Consumer intentions to get the COVID-19 vaccine: A protection motivation theory explanation

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ABSTRACT

This paper examines social distancing and face covering as perceived responses based on Protection Motivation Theory, then determines what factors may influence people's decision to get vaccinated. Further, we examine these perceived responses when consumers use online sources of information. Study 1 included 204 parents and students from the U.S. and tested the Protection Motivation Model and three mediators (vulnerability, severity, and efficacy of coping responses) on consumer intentions to get the vaccine. Study 2 included a national sample of 242 Prolific respondents using online sources of information (social media and non-social media) to test the role of perceived responses and determine if chosen news source affected consumer intention to be vaccinated. The findings indicate that fear magnitude positively influences severity and fear efficacy positively influences coping responses, respectively, and both further impact consumer vaccine intention. Consumers with non-social media COVID-19 information sources who had a high fear efficacy were more likely to respond by wearing face coverings and keeping social distance, thus had a higher intention of getting vaccinated. This pandemic seems to evolve weekly. At the time of this writing, vaccines are rolling out slowly and variants of the virus developing rapidly. As vaccinations are only recently available, there is little research on using fear as a tactic to influence consumer behaviors that are beneficial to society during a pandemic. Addressing the differences in information sources will be pivotal in getting the correct message presented in the correct source.

Keywords: COVID-19 vaccine, Protection motivation theory, Social distancing, Face covering, Online sources, Social media

INTRODUCTION

In late January 2020 word spread of a serious virus emanating in China. Initially, no one was aware of how the virus was transmitted. As more information came to light, experts recommended wearing face covering, frequent hand washing, and staying 6 feet away from others. It was not until the first deaths from the disease at a Washington nursing facility were reported that Americans began to pay attention. While wearing face covering is standard behavior in most Asian countries (mostly due to pollution), it is rare in the United States. Social distancing has never been a part of our society. A pandemic with major losses of life had not occurred in the United States since the Spanish Flu of 1918. Stay at home orders were issued in many areas of the country in March 2020. Consumers had to change their daily lives. We later learned that the virus spreads through droplets expelled when speaking, and even just breathing. It is less likely to be spread on surfaces (though many washed everything that entered their homes). By this time, the virus had become politicized and behaviors such as wearing masks and social distancing were also politically motivated.

In the past six months, we all have learned to change our behavior whether we agree with the mandates or not. One thing that has been made clear is that the only way back to some form of normalcy is by getting the vast majority of people vaccinated. However, despite the expected challenges of vaccine development and distribution, there is also the challenge of convincing the entire population that it is imperative that everyone gets vaccinated. This challenge may be the biggest of all. Because few of us have the credentials to truly understand this virus, we must turn to our chosen sources of information about the disease. Given the fractured nature of media options, both online and offline, each of us may receive different information about the nature, vulnerability to, severity of, and response to the virus. We make decisions based upon available information and what we chose to expose ourselves to.

The goal of this paper is to first identify social distancing and face covering as perceived responses in the Protection Motivation Theory, then determine what factors may influence people in making the decision to get vaccinated once their turn arrives, and further examine the role of social distancing and face covering as perceived responses when consumers use online sources of pandemic information, such as social media and non-social media.

We begin the next section by first discussing literature on the Protection Motivation Theory and health information via different sources. Based on the literature, a series of hypotheses are developed. We then move to methodology and data, followed by our findings. After that, theoretical and practical contributions of the findings are discussed, followed by research limitations and future research of this study.

LITERATURE REVIEW

Protection Motivation Theory

Protection Motivation Theory or PMT (Rogers, 1975) has been used by researchers as a framework for predicting protective behavior regarding food (Haapala and Probart, 2004), environmental (Ruan, Kang, and Song, 2020), and cyber safety (Lwin, Li, and Ang, 2012; Tsai *et al.,* 2016), and threats of personal violence (Singh, Orwat, and Grossman, 2011). Additionally, PMT has been used to investigate health-related threats (McMath and Prentice-Dunn, 2005; Rippetoe and Rogers, 1987), including pandemics (Kok *et al*., 2010) and in the marketing

literature to study unusual purchasing behavior during the COVID-19 pandemic (Laato *et al*., 2020). This theory posits that people respond to threats by performing protective actions (Rogers, 1975). For example, when a person's perceived risk increases, they are more likely to avoid the threat and take steps to protect themselves from the threat (Schafer *et al*., 1993). According to the World Health Organization (WHO), COVID-19 is a severe global threat (World Health Organization, 2020) but individuals make their own assessment of the threat when it comes to taking preventative actions. Several appraisals are made when evaluating threat perceptions in the PMT framework.

