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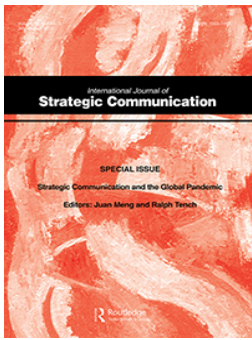
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The Effects of Dangerous World Beliefs on COVID-19 Preventive Behaviors in Singapore: The Moderating Role of Public Health Communication

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ABSTRACT

This research purposes to examine the role of strategic communication, specifically the effectiveness of government's crisis communication messages at the onset of COVID-19 pandemic in Singapore, on disease preventive behaviors. It employed a mixed method research approach by first carrying out a content analysis of 7128 news headlines on COVID-19 to confirm our presupposition that the media may be communicating messages that the world order is being threatened. Informed by our findings that 90% of news reports were framed to suggest a dangerous world, we surveyed 453 respondents in the main study, and tested if people's beliefs in a dangerous world (BDW) were linked to their disease preventive behaviors (DPB), and whether such a link was modulated by how effective they perceived the government's pandemic communication. As predicted, results revealed that the perceived effectiveness of the government's pandemic communication trumped the effects of beliefs in a dangerous world such that the link between BDW and DPB was significant only when the perceived effectiveness was low. Further analysis of the effects of specific communication dimensions on disease preventive behaviors suggests that public health communication needs to be strategically calibrated to offer personally relevant messages that are informative and objective. (199 words)

Introduction

On March 11, 2020, the World Health Organization (2020) declared a new coronavirus disease named COVID-19 a global pandemic and a public health emergency of international concern. The variability and the range of severity of identifying and isolating COVID-19 contagion among humans have inevitably made this pandemic hard to fight. Governments and health authorities across continents implemented massive stringent measures to cope with COVID-19. Countries shut their borders, initiated nationwide lockdown and ordered closures of offices and public places (Lee, 2020). Until medical scientists develop a drug to treat the disease, the only way to stem the spread of COVID-19 was to adopt protective measures which call for the changing of social behaviors and transforming of individuals' way of life (Verity et al., 2020). Populations were advised to take disease preventive behaviors (e.g., stay at home, wash their hands with soap frequently, maintain social distancing, wear masks, and practice respiratory hygiene).

A review of past studies which examined the impact of psychosocial factors on disease preventive behaviors in times of a pandemic showed that public reactions to health crises depended on many psychosocial factors. Psychologically, they range from perception of individual's susceptibility to the

disease, perception of what others would do, their trust in government authorities' abilities to handle the situation, and individuals' general disposition to anxiety (Bish & Michie, 2010). The existence of certain traits could further render some individuals more vulnerable to excessive reactions to pandemics, particularly those whose personality exhibits high anxiety, need for certainty or cognitive closure, and high perceived vulnerability (Asmundson & Taylor, 2020).

In addition to psychosocial factors, literature on media and communication effects (e.g., Siegrist & Zingg, 2014; Taha et al., 2013) have shown that two factors – trust in media reports and public health messages disseminated by the government and health authorities – played moderating roles in individuals' responses and motivation to adopt disease preventive behaviors in past pandemics. As media coverage is vital to people's shared conversations to better comprehend and make sense of the uncertainty in the face of a pandemic, public health messaging carried by mass media can greatly affect people's emotions, cognitive and behavioral responses to the risk messages received (Wheaton et al., 2012).

Perception of a dangerous world

The rapid onset of COVID-19 in the initial months sparked extensive news coverage by media worldwide. Early investigations on news reports on the pandemic revealed that the media played a monumental role in framing the global health crisis. According to Mutua and Oloo Ong'ong'a (2020), international news media's response and framing of the disease at the onset of the breakout concentrated on Sinophobia, crime, geopolitics, strained international relations, misinformation and fake news. The media's alarmist tones and frequent use of words such as “deadly disease”, “scary”, and “high fatality rate” reflected the progressive spread of the disease and communicated messages that portrayed pessimism and xenophobia. Ogbodo et al. (2020) further argued that human interest stories were the motivation of the global news agencies in a highly competitive media environment. As scaremongering frames dominated the global media coverage, such information “not only shapes public perception and attitudes towards the pandemic but also risks causing more problems for those with existing health conditions due to fear or panic attack” (p. 257). Such a phenomenon stemming from the way the virus is framed in the media naturally influences people's global threat perceptions, which consequently affects perceived importance of engaging in health preventive behaviors (Bolsen et al., 2020).

Research in behavioral studies has shown that individuals are likely to adopt disease preventive behaviors when they feel threatened (Cook et al., 2016). Given that individuals are continuously exposed to global health risk information determined by the media's agenda, this is particularly relevant in a pandemic as infection preventive behaviors will likely be driven by self-protective desires, even if the government does not mandate such behaviors or clearly communicate the necessity of such behaviors. According to a meta-analysis study, individuals are more likely to adopt disease preventive behaviors (e.g., vaccination) if they perceive a health-threat, particularly if it is easy to carry out that behavior (Brewer et al., 2007). According to Shorey et al. (2020), the initial outbreak in Singapore elicited panic and unease among the population. The study found several common themes from public's comments in online news publications which included ‘fear and concern’, ‘panic buying and hoarding’ and ‘worries about the future’. As mainstream media may have carried negative stories of COVID-19, these news articles could possibly communicate messages that the current world is dangerous or uncertain (Ng & Kemp, 2020).

