Qu et al., 2011). Similarly, Griswold (2013, p. 19) proposed the establishment of a virtual operations support team, which was defined as "a group of trusted agents who support emergency management and disaster recovery efforts through the use of new communication technologies and social media tools via the internet [and lend support] to those on-site [...] who may otherwise be overwhelmed or unwilling to handle the volume of data generated during the emergent event."

Nevertheless, engagement in social media is a grass-roots activity that generates communication in disaster management that can be uncontrollable for the authorities (Kaewkitipong et al., 2012). Its massive amount of information may hinder data analysis for affected communities and professional emergency agencies. Moreover, there is limited engagement between public officials and industry representatives (Sutton, 2010). Therefore, the authorities are suggested to analyze the dynamics of online social networks to control disinformation that emerges from unsupervised posting and sharing, based on which to establish an official central information hub to validate and correct information, deliver and publicize useful information, and minimize information redundancy.

#### *5.4. Limitations and future research*

This study has a few limitations. First, although approximate information on Reddit users are identified, detailed demographic information on the targeted online community members is still unknown as most Redditors do not share their personal details and are anonymous by using nicknames in discussions. Second, according to the distribution of Reddit traffic in 2020, issued

by statista.com, the US has the largest Reddit user base (49.76%), followed by the UK (8.21%), Canada (7.59%), Australia (3.74%), and Germany (3.06%) (Clement, 2020b). The Reddit discussions are predominantly from the Anglosphere perspective, or saying, the US perspective. Thus, perspectives from other cultural contexts are not captured. Future studies can combine various cultural perspectives to compare different opinions or emotions toward the pandemic. Third, even though Reddit has the advantage of capturing the discussions of potential travelers, who are major stakeholders of the tourism industry, the opinions of other stakeholders, such as government, DMOs, or travel companies, were not explored. Fourth, this study employs an exploratory approach to ascertain the natural perceptions and emotions regarding the pandemic. Despite this contribution, the influence of public opinion, and the degree of emotions related to the impact of COVID-19 on the tourism industry, such as tourist arrival and willingness to travel, are not tested. Future studies may adopt the findings of this study to advance theories. They may also adopt the secondary data as the proxy of tourism industry performance, which can be integrated to test the influence of public opinion on tourism. Finally, this study only analyzes texts. However, many posts include videos and pictures that may be used to express perceptions and emotions. Future studies may analyze the various media on social media posts and comments to better comprehend their role in shaping opinions and emotions.

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