According to Rogers (1975), PMT has three main cognitive mediating threat appraisals, including perceived vulnerability, perceived severity, and perceived response efficacy (see Figure 1 in Appendix). In the current research, perceived threat vulnerability refers to beliefs about the likelihood of getting COVID-19 whereas perceived threat severity refers to feelings about the seriousness of the COVID-19 threat. Perceived response refers to the belief that the COVID-19 vaccine effectively reduces or prevents the disease or that other health guidelines are effective at reducing disease transmission. According to the PMT model, an individual's threat appraisal of contracting COVID-19 predicts their actions taken to protect against the virus. If COVID-19 is considered likely to personally occur or appraised as severe, or if something can be done to prevent COVID-19, then protection motivation may be activated (Kok *et al.,* 2010; Rogers, 1975). This threat appraisal may lead to protective actions, such as taking the vaccine and/or engaging in other preventative health guidelines, including face coverings, frequent handwashing, and social distancing. Tremendous efforts have been devoted to communicating the severity and risks associated with COVID-19 and disease spread and the importance of individuals following recommended health guidelines to prevent infection and spread.

COVID-19 has taken the lives of hundreds of thousands and sickened millions of Americans (John Hopkins, 2021). The threat posed by COVID-19 has been extensively reported by the media and widely discussed on social media. Various news outlets have communicated the danger of COVID-19 and have suggested protective measures to take to mitigate the risk of contracting or spreading the virus, including taking vaccines as soon as they are available. Recent breakthroughs in immunization have provided healthcare providers with effective vaccines to combat the virus. The efficacy of these mitigating behaviors, including taking a vaccine has been the topic of considerable debate and misinformation. The effectiveness of the communication to adopt the vaccine behavior is based on the level of protection motivation, or the perception that the action taken will reduce the likelihood of severity or harm (Weinstein, 1993).

In summary, a fear appeal such as COVID-19 following the PMT (Rogers, 1975) is primarily treated as a cue, which can motivate consumers to protect themselves in a mediation process to affect consumer intention to adopt recommended responses. This study focuses on applying PMT to examine the influence of COVID-19 as a fear appeal on consumer vaccine intention. Specifically, consumers react to cognitive fear appeals in three mediating paths in a process, consisting of the impacts of fear (1) occurrence through perceived vulnerability, (2) magnitude through perceived severity, and (3) efficacy through perceived response to further influence consumer COVID-19 vaccine intention. Therefore, the following is expected:

H1. Perceived vulnerability mediates the effect of fear occurrence on COVID-19 vaccine intention.

H2. Perceived severity mediates the effect of fear magnitude on COVID-19 vaccine intention.

H3. Perceived response mediates the effect of fear efficacy on COVID-19 vaccine intention.

Health information via different sources

As reports in traditional and social media platforms regarding COVID-19 infections, hospitalizations, and deaths spread, people turned to a variety of outlets to get updates and learn more about the disease. Many governments around the world responded to the COVID-19 threat by releasing health recommendation guidelines. Once vaccines moved toward approval, the guidelines changed, relating to vaccination implementation, such as funding, distribution plans, and priority lists. Regular local and national press conferences were called to share information from health officials about the dangers of the disease and precautions that could be taken to slow and prevent the spread of COVID-19 while awaiting vaccines. Critical information for protecting society was communicated in these briefings, including best practices for slow and preventing the spread of disease.

A highly contagious disease such as COVID-19 presents a unique set of challenges since individuals' actions may lead to harmful outcomes for the greater population. For example, the disease can further spread if individuals do not follow health recommendations, including wearing a mask, socially distancing, handwashing, covering coughs and sneezes, and taking the vaccine (McIntosh, Hirsch, and Bloom, 2020). Not taking precautions can result in super spreader events and new surges in cases. The recent Super Bowl is an example of just such an event. Understanding how information about COVID-19 is consumed during a global health pandemic and how that information affects attitudes and behaviors is important to understand to improve the effectiveness of future health messages (Hua and Shaw, 2020; Tran *et al.,* 2020).

Information and guidelines for slowing and preventing the spread of COVID-19 were widely available in traditional (e.g., non-social media sources such as local or national news, John Hopkins, Huffington Post, Google, Yahoo! websites and/or apps) and social media online channels (Wang$_b$ *et al.,* 2020). Previous research on pandemics has found that outbreaks are often accompanied by a large increase in information and information-seeking (Hua and Shaw, 2020). As consumers search for answers, fear arises due to a lack of available knowledge, causing people to seek information from less reliable sources (Rubin and Wessely, 2020). Research investigating sources of information about COVID-19 found that the Internet was one of the most popular channels for health information about transmission, availability, and effectiveness of medicines and vaccines, and prevention advice (Wang$_a$ *et al.,* 2020). Often, information about COVID-19 gathered on the Internet came from social media (Saud *et al*., 2020).

