Collective remembering and future forecasting during the COVID-19 pandemic: How the impact of COVID-19 affected the themes and phenomenology of global and national memories across 15 countries.

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Conflicts of interest/Competing interests

The authors declare no conflict of interest.

Ethical approval

No animal studies are presented in this manuscript. All procedures performed in our study involving human subjects were in accordance with the ethical standards of the institutional and/or national research committees and with the 1964 Declaration of Helsinki and its later amendments

or comparable ethical standards. The study (including the treatment of participants) reported in this article were approved by the Local Ethical Committees of the institutions involved.

Consent to participate

Our subjects were provided with written information about the study and their rights. They gave informed consent prior to participation.

Consent for publication

Not applicable - all data were collected anonymously and no potentially identifiable human images or data are presented in the manuscript.

Availability of data and materials (data transparency)

This study was pre-registered with the Open Science Framework. Further information about the study and the materials used are available via the following link (https://osf.io/m46nq/). Data from this study will be publicly accessible on the same webpage following an embargo period (with the exception of a minority of countries based on country-level ethics and data protection regulations).

Code availability (software application or custom code)

Not applicable

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Abstract

The COVID-19 pandemic created a unique set of circumstances to investigate collective memory and future simulations of events reported during the onset of a potentially historic event. Between early April and late June, 2020, we asked over 4000 individuals from 15 countries across four continents to report on remarkable (a) national and (b) global events that (i) have happened since the first cases of COVID-19 were reported, and (ii) they expect to happen in the future. Whereas themes of infections, lockdown, and politics dominated global and national past events in most countries, themes of economy, a second wave, and lockdown dominated future events. The themes and phenomenological characteristics of the events differed based on contextual group factors. First, across all conditions, the event themes differed to a small yet significant degree depending on the severity of the pandemic and stringency of governmental response at the national level. Second, participants reported national events as less negative and more vivid than global events, and group differences in emotional valence were largest for future events. This research demonstrates that even during the early stages of the pandemic, themes relating its onset and course were shared across many countries, thus, providing preliminary evidence for the emergence of collective memories of this event as it is occurring. Current findings provide a profile of past and future collective events from the early stages of the ongoing pandemic and factors accounting for the consistencies and differences in event representations across 15 countries are discussed.

Key words: COVID-19, pandemic, collective memory, cross-cultural, future forecasting

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The COVID-19 pandemic has been a truly global phenomenon. Since the first case was identified in Wuhan in early December 2019, over 229 million cases have been recorded and over 4.7 million lives have been lost (Coronavirus Resource Center, 2021, September 22nd). The world has experienced a global recession; world leaders, politicians, and the World Health Organisation have addressed global and national communities stating the need for urgent and aggressive action (i.e. World Health Organisation, 11th March, 2020). In line with these calls to action, many countries have experienced prolonged periods of government enforced lockdown measures, with social distancing, mask mandates, work from home orders, school closures, and restrictions on both national and international travel (Hiscott et al., 2020; Thomas et al., 2020).

Whereas most public events typically affect only a small group of people directly, the COVID-19 pandemic is unprecedented in modern times in that it affected nearly everyone. Events related to the COVID-19 pandemic will likely leave their mark on history and become a part of nations', and the world's, collective memory—that is, memories that transcend individuals and are shared by a social group, be that cultural, religious, or based on national identity (Wertsch & Roediger, 2008). The pandemic, then, created a unique set of circumstances to investigate factors that shape collective memory and future simulations of events experienced universally by individuals across the globe from both national and global perspectives.

Collective Memory for Public Events

Since early work by Halbwachs (1992), there has been a steady rise in empirical and conceptual studies focussing on collective memory (e.g., Hirst, Yamashiro & Coman, 2018; Roediger & Adel, 2015; Wertsch & Roediger, 2008). It is well established that memories for personal and public events are shaped by event-related factors, such as the distinctiveness and emotional intensity of the event (Finkenauer et al., 1998); individual difference factors, such as the age and cultural background of the individual recalling the event (Koppel, Brown, Stone, Coman, & Hirst, 2013; Wang, 2009); and the context in which the event is recalled (Stone & Jay, 2019). Importantly, the formation and retrieval of memories for public events experienced by a collective group are influenced by the motivations, goals, and context of the group (Abel et al., 2019; Wang, 2016, 2021).

Cross-country similarities in the events reported as part of world history demonstrate how mechanisms of collective remembering operate. Recent events, political revolutions, and wars are identified as events of most historical significance across many countries (Liu et al., 2005; Pennebaker et al., 2006). Events that change or enforce the collective identity of a group are maintained in world history over longer time periods, whereas traumatic or emotionally intense events that have less of an impact on overall collective identity are often lost over two to three generations (Wertsch, 2002). Importantly, striking socio-cultural differences are also evident. In broader representations of world history (Liu et al., 2005) and in relation to specific historical events with global impact, such as World War II (Abel et al., 2019), differences in events reported across countries are shaped by the political, religious and cultural perspectives dominant within those countries.

Studies on flashbulb memories for public events (Brown & Kulik, 1977) have similarly demonstrated that memories and the associated emotional and social responses are influenced by the individual's group membership, as defined by respondents' national provenance (i.e., Curci &

Luminet, 2006; Curci et al, 2001; Kvavilashvili et al., 2003; Luminet et al., 2004), religious involvement (i.e., Curci et al., 2015; Tinti et al., 2009), political concerns (Conway et al., 1994), geographic proximity (Pezdek, 2003), and personal involvement (Er, 2003). Taken together, these findings demonstrate that representations of world events within collective memory are shaped by the socio-cultural context in which group membership exists.

In contrast to the "symbolic" approach outlined above, a more "pragmatic" perspective suggests that memorability of public events also depends on their impact on daily routines (Brown et al., 2012; Brown et al., 2016). In accordance with this view, a living-in-history effect has been observed, which demonstrates that the tendency to use public events as an organizational framework for personal life stories is more pronounced in people who survived enduring wars and natural disasters than in people who simply witnessed symbolically influential events followed by a return to business as usual (Brown et al., 2016; Nourkova & Brown, 2015).

The studies outlined above demonstrate the emergence of long-lasting shared representations of past events that had a global impact, which are held by many countries and individuals decades *after* important periods in world history. Regarding the COVID-19 pandemic, the level of continuity between pre-pandemic and post-pandemic life is still uncertain. As of yet, nobody can predict what aspects of the pandemic will be retained as part of collective narratives over time. Therefore, it seems very informative from both pragmatic and symbolic perspectives to examine memories of the pandemic period *at its outset* when the mnemonic interrelations between public and private have just started to develop.

Relatedly, whereas studies investigating collective representations of political and conflict-related world events such as WWII and September 11th have been conducted (i.e. Abel et al., 2019; Curci & Luminet, 2006; Hirst et al., 2009; Liu et al., 2005), psychological research into collective representations of biological or viral events, such as pandemics (i.e., the Spanish flu in

1918/1919; HIV in 1980; Ebola in 2015/2016) is more limited (Erll, 2020). These events are particularly interesting because despite the extreme loss of life associated with them and their long-term impact on the economy and society (Qiu et al., 2017), they are poorly preserved in collective memory (Hirst, 2020). A first step in beginning to understand why these events are poorly preserved within collective remembering in the long term, is to identify which features of the pandemic are reported by collective groups *during* the event and, the phenomenological qualities of these events when they are brought to mind.

Whereas autobiographical memories are often positive in emotional valence (Walker, Skowronski & Thompson, 2003), events reported as collective memories (Öner & Gülgöz, 2020) and as part of world history are often reported as negative in emotional valence (Liu et al., 2005; Pennebaker et al., 2006). However, when comparing events reported as part of national history across three nations (USA, UK, and India), Cyr and Hirst (2019) found a small positivity bias in the top 20 events reported as part of one's own national history. Although these positivity effects were also present when groups reported on the national history of another country, the effects were less consistent. These results may suggest that individuals demonstrate a more robust positivity bias when evaluating historical events from the perspective of their own national group relative to other collective groups to support their own positive identity. On the basis of these studies, we predict national memories to be rated as less negative than global ones.

During the early phase of the pandemic, information was constantly available about the spread of the virus in one's own country relative to other countries (i.e. via the Coronavirus Resource Center). Although theoretical comparisons are often drawn between personal and public or collective memory in previous research, we sought to investigate how global and national perspectives shaped the themes and phenomenology of the events reported. The comparison between global and national event representations was selected as it may better

reflect naturally occurring comparisons made by collective groups within the context of a global pandemic.

Another contextual factor which may shape shared event representations during the early phase of the pandemic is variations in the impact of the pandemic across different countries. The severity of the pandemic outbreak and the stringency of the government restrictions put in place to limit the spread of the virus may influence the type of public events that occurred within each country and the accessibility and phenomenological qualities of such events within collective (i.e., media, health systems) and inter-personal (i.e., discussion with friends, cognition) information processing systems. Although previous research has sought to examine the influence of personal impact of public events on collective remembering (Neisser, 1996, Koppel, Brown, Stone, Coman, & Hirst, 2013; Tinti et al., 2009), less research has focused on how the impact of public events at the national level influences collective remembering. We utilized 'big data' to examine the influence of country-level pandemic impact on shared event representations.

Collective Future Thought

Whereas the study of collective memory is well established, the field of collective future thought is still in its infancy (Michaelian & Sutton, 2019). Collective future thought is defined as the act of imagining an event that has yet to transpire on behalf of, or by, a group (Szpunar & Szpunar, 2016). It has been suggested that collective future thought may underpin how people predict, communicate about, and respond to events that could impact future outcomes and associated collective group identity (Szpunar & Szpunar, 2016). Furthermore, there is some emerging evidence of similarities and differences between collective future thought for public events and other forms of public event representation. Öner and Gülgöz (2020) found that the themes of public events reported were similar across both past and future orientations and that the

frequency of reported collective events in both the past and future was associated with closer psychological (temporal) distance and stronger belief that the events reported form part of a shared group representation. In line with personal event memory, the association between visual imagery and reporting of public events was stronger for past than future representations. Conversely, whereas a positivity bias is evident when individuals report on personally experienced events, events reported in the past and future of collective groups have been found to be more negative in emotional valence (Öner & Gülgöz, 2020; Shrikanth, Szpunar, & Szpunar, 2018). Topcu and Hirst (2020) also found strong correspondence between the themes and phenomenology of past and future national events. However, some differences were also observed. In line with studies of autobiographical memory, future events were found to be less specific and more positive than past events and the positivity bias in the future was partially explained by viewing the nation as more agentic in future than past temporal perspectives.