Some individuals also have a proclivity to perceive the world as dangerous, regardless of the message communicated via mainstream media. This proclivity is also known as a belief in a dangerous world (BDW). The belief in a dangerous world, a type of implicit theory, is a stable biased belief that the world is chaotic, unpredictable, and threatening (Duckitt, 2001). These implicit beliefs are often not targeted at any objective threats; rather, individuals with strong belief in a dangerous world simply have a diffused sense of the world being threatening without any specific threats in mind (Stroebe et al., 2017). During a pandemic, confirmation bias can further fuel

individuals' belief that the world is dangerous as there is an abundance of news, both real and fake, about the pandemic being threatening and unpredictable (Laato et al., 2020). This in turn increases individuals' motivation to protect themselves from the impending threat of being infected (Brown et al., 2017).

Present study

Heightened exposure to news of uncertainty and danger during the COVID-19 pandemic creates emotional stress for many people (Wang et al., 2020). Recognizing the need for public trust in times of a national crisis if the city-state hopes to maintain calm and obtain public's cooperation to deal with the virus, the Singapore government set out to establish clear communication between themselves and its population of 5.7 million. However, high transparency and honest communication in times of such crises can also trigger undesirable responses that are contrary to government's suggestions, especially when mainstream media are inclined to provide emotionally loaded impressions of COVID-19. As a result, these messages may misinform, or they are amplified and framed to induce panic and fear as individuals perceive that the pandemic world is indeed dangerous and uncertain (Ng & Kemp, 2020), particularly if they have pre-existing belief in a dangerous world.

To validate our presupposition that the Singapore mainstream media communicated messages of danger or uncertainty related to the pandemic, we conducted a pre-study as a form of an assumption check by analyzing the contents of mainstream news headlines in March 2020. By first confirming our suspicion that the local mainstream news reporting resonated with the global media's frames of portraying the disease as threatening, we hope to provide empirical evidence that messages of danger were also being conveyed by the Singapore's mainstream media. As a result, we hope to validate the presence of messages communicating that the world is dangerous in the larger societal environment in Singapore advocated by local mainstream media. Second, considering that trust in the Singapore media is high (Edelman Trust Barometer, 2021) and that the government relied heavily on conventional media to communicate with the population in the initial outbreak in the city-state (Wong & Jensen, 2020), establishing the association between the local news reporting frames and the possible perception that the world is a dangerous place is important for our research as Singaporeans tuned in daily to local media for updates provided by authorities' health risk messages and advice on health preventive behaviors.

The main study subsequently proceeded to investigate the effects of the BDW of individuals and perceived effectiveness of government COVID-19 communication on disease preventive behaviors (DPB) in a context of heightened exposure to messages of danger due to the pandemic. These variables were selected for examination as strategic communication scholarship has continuously demonstrated the importance of crisis communication messages employed by leaders and health experts during pandemics in order to invoke trust and ensure compliance with disease preventive behaviors (e.g., McGuire et al., 2020). As BDW is a type of implicit theory that suggests people with certain personality traits tended to regard the world as inherently a dangerous place, our research is therefore keen to uncover 1) the impact, if any, of crisis communication messages employed by government in times of a pandemic on individuals with these biased beliefs, and 2) the extent of government's crisis communication messages and their effectiveness on other individuals who do not exhibit such personality traits (Figure 1).

Drawing our theoretical insights from literature on BDW and considering that mainstream media may have likely communicated messages of danger or uncertainty in the initial stages of the pandemic, it makes sense to assume that individuals with the beliefs that the world is dangerous are thus more likely to adopt the various preventive behaviors (e.g., wearing mask, avoiding crowded places etc.) out of self-protective motive without much persuasion required from the authorities. However, individuals who do not subscribe to the dangerous world worldview are probably less likely to adopt DPB without much persuasion from the government. Hence, we hypothesize the following:

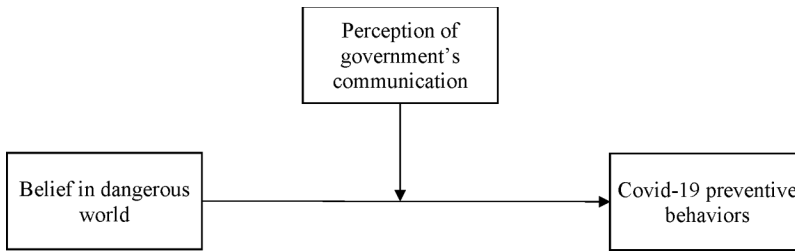


Figure 1. Conceptual framework examining the relationships between belief in a dangerous world, perceived effectiveness of government's communication and engagement in COVID-19 disease preventive behaviors.

H1: Endorsement of BDW is positively associated with adoption of DPB.

