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To cite this article: Porismita Borah, Juwon Hwang & Ying Chia (Louise) Hsu (2021) COVID-19 Vaccination Attitudes and Intention: Message Framing and the Moderating Role of Perceived Vaccine Benefits, *Journal of Health Communication*, 26:8, 523-533, DOI: [10.1080/10810730.2021.1966687](https://doi.org/10.1080/10810730.2021.1966687)

To link to this article: <https://doi.org/10.1080/10810730.2021.1966687>



Published online: 23 Aug 2021.



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COVID-19 Vaccination Attitudes and Intention: Message Framing and the Moderating Role of Perceived Vaccine Benefits

PORISMITA BORAH ¹, JUWON HWANG ², and YING CHIA (LOUISE) HSU³

¹Associate Professor, GTZN 224, Edward R. Murrow College of Communication, Washington State University, Pullman, Washington State, USA

²Assistant Professor, School of Media and Strategic Communication, Oklahoma State University, Stillwater, Oklahoma, USA

³Ph.D. Student, Edward R. Murrow College of Communication, Washington State University, Pullman, Washington State, USA

The United States is one of the hardest-hit countries by the COVID-19 pandemic and yet there is widespread hesitancy to take the vaccine. In order to address vaccine hesitancy and foster public understanding of the COVID-19 vaccine, it is necessary to strategize public health messages based on evidence. To this end, we use experimental data to examine the effects of four message frames on participants' attitudes toward the COVID-19 vaccine and their vaccine intention. The primary purposes of this paper are to examine the 1) impact of loss vs. gain frames and individual vs. collective frames and 2) role of perceived benefits on participants' attitudes toward the COVID-19 vaccine and their vaccine intention. Our findings show that participants with higher perceived benefits and exposed to the loss frame showed higher positive attitudes toward the COVID-19 vaccine and greater intention to vaccinate. Similar patterns were revealed in case of the individual frame message. Implications are discussed.

The United States is one of the hardest hit countries by the COVID-19 pandemic and one of the effective means to combat the virus is to get vaccinated (Yamey et al., 2020). Vaccination reduces multitude of infectious diseases (Ferdinands et al., 2014; Thompson et al., 2018) as well as provide social benefits (The United Nations Children's Fund, 2019). However, the anti-vaccination movement is speaking out strongly against the COVID-19 vaccine (Jamison et al., 2020; Law, 2020). Research in the area of vaccine hesitancy is abundant. Scholars have most enthusiastically studied the impact of message content to promote vaccination behavior (e.g. Gainforth, Cao, & Latimer-Cheung, 2012; Nan, 2012a; Nan et al., 2016; Xiao & Borah, 2020), primarily using message framing as a theoretical background. Fundamentally, message framing research focuses on the impact of messages with the same information but presented differently (e.g., Kahneman & Tversky, 1984). Moreover, prior research has shown the significance of perceived benefits on vaccination behavior (e.g., Chen, Chiu, Chih, & Yeh, 2015; Mostafapour, Meyer, & Scholer, 2019; Sundstrom et al., 2015).

Although important, to the best of our knowledge, prior research has not examined the interplay of the four frames, loss vs. gain and individual vs. collective, and perceived benefits on vaccination attitudes and behavior during a pandemic. Central to our inquiry is to investigate how these theory-driven

messages impact COVID-19 vaccine attitudes and intention. The primary purposes of this paper are to examine the 1) impact of loss vs. gain frames and individual vs. collective frames and 2) role of perceived benefits on participants' attitudes toward the COVID-19 vaccine and their vaccine intention. The findings from our study can help to strategize public health messages.

Framing Theory, Health Behavior, and Vaccination

Originating from prospect theory (e.g. Kahneman & Tversky, 1984), framing effects are increasingly used in communication (Borah, 2011) and health communication (Guenther, Gaertner, & Zeitz, 2020). Prospect theory indicates that messages framed as benefits vs. costs can influence people's decisions (Kahneman & Tversky, 1984). Message framing has been extensively studied in health-related research and have been shown to influence health attitudes and behaviors (Latimer, Salovey, & Rothman, 2007). With the increasing emphasis on vaccination research, the effects of framed messages on perception, attitudes, and intention toward vaccines (Yang & Pittman, 2017) are significantly applied across various types of vaccines such as Human Papilloma Virus (e.g. Nan, 2012a, 2012b; Xiao & Borah, 2020).