The above-mentioned results demonstrate that the events reported in the context of collective future thought show a number of shared and distinct features when considered in relation to other forms of psychological event representation. The similarities and differences identified in previous research may demonstrate that, as for collective memory, the event represented in the collective future of a group may act as an interface on which the goals and values of the individual and the society interact (Hirst & Manier, 2008). The pandemic provides a unique set of circumstances to explore the extent to which future event representations are shared across global and national collective groups during an event of historical significance that is likely to have far-reaching implications for the future of individuals and society at large. Identification of the themes and phenomenological characteristics of the events reported in the context of the collective future will help us better understand the relationship between collective

memory and future thought, and help elucidate the socio-cultural mechanisms that shape representations of collective future events.

The Present Study

The current pre-registered study[1] had two related aims. First, we aimed to explore the types and phenomenological qualities of remarkable public events people reported *during* the early stages of the COVID-19 pandemic. Second, we aimed to examine how contextual factors at the national level might alter the lens through which the wider pandemic was understood. To address these aims, we asked over 4000 people across 15 countries to report remarkable events that have happened in a) the world, and b) their country, following the reports of the first case of COVID-19 in Wuhan. We also asked participants to report remarkable events that they expect to happen in the future in both the world and their country.

Because the COVID-19 pandemic is an unprecedented situation, we made no a priori hypotheses about the themes evident in the events reported by participants or if the themes reported would differ between past and future perspectives. To address this aim, a thematic coding scheme was developed specifically for this study using a bottom-up data-driven approach. Comparisons of the themes evident in the events reported by participants were based on the frequency with which themes were reported from global and national perspectives across past and future temporal orientations.

In relation to the second aim, we explored similarities and differences between event representations as a function of two contextual factors operating at the group level to examine their influence on past and future event representations during the early stage of the pandemic. The first contextual factor was the group perspective from which events were retrieved (i) global or (ii) national. The second contextual factor was the impact of the pandemic at the national level.

Namely, the severity of the pandemic outbreak within each country (as measured by the total number of COVID-19 cases per million), and the stringency of the governmental restrictions within each country (as measured by the governmental stringency index, see Balmford et al., 2020, for a similar approach).

When exploring the similarities and differences in the types of events reported from global and national perspectives, we expected that events that characterize the onset and course of the pandemic would be represented similarly across countries. Given the influence of national identity (Abel et al., 2019), national provenance (Curci & Luminet, 2006), and geographical proximity (Pezdek, 2003) on memory for public events, it is possible that greater discrepancies might be observed for national collective events relative to global events, as these events may be more closely linked to country related differences in the content and accessibility of pandemic-related information.

We also conducted exploratory analyses on the emotional valence of past and future events and the vividness of past events. Based on previous research, we expected that the events reported by participants may not necessarily be positive in emotional valence (Öner & Gülgöz, 2020; Shrikanth et al., 2018) but differences may be observed, such that future events are more positive, or less negative, than past events (Topcu & Hirst, 2020), although this effect has not been observed consistently (Öner & Gülgöz, 2020). We also expected that individuals may demonstrate a group bias for national events (Cyr & Hirst, 2019), such that these events may be rated as more positive (or less negative) than global events, and that national events may also be more vivid in memory.

Method

Multi-country design

The study is an international collaboration between memory researchers from universities across 15 countries (i.e., Canada, China, Denmark, France, Germany, Greece, Italy, Malaysia, New Zealand, Poland, Russia, Spain, Turkey, the United Kingdom, and the United States of America). Initially, an expression of interest in a research collaboration was posted within a memory research interest group (24th March, 2020). Additional countries were then targeted to ensure that the countries participating in the study were fairly representative of global variations in the nature of the COVID-19 outbreak (i.e., severity of the situation) and pandemic regulation strategies implemented at the national level (i.e., lockdown regulations). Table 1 and supplementary Figure 1 outline the severity of COVID-19 parameters across the countries included in the study relative to worldwide statistics from the same period. Supplementary Figure 2 presents a world map with countries categorized by their severity and stringency, and Supplementary Figure 3 shows a scatterplot of stringency and severity across countries.

The study was pre-registered during the period of data collection and all collaborators consented to the registered study design and protocols. A master survey was first constructed in English as a result of a "crude and effective" process with the aim of collecting comparable data from different countries. Researchers located in each specific country were responsible for translating the master survey into the primary language in their country and obtaining IRB/ethical approval in line with local standards. Using a thematic coding scheme, written descriptions of the collective events were also coded at country-specific sites in the original language. The master survey, study aims, procedures for data collection and coding manuals can be accessed here (https://osf.io/m46nq/)[1].

Participants

Over 100 individuals from each country participated in the study between the 11th of April - 28th of June 2020. The length of the data collection period within this timeframe differed

across countries. We included only participants who completed at least one group of memory questions (i.e., past global, future global) as well as the demographic information in the survey. Final analyses were conducted with 3983 participants (68.8% female, M_{age} = 33.54, *SD* = 13.84). Participant demographic information for each country is presented in Table 2. To maximize recruitment, participant recruitment strategies differed across countries. The majority of countries recruited through social media outlets and undergraduate subject pools. In addition, other recruitment platforms (e.g., MTurk in the USA and Wjx in China) were used when possible.

Procedure

The survey was developed and distributed anonymously using Qualtrics. On accessing the Qualtrics survey link, participants were informed about the aims of the study and their rights as participants. Informed consent was then obtained. The survey covered general demographic information, the personal impact of the COVID-19 pandemic, six key memory phenomena which were flashbulb events, past global, future global, past national, and future national events, involuntary past and future thinking, and the potential future consequences of the pandemic (see https://osf.io/m46nq/). At the end of the study, participants had the option of providing their email address for participation in possible future studies. Any email addresses obtained are held in accordance with ethical regulations at country-specific sites.

Materials

Past and future collective events. The survey sections focusing on past collective events (global and country-specific) and future collective events (global and country-specific) are of relevance to the research questions under investigation. Within these four collective event

categories, participants were asked to report three events for each category, regardless of event content. Specific instructions for these collective event categories were as follows:

- Past global: "Please indicate three remarkable events that have happened *in the world* (not in your own country, but in other countries) since the disease first appeared in Wuhan."
- Past national: "Please indicate three remarkable events that have happened *in your country* after you first heard about the first case in the world."
- Future global: "Please indicate three remarkable events that you expect to occur *in the world.*"
- Future national: "Please indicate three remarkable events that you expect to occur *in your country.*"

Participants were asked to rely on their memory and not to check details of reported events using other sources. Seven percent of the participants indicated they looked up either content or date information for the past collective events. We did not exclude these participants, because the number of participants who searched for the events were similar country-wise. The instructions did not ask participants to write the specific details of events but rather to provide the name of the event or a short label for it. Participants were also informed that the order in which the three events were reported within each category was not important. Additional information about the estimated dates and phenomenological characteristics of the events was also obtained. For the purposes of the present study emotional valence (" How did/will this event affect you?", 5-point Likert: 1=Very negative, 5=Very positive) and vividness (only for past events, "How vivid is your memory of this event?", 5-point Likert: 1=Not vivid at all, 5=Extremely vivid) were recorded.

Thematic coding. To determine the proportion of reported events related to the COVID-19 pandemic and the events' themes, a thematic coding scheme was developed specifically for this study. The same coding scheme was used across all four collective event categories (i.e., global past, national past, global future, and national future).

A bottom-up data-driven approach was employed for the development of the thematic coding scheme. The thematic coding scheme was based on the coding scheme used by Topcu and Hirst (2020) and adapted to consider additional pandemic relevant themes. The coding scheme was organized using the following hierarchical structure: first, events were coded as *COVID-19 related* or *non-COVID-19 related*. COVID-19 related events were then categorized into 20 main thematic categories (e.g., *lockdowns*, *deaths*, *infections*, *economy*, *travel*, *culture*, *politics and pandemic management*, *health*, *social solidarity*, *media*). Nine of these 20 main COVID-19-related categories included thematic subcategories that reflected a higher event specificity (e.g., the main thematic category *lockdown* included five subcategories, such as *lockdown in Wuhan*, *lockdown in Italy*, or *lifting of lockdown*). The thematic subcategories will not be considered further in this study. Events identified as non-COVID-19-related were categorized into six separate thematic categories (e.g., environment, politics, economy). Finally, reported events that did not correspond with the specific task instructions (6.7% for global past events, 3.1% for national past events, 2.1% for future global events, 1.2% for future national events) were coded in four separate categories (e.g., autobiographical events, listing multiple events). This thematic coding system allowed us to quantitatively inspect the broad range of event themes reported by the participants and examine cross-country overlaps and discrepancies.

Using the thematic coding scheme, all events were initially categorized at each country-specific site in the original language. Coders from each country categorized 10% of the events reported by participants from their country, compared codes, and resolved any disagreements

through discussion. The coders then categorized the remaining events. Interrater reliability was computed among raters in each country and the agreement between the raters was found to be moderate to high[2]. Country-specific data along with their associated thematic codes were subsequently collated in a large multi-country dataset. The coding scheme with all the thematic categories and subcategories, along with some exemplar events representative of different thematic categories, can be found on the project's Open Science Framework page (https://osf.io/m46nq/).

Country-specific COVID-19 severity and stringency parameters. Two parameters were used in the present study to examine the impact of the COVID-19 pandemic across the 15 countries represented: (1) total confirmed cases of COVID-19 per million at the last day of data collection[3] in each country which considered as the severity and (2) the governmental stringency index. The total confirmed cases of COVID-19 per million was used as a severity index of the spread of the disease within each country. The stringency index was used as a measure of the governmental response to the pandemic at the national level. The governmental stringency index was developed by the University of Oxford and consists of a composite score across a number of indicators including travel bans and school and workplace closures. The index is recorded as a score from 0-100 with 100 indexing the strictest form of governmental response (Hale, Petherick, Phillips, & Webster, 2020). The data for these measures was extracted for each country site from the coronavirus pandemic dataset available at the website run by Our World in Data (2020). Since the pandemic began, governmental restrictions have varied within countries. For that reason, to calculate each country's stringency index, we extracted the data from the very beginning of the pandemic to the last day of data collection in each country and then computed the average level of stringency between these dates. A bivariate Pearson's correlation between the severity and stringency parameters demonstrated a moderate negative correlation (r = -.34, p

< .01), suggesting that although related, these two parameters represent separate underlying constructs.

We divided the countries into three categories (low, medium and high) in terms of both COVID-19 severity and governmental stringency. To create these groups, we calculated the mean and standard deviation of each index, and assigned countries to a group on the basis of where they fell in relation to these metrics. More specifically, countries 1 SD or more below the mean score of each index were assigned to the "low" severity or stringency group; countries 1 SD or more above the mean score of each index were assigned to the "high" severity or stringency group; and the remaining countries were assigned to the "medium" severity or stringency group. Table 1 shows the exact numbers of total cases and deaths per country, along with the countries and their categorization.