The importance of the role social media plays in disseminating information, including information about health guidelines cannot be understated. Infodemiology approaches, or data approaches using the science of distribution of Internet information to inform public health or policy, have provided researchers with valuable input for detecting, monitoring, and forecasting COVID-19 infection, awareness, and response (Mayragani, 2020; Sarker *et al*., 2020; Shaman *et al.*, 2013). Online sources such as Facebook, Instagram, Twitter, and Google Trends has been used for COVID-19 infodemiology analyses (Mavragani, 2020; Mavragani and Gkillas, 2020). Social media is also a useful channel to capture user sentiment. In a recent Facebook study of COVID-19 perceptions and behaviors on social media, Shorey *et al.,* (2020) found that several common themes emerged in posts, including fear and concern, panic buying and hoarding, and concern for the future, among others. Users seeking information online tend to access

information consistent with their worldviews (Cinelli *et al.*, 2020). Users also frequently disregard or discount dissenting information (Zollo *et al.*, 2017). During the COVID-19 pandemic, the accuracy of the information found online became a concern and significant challenge for public health officials.

The information shared on social media, when compared to non-social media sources, about COVID-19 or recommend health guidelines was not always accurate. This became such a concern that Tedros Adhanom Ghebreyesus, Director General of the World Health Organization, stated, "We're not just fighting an epidemic; we're fighting an infodemic. Fake news spreads faster and more easily than the virus and is just as dangerous" (2020). Misinformation about COVID-19 spread rapidly on social media. Based on users' search information and social media's algorithms, misinformation may prioritize over accurate information (Kulshrestha *et al.,* 2019). This is particularly dangerous to public health because some studies suggest that inaccurate information may spread faster and wider than fact-based information (Vosoughi, Roy, and Aral, 2018; Liu, An, and Zhou 2021). Based on this understanding of misinformation on social media, the following hypotheses were developed:

H4a. When consumers use social media sources, the indirect effect of fear efficacy through a perceived response to COVID-19 vaccine intention is insignificant.

H4b. When consumers use non-social media sources, the indirect effect of fear efficacy through a perceived response to COVID-19 vaccine intention is significant.

METHODOLOGY

Study 1

Sample and procedure.

The purpose of Study 1 was to test the full model of PMT including the three mediation paths in hypotheses 1-3. A Qualtrics online survey was conducted at the end of October to early November 2020 in the United States to test the research questions and proposed hypotheses. Undergraduate and graduate students and their invited family participants from a large public university in the U.S. were recruited. Small extra credit points were offered to motivate participants. After a consent statement, the screening question of "Do you believe that you know what COVID-19 is?" was added to exclude participants who did not know what COVID-19 was. Those participants who answered "yes" for the screening question were qualified to take the survey. After data cleaning, a total of 204 complete responses were used for data analysis.

Among the 204 respondents, 35.8% were males, as indicated in Table I (Appendix). Respondents' age ranged from 19 to 84 with a mean of 35 years old. 69.6% of the respondents were White or Caucasian, followed by Black or African American (15.7%) and Hispanic, Latino, or Spanish Americans (6.9%). 44.6% of respondents had some college and 26% of them had college degrees.

The main questionnaire comprised of three sections. In the first section, the questions were about participants' attitudes toward COVID-19 such as fear appeals and motivations. Then, respondents answered questions regarding their intentions to get a vaccine in the second section. Finally, the third section asked a question of respondents' information source for getting COVID-19 information and their demographics.

Measures

This study mostly used the seven-point Likert scale anchored by 1 being "strongly disagree" and 7 being "strongly agree" to measure the focal constructs. Fear appeal components included the probability of occurrence ("I won't get COVID-19"), the magnitude of noxiousness ("Even if I get COVID-19, I won't die" and "COVID-19 is a serious threat for someone like me"), and the efficacy of recommended responses ("During COVID-19, I intend to deliberately cancel or postpone a social event," "During COVID-19, I intend to reduce using public transportation," "During COVID-19, I intend to avoid going to shops," and "During COVID-19, I intend to stay at home and study/work remotely"). Corresponding to these three components of fear appeals, the cognitive COVID-19 protection motivation following the Protection Motivation Theory (Rogers, 1975) comprised of three components of perceived vulnerability ("I am afraid of going out to public places," "I am afraid of gathering with friends," and "I am afraid of gathering with people I do not know"), perceived severity ("COVID-19 is no worse than flu," "COVID-19 is deadly," and "COVID-19 can be life-threatening"), and perceived belief in the efficacy of coping responses ("I don't need to wear a face covering if I don't have symptoms of COVID-19" and "I don't need to be social distanced if I don't have symptoms of COVID-19"). The outcome variable of respondents' intentions to adopt the recommended response is vaccine intention ("When a vaccine is approved, I am willing to get it," "I will only get the vaccine if it has been proven safe and effective," and "I will get a vaccine for COVID-19 after a majority of Americans have gotten it").