In addition to effects of intrinsic belief in a dangerous world, clear and coordinated communication and messaging in times of health crises have also been shown to be a key factor in driving behaviors (Saliou, 1994). This is particularly so if trust in government handling of the pandemic is high (Han et al., 2021). Such extrinsic motivation to adopt DPB is important for individuals who do not endorse the BDW worldview because they are less likely to perceive the need for such behaviors out of their own volition. In other words, if government messages are effective, people are likely to adopt DPB, regardless of their intrinsic motivation that arise from BDW. However, if government messages are not effective, DPB will depend on individuals' BDW to whether the world is dangerous and hence require preventive measures. As such, we posit our following second hypothesis:

H2: Perceived effectiveness of government crisis communication will moderate the relationship between belief in a dangerous world and engagement in disease preventive behaviors. For individuals who do not perceive government communication as effective, the likelihood to adopt DPB will be significantly associated with BDW. For individuals who perceive government communication as effective, there will be no significant association between BDW and DPB.

Pre-study (content analysis of news headlines)

To confirm our presupposition that messages communicating that the world is dangerous are also present in the larger environment in Singapore, our pre-study employed content analysis to uncover the frequency and frames of mainstream news headlines from 1 March to 31 May 2020 carried by two national mainstream media in Singapore – The Straits Times and Channel NewsAsia. We selected these two outlets as they are the largest English mainstream and accredited media in Singapore, and are highly trusted news sources on information concerning COVID-19 (Tandor, 2021). The sampling unit was 'COVID-19' and the news crawling tool used was the Factiva database, which is a global news and data archival search engine used for educational purposes (Johal, 2009). The search yielded a total of non-duplicated 7128 'COVID' articles from both media outlets over the three-month period.

Coding procedures and inter-coder reliability

As the pre-study serves only as an assumption check to provide empirical evidence of concurrence with global media's frames, only news headlines were selected for measurement. According to Dor (2003), headlines play a substantial role in news communication since headlines aid to summarize the main idea of the article. Communication scholars have argued that readers spend more time scanning headlines than reading articles as the former allows for quick assessment of the news. As a headline is the first set of words that gets encoded when people read news (McCrudden & Schraw, 2007), they are often enough to trigger emotions among the general public (Aslam et al., 2020).

Text headlines on COVID-19 online news reports provided by the two mainstream media were coded according to the presence of 'whether the headline makes one feel or think that the world is a dangerous place'. In other words, we are interested to know if the one or two liners communicate the message that COVID-19 threatens existing order, generates uncertainty, and instills fear concerning death, lives, livelihood and overall well-being. Absence of such perceptions was coded as 0 and presence was coded as 1. This manifest coding process was adopted because this form of method draws on the objective and replicates qualities offered by quantitative methods (Hilton et al., 2012). A codebook was also developed and two trained postgraduate students were hired to code with each of them coding all 7128 news headlines as outlined in the procedure spelt out in the codebook. After coding 100% of the 7128 news article headlines, every fifth headline (20%) was selected to be subjected to inter-coder reliability checks needed to confirm the level of agreement between coders' judgment of a given set of data (Freelon, 2013). De Swert and Krippendorff's (2012) alpha was established as a general statistical measure of agreement of reliability between coders and their input. The inter-coder reliability score achieved on the stratified 20% selected sample in nominal data was 0.87 which satisfied the acceptable score of 0.8 or higher for manifest sampling (Neuendorf, 2017).

Results

After ensuring that we achieved an acceptable inter-coder reliability coefficient, we proceeded to calculate the absolute numbers of the article headlines that were coded as having the presence of making a reader feels or thinks that the world is a dangerous place. Findings from our pre-study showed that both coders shared agreement on 91.1% (6495) of the 7128 news headlines; and of the 6495 COVID-19 headlines found in Singapore's mainstream media, an overwhelming 91.3% (5931) were found to communicate fear, uncertainty, danger and chaos. The negative reporting centered on concerns such as fatality rates, failed attempts to contain the spread, harsh quarantine orders, economic and financial hardships and loss of jobs. Our findings hence validated our presupposition that news reporting by the Singapore mainstream media resonated with global media frames, establishing the presence of media messages communicating that the world is dangerous in the larger environment in Singapore.

Main study

Having established the association and validated the concurrence of news frames of Singapore mainstream media with those advocated by global media at the onset of COVID-19, we proceeded to test Hypothesis 1 that participants' belief in a dangerous world is positive associated with their adoption of disease preventive behaviors, and Hypothesis 2 that perceived effectiveness of government crisis communication will moderate the relationship between belief in a dangerous world and engagement in disease preventive behaviors.

Methods

Participants

Four hundred and fifty-three (453) Singaporean adults (age \geq 21; 231 males and 222 females) residing in Singapore were recruited by Qualtrics to participate in the main study. Exact age was not captured. Instead, participants selected the age bracket they were in: 21 to 30 years ($n = 101$; 22.3%), 31 to 40 years ($n = 101$; 22.3%), 41 to 50 years ($n = 99$; 21.9%), 51 to 60 years ($n = 101$; 22.3%), and above 61 years ($n = 51$; 11.3%). 84.1% of the participants were of Chinese ethnicity ($n = 381$), 8.8% of Malay ethnicity ($n = 40$), 4.0% of Indian ethnicity ($n = 18$), and 3.1% of other ethnicities ($n = 14$). Information about the study was communicated to participants via an online consent form and participants had to consent to the study before proceeding to the questionnaires.