Results

Data analytic strategy

The results are organized into three sections in which we address our primary aims. First, we summarized the types of events reported across the 15 countries and compared these events between countries. For these analyses, we focused only on the COVID-19-related events which were reported by at least 4% of our participants. Although there are studies using a higher value (e.g., 10%; Topçu & Hirst, 2020) or relying on the number of participants (Tekcan, Boduroğlu, Mutlutürk, & Aktan-Erciyes, 2017), we set a lower minimum value of 4% in an effort to be relatively representative of the different event themes reported across countries. Second, we compared the frequency of the themes evident in the reported events across the three levels of severity and stringency to examine if the themes reported were related to country-specific COVID-19 factors (see Table 1 for the severity and stringency categories of countries). Finally,

we investigated whether the phenomenological properties of global and national events differed across past and future orientations.

COVID-19 related event themes

To determine the frequency and content of COVID-19 related event themes, we calculated the mean percentage of participants across the 15 countries who reported events corresponding to the various themes. As Tables 3-6 show, the majority of reported events across all event categories were COVID-19-related events (81.4% of global past events, 87.5% of national past events, 85.4% of global future events, and 85.2% of national future events).

For past events, infections (14.8% and 10.3%) and lockdown (9.2% and 20.1%) were the most commonly reported themes across the majority of countries in both global and national events, respectively. Infections in global and national events and lockdown in national events were reported by at least 4% of participants across 14 of the 15 countries, whereas lockdown in national events was reported by at least 4% of participants across 10 of the 15 countries included in the study. In addition, politics (7.1% and 6.3%) and impact on health systems (4.1% and 5.0%) were also reported frequently. Politics was reported by at least 4% of participants across 10 countries and impact on health systems was reported by at least 4% of participants across 7 countries for global events and 4 countries for national events. For global events specifically, deaths (5.7%, > 4% across 11 countries), cultural events (4.9%, > 4% across 6 countries), travel limitations (4.2%, > 4% across 7 countries), and media-related themes (4.0%, > 4% across 4 countries) were reported frequently. Whereas for past national events, events related to mass closures (8.9%, > 4% across 7 countries), hygiene and social behaviour (6.1%, > 4% across 12 countries), and to a lesser degree social solidarity (4.6%, > 4% across 2 countries) were reported by >4% of participants.

For future events, economy (22.4% and 26.8%) and a second-wave of the pandemic (6.4% and 4.4%) were listed by the majority of countries in global and national events, respectively. The economy was reported by more than 4% of participants across 14 countries for both event types and a second wave was reported by more than 4% of participants across 13 countries for global events and 11 countries for national events. Whereas developments in health science (8.9%, < 4% across 12 countries), politics (5.0%, < 4% across 11 countries), and travel (4.8%, < 4% across 8 countries) were common themes in global future events, lockdown related events (12.4%, < 4% across 10 countries) were mentioned by the majority of countries for future national events.

Thematic differences based on severity and stringency measures.

We then investigated the relationship between COVID-19 related event themes and the impact of COVID-19 within each country. Figures 1 and 2 demonstrate that, for each event category (past global, past national, future global, and future national), the frequency of reported events varied significantly, with a small effect size, depending on the severity and stringency of the pandemic within the country in which participants were living.

For past global events (see Figures 1a and b), individuals in countries where pandemic severity was medium and high reported significantly more events across almost all themes, with the exception of infections and politics-related event themes. An opposite pattern was observed for stringency, where individuals from high-stringency countries reported more political and infection-related events. In addition, low-stringency countries reported more events related to travel, culture, lockdown, and health. This difference was more robust for deaths, such that high-stringency countries reported 6 to 9 times fewer death-related events than low- and medium-stringency countries (see Figure 1b).

For past national events, the theme of lockdown was reported frequently regardless of pandemic severity and stringency. Events related to infections and hygiene were reported more frequently in high-severity (see Figure 1c) or low-stringency countries (see Figure 1d), whereas health and social solidarity-related issues were reported more frequently in low-severity or high-stringency countries.

Thematic differences in future global and national events as a function of pandemic severity and stringency are shown in Figure 2. Although the economy was a frequent theme across future global and national events, Figures 2a and b indicate that people living in low-severity or high-stringency countries brought to mind more future thoughts about global events related to the economy relative to other severity/stringency groups whereas people living in high-severity and low stringency countries brought to mind more future thoughts related to lockdown. Whereas events related to the developments in health science were comparable across different levels of severity, this theme was more common in individuals from countries where stringency was low compared to countries with higher stringency levels.

For future national events, the pattern was similar to the pattern for future global events. Participants in countries with low severity and high governmental stringency brought to mind a greater proportion of future thoughts related to the economy relative to individuals from countries with high severity and low governmental stringency levels, whereas participants in low severity and high stringency countries brought to mind more future thoughts about lockdowns.

Phenomenological properties of reported events

To examine the emotional valence of global and national events for the past memories and future simulations, we conducted a two-way factorial ANOVA with time (past-future) and event type (global-national) as between-subject factors and valence as the dependent variable.

The main effects of time, $F(1, 14384) = 255.58$, $MSE = 408.12$, $p < .01$, $\eta^2 = .02$, and event type, $F(1, 14384) = 24.31$, $MSE = 38.82$, $p < .01$, $\eta^2 = .01$, were significant, indicating that individuals reported past memories ($M = 2.47$, $SD = 1.15$) as more negative than future simulations ($M = 2.87$, $SD = 1.52$), and global events as slightly more negative ($M = 2.53$, $SD = 1.35$) than national events ($M = 2.59$, $SD = 1.17$). Means and standard deviations for valence and vividness ratings of past and future events are presented in Table 7.

The interaction between event type and time was found to be significant, $F(1, 14384) = 8.15$, $MSE = 13.02$, $p = .01$, $\eta^2 = .01$. Further pairwise comparisons indicated that national events were less negative than global events, and in addition, this difference was more pronounced for future events, suggesting that individuals tend to perceive a less negative future for their own country than for the world.

We also controlled for the severity and stringency measures to examine whether observed differences could be explained by the context in each country. The covariate effects of severity, $F(1, 14384) = 15.28$, $MSE = 24.14$, $p < .01$, $\eta^2 = .02$, and stringency, $F(1, 14384) = 7.30$, $MSE = 11.53$, $p = .007$, $\eta^2 = .02$, were significant and indicate that the difference in emotional valence between past and future events becomes more salient for high severity-low stringency countries. Nevertheless, the main effects of time and event type, and their interaction remained significant.

Finally, we examined whether individuals recalled global and national events with differing degrees of vividness. Event type had a significant effect on the vividness of reported memories, $F(1, 10764) = 788.2$, $MSE = 889.94$, $p < .01$, $\eta^2 = .07$, showing that individuals recalled national events ($M = 3.19$, $SD = 1.07$) more vividly than global events ($M = 3.77$, $SD = 1.05$). When we controlled for the effect of severity and stringency measures on vividness, the covariate effects of severity and stringency were not significant, $ps > .10$.

Discussion

The COVID-19 pandemic has led to a dramatic change and an unprecedented challenge to people's lives worldwide. The outbreak of the virus has changed daily routines of individuals and reshaped the goals and concerns of societies. Although the entire world was alarmed by the virus, how countries experienced the pandemic differed depending on the timing and severity of the outbreak. Responses to the pandemic varied too; accordingly, some countries implemented very harsh restrictions from the very beginning, whereas others remained more passive (Hale et al., 2020), all of which influenced how the situation was viewed at the individual level. Thus, although the COVID-19 pandemic is a globally shared event resulting in a common concern across the world, individuals may have unique representations of the pandemic depending on the country they are living which are tied to the goals and motivations of that national collective group.

Here, we asked individuals from 15 countries to report the most remarkable past and future public events from during the early phase of the pandemic and examined the themes and phenomenology of events reported. We were interested in investigating the emergence of shared pandemic-related event representations during this period and the influence of contextual group factors on these event representations. Firstly, we compared event representations of global and national events. Then we conducted country-level analyses testing whether past and future events differed across countries with different levels of pandemic severity and governmental stringency. Finally, we focused on individual responses to examine whether reported events differed in terms of their phenomenology.

Collective Events for COVID-19

As the main concern of the countries during the spring of 2020 was presumably the COVID-19 pandemic, we expected reported events to be dominated by themes related to the pandemic. In line with this expectation, an average of 85% of all events were related to COVID-19 across past and future orientations, reflecting a pattern of remembering and simulation congruent with active goals and concerns of the collective (Hirst & Manier, 2008). Importantly, we found significant overlap in the most frequently recalled event themes reported in past events across countries, thus providing evidence for the emergence of event themes shared both by individuals within countries and across countries *during* the pandemic.. Themes of lockdown and infections dominated memories of public events at both national and global levels and themes of politics and health systems were also evident. These findings suggest that the spread of the virus (infection), responses limiting the spread (lockdown), and the systems acting to fight COVID-19 (politics and health systems) were prevalent in the minds of individuals throughout the world during the early stages of the pandemic. Differences were also identified across global and national events. Although event themes relevant to the spread of the disease across international borders were frequent in past global events (i.e., travel restrictions and cultural events), themes related to more local concerns and of intra-cultural relevance (e.g., hygiene, social distancing, mass closures) appeared distinctively for national events.

For future events, there was a far greater overlap across countries in the events expected both globally and nationally relative to past events. Importantly, this overlap suggests that, in addition to countries or social groups (Szpunar & Szpunar, 2016), collective future thought can occur at a global level during ongoing collective events. The impact of the pandemic on the future economy was the most common event theme in global and national events with over 20% of events focusing on this theme. Themes of a potential second wave and lockdown were also represented in both global and national future events. The focus on the economy in future

thinking is a clear contrast to the themes reported in past events, demonstrating a change in focus to thinking about how the pandemic may continue to impact on systems integral to daily life.

Although the study of future collective thought is still in its infancy, current views suggest that the greater overlap in future event themes may be shaped to a larger degree by the views conveyed by mass media and global or local authorities (Szpunar & Szpunar, 2016). Individuals may have even experienced the initial signs of, or been exposed to speculation about, such events at the time of the data collection, resulting in shared future thought, not only for their nation, but also for the broader global collective.

Levels of Severity and Stringency Influence Recall

We expected measures of severity and stringency to constitute the context of retrieval and to influence which events would be reported across countries. We believe these measures also reflect the context of encoding, in the sense that they are indices of the way people experienced the reported events while they were occurring. In countries where stringency levels were high, the severity of the pandemic tended to be low, resulting in a consistent pattern in the recall of events at high and low ends of the respective measures (Dalton, Corbett, & Katelaris, 2020). High stringency measures may prevent the pandemic becoming more severe in a country or vice versa, and this association may influence the way individuals attend to or evaluate the information related to the pandemic. Thus, we expected contextual features of severity and stringency to shape collective memory and future thought both at the country and individual level.