Results

Descriptive analysis. Table II (Appendix) shows descriptive statistics and Cronbach's alphas for our measures. Some items were reverse coded as indicated in Table II. Cronbach's alphas were mostly in the acceptable range of 0.62 to 0.87. Table III (Appendix) provides a construct level correlation matrix. About COVID-19 information, online (66.2%, vs. TV 33.8%) was respondents most often used information source.

Results of the proposed hypotheses. This study tested hypotheses 1-3 using PROCESS bootstrapping with repeated extraction of 5,000 samples and bias-corrected 95% confidence intervals (Hayes 2018). Demographics were included in the analyses as covariates. H1 proposed that perceived vulnerability mediates the effect of fear occurrence on COVID-19 vaccine intention. The results in Table IV (Appendix) revealed that the indirect effect of fear occurrence on COVID-19 vaccine intention through perceived vulnerability was significant when the most often used COVID-19 information source was TV (β = .1256, 95% C.I. = .0476, .2231), but not for online source (β = -.002, 95% C.I. = -.0411, .0451). Thus, H1 was partially supported by the results. In support of our hypotheses H2 and H3, the bootstrapping results (Model 4; Hayes 2018) indicated that the indirect effect of fear magnitude on vaccine intention through severity (β = .1118, 95% C.I. = .0323, .1994) and the indirect effect of fear efficacy on vaccine intention through response (β = .1024, 95% C.I. = .0153, .2331) were significant. These results indicate that consumers who had high fear appeals were more likely to be motivated to protect themselves, resulting in a higher likelihood to get COVID-19 vaccines.

Figure 2 (Appendix) provides support of the different indirect effects when respondents chose their most often used COVID-19 information source to be either TV or online. When COVID-19 information is from TV (i.e., Sou value is 1 in Figure 2), there is a significant

positive slope between fear occurrence and perceived vulnerability, but not when information is from online sources (i.e., Sou value is 2 in Figure 2). This prompted us to further examine online sources such as social media vs. non-social media in Study 2 when consumers use online sources of information.

Study 2

Sample and procedure

Following Study 1, the goal of Study 2 was to examine hypotheses 3-4 on the role of online sources, specifically social media vs. non-social media, to influence COVID-19 vaccine intention through consumers' responses on wearing face coverings and keeping social distance. An online survey was conducted in early November 2020 to focus on COVID-19 information from online sources by selecting respondents who chose "online" to the question of "where do you most often get your COVID-19 information." Respondents who did not answer "online" were screened out from the data. A national sample of American adults was recruited via Prolific, a high-quality research participants recruitment platform. To encourage participation, participants were rewarded with a reasonable monetary amount. We obtained 242 valid responses in this study.

Table I (Appendix) summarizes the demographic characteristics of the sample. Among the 242 respondents, 44.2% were males and the age ranged from 18 to 75 with a mean of 32 years old. 69% of the respondents were White or Caucasian, followed by Asians (11.6%) and Hispanic, Latino, or Spanish Americans (9.9%). 37.2% of respondents had college degrees and 28.1% of the respondents had some college education.

Like Study 1, the main questionnaire comprised of three sections. In the first section, the questions were about participants' fear efficacy and responses including wearing face coverings and keeping social distance. Then, respondents answered questions regarding their intentions to get vaccines in the second section. Finally, the third section asked a question of respondents' online information source for getting COVID-19 information, either from social media or non-social media, and some demographics.

Measures

This study used the seven-point Likert scale anchored by 1 being "strongly disagree" and 7 being "strongly agree" to measure the focal constructs. The efficacy of recommended responses ("During COVID-19, I intend to deliberately cancel or postpone a social event," "During COVID-19, I intend to reduce using public transportation," "During COVID-19, I intend to avoid going to shops," and "During COVID-19, I intend to stay at home and study/work remotely") and belief in the efficacy of coping response ("I don't need to wear a face covering if I don't have symptoms of COVID-19" and "I don't need to be social distanced if I don't have symptoms of COVID-19") were measured. The outcome variable of respondents' intentions to adopt recommended responses is vaccine intention ("When a vaccine is approved, I am willing to get it," "I will only get the vaccine if it has been proven safe and effective," and "I will get a vaccine for COVID-19 after a majority of Americans have gotten it").

Results

Descriptive analysis. The average COVID-19 efficacy of the recommended responses was 5.31 (SD = 1.43) and the average perceived belief in the efficacy of coping responses such as wearing a face covering and keeping social distance was 6.17 (SD = 1.32). Respondents' average vaccine intention was 4.86 (SD = 1.40).