Measures

Belief in a dangerous world

On a scale of 1 (strongly disagree) to 6 (strongly agree), participants rated how much they agree with of the 12 statements (e.g., “There are many dangerous people in our society who will attack someone out of pure meanness, for no reason at all.”) of the belief in a dangerous world scale ($\alpha = 0.80$; Altemeyer, 1988). The ratings were averaged to a single belief in a dangerous world score.

Perceived effectiveness of government's crisis communication

The perceived effectiveness of government's messages ($\alpha = 0.92$) about the pandemic was assessed with a 19-item scale adapted from Kim (2019). On a scale of 1 (strongly disagree) to 6 (strongly agree), participants rated how much they agree with each item regarding communication from government agencies in Singapore. The scale assessed six dimensions of public communication: (1) informativeness (e.g., “. . . have been actively providing information about who is benefiting from the infection control practices”; $\alpha = 0.91$), (2) personal relevance (e.g., “. . . have been actively informing me how its infection control practices are relevant to me”; $\alpha = 0.93$), (3) transparency (e.g., “. . . have provided the public information about its infection control failures, not just successes”; $\alpha = 0.92$), (4) consistency (e.g., “What the Singapore government are communicating about its infection control practices has been consistent”; $\alpha = 0.30$), (5) objectivity (e.g., “. . . the Singapore government agencies' infection control messages have been based on facts”; $\alpha = 0.84$), and (6) promotional tone (e.g., “. . . have been too promotional”; $\alpha = 0.85$; reverse coded). The ratings were averaged into a total perceived effectiveness score. The items in the respective subscales were also averaged to subscale scores of one's perception of the specific dimensions of the government's communication.

Disease preventive behaviors

Nine items were adapted from Oh et al. (2021) to measure the extent participants adopted COVID-19 preventive behaviors in response to the pandemic ($\alpha = 0.81$). On a scale of 1 (strongly disagree) to 6 (strongly agree), participants rated how much they agreed with each statement. Some sample items include “I stay home as much as possible”, “I wash my hands or use hand sanitizer regularly”, and “I observe social distancing by keeping myself away from people and standing at least 1 meter (or 6 feet) away from them”. The ratings were averaged to a total preventive behavior score.

Results

To test H1, we regressed belief in a dangerous world ($M = 3.65$, $SD = 0.69$) and perceived effectiveness of government communication ($M = 4.28$, $SD = 0.70$) on disease preventive behaviors ($M = 5.16$, $SD = 0.58$). Interestingly, there was no significant main effect of belief in a dangerous world on preventive behaviors ($\beta = .08$, $p = .07$). However, there was a significant main effect of perceived effectiveness of communication ($\beta = .33$, $p < .001$). H1 was not supported as individuals' belief in a dangerous world was not significantly associated with their self-reported engagement in preventive behaviors.

To test H2, belief in a dangerous world, overall perceived effectiveness of communication, and their interaction were regressed on preventive behaviors. The interaction effect was significant ($\beta = -0.78$, $p = .003$; see Table 1). Simple slopes analyses (Figure 2) showed that for individuals who perceived the government's communication as low ($\beta = 0.17$, $p = .001$) or average ($\beta = 0.09$, $p = .03$) in effectiveness, their belief in a dangerous world was significantly linked with higher adoption of preventive behaviors. However, the effect of belief in a dangerous world on adoption of preventive behaviors was not significant for individuals who perceived the government's communication as highly effective ($\beta = -0.001$, $p = .98$), suggesting that these individuals are likely to follow government's call to adopt preventive behaviors regardless of their belief in a dangerous world. H2 is thus supported.

Table 1. Regression results using COVID-19 preventive behaviors as the criterion.

Predictor	<i>b</i>		<i>beta</i>	<i>s</i> ²	<i>s</i> ²		Fit	Difference
	<i>b</i>	95% CI [LL, UL]			95% CI [LL, UL]			
(Intercept)	3.77**	[3.30, 4.24]						
BDW	0.07	[-0.01, 0.14]	0.08	.01	[-.01, .02]			
Effectiveness	0.27**	[0.19, 0.34]	0.33	.10	[.05, .15]			
							<i>R</i> ² = .101**	
							95% CI [.05, .15]	
(Intercept)	1.65*	[0.17, 3.13]						
BDW	0.61**	[0.24, 0.98]	0.73	.02	[-.00, .05]			
Effectiveness	0.75***	[0.42, 1.07]	0.91	.04	[.01, .07]			
Interaction	-0.12**	[-0.20, -0.04]	-0.78	.02	[-.01, .04]			
							<i>R</i> ² = .118**	$\Delta R^2 = .017^{**}$
							95% CI [.06, .17]	95% CI [-.01, .04]

BDW = belief in dangerous world. Effectiveness = Perceived effectiveness of government communication. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *s*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. * indicates *p* < .05. ** indicates *p* < .01. *** indicates *p* < .001.