For global past events, people in countries where severity was high and stringency was low (e.g., the United States) reported more events related to the lockdown and deaths than did people in countries where severity was low and stringency was high (e.g., China). As individuals perceived more threats in their own country, they may have become more interested in the

situation in other countries. Similarly, these individuals reported more media-related global events, including COVID-19 related briefings or social media. Perhaps these individuals had a tendency to turn to media or other information sources around the world—especially during crisis situations when fear and uncertainty is high (Longstaff & Yang, 2008). Surprisingly, infection-related events were reported more frequently in low severity-high stringency countries than in high severity-low stringency countries. On the one hand, we might have expected the opposite pattern, which would have been consistent with the reports of deaths and lockdown, because all three themes could be considered as pandemic-related threat indicators. On the other hand, it is possible that in high severity countries, the number of deaths (rather than infections) may have been a better indicator of global risk (Sornette et al., 2020). Furthermore, perhaps in low severity countries, media coverage of infections in other countries was more prevalent to remind people of the severity of the pandemic elsewhere and the importance of following mandated restrictions.

At the national level, reporting of infection-related events increased with pandemic severity, showing a more consistent pattern with reports of deaths and lockdown measures. Individuals may have been more attuned to the rate of infections, as well as measures of hygiene and social distancing, when considering the severity and spread of the virus in their own country. On the contrary, issues related to social solidarity and health (e.g., mental health, health systems) came up more frequently in these countries. It appears that when pandemic threat was high—as in high severity-low stringency countries—, threat-related information (e.g., infections, hygiene) was prioritized (Mathews & Mackintosh, 1998). On the contrary, in low severity-high stringency countries, individuals retrieved a wider range of information, allowing them to attend to civil engagements and social collaboration to deal with the immediate effects of COVID-19.

For future events, economy-related changes were common in individuals' reports. In low severity-high stringency countries especially, people reported more economy-related events for

both global and national events than in the high severity-low stringency countries. High severity countries, however, tended to report the more direct consequences of the pandemic, such as lockdown and second wave of COVID-19, reflecting how current concerns can be embedded in one's thoughts about the future (Cole & Berntsen, 2016) in those countries. We also observed similarities in future expectations. For global events, irrespective of the levels of severity or stringency, expectations for the development of cures and vaccines for COVID-19 were comparable across countries. For national events, there were only slight variations in reports on the course of the pandemic (e.g., the end of the pandemic, the second wave of COVID-19). Such consistency across levels of stringency and severity suggests the adoption of common goals at global and national levels.

Comparing the past and future events, there was some variation in the themes of global and national events occuring in the past, suggesting individuals focus on different issues in their relatively closer micro context relative to the broader macro context. However, for future events, there was greater overlap: all the themes reported for national events were also evident in the global events, which may be a function of the semanticized schematic information people use to infer the 'unknown' (Michaelian & Sutton, 2017; Scherman, Salgado, Shao, & Berntsen, 2017). Themes evident in future simulations target how to re-establish the pre-pandemic state of the collective and the consequences to be experienced post-pandemic, both of which serve to reduce the uncertainty in the future of the nation and the world.

Individual Level Analysis: Phenomenology of Reported Events

Research on personal events has demonstrated that reports of future events tend to be more positive but less vivid compared to past events (D'Argembeau & Van der Linden, 2006; Shao, Yao, Ceci, & Wang, 2010). Although there has been less evidence for the phenomenology

of collective events, existing evidence suggests considerable consistency in the valence and vividness of past and future collective events, and in line with personal events, collective future is perceived more positively than the collective past (Topçu & Hirst, 2020), which may reflect individuals' willingness to create a more positive future for their collective group. In the context of national events, the country that individuals are living in represents a collective ingroup with which individuals have a shared context and culture In contrast, global events, could be perceived as occurring within a wider collective group (i.e. humans on earth) or, as occurring for an outgroup (i.e. our nation vs. other nations) and both of these global perspectives may make global event representations less relevant to individuals relative to national events. For this reason, we expected differences in the phenomenology of the global and national events reported for the past and the future.

We found a positivity bias for the future events. Consistent with previous findings (e.g., Cole, Staugaard, & Berntsen, 2016), future events were perceived as less negative than past events and this difference was more salient for national events compared to global event reports. When thinking about their nation, the social group of greater relatedness, individuals tend to envisage a more positive future. In line with explanations at the level of personal past and future events (Berntsen & Bohn, 2010), this bias may serve a self-regulatory function. Irrespective of what could happen in the world, belief in the recovery of one's own country from the impact of the pandemic may help individuals to maintain hope in the time of the COVID-19 crisis. Similarly, individuals reported relatively less negative past events for their nation, by which comparisons of their nation with other countries preserves a more favourable view of their national collective. It is also important to point out that the pattern of the phenomenology of reported events persisted even when we controlled for severity and stringency. Specifically, although contextual factors of the pandemic influence what is reported at a global and national

level, the way these events are recalled could have a universal function for these individuals that serves them to adaptively represent the closer and more distant collectives.

In addition to valence, we asked participants about the vividness of past events and compared the richness of global and national event memories. We found national events were recalled more vividly than global events and the stringency or severity of the pandemic had no influence on these vividness ratings. The source of information for global events is likely media outlets, thus although the information is detailed, paired with vivid images, it may be less personally relevant. On the other hand, for national events, although the events were not directly experienced and also learned of through media, individuals may have experienced the consequences of the events at a more personal level. In addition, frequent exposure to information may be less likely for global events, whereas for national events, exposure through media as well as social sharing of event-related information within the collective may serve as additional forms of rehearsal, thus facilitating consolidation of memories of the event and contributing to the saliency of event representations. This pattern could also be explained by the self-relevance effect, making memories more salient (i.e., Bluck, 2003; Conway, 2005). Individuals are part of the national collective, and other than the shared goals and the history, the shared context of living binds these group of individuals (Hirst et al., 2009), As such, these events are perceived as more self-relevant, which in turn activates a more organized, highly elaborated knowledge of the nation group as a collective (Johnson et al., 2002). Thus, reference to the national collective at the time of recall may enhance the accessibility of the positive information, favouring the group and aiding the retrieval of vivid representations of these national events. Future research could serve to examine the relationship between self-relevance and the phenomenological characteristics of collective past and future thought.

Theoretical Implications

The COVID-19 pandemic has changed the world's agenda. Individuals' memory representations have become aligned with these changes as evidenced by the overrepresentation of COVID-19-related events in both the national and global events recalled. These findings support the view that shared concerns are represented through consistent recall across individuals at different levels of the collective (Hirst & Manier, 2008). We found overlap in reports of global and national events about critical information related to the spread and minimization of the COVID-19 pandemic. However, the situation in each country was unique, resulting in small differences in reports of national and global collective events. Also, in line with previous findings (Abel et al., 2019), the events countries recalled differed depending on the country-specific factors. The contextual dynamics of stringency and severity in each country characterized the situation of the pandemic, which also informed members of the collective about which events were more remarkable. These two measures are especially important, because severity of the pandemic represents the degree of pandemic threat within each country, potentially influencing both the individuals' emotional responses to the pandemic and the general affective climate in the society (e.g., frequent media exposure to infections, deaths). Similarly, stringency represents a preventive collective action, a collective goal, shared by the members of the social group. Thus, from the bottom-up, these measures characterize the shared features of the pandemic in a particular context and provide objective sources of information about the context in which individuals begin to form mental representations of collective events.

Accordingly, high degree of overlap in countries where the contextual factors were similar indicated unique collective concerns and event representations for the smaller national and larger global collective. Importantly, these findings build on previous research by demonstrating that shared representations of world events emerge within global and national collective memory

during ongoing events which have worldwide impact and are likely to be of historical significance (Hirst et al., 2018). In line with studies of collective event representations of events which occurred decades previously (Abel et al., 2019; Pennebaker et al., 2006), these event representations for ongoing world events are also influenced by country-specific contextual factors. It is important to note that other contextual group factors may also play a role at the national level such as the size of the nation, the economic and welfare systems in place and previous experience with epidemic or pandemic diseases (e.g., SARS). These contextual group factors warrant further investigation in future research.

Because there are many unknowns regarding the long-term effects of COVID-19, future simulations are likely to be shaped by the external sources of information, such as conversations with friends or family or media input (Anderson, 2012), showing how shared knowledge in the collective can lead to mnemonic convergence. Although we observed considerable overlap in the themes reported in past and future events (Öner & Gülgöz, 2020; Topcu & Hirst, 2019), we also observed greater consistency across countries in the event themes reported in the future relative to the past. These findings are in line with previous research demonstrating higher levels of consistency within future events relative to past event representations (Kane, Van Boven, & McGraw, 2012). The future event themes were similar to the messages promoted by governmental and health regulation authorities on how to manage the virus (i.e., developments in health science), and its associated societal consequences (i.e., the economy, lifting of lock-down, and politics).

Possible Limitations

The current research has several limitations. First, although the data from all countries were collected within the same two-and-a-half-month period, the duration of active data

collection differed in each country. The outbreak and the spread of the COVID-19 virus was different across countries. Although severity and stringency measures may countervail part of this variability, it is possible that the rapidly changing COVID-19 situation within each country influenced the events individuals reported. As individuals gradually have more information, the types of events they preferentially keep salient may change accordingly. Additionally, data was collected during one time point and therefore was not analysed longitudinally. However, we hope to address this limitation in follow-up studies.

Second, we asked participants to report remarkable events since the pandemic outbreak. We used this restriction as a time limit for the responses reported. On the one hand, this instruction may have biased responses toward pandemic related events, resulting in COVID-19-themed events dominating the responses. On the other hand, the period during which we collected data was dense with pandemic-related events and due to the uncertainty in the situation, it is very likely that individuals preferentially attended to COVID-19-related information. Thus, even if we used a more neutral instruction, we would expect a similar pattern in event themes. Despite this limitation, the study demonstrates important similarities and differences in the themes and phenomenological characteristics of past and future collective events reported during the early stage of the pandemic which are informative within the field of collective thinking.

Third, sample characteristics differ across countries. Our goal was to include a range of 100 to 300 participants from each country in proportion to the population of the country. For that reason, some countries used crowd-sourcing data collection tools, some recruited student samples, and some distributed the survey through social media. As such, this sampling method resulted in samples of differing age and education levels. Although the current research does not rely on demographics, this variation makes it difficult not only to generalize the findings across the nations but also to make direct country-wise comparisons. The second issue with respect to

sampling is the sample size, in that, although we recruited at least 100 participants from each country, a larger sample would be preferable, and more representative of the population characteristics, for collective memory research. Nevertheless, by measuring three events per condition, we increased the overall power and reliability of the data. One final issue about sampling is related to the possible diversity in the situation within some countries. Especially in large countries, like China, Russia, and the United States, contextual factors differed across cities or states, resulting in variation in the psychological responses of individuals. Our measures of severity and stringency, however, were taken across the whole country, not particular provinces or states. We addressed this problem not in regard to the content but to the phenomenology. Although country-level severity and stringency had significant effects on the phenomenology, differences in the past-future and global-national events persisted. Although this finding provides a general view of how individuals represent events at a country-level, individual-level data could be examined in future research by looking into the effect of the pandemic on individuals' lives.