Results of the proposed hypothesis. According to H3, perceived response mediates the effect of fear efficacy on COVID-19 vaccine intention, which was strongly supported by the results (β = .1248, 95% C.I. = .0307, .2358). This result was consistent with Study 1. H4 proposed that the indirect effect of fear efficacy through a perceived response on COVID-19 vaccine intention is insignificant when consumers most often use social media as the online information source, but significant when using non-social media. The results in Table IV revealed that when consumers most often used non-social media for their COVID-19 information, their fear efficacy through perceived response on COVID-19 vaccine intention was positive and significant (β = .1584, 95% C.I. = .0526, .2859), but the path in social media was not significant (β = .0762, 95% C.I. = -.0789, .2345). Thus, H4a and H4b were supported by the results. Figure 3 (Appendix) shows a significant effect when consumers most often use non-social media as the online information source (i.e., the solid line when SM Dummy is 0). The results suggest that consumers with non-social media (vs. social media) COVID-19 information who had a high fear efficacy were more likely to respond by wearing face coverings and keeping social distance, thus had a higher intention of getting vaccinated.

DISCUSSION AND CONCLUSION

Theoretical and practical implications

Theoretically, this paper extends the research into the Protection Motivation Theory by testing its full model with respect to consumer perceptions during the pandemic. The results showed that perceived vulnerability, perceived severity, and perceived efficacy of coping responses affected the behavioral outcome of intention to get the COVID-19 vaccine. Furthermore, social distancing and face covering may serve as a mediator of perceived responses in the Protection Motivation Theory. While this is a specific context for the model, it shows that the model holds for the most extreme, unexpected fear inducing event. However, looking at the sources of information consumers used showed that they too, influenced intentions to vaccinate. Some social media sources, which could and had been filled with misinformation and outright untruths could lead consumers to hold beliefs and attitudes about vaccination that are also misinformed and untrue. Thus, academics pursuing studies of information use need to consider the fragmented sources of information consumers use to gain insight into their thought processes.

Practically, brand managers, public health officials, and anyone else who needs to communicate to the public about mandates (health related or otherwise) would be well served by customizing the messages to appropriate channels. The fragmentation of online media options, such as social media sources, requires a fragmentation of messages for each source. It may be that a fear appeal may work for some consumers (who utilize non-social media for their information), whereas a different message appeal is better suited to those who use social media as their source of information.

Limitations and future research

Despite the contributions, this research also comes with some limitations. First, asking mainly student respondents in Study 1 might be slanted as a test of the full Protection Motivation Theory. Although Study 1 did cover a large range of respondent ages and we followed it with a generalized Prolific sample in Study 2, it would be valuable to conduct future research with other representative samples to test the full Protection Motivation model.

Second, given that this study was based on the fear appeal of COVID-19 with different information sources such as TV versus online in Study 1 and further social media and non-social media in Study 2, it might be limited by only knowing general types of information sources. Future research could broaden existing social media marketing frameworks to non-social media and ask for specific health related information from online sources.

Third, due to the new pandemic of COVID-19, there were no existing COVID-19 specific constructs we could adopt directly. So, we had to generate a single-item COVID-19 related measures for fear appeal components of occurrence. Future research could develop pandemic related multiple item constructs to measure fear appeals and protection motivation.

References

Cinelli, M., Brugnoli, E., Schmidt, A. L., Zollo, F., Quattrociocchi, W. and Scala, A. (2020), "Selective exposure shapes the Facebook news diet", *PloS one*, Vol. 15 No. 3, e0229129.

Fornell, C. and Larcker, D.F. (1981), "Structural equation models with unobservable variables and measurement error: Algebra and statistics", *Journal of Marketing Research*, Vol. 18 No. 3, pp. 382-388.

Ghebreyesus, T. A. (2020), "Munich Security Conference. World Health Organization", 15 February, available at: www.who.int/director-general/speeches/detail/munich-security-conference (accessed 10 February 2021).

Hayes, A. F. (2018), *Introduction to Mediation, Moderation, and Conditional Process Analysis, A Regression-Based Approach*, 2nd ed. New York: Guilford Press.

Hua, J. and Shaw, R. (2020), "Corona virus (Covid-19) 'infodemic' and emerging issues through a data lens: The case of china", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 7, pp. 2309.

John Hopkins University and Medicine (2021), "COVID-19 Dashboard by the Center for Systems Science and Engineering at John Hopkins University", available at: coronavirus.jhu.edu/map.html (accessed 10 February 2021).

Kok, G., Jonkers, R., Gelissen, R., Meertens, R., Schaalma, H. and de Zwart, O. (2010), "Behavioural intentions in response to an influenza pandemic", *BMC Public Health*, Vol. 10 No. 1, pp. 174.