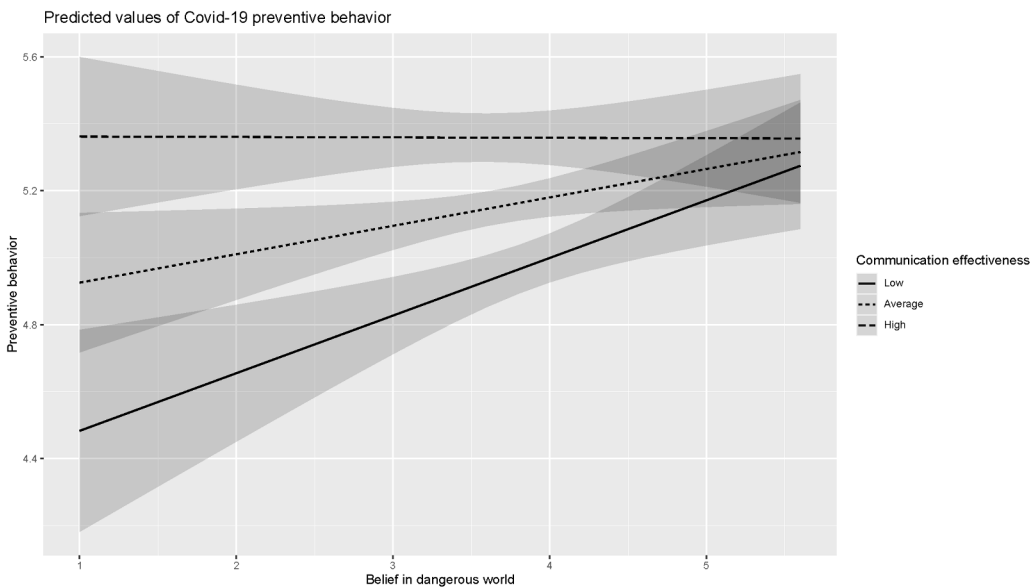


Figure 2. Simple slopes of the effects of belief in dangerous world on COVID-19 preventive behaviors, moderated by overall perceived effectiveness of government’s communication.

To dive deeper into the specificity of the communication tenets that contribute to the effectiveness of Singapore’s government’s public health messaging, we ran separate regression models for the six sub-dimensions of perceived effectiveness of the government’s communication. We are keen to unravel if the moderating effect of communication effectiveness was restricted to certain aspects of communication. Since we have not set up prior predictions, these analyses were exploratory in nature. Perceived consistency of communication was excluded due to low internal reliability ($\alpha = 0.30$). We found significant moderating effects of perceived informativeness ($\beta = -0.69, p = .020; M = 4.51, SD = 0.81$), personal relevance ($\beta = -0.76, p = .005; M = 4.65, SD = 0.86$), and objectivity ($\beta = -0.63, p = .013; M = 4.55, SD = 0.97$) on the relationship between belief in a dangerous world and preventive behaviors. For individuals who perceived the government’s communication as being low in

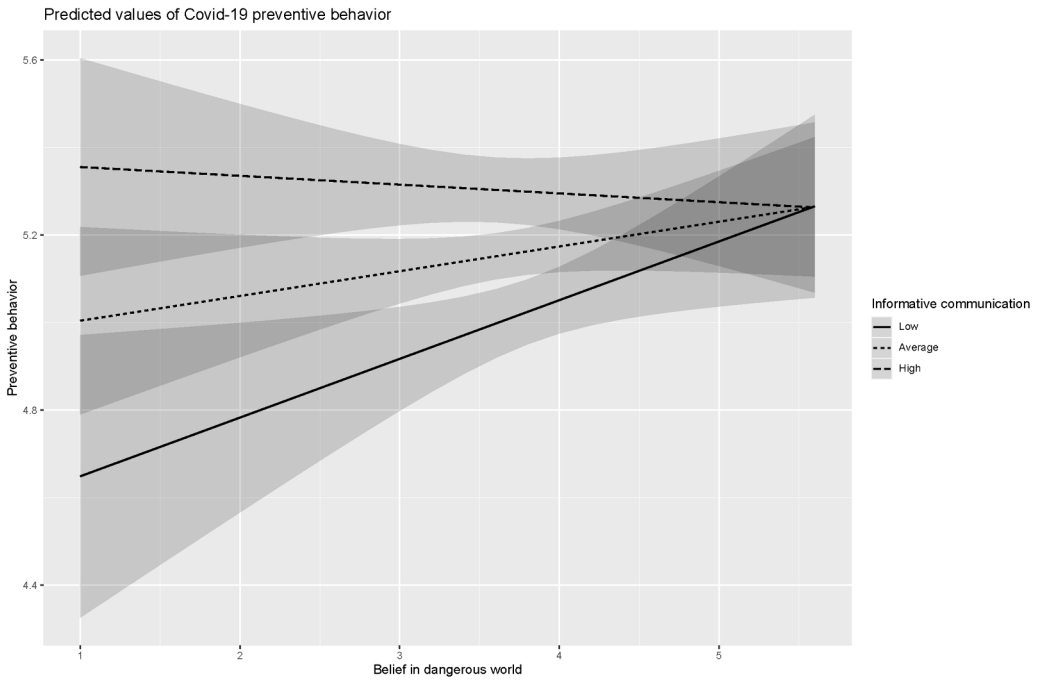


Figure 3. Simple slopes of the effects of belief in dangerous world on COVID-19 preventive behaviors, moderated by perceived informativeness of government's communication.