Final Conclusions and Future Directions

The present study took advantage of the unique opportunity to examine cross-country differences in collective memory and forecasted events in a large dataset of almost 4,000 participants recruited from 15 countries across Asia, Europe, North America, and Oceania. Despite a diverse range in cultures, there was a clear congruency in the content of collective events across all nations in this study. Themes of infection and lockdown dominated reports of public past events, and themes of impact on the economy and a second wave dominated future thought. Although we asked for only three events per condition (past-country; past-global; future-country; future-global), the most frequently mentioned events were typically shared rather than idiosyncratic to specific countries. This global sharing of key events is in line with how people

remembered World War II (Abel et al., 2019; Roediger & Abel, 2015); with some exceptions, commonalities in collective remembering across nations was typical. However, differences in events were found. In line with previous research, future events were reported as less negative than past events. Furthermore, events reported from the perspective of the future of the nation were less negative than global future events, suggesting that the collective group from which events are constructed influences the phenomenological characteristics of past and future events. In addition, we used 'big data' to show how country-level statistics explained specific differences in the content of past and future collective events (e.g., greater frequencies of economic events for low severity-high stringency countries) and presented the first study of shared representations of global and national events for the 'collective future' (a fledgling but promising area of study; Szpunar & Szpunar, 2016).

This study was cross-sectional and future research should explore how changes in national narratives on the impact of COVID-19 (e.g., national 'successes' in eradicating its effects) could potentially alter collective memory and forecasted events (perhaps creating divergence in key memories across countries). In sum, the current study therefore not only provides an expansive 'snapshot' of collective understanding from within a global pandemic, but also presents a solid starting point to examine the longer-term effects of the COVID-19 pandemic on collective memory and collective forecasting.

Footnotes

[1] We intend to make the data available online via OSF so that researchers can benefit from this unique data set to test separate hypotheses. However, in a minority of cases, data was not available for sharing due to either specific IRBs or individuals not giving such a consent.

[2] Most of the countries computed the agreement between two raters and they tested interrater reliability using Cohen's Kappa. However, the countries having more data points used more than two coders and, for these countries, Krippendorf's Alpha was used as the index of agreement between more than two raters. For the two measures, we found a fair to good level of agreement across raters with values ranging from .53-.69 (for Krippendorf's Alpha) and .61 to .89 (for Cohen's Kappa).

[3] Total confirmed COVID-19 deaths per million was also considered as a measure of COVID-19 severity, and analyses using this index demonstrated a similar pattern of findings. Total COVID-19 cases per million was selected as the final index of severity for this study to minimise the influence of variations in national health system response on the index of COVID-19 severity.

Open Practices Statement

The study was preregistered and can be accessed at https://osf.io/m46nq/ . The data have not been made available on a permanent third-party archive because Institutional Review Board in each country does not approve that we could not post the data; requests for the de-identified data can be sent via email to the corresponding author.

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Figure Captions

Figure 1. *Frequency of past events reported as a function of COVID-19 severity and stringency*

Figure 2. *Frequency of future events reported as a function of COVID-19 severity and stringency*

Table 1

Stringency and Severity Indices of Countries

Abbr.	Date	Country	Continent	Stringency Index (Mean)	Categories for Stringency	Total Cases	Total Deaths	Total Cases (per million)	Categories for Severity	Total Deaths (per million)	Info on Stringency Index
USA	23-05-20	United States	North America	37.69	Low	1631175	100399	4927	High	303.46	(SD = 33.500, max = 72.69, N=144)
CAN	15-05-20	Canada	North America	39.55	Low	75959	5679	2012	Medium	150.468	(SD = 33.959, max = 74.54, N=116)
DNK	03-06-20	Denmark	Europe	43.90	Low	11971	580	2066	Medium	100.135	(SD = 30.886, max = 72.22, N=135)
DEU	25-05-20	Germany	Europe	45.85	Low	180600	8309	2155	Medium	99.172	(SD = 29.748, max = 76.85, N=126)
MYS	21-05-20	Malaysia	Asia	47.78	Medium	7059	114	218	Low	3.522	(SD = 26.488, max = 73.15, N=122)
GBR	05-06-20	United Kingdom	Europe	47.79	Medium	264150	38505	3891	High	567.201	(SD = 32.593, max = 79.63, N=137)
POL	26-05-20	Poland	Europe	48.26	Medium	22074	1024	583	Low	27.057	(SD = 35.361, max = 83.33, N=127)
GRC	05-06-20	Greece	Europe	49.29	Medium	2967	180	285	Low	172.69	(SD = 34.639, max = 84.26, N=137)
RUS	26-06-20	Russia	Europe	50.33	Medium	619936	8770	4228	High	60.1	(SD = 35.588, max = 87.04, N=127)
NZL	05-06-20	New Zealand	Oceania	50.54	Medium	1504	22	312	Low	4.562	(SD = 33.855, max = 96.3, N=137)
TUR	28-06-20	Turkey	Asia	51.74	Medium	197239	5097	2338	Medium	60.435	(SD = 27.739, max =75.93, N=160)
ESP	20-06-20	Spain	Europe	53.57	Medium	245938	28322	5260	High	605.756	(SD = 32.236, max = 85.19, N=152)
FRA	02-06-20	France	Europe	57.89	High	190735	28943	2922	Medium	443.411	(SD = 33.371, max = 87.96, N=134)
ITA	30-05-20	Italy	Europe	63.93	High	232664	33340	3848	High	551.422	(SD = 30.769, max = 93.52, N=131)
CHN	15-05-20	China	Asia	69.83	High	84038	4637	58	Low	3.222	(SD = 12.626, max = 81.94, N=116)

Note. Date refers to the last day of data collection in the respective countries. Severity categories were obtained using total cases per million.

Table 2

Demographics Grouped by Countries

		% of study completed		Age		Gender			Education		Home country	COVID diagnosis (Self)		COVID diagnosis (other)	
Country	*N*	*M*	*SD*	*M*	*SD*	Male (%)	Female (%)	Other (%)	Higher education (%)	Up to high school (%)	(%)	*N*	(%)	*N*	(%)
Canada	189	99.5	4.95	31.59	10.64	60.85	38.1	1.06	75.13	24.87	86.6	1	0.52	49	25.93
China	610	100	0	23.48	6.4	19.84	75.41	4.75	84.26	15.74	100	1	0.16	4	0.66
Denmark	151	99.8	0.6	42.32	19.16	21.85	78.15	0	76.16	23.84	96.7	0	0	47	31.13
France	159	82.52	25.74	41.46	17.98	29.56	69.18	0	88.05	10.69	94.9	2	1.27	79	50.32
Germany	115	98.3	9.3	25.12	7.71	12.17	84.35	2.61	25.22	73.04	93.8	1	0.88	35	30.7
Greece	187	87.09	22.11	42.1	11.11	22.99	74.87	1.07	74.33	24.06	99.5	0	0	29	15.68
Italy	337	92.98	13.8	30.28	10.85	24.33	75.37	0.3	62.02	37.98	98.8	0	0	114	33.83
Malaysia	107	99.99	0.1	22.93	5.25	17.76	82.24	0	70.09	29.91	75.7	0	0	14	13.08
New Zealand	91	90.86	20.99	28	10.57	14.29	85.71	0	53.85	46.15	78	0	0	15	16.48
Poland	240	82.52	24.7	29.92	9.07	16.25	79.58	0.42	72.92	22.5	99.1	2	0.87	26	11.26
Russia	197	89.55	20.91	39.35	14.77	26.9	69.54	0	84.26	9.14	92.6	2	1.05	53	27.6
Spain	352	83.94	23.51	38.31	15.06	34.38	64.77	0.57	74.15	25	95.7	2	0.57	189	53.69
Turkey	563	99.53	3.09	37.03	14.62	25.22	72.82	1.78	67.32	32.15	100	6	1.07	182	32.38
UK	120	89.72	20.7	29.74	11.48	13.33	78.33	1.67	74.17	18.33	77.3	0	0	42	37.84
USA	565	87.38	22.72	38.24	12.4	52.21	46.9	0.88	70.97	29.03	96.6	8	1.42	150	26.55

Table 3. *The Frequencies of Event Themes for Past- Global events*

Themes		Countries															
		Canada	China	Denmark	France	Germany	Greece	Italy	Malaysia	N.Z.	Poland	Russia	Spain	Turkey	UK	USA	Total
COVID-19-related themes (%)																	
Environment		3.8	1.5	**4.6**	1.6	2.4	**6.5**	1.8	2.3	3.9	**5.1**	**10.8**	2.1	1.8	.5	2.9	2.9
Economy		**4.1**	**6.0**	1.4	.8	2.4	1.1	1.6	**4.7**	.5	0.0	**6.3**	.6	2.7	0.0	2.1	2.9
Travel		**8.4**	.5	2.6	3.3	**8.9**	**4.5**	2.8	3.5	**4.9**	**25.4**	**9.3**	**4.4**	2.5	2.4	**5.2**	4.2
Culture		**4.3**	3.2	**7.7**	**7.3**	1.6	1.7	**6.1**	2.9	**15.0**	0.0	**4.2**	1.9	3.8	3.8	**8.2**	4.9
Mass closures		3.0	1.3	.6	2.2	.8	.3	1.1	1.2	1.0	**6.8**	.9	1.1	.9	3.8	2.3	1.6
Lockdown		**10.7**	**6.9**	**7.4**	**13.6**	**13.3**	**9.4**	**12.3**	**16.4**	**5.8**	0.0	**11.4**	**8.6**	**4.6**	**19.2**	**11.2**	9.2
Deaths		**5.3**	.8	**7.1**	2.4	**12.1**	**22.4**	3.1	**9.9**	**7.8**	0.0	**6.0**	**6.3**	**6.1**	**9.1**	**6.5**	5.7
Infections		**14.5**	**35.5**	**10.3**	**9.8**	**8.1**	**9.9**	**7.8**	**18.7**	**12.6**	0.0	**9.0**	**13.7**	**6.5**	**11.1**	**12.0**	14.8
Politics	81.4	3.8	**15.5**	**15.4**	**6.0**	3.6	**6.5**	**9.7**	**4.1**	2.9	0.0	**5.4**	**6.3**	4.0	**4.3**	1.6	7.1
Health		3.6	2.1	**7.1**	1.4	**6.5**	**4.8**	**6.1**	**8.2**	2.9	0.0	2.4	**4.6**	**6.0**	2.9	3.8	4.1
Media		2.8	1.0	3.7	**11.7**	2.4	.6	**9.9**	**9.4**	3.9	0.0	3.6	3.2	3.0	2.4	5.0	4.0
Misinformation		1.3	.3	1.1	.3	**7.3**	1.7	3.4	1.2	1.0	1.7	1.5	1.3	1.0	**6.7**	1.5	1.6
Social solidarity		0.0	**4.8**	.9	.3	3.2	2.0	.4	2.3	0.0	1.7	1.2	.6	.5	1.9	.7	1.6
Hygiene		3.0	1.1	3.1	3.5	3.6	3.4	**4.4**	0.0	1.9	0.0	.3	1.7	2.4	3.4	2.0	2.2
Civil rights		2.5	.1	4.6	0.0	.8	1.7	.7	.6	1.0	**5.6**	.3	1.7	.3	0.0	.9	1.0
Health Science		0.0	.5	0.0	0.0	.4	0.0	0.0	0.0	1.5	0.0	0.0	1.1	.3	0.0	.8	.4
Digitalization		.8	.3	0.0	.3	0.0	.6	0.0	1.8	0.0	.6	1.2	.4	.4	0.0	.2	.4
Second wave		0.0	.1	0.0	0.0	0.0	0.0	.4	.6	.5	0.0	0.0	0.0	.1	0.0	.3	.1
End of pandemic		0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.0
Non COVID-19-related themes (%)																	
Environment		**5.3**	**8.3**	**4.9**	**11.7**	**4.4**	**5.7**	**7.2**	1.8	**9.7**	**17.5**	**6.6**	**6.1**	**23.3**	**4.8**	**6.5**	9.5
War		2.3	1.3	1.1	1.1	3.2	**8.2**	**6.2**	0.0	3.4	**5.6**	**5.1**	1.9	**10.6**	1.4	3.4	4.2
Politics		**4.6**	3.3	**8.3**	**13.0**	**10.1**	**4.8**	**6.2**	1.8	3.9	**17.5**	**6.6**	**13.9**	**5.5**	**8.2**	**8.3**	6.9
Culture	18.6	**5.3**	3.2	**4.0**	**4.6**	3.2	2.6	**5.2**	1.2	**8.3**	**5.6**	**6.6**	**11.2**	**5.4**	1.9	**6.6**	5.2
Crime		**4.1**	1.3	2.0	2.7	1.2	.9	2.1	1.2	5.3	1.1	0.0	3.4	1.7	5.8	1.9	2.0
Other		**6.6**	.9	2.0	2.7	.4	.6	1.3	**6.4**	2.4	**5.6**	1.5	3.8	**6.5**	**6.3**	**6.0**	3.5