Kulshrestha, J., Eslami, M., Messias, J., Zafar, M. B., Ghosh, S., Gummadi, K. P. and Karahalios, K. (2019), "Search bias quantification: investigating political bias in social media and web search", *Information Retrieval Journal*, Vol. 22 No. 1, pp. 188-227.

Laato, S., Islam, A. N., Farooq, A. and Dhir, A. (2020), "Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach", *Journal of Retailing and Consumer Services*, Vol. 57, pp. 102224.

Liu, R., An, E. and Zhou, W. (2021), "The effect of online search volume on financial performance: Marketing insight from Google trends data of the top five US technology firms", *Journal of Marketing Theory and Practice*, pp. 1-12.

Lwin, M. O., Li, B. and Ang, R. P. (2012), "Stop bugging me: An examination of adolescents' protection behavior against online harassment", *Journal of Adolescence*, Vol. 35 No. 1, pp. 31-41.

Mavragani, A. (2020), "Infodemiology and infoveillance: scoping review", *Journal of medical Internet research*, Vol. 22 No. 4, pp. e16206.

Mavragani, A. and Gkillas, K. (2020), "COVID-19 predictability in the United States using Google Trends time series", *Scientific Reports*, Vol. 10 No. 1, pp. 1-12.

McIntosh, K., Hirsch, M. S. and Bloom, A. (2020), "Coronavirus disease 2019 (COVID-19): Epidemiology, virology, and prevention", *Lancet. Infect. Dis*, Vol. 1, 2019-2020.

McMath, B. F. and Prentice-Dunn, S. (2005), "Protection motivation theory and skin cancer risk: The role of individual differences in responses to persuasive appeals", *Journal of Applied Social Psychology*, Vol. 35 No. 3, pp. 621-643.

Rippetoe, P. A. and Rogers, R. W. (1987), "Effects of components of protection-motivation theory on adaptive and maladaptive coping with a health threat", *Journal of Personality and Social Psychology*, Vol. 52 No. 3, pp. 596-604.

Rogers, R. W. (1975), "A protection motivation theory of fear appeals and attitude change", *The Journal of Psychology*, Vol. 91 No. 1, pp. 93-114.

Rubin, G. J. and Wessely, S. (2020), "The psychological effects of quarantining a city", *Bmj*, Vol. 368.

Sarker, A., Lakamana, S., Hogg-Bremer, W., Xie, A., Al-Garadi, M. A. and Yang, Y. C. (2020), "Self-reported COVID-19 symptoms on Twitter: an analysis and a research resource", *Journal of the American Medical Informatics Association*, Vol. 27 No. 8, pp. 1310-1315.

Saud, M., Mashud, M. and Ida, R. (2020), "Usage of social media during the pandemic: Seeking support and awareness about COVID-19 through social media platforms", *Journal of Public Affairs,* Vol. 20 No. 4, pp. 1-9.

Schafer, R. B., Schafer, E., Bultena, G. and Hoiberg, E. (1993), "Coping with a health threat: a study of food safety 1", *Journal of Applied Social Psychology*, Vol. 23 No. 5, pp. 386-394.

Shaman, J., Karspeck, A., Yang, W., Tamerius, J. and Lipsitch, M. (2013), "Real-time influenza forecasts during the 2012–2013 season", *Nature Communications*, Vol. 4 No. 1, pp. 1-10.

Sharifirad, G., Yarmohammadi, P., Sharifabad, M. A. M. and Rahaei, Z. (2014), "Determination of preventive behaviors for pandemic influenza A/H1N1 based on protection motivation theory among female high school students in Isfahan, Iran", *Journal of Education and Health Promotion*, Vol. 3 No. 7.

Shorey, S., Ang, E., Yamina, A. and Tam, C. (2020), "Perceptions of public on the COVID-19 outbreak in Singapore: a qualitative content analysis", *Journal of Public Health*, Vol. 42 No. 4, 665-671.

Singh, S., Orwat, J. and Grossman, S. (2011), "A protection motivation theory application to date rape education", *Psychology, Health & Medicine*, Vol. 16 No. 6, pp. 727-735.

Tran, B. X., Dang, A. K., Thai, P. K., Le, H. T., Le, X. T. T., Do, T. T. T., ... and Ho, C. S. (2020), "Coverage of health information by different sources in communities: implication for COVID-19 epidemic response", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 10, pp. 3577.

Tsai, H. Y. S., Jiang, M., Alhabash, S., LaRose, R., Rifon, N. J. and Cotten, S. R. (2016), "Understanding online safety behaviors: A protection motivation theory perspective", *Computers & Security*, Vol. 59, 138-150.

Wang$_a$, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S. and Ho, R. C. (2020), "Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 5, pp. 1729.