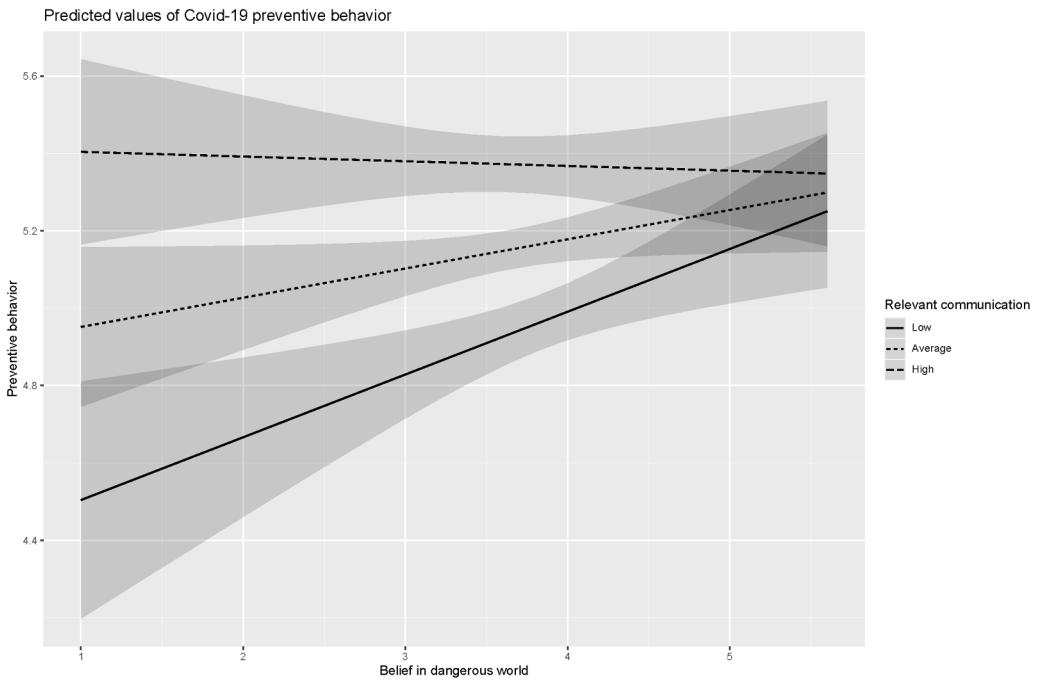


Figure 4. Simple slopes of the effects of belief in dangerous world on COVID-19 preventive behaviors, moderated by perceived personal relevance of government's communication.

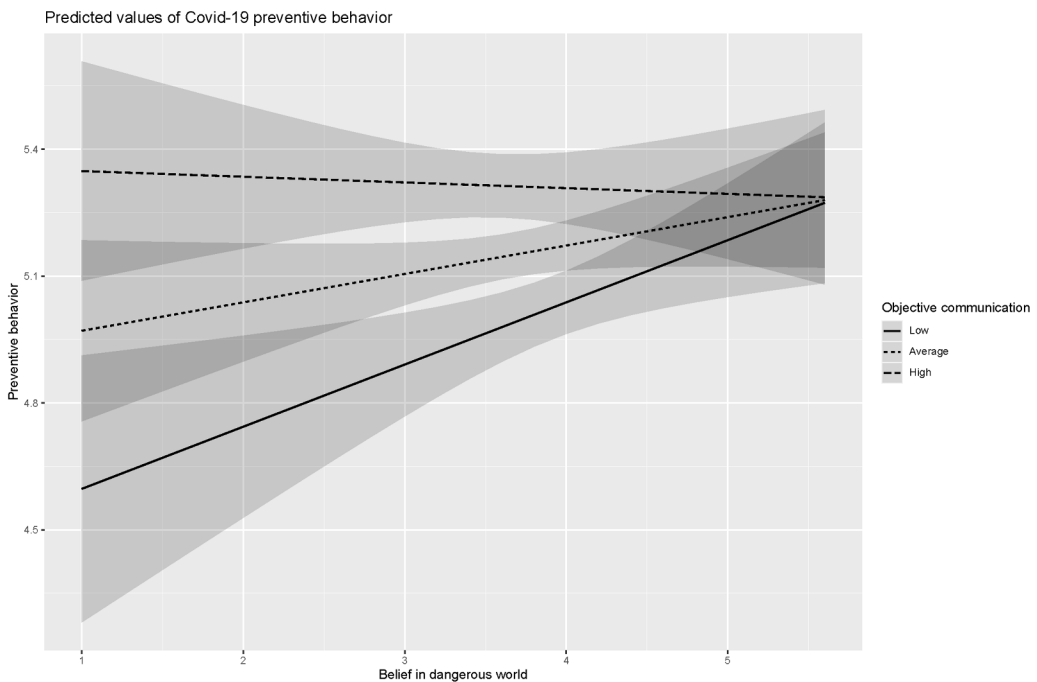


Figure 5. Simple slopes of the effects of belief in dangerous world on COVID-19 preventive behaviors, moderated by perceived objectivity of government's communication.

informativeness ($\beta = 0.13, p = .018$; [Figure 3](#)), personal relevance ($\beta = 0.16, p = .003$; [Figure 4](#)), and objectivity ($\beta = 0.15, p = .006$; [Figure 5](#)), whether they adopted preventive behaviors depended on whether they believed the world was a dangerous place. Perceived transparency ($\beta = -0.16, p = .48$; $M = 4.11, SD = 1.24$) and promotional tone ($\beta = -0.03, p = .24$; $M = 3.35, SD = 1.22$) of government's communication, on the other hand, did not significantly moderate the relationship between belief in a dangerous world and preventive behaviors. This set of findings reveals that when strategic communication professionals craft public health messages, informativeness, personal relevance and objectivity of communication should drive the messaging.