Note:N.Z. = New Zealand, Hygiene = Hygiene & Social Behavior, Digitalization = Digitalization of society

Table 4: *The Frequencies of Event Themes for Past- National events*

Themes		Countries															
		Canada	China	Denmark	France	Germany	Greece	Italy	Malaysia	N. Z.	Poland	Russia	Spain	Turkey	UK	USA	Total
COVID-19-related themes (%)																	
Environment		1.4	.1	.8	0.0	0.0	.8	.5	0.0	1.0	0.0	1.6	1.2	.4	0.0	.4	.5
Economy		1.4	1.7	3.0	.6	.8	1.6	1.0	.4	1.5	0.0	**7.0**	2.3	3.7	.5	**4.2**	2.5
Travel		**10.6**	.2	2.5	1.9	**7.1**	1.3	.7	2.9	**6.4**	**9.3**	**13.3**	1.2	3.4	2.1	3.2	3.2
Culture		**6.7**	0.0	0.0	.6	0.0	.3	0.0	.4	1.0	0.0	2.1	.9	.4	**15.3**	1.1	1.1
Mass closures		**21.0**	**5.1**	**6.9**	**14.0**	**12.6**	**10.9**	**7.5**	**4.9**	3.4	**42.6**	**5.2**	**5.6**	**8.4**	**11.1**	**8.3**	8.9
Lockdown		**4.8**	**27.6**	**30.5**	**23.7**	**13.0**	**22.0**	**28.3**	**24.7**	**32.8**	0.0	**20.8**	**18.1**	**11.5**	**17.9**	**16.1**	20.1
Deaths		1.1	.9	1.4	1.0	3.2	**5.3**	**6.5**	.8	**5.9**	0.0	2.3	**4.0**	**5.2**	.5	**7.4**	3.8
Infections		2.8	**13.9**	1.9	**7.1**	**11.5**	**8.0**	**15.5**	**30.5**	**7.4**	0.0	3.6	**8.9**	3.9	**11.6**	**14.7**	10.3
Politics		**11.5**	**6.6**	**19.7**	**5.8**	**4.7**	**5.3**	3.9	**12.8**	2.0	0.0	1.6	**4.7**	**5.7**	2.1	**6.4**	6.3
Health	87.5	3.1	**10.6**	2.2	3.2	.4	4.0	**7.3**	.8	1.5	0.0	2.6	**5.2**	**4.3**	2.6	3.4	5.0
Media		**5.3**	.7	**4.4**	**10.4**	**4.0**	**5.6**	2.7	**4.5**	**11.8**	0.0	1.0	**4.7**	2.9	3.7	2.5	3.2
Misinformation		0.0	.7	.3	0.0	.4	1.3	1.1	.4	.5	2.2	.5	.7	.2	0.0	**5.6**	1.4
Social solidarity		1.1	**18.8**	2.8	1.3	2.8	1.1	1.8	.8	1.0	2.7	.5	1.9	.7	**7.9**	.7	4.8
Hygiene		**5.6**	3.4	**6.9**	**4.5**	**16.2**	**5.3**	**11.3**	**4.1**	**5.9**	0.0	1.3	**6.3**	**8.3**	**8.4**	**4.6**	6.1
Civil rights		1.7	0.0	1.1	0.0	3.2	2.9	2.5	.4	1.0	**10.9**	**4.7**	2.8	0.0	0.0	3.2	1.7
Health Science		.3	.6	0.0	0.0	.4	.3	.1	0.0	0.0	0.0	0.0	0.0	.5	0.0	.2	.3
Digitalization		2.0	.6	0.0	0.0	5.1	2.9	.3	.8	0.0	1.6	6.5	.9	1.6	1.1	.8	1.3
Second wave		0.0	.1	0.0	0.0	0.0	0.0	0.0	.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.0
End of pandemic		0.0	0.0	0.0	0.0	0.0	0.0	.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.0
Non COVID-19-related themes (%)																	
Environment		1.1	2.8	1.7	1.9	.8	1.3	1.4	0.0	3.4	8.7	.8	2.6	**15.1**	0.0	1.5	4.0
War		0.0	.1	0.0	0.0	.8	**8.2**	.2	.4	.5	.5	.3	0.0	**10.0**	0.0	.3	2.1
Politics	12.5	2.8	.7	3.3	**16.6**	**7.1**	**5.8**	.6	**4.9**	3.4	**8.7**	**15.9**	**16.2**	3.5	**4.2**	**6.9**	5.2
Culture		.6	1.9	**8.3**	**4.2**	2.0	2.7	1.9	0.0	2.5	**4.4**	3.6	**8.2**	.7	3.2	3.8	2.8
Crime		**11.8**	1.4	1.4	1.0	3.6	2.9	1.8	0.0	2.0	.5	1.3	0.0	.9	0.0	1.2	1.7
Other		3.4	1.5	.8	1.9	.4	.3	2.4	**4.9**	**5.4**	**7.7**	3.4	3.5	**8.8**	**7.9**	3.6	3.7

Note: N.Z. = New Zealand, Hygiene = Hygiene & Social Behavior, Digitalization = Digitalization of society

Table 5: The Frequency of Event Themes for Future-Global events

Themes		Countries															
		Canada	China	Denmark	France	Germany	Greece	Italy	Malaysia	N.Z.	Poland	Russia	Spain	Turkey	UK	USA	Total
COVID-related event themes (%)																	
Environment		3.1	5.9	2.5	**7.9**	**4.2**	0.0	1.5	4.3	2.6	3.8	3.5	**5.3**	1.7	0.5	1.8	3.1
Economy		**23.4**	**26.9**	**10.2**	**19.0**	**15.1**	**30.4**	**29.8**	**26.6**	**17.9**	0.0	**35.8**	**19.4**	**23.1**	**16.6**	**15.4**	22.4
Travel		**10.0**	0.5	**18.6**	5.4	**8.4**	2.7	2.7	3.3	**15.4**	**18.3**	**10.2**	1.8	3.8	4.3	2.3	4.8
Culture		0.3	0.0	0.0	0.0	0.4	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.5	0.6	0.2
Mass closures		1.4	1.4	0.8	0.0	0.0	0.0	0.9	2.2	0.0	1.0	0.3	0.2	0.1	1.6	0.6	0.7
Lockdown		**6.9**	1.2	2.2	3.2	**7.1**	1.6	**7.7**	**17.9**	1.0	0.0	3.5	**13.9**	1.6	**10.2**	**15.8**	6.1
Deaths		0.9	1.0	0.0	0.4	0.4	0.0	0.2	1.1	2.1	0.0	0.5	0.9	0.1	0.0	0.7	0.5
Infections		2.3	**5.7**	0.3	0.0	0.0	0.3	0.3	4.9	1.5	0.0	0.0	0.4	0.1	0.5	0.3	1.4
Politics	85.4	**5.4**	4.8	**5.8**	**7.5**	0.8	1.6	**5.6**	3.3	**5.1**	0.0	**5.3**	**5.5**	**6.0**	4.3	4.9	5.0
Health		2.9	2.7	0.6	1.8	1.7	4.0	**7.6**	3.8	1.0	0.0	3.2	2.4	3.3	2.7	1.9	3.0
Media		1.1	0.2	0.0	0.7	0.0	0.3	0.2	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Misinformation		0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	1.2	0.0	0.1	0.3
Social solidarity		0.0	3.6	0.3	0.7	1.3	0.8	0.2	1.6	0.5	1.0	1.9	0.4	0.6	2.7	1.1	1.3
Hygiene		2.6	1.7	1.4	1.1	1.7	3.2	3.8	**5.4**	1.5	0.0	0.3	0.7	1.5	4.3	0.9	1.8
Civil rights		1.7	0.1	1.1	2.2	1.7	**10.2**	2.0	4.3	0.5	**11.5**	3.5	2.2	0.6	2.1	1.2	1.9
Health Science		**4.6**	**8.2**	**11.1**	**15.4**	**6.3**	**14.2**	0.0	0.0	**15.4**	0.0	4.3	**20.5**	**6.3**	**13.9**	**13.4**	8.9
Digitalization		2.0	1.0	0.8	0.7	2.1	2.4	1.8	4.3	0.5	3.8	**7.8**	2.4	**6.3**	3.2	0.4	2.7
Second wave		**7.4**	2.9	**5.3**	**12.9**	**7.9**	**8.3**	**10.6**	4.9	4.6	**17.3**	4.8	**7.9**	3.8	**5.9**	**8.2**	6.4
Pandemic end		3.7	4.7	5.3	5.7	3.3	2.2	5.6	3.8	3.1	0.0	3.5	8.8	3.5	2.1	0.8	3.8
Non COVID-related event themes (%)																	
Environment		3.7	6.4	6.4	2.5	11.7	4.6	4.2	0.0	2.6	8.7	1.3	1.1	11.6	1.1	6.5	6.0
War		2.3	3.1	0.6	0.7	3.3	4.0	5.0	0.0	1.5	10.6	1.3	0.4	6.9	1.6	4.8	3.7
Politics	14.6	9.4	13.0	22.7	7.2	17.6	8.6	4.7	6.0	12.8	17.3	6.1	2.6	6.6	15.5	5.8	9.0
Culture		0.6	0.2	0.6	0.7	3.8	0.0	3.8	0.0	2.6	0.0	1.6	1.5	0.1	2.7	5.1	1.6
Crime		1.1	1.2	1.1	0.4	0.8	0.3	0.5	0.5	0.5	4.8	0.5	0.0	1.0	1.1	0.5	0.8
Other		3.1	3.6	2.5	3.9	0.4	0.3	1.4	0.5	6.2	1.9	0.5	1.5	10.3	2.7	6.7	4.4