Wang$_b$, P. W., Lu, W. H., Ko, N. Y., Chen, Y. L., Li, D. J., Chang, Y. P. and Yen, C. F. (2020), "COVID-19-related information sources and the relationship with confidence in people coping with COVID-19: Facebook survey study in Taiwan", *Journal of Medical Internet Research*, Vol. 22 No. 6, pp. e20021.

Weinstein, N. D. (1993), "Testing four competing theories of health-protective behavior", *Health Psychology*, Vol. 12 No. 4, pp. 324-333.

World Health Organization (2020), "Naming the coronavirus disease (COVID-19) and the virus that causes it", available at: www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-%28covid-2019%29-and-the-virus-that-causes-it (accessed 10 February 2021).

Zollo, F., Bessi, A., Del Vicario, M., Scala, A., Caldarelli, G., Shekhtman, L., Havlin, S. and Quattrociocchi, W. (2017), "Debunking in a world of tribes", *PLoS ONE* Vol. 12 No. 7, e0181821.

Table I. Demographic characteristics

Demographics	Study 1 Percent N=204	Study 2 Percent N=242
Sex		
Male	35.8	44.2
Female	64.2	55.8
Ethnicity		
White or Caucasian	69.6	69
Black or African American	15.7	5.8
American Indian or Alaska Native	0.5	1.7
Hispanic, Latino, or Spanish American	6.9	9.9
Asian	4.4	11.6
Native Hawaiian and Pacific Islander	0.5	0.4
Some Other Race	2.5	1.7
Education Level		
Less than high school	1	1.2
High school diploma	8.3	10.7
Some college	44.6	28.1
College degree	26	37.2
Some graduate studies	13.7	7
Advanced degree	6.4	15.7

Table II. Study 1 mean, standard deviation, construct reliability, and convergent validity of constructs and items

Constructs/items	Mean	SD
Occurrence		
I won't get COVID-19 (reverse).	2.75	1.55
Magnitude (Cronbach's α = 0.69)		
Even if I get COVID-19, I won't die (reverse).	4.12	1.68
COVID-19 is a serious threat for someone like me.	3.98	1.88
Efficacy (Cronbach's α = 0.77)		
During COVID-19, I intend to deliberately cancel or postpone a social event.	4.47	1.98
During COVID-19, I intend to reduce using public transportation.	5.38	1.78
During COVID-19, I intend to avoid going to shops.	3.72	1.84
During COVID-19, I intend to stay at home and study/work remotely.	4.64	2.07
Perceived Vulnerability (Cronbach's α = 0.86)		
I am afraid of going out to public places.	3.33	1.78
I am afraid of gathering with friends.	3.46	1.86
I am afraid of gathering with people I do not know.	4.60	2.00
Perceived Severity (Cronbach's α = 0.62)		
COVID-19 is no worse than flu (reverse).	2.96	1.90
COVID-19 is deadly.	5.37	1.55
COVID-19 can be life-threatening.	6.18	1.16
Perceived Response (Cronbach's α = 0.87)		
I don't need to wear a face covering if I don't have symptoms of COVID-19 (reverse).	5.84	1.73
I don't need to be social distanced if I don't have symptoms of COVID-19 (reverse).	5.79	1.63
Vaccine Intention (Cronbach's α = 0.70)		
When a vaccine is approved, I am willing to get it.	4.17	2.02
I will only get the vaccine if it has been proven safe and effective.	5.24	1.94
I will get a vaccine for COVID-19 after a majority of Americans have gotten it.	4.02	1.81

Notes: SD = standard deviation

Table III. Study 1 correlation matrix

Constructs	Mean	SD	1	2	3	4	5	6	7
1. Occurrence	5.25	1.55	1						
2. Magnitude	3.93	1.56	.23**	1					
3. Efficacy	4.55	1.48	.07	.46**	1				
4. Vulnerability	3.79	1.67	.14	.56**	.65**	1			
5. Severity	5.53	1.18	.25**	.52**	.39**	.51**	1		
6. Response	5.82	1.59	.24**	.42**	.47**	.49**	.65**	1	
7. Vaccine Intention	4.48	1.53	-.06	.09	.12	.23**	.22**	.24**	1

Note: **Correlation is significant at the 0.01 level (2-tailed)

Table IV. Summary of hypotheses testing results from both studies

Hypotheses	Paths	Study 1		Study 2 (Online Source)		Results
		Coeff	95% C.I.	Coeff	95% C.I.	
H1	Occurrence → Vulnerability → Vaccine intention	TV: .1256* Online: -.002	TV: (.0476, .2231) Online: (-.0411, .0451)			Partially supported
H2	Magnitude → Severity → Vaccine intention	.1118*	(.0323, .1994)			Supported
H3	Efficacy → Response → Vaccine intention	.1024*	(.0153, .2331)	.1248*	(.0307, .2358)	Supported
H4a	Efficacy → Response → Vaccine intention is insignificant for social media			SM: .0762	SM: (-.0789, .2345)	Supported
H4b	Efficacy → Response → Vaccine intention is significant for non-social media			NSM: .1584*	NSM: (.0526, .2859)	Supported