Discussion

This research sought to investigate the effects of individuals' belief in dangerous world and perceived effectiveness of government's messages on adoption of disease preventive behaviors in an environment that has heightened exposure to media messages that communicate uncertainty or danger during this pandemic. To validate our presupposition that Singapore's mainstream media news reporting on COVID-19 resonated with those advocated by global media which communicated messages of danger in the larger environment in the city-state, we first conducted a pre-study as an assumption check by analyzing the text headlines of two major news media in Singapore. Our main study thereafter proceeded to investigate the relationships between belief in a dangerous world, engagement in disease preventive behaviors and perceived effectiveness of Singapore government's crisis communication at the onset of the pandemic in March 2020. As trust in government communication in times of crises has been shown to be a key factor in driving behaviors (Lim et al., 2020), we are keen to understand the role of strategic communication, specifically people's perceived effectiveness of Singapore government's pandemic communication messages in modulating the link between the belief in a dangerous

world and engagement in disease preventive behaviors. In the process, we hope to better comprehend how public health communication in a pandemic can be strategically calibrated to better achieve optimal message effectiveness in the country's collective fight against the spread of COVID-19.

Our pre-study sheds light on the influence of media setting the agenda for the public on what news to think about and how public should think about news events. Our findings concurred with past research (e.g., Aslam et al., 2020) which suggested that news headlines tended to communicate that the world is dangerous in times of a pandemic. As previous studies have demonstrated positive associations between exposures to media and heightened fear in individuals during health crises, such perceptions can interfere with motivation to embrace health preventive behaviors (Melki et al., 2020). As mass media play a monumental role in framing global pandemics, the media should have offered helpful information that promoted health sustaining and disease preventive behaviors to enhance personal safety instead of spotlighting on unsound medical evidences, or providing endless negative newsfeed on health consequences (Su et al., 2021). For the reason that people tend to turn to the media for information in times of crises, the media have the responsibility to report scientific truths and promote adherence to health regulations so as to help to avoid mass hysteria and panic.

Considering that the media's evaluation and assessment of the pandemic make it possible for them to shape the public's perceptions of the dreaded disease they choose to bring to prominence (Carroll & McCombs, 2003), communication professionals practicing in the public health sectors should work closely with all mainstream and accredited media in the country. Instead of being reactive, public health communication professionals should be proactive when engaging the media so as to be able to offer medically sound opinions from experts and to help with the crafting of the national health narratives. Knowing that this pandemic and its associated health risks are of great concern to everyone, practitioners should continuously provide timely updates, and scientific medical evidences for the media to report. In addition, the public health communication team should be relentlessly scanning the environment so that fake news can be doused with truths in order to stamp out misinformation and scaremongering tactics in a highly competitive media environment (Tagliabue et al., 2020).

As for our main study, our first set of results from H1 shows that individuals' belief in a dangerous world was not a significant contributor to whether individuals adopt disease preventive behaviors. Contrary to our expectation, individuals' propensity to believe that the world is dangerous was not significantly associated with disease preventive behaviors. One plausible reason is that the heightened sense of danger or uncertainty during the pandemic have increased most people's perception of a dangerous world, regardless of whether they have the proclivity towards such a belief. This is aligned with our pre-study's findings that there is indeed excessive communication of danger and uncertainty in the mainstream news media.

Our second set of findings from H2 shows that there was a significant interaction effect of belief in a dangerous world and perceived effectiveness of government communication on preventive behaviors. These findings show that for individuals who perceive the government's crisis communication messages as effective, they are more likely to adopt disease preventive behaviors regardless of whether they perceive the world as a dangerous place. For individuals who do not perceive the government's crisis communication messages as effective, whether they adopt disease preventive behaviors depends on their belief in whether the world is dangerous.

Essentially, the takeaway from our main study suggests that the presence of significant moderating effect of perceived effectiveness of government messages on belief in a dangerous world and preventive behaviors in the absence of main effect of individuals' belief in dangerous world highlight the critical importance of effective crisis communication in times of a pandemic. It demonstrates that strategic communication in a pandemic is imperative. Otherwise, if crisis communication and public health messaging are perceived to be ineffective, the behavioral consequences will tend to depend on the individuals' social beliefs and attitudes. This may result in the lack of control and ineffective policies as the government may be less successful in ensuring that the populace follow recommended national directives to stop the spread of COVID-19.