Note:N.Z. = New Zealand, Hygiene = Hygiene & Social Behavior, Digitalization = Digitalization of society

Table 6: *The Frequency of Event Themes for Future-National Events*

Themes		Countries															
		Canada	China	Denmark	France	Germany	Greece	Italy	Malaysia	N.Z	Poland	Russia	Spain	Turkey	UK	USA	Total
COVID-19-reated themes (%)																	
Environment	85.2	1.5	2.6	0.3	**4.0**	0.0	0.0	0.9	1.4	0.5	0.0	2.2	0.6	0.3	0.0	0.5	1.0
Economy		**24.9**	**32.8**	**8.9**	**19.4**	**13.7**	**43.3**	**31.3**	**23.9**	**18.1**	0.0	**33.3**	**29.4**	**33.9**	**14.2**	**18.1**	26.8
Travel		**8.5**	0.4	**12.8**	3.6	**5.7**	0.3	0.9	1.9	**22.1**	3.3	**4.0**	1.7	1.3	1.3	0.4	2.8
Culture		0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.6	0.8	0.2
Mass closures		2.8	**5.3**	0.3	0.8	0.9	0.3	0.7	0.9	5.0	0.8	1.5	0.6	0.3	0.6	1.5	1.7
Lockdown		**23.4**	1.7	**17.7**	**9.9**	**24.2**	2.7	**18.8**	**32.9**	**12.1**	0.0	0.9	**24.9**	3.2	**38.1**	**20.1**	12.4
Deaths		0.0	0.1	0.3	0.4	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.1	1.9	2.7	0.6
Infections		0.8	0.6	0.7	0.0	0.0	0.0	2.5	1.4	2.5	0.0	0.3	0.6	0.8	2.6	1.0	0.9
Politics		3.8	3.8	1.3	1.2	0.0	1.8	3.0	**8.0**	1.0	0.0	1.9	4.9	1.7	0.6	4.0	2.8
Health		2.3	3.5	2.6	**5.9**	**4.4**	**8.9**	**6.2**	2.3	1.5	0.0	3.4	**4.0**	3.8	**5.2**	1.4	3.6
Media		0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1
Misinformation		0.0	0.0	0.0	0.4	0.4	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1
Solidarity		0.0	3.5	1.0	2.0	0.9	0.9	0.4	1.4	0.5	0.8	1.2	0.6	0.3	1.3	0.3	1.1
Hygiene		3.5	3.1	2.3	1.2	2.6	3.3	**4.1**	3.8	1.5	0.0	0.3	0.9	1.3	**7.1**	1.1	2.2
Civil rights		1.8	0.2	0.3	8.3	2.6	5.0	2.4	1.4	0.5	26.4	14.8	2.9	0.8	0.0	2.0	2.7
Health Science		4.8	9.0	5.2	2.4	2.6	3.3	0.0	0.0	1.0	0.0	1.5	4.6	1.2	4.5	5.3	3.7
Digitalization		1.5	2.1	**4.9**	2.4	**5.7**	3.6	2.8	3.8	1.5	**4.1**	**8.0**	1.7	1.8	2.6	1.1	2.5
Second wave		**6.0**	1.4	**5.2**	**11.1**	**8.8**	**7.7**	**5.8**	**6.1**	**4.0**	**5.0**	3.1	**8.9**	1.5	3.9	**5.0**	4.4
Pandemic end		2.3	**7.4**	**6.2**	**8.7**	3.1	1.5	2.8	0.0	**6.0**	0.0	3.4	**10.6**	3.6	0.6	0.4	3.9
Non COVID-19-related themes (%)																	
Environment	14.8	3.0	**4.2**	**6.9**	1.6	2.6	3.3	0.7	0.9	2.0	5.0	0.3	0.0	**9.1**	0.6	2.7	3.9
War		0.5	1.2	0.0	0.0	0.0	3.3	0.1	1.4	0.0	0.0	0.6	0.0	2.4	0.0	0.9	1.1
Politics		**5.0**	**7.8**	**15.4**	**14.2**	**14.1**	**7.7**	**9.5**	**6.1**	**16.6**	**43.8**	**14.2**	2.3	**16.0**	**9.0**	**18.6**	12.7
Culture		0.8	1.1	3.9	0.8	**5.3**	0.3	0.7	0.0	1.0	0.8	0.3	0.6	0.4	1.9	4.8	1.6
Crime		0.8	0.8	1.3	0.0	0.0	0.3	1.0	1.9	0.5	0.8	1.5	0.0	2.8	0.0	1.0	1.2
Other		2.3	7.5	2.3	2.0	1.8	2.1	4.4	0.5	2.0	**9.1**	2.8	0.6	**13.0**	3.2	**5.9**	5.9

Note:N.Z. = New Zealand, Hygiene = Hygiene & Social Behavior, Digitalization = Digitalization of society

Table 7. *Means and standard deviations for the phenomenological properties of reported events*

	Past		Future	
	Global	National	Global	National
Valence	2.44 *(1.27)*	2.49 *(1.01)*	2.75 *(1.47)*	2.94 *(1.59)*
Vividness	3.07 *(1.05)*	3.19 *(1.07)*		

Figure 1: Frequency of past events reported as a function of COVID-19 severity and stringency