Note: 5,000 bootstrap samples; C.I. = Confidence interval; *$p < 0.05$; SM = social media; NSM = non-social media

Figure 1. The conceptual model of study 1

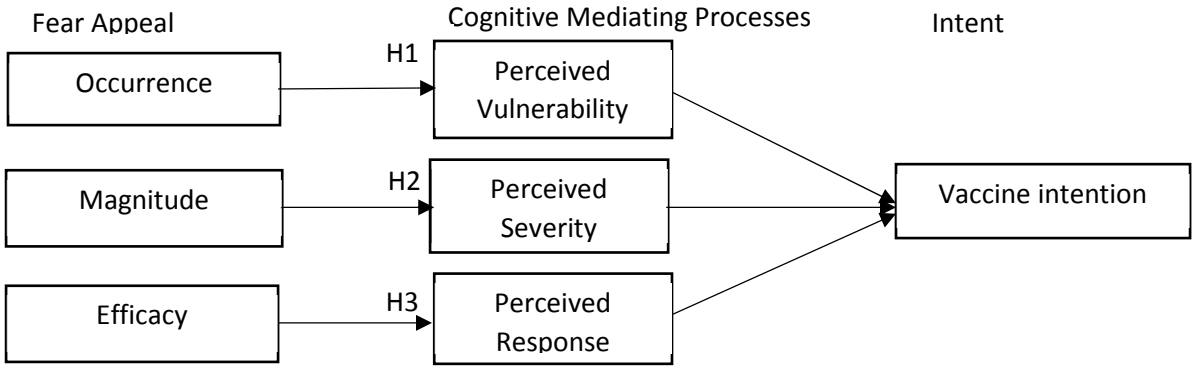
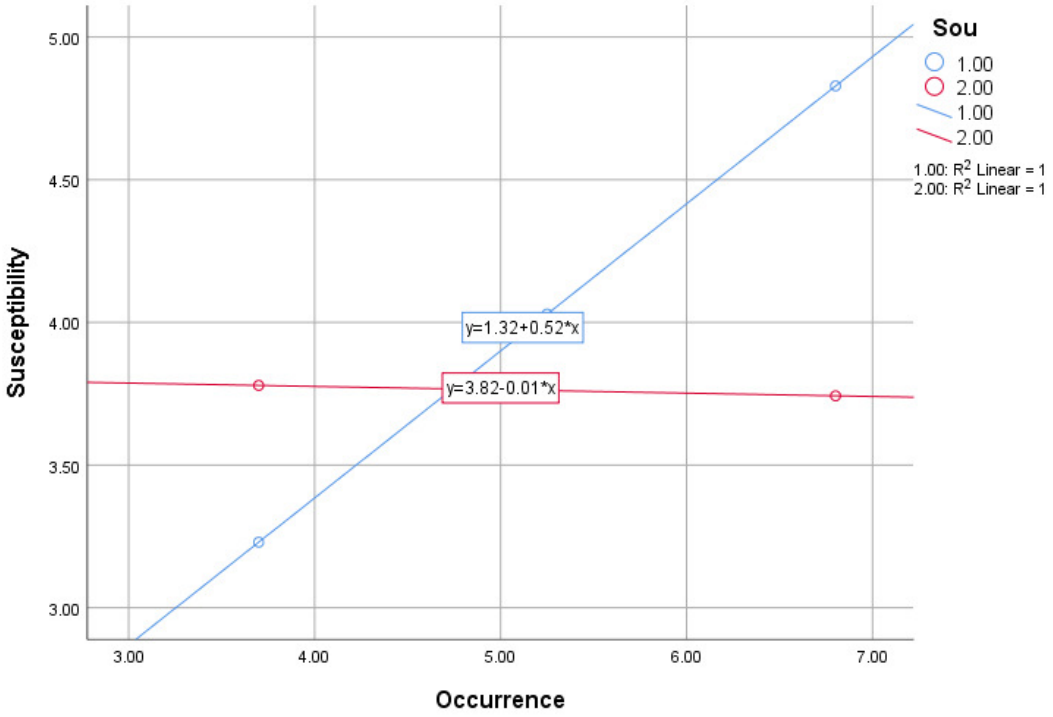


Figure 2. Study 1's mediation for occurrence → perceived vulnerability → Vaccine intention



Note: Sou = 1 when the most often used source is TV; Sou = 2 when the most often used source is online

Figure 3. Study 2's subgroup mediations of efficacy → response → Vaccine intention (social media vs. non-social media)