On that note, our main study further uncovered that Singaporeans are more persuaded by messages that offer personal relevance, are informative, and delivered objectively during a pandemic. They are less thrilled with messages that adopt promotional tones or transparency. According to Wong and Jensen's (2020) study on the Singapore government's unique deployment in risk communication which the authors termed as "defensive pessimism" (p. 1022), Singapore authorities have consistently shown objectivity by communicating facts to prepare citizens mentally for future health risks. The messages were never intended to make people feel safe or to heighten risk perceptions of the pandemic. Great care was also given to ensure that health information offered personal relevance by ensuring that they were translated into four different languages for the multicultural society. Dialogues with residents were further carried out regularly at all levels from government to communities in an effort to manage health risk perceptions. As for message informativeness, officials would address scientific untruths concerning the virus openly and publicly via conventional and social media such as online discussion groups, and by arming the media and all health care workers with updated hourly information concerning the progress of the disease and actions taken to reduce uncertainty and fear. These three dimensions present in Singapore's public health communication messages have evidently worked well to invoke public trust and compliance during the COVID-19 pandemic in Singapore (Wong & Jensen, 2020).

Implications for public health communication in times of a pandemic

To offer pioneering empirical evidence needed to better understand the multi-faceted challenges that countries around the world continue to face in their struggles to stop the spread of COVID-19, our multi-disciplinary research integrated various tracks in communication literature and behavioral studies in order to provide insights on strategic communication in a global pandemic. Given the extensive influence of negatively framed news reports on COVID-19 which tended to present the world as a scary place, we adopted a mixed method research approach to investigate the role of Singapore government's pandemic communication efforts and its relationship between psychosocial factors and the motivation to engage in disease preventive behaviors. Drawing on the strengths of both qualitative and quantitative methods, we carried out the pre-study to first scan the larger societal environment and the worldviews that were being presented by the mainstream media to the Singapore publics. We subsequently carried out our main study and dived deep into the interaction between personality traits (lay beliefs) and social factors (public health communication) that impact disease preventive behaviors.

Our main study validated many past findings found in crisis communication scholarship that consistently maintain that strategic communication and public messaging in times of crises are obligatory (e.g., Coombs & Holladay, 2011). In fact, the inability to manage well-coordinated and calibrated crisis communication in the current COVID-19 pandemic may lead to unnecessary upheaval if publics are confused by government's health messaging. The importance of strategic communication cannot be emphasized enough, considering that our findings showed that effective government communication can even override individuals' personal predisposition to engage in disease preventive behaviors. As argued by Abraham (2010), the price of poor pandemic communication is arsenic and devastating. This is particularly so if the failed communication is perceived as the government being ill-prepared, as this can greatly incite public mistrust leading to hindering obstacles for countries to overcome the health damaging impact of the epidemic.

In the case of COVID-19, clear communication, continuous engagement and dialogues with publics are mandatory requisites in crisis management if the Singapore government hopes to achieve understanding and unite the population in a collective fight against this prolonged health threat. The purpose of communicating in a pandemic should be to focus on raising "the level of understanding so that all those who are involved are adequately informed within the limits of available knowledge" (Abraham, 2010, p. 1307). Our study further suggests that for the crisis messages to be effective, public health communication professionals should ensure that the content and delivery are driven by

informativeness, personal relevance and objectivity when government leaders exchange information about the virus contagion and call for the adoption of preventive health behaviors. The building of this shared understanding anchored on two-way exchanges will contribute towards helping the population to better appreciate the government's efforts to stem the spread of COVID-19.

Effective communication exchanges on a national level will also need to depend on the strategic use of multiple media channels, given the complexity of communication in today's digital era. Not only should strategic communicators in the public health sectors proactively engage mainstream media, equally critical or even more vital is to be actively involved in social listening. Yeo et al.'s (2020) study for instance, found that for ongoing crises, the sheer volume of voices and the speed at which images and words are exchanged and circulated online can vastly impact perception of crisis communication messages and responses. Social media should definitely be a major communication platform for two-way exchanges when integrating and strategizing public health messages as they afford communication professionals a better understanding of public's sentiments. The comprehension of netizens' expression of emotions will definitely aid in managing responses and calibrating targeted narratives to achieve public trust, which in turn will encourage the adoption of disease preventive behaviors in times of a pandemic.

This research, however, is not without limitations. Our main study only examined one personality trait predictor when there are other traits that can also impact disease preventive behavioral outcomes. Future researchers may wish to examine the effects of other social psychological factors that may interact with effective communication messages on individuals' motivation to be proactive in protecting their health. Further, as our study did not consider social influence such as subjective norms, future research should employ the Theory of Planned Behavior as a theoretical lens to better understand perceived beliefs of friends and family and their influence on individuals' disease preventive behaviors.

Conclusion

This study investigates the moderating effect of perceived government communication effectiveness on the link between belief in a dangerous world and disease preventive behaviors at the onset of COVID-19 pandemic in Singapore. Our results showed that effective communication is the "lifeblood" of the Singapore government if the country hopes to halt the coronavirus spread. Transcending conventional academic boundaries to uncover wider societal issues impacted by COVID-19, this study offers a resounding endorsement that confirms communication scholars' conviction that strategic message management is always a key factor that fuels public trust and drives behaviors in times of a crisis (MacLeod, 2014). Finally, given that the COVID-19 is far from over, we hope that our study will be able to shed some light on possible measures that governments from around the world can adopt in their fight against the unending rampage of the COVID-19 virus.

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