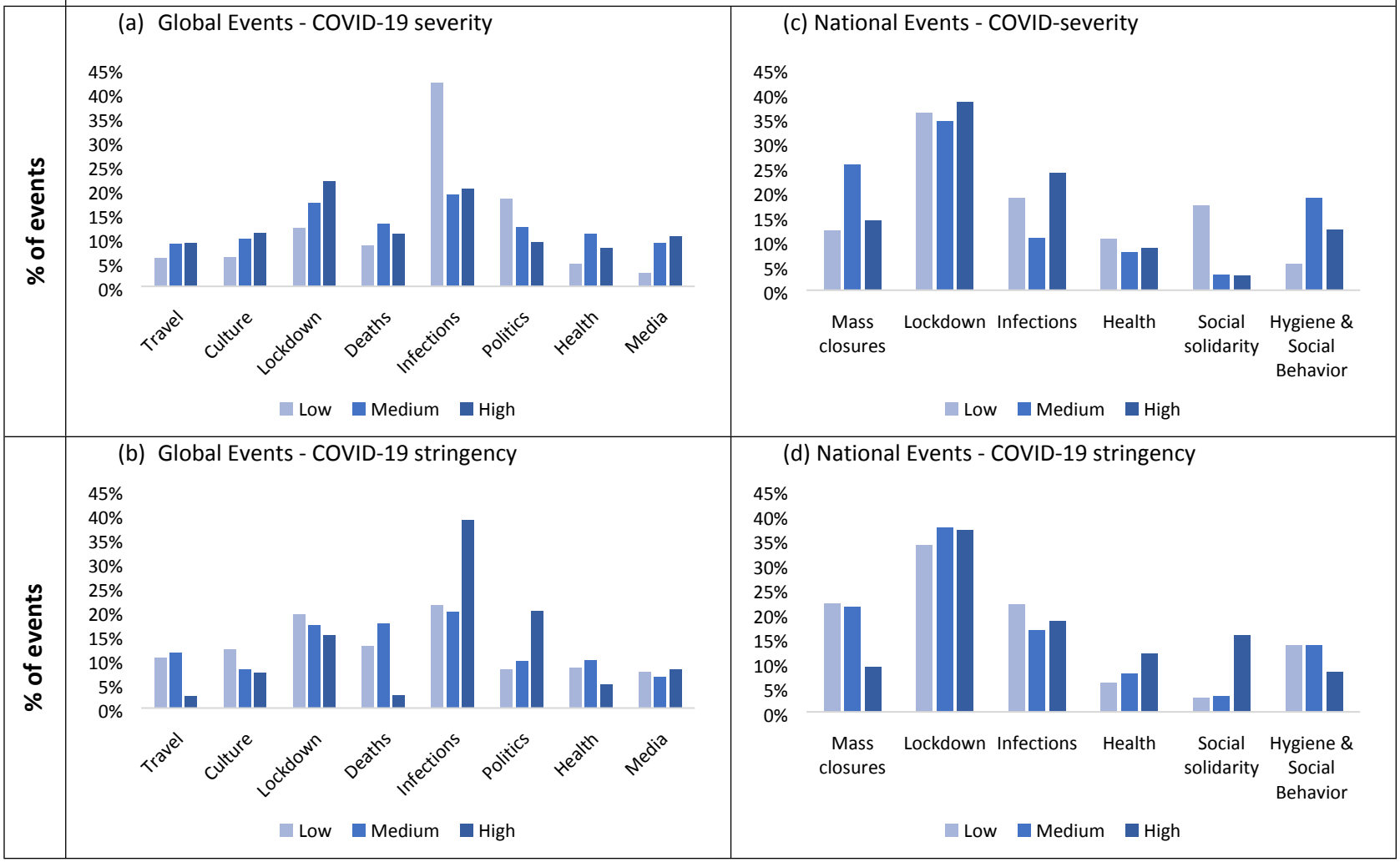
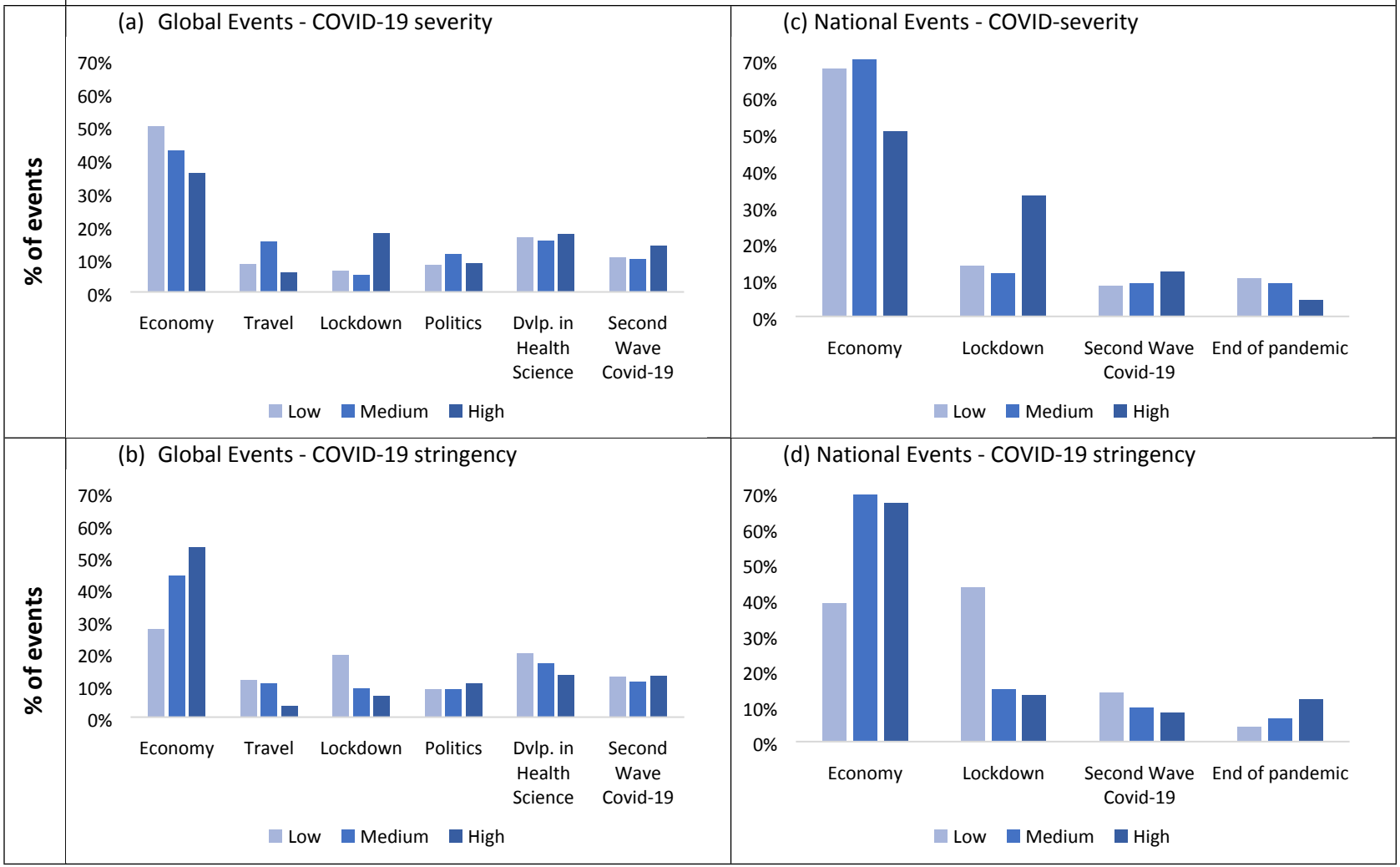
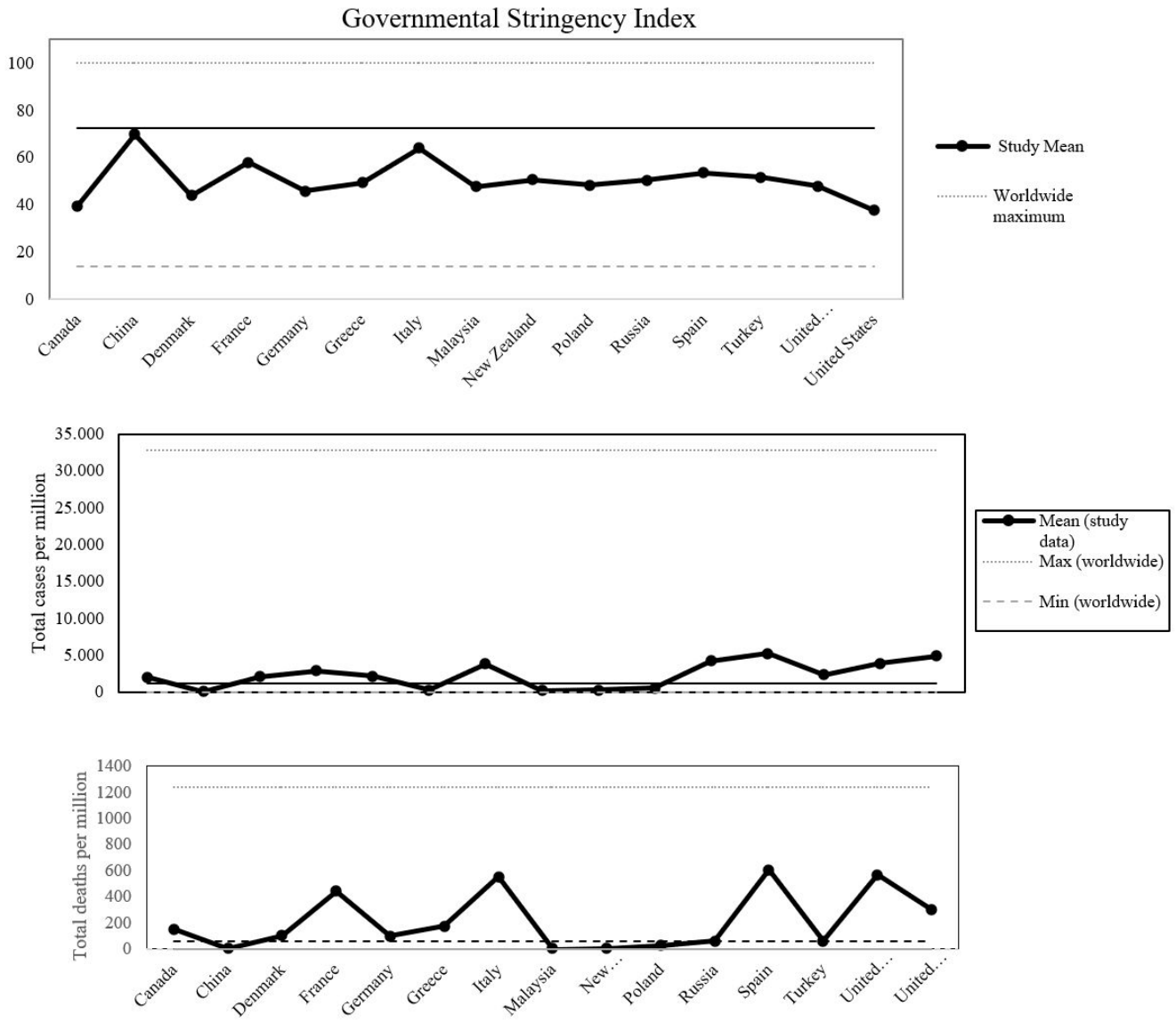


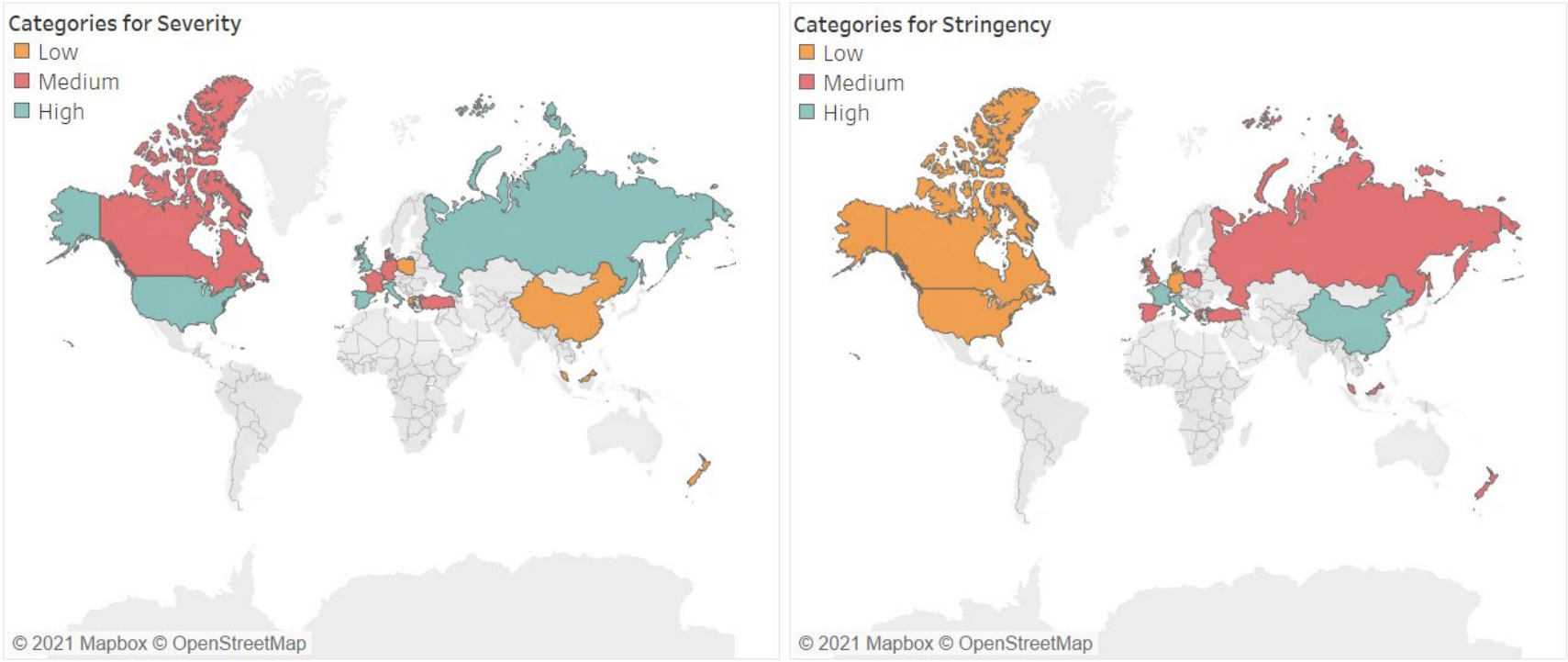
Figure 2: Frequency of future events reported as a function of COVID-19 severity and stringency



Supplementary Figure 1: *Country-wise comparison of COVID-19 severity and governmental regulation indexes with worldwide statistics during the period of data collection.*



Supplementary Figure 2: *Three categories of countries for the COVID-19 severity (left panel) and governmental regulation (right panel) indexes around the world*



Note. World maps were created in Tableau

Supplementary Figure 3: *The scatterplot showing the values of the COVID-19 severity and stringency measures for 15 countries*