Loss Vs. Gain Frames

Loss frames describe the costs of failing to participate in a behavior while gain frames discuss the benefits of engaging in a recommended health behavior (Gainforth et al., 2012). These message frames characterized by the costs, or the

Address correspondence to Porismita Borah porismita@gmail.com
Associate Professor, GTZN 224, Edward R. Murrow College of Communication, Washington State University, Pullman, Washington State 99163

benefits can potentially shape individuals' attitudes and behavior. Loss vs. gain messages have been examined in a wide variety of attitudes and behaviors such as substance use (Quick & Bates, 2010; Toll et al., 2007), pap smear testing (Rivers, Salovey, Pizarro, Pizarro, & Schneider, 2005), sunscreen use (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999), physical activity (Borah & Xiao, 2018) and smoking cessation (Steward, Schneider, Pizarro, & Salovey, 2003). Moreover, loss vs. gain frames have received crucial attention from vaccination research, such as MMR vaccine (Abhyankar, O'Connor, & Lawton, 2008), flu vaccines (Kim, Pjesivac, & Jin, 2019; Lee, Jin, & Nowak, 2018), and HPV vaccine (Kim, Lee, & Kong, 2020; Nan, 2012a, 2012b; Xiao & Borah, 2020).

Several meta-analytic reviews of loss- vs. gain-frames have been undertaken to study the effectiveness of the two message frames. Among the quantitative studies of illness prevention behaviors, O'Keefe and Jensen (2007) reviewed 93 articles between 1977–2006 and found that gain frames were more persuasive than loss frames. Moreover, O'Keefe and Jensen (2009) extended their analysis on promoting disease detection. Contrary to their previous findings, loss-framed messages were marginally more persuasive compared to gain frames. Specifically, in breast cancer detection, loss-framed messages can facilitate the likelihood of the use of mammography and breast self-exams more effectively. O'Keefe and Nan (2012) further compared the difference between loss and gain frames on different levels of persuasive outcomes (e.g., attitudes, intention, and behavior) and narrowed it down to a specific topic, vaccination uptake. Overall, no significant difference was found between loss and gain frames in persuasion.

A few studies have shown that loss frames might not always be effective (e.g., Gainforth et al., 2012). Gallagher and Updegraff (2012) reported that a gain frame was slightly more effective in actual prevention behaviors, such as physical activity, skin cancer, and smoking. However, a higher number of previous studies on vaccination have demonstrated that loss-frames may be more persuasive than gain-framed messages. According to the findings by Nan (2012a), participants showed a positive attitude and higher intention of obtaining the HPV vaccine after exposure to loss-framed content. A recent quasi-experiment conducted by Kim et al. (2020) showed that a loss-framed story evoked a higher intention of taking the HPV vaccine. Nan (2012b) revealed that college students were more convinced by a loss-framed pamphlet, which encouraged them to accept the HPV vaccine. Moreover, Nan, Xie, and Madden (2012) investigated the interaction between loss vs. gain frames and perceived vaccine efficacy on the tendency of getting vaccinated after the H1N1 outbreak in the U.S.

Although there are some mixed findings, the substantial body of literature indicate that the loss frames are more impactful for vaccine attitudes and intention (e.g., Nan, 2012a, 2012b; Park, 2012). With the help of this literature, we propose our first set of hypotheses.

H1a-b. Participants in the loss frame condition will show a) positive attitudes toward the COVID-19 vaccine and b) higher intention to get the COVID-19 vaccine compared to the gain frame condition.

Individual Vs. Collective Frames

Often societal factors can impact health decision-making processes. A meta-analysis of 67 research articles by Oyserman and Lee (2008) revealed the role of peoples' world views on information processing. One such important factor is individualism vs. collectivism (Hofstede, 1996; Orji & Mandryk, 2014; Oyserman & Lee, 2008; Triandis, 2001; Triandis & Gelfand, 1998). Individualism posits "the core unit is the individual" (Oyserman & Lee, 2008, p. 311). This cultural perspective believes individuals prosper with the help of societies. Collectivism, on the other hand, believes that the "core unit is the group" (Oyserman & Lee, 2008, p. 311) and individuals are part of the larger existing societies, and they adjust themselves to these societies.

These cultural perspectives can influence health decision-making and individuals' responses to a health crisis (e.g., Dutta, 2007). People with a collective worldview would perhaps consider collective protection in terms of vaccine behavior (e.g., Finkelstein, 2010; Oyserman, Coon, & Kimmelmeier, 2002; Uskul, Sherman, & Fitzgibbon, 2009). In case of individualism, people would habitually think in terms of individual interest (Böhm, Betsch, Korn, & Holtmann, 2016; Earley, 1989). Briley, Rudd, & Aaker, (2017) conducted a series of studies examining individuals' cultural views and health behavior. Their findings show that individualism and collectivism moderated vaccination behavior. Prior research has used these cultural factors in message design and examined how messages framed as individual vs. collective could impact individuals. For example, in case of the flu vaccine, Pittman (2020) found that messages that were framed with an individualistic appeal were related to higher flu vaccination behavior. Similarly, in case of the COVID-19 vaccination Rabb, Glick, Houston, Bowers, and Yokum (2021) found that individual appeals were more persuasive compared to collective appeals. The U.S. scores high on individualism (Hofstede, 1980), which means in general, people would focus on individual interest (Workman & Lee, 2011). Considering the individualistic nature of the U.S., and the findings from prior research we propose:

H2a-b. Participants in the individual frame condition will show a) positive attitudes toward the COVID-19 vaccine, and b) higher intention to get the COVID-19 vaccine compared to the collective frame condition.

Perceived Benefits

Perceived benefits are defined as the belief in the advantages of adopting suggested prevention methods for a given health issue and actions taken to prevent the disease (Rosenstock, 1974; Strecher & Rosenstock, 1997). When individuals

perceive strong positive benefits of the target behavior, they are likely to be involved in that behavior. Specifically, the target behavior is likely to prevent the negative health outcome. In the context of vaccination, perceived benefits are beliefs regarding benefits that may be caused by vaccination. If individuals perceive that a vaccine is likely to protect them from vaccine-preventive diseases, they will be likely to get vaccinated (e.g., Chen et al., 2015; Mostafapour et al., 2019; Sundstrom et al., 2015). A study examining HPV vaccine uptake showed that perceived benefits were positively associated with HPV vaccination (Sundstrom et al., 2015). Similar findings were reported by Chen et al. (2015) in case of the influenza vaccination.

Given the novelty of the COVID-19 vaccine, the long-term benefits are largely unknown. Thus, it is likely that the perceived benefits of COVID-19 vaccine could play an important role in vaccine intention and attitudes. To be specific, when the projected benefits of the COVID-19 vaccine would far outweigh the projected costs, people would be inclined to get vaccinated against the COVID-19 virus (Kostoff, Briggs, Porter, Spandidos, & Tsatsakis, 2020). For a vaccine with high levels of uncertainty like the COVID-19 vaccine, the projected costs are usually high. Thus, to justify getting vaccinated, a very high level of perceived benefits would be required. Considering the importance of perceived benefits on potential COVID-19 vaccine attitudes and behavior, we tested the association between perceived personal benefits and the attitudes toward the vaccine and vaccine intention behavior.

H3a-b. Higher perceptions of benefits will be associated with a) positive attitudes toward the COVID-19 vaccine and b) higher intention to get the COVID-19 vaccine.

Perceived Benefits as a Moderator

Framing effects studies on health behavior outcomes including vaccination attitudes and behavior often test the moderating effects of different variables (Nan et al., 2016, 2012). For example, Nan et al. (2016) indicated that parents' intention toward vaccines might vary because of the perceived risk of HPV infection for their children. Their findings show that loss frames were more effective for the parents with lower perceived susceptibility.

An important moderator for health attitudes and behavior studies is perceived benefits. As explained above, perceived benefits could play a particularly critical role in individuals' attitudes toward the COVID-19 vaccine as well as their intention to get vaccinated because individuals may wish to maximize the benefits of the COVID-19 vaccine due to the fatality of this novel disease. But at the same time, the benefits of the vaccine are unknown due to the novelty of the virus. Indeed, perceived benefits can be considered a key factor for COVID-19 vaccine attitudes and intention (Chen et al., 2015; Mostafapour et al., 2019). Meanwhile, the vast literature on loss vs. gain frames seem to indicate a slight advantage of loss framed messages (e.g., Nan et al., 2016). Individuals with higher perceived benefits about the vaccine when exposed to the loss framed message are likely to show higher positive

attitudes and higher vaccine intention. These individuals already perceive the vaccine as beneficial, and when they are exposed to the loss frame, which in general has been more persuasive in influencing vaccine attitudes and intention (e.g., Nan, 2012a, 2012b; Park, 2012), should be more impacted compared to the individuals in the gain frame condition. Thus, we propose:

H4a. Perceived benefits will moderate the relationship between message frames and positive attitudes toward the COVID-19 vaccine such that participants with higher perceived benefits and in the loss framed condition will show higher positive attitudes toward the COVID-19 vaccine compared to the participants in the gain frame.

H4b. Perceived benefits will moderate the relationship between message frames and higher intention to get the COVID-19 vaccine such that participants with higher perceived benefits and in the loss framed condition will show higher intention to get the COVID-19 vaccine compared to the participants in the gain frame.

Individuals may expect two different types of benefits by getting vaccinated such as personal and social benefits (Kwok et al., 2021). While personal benefits mean the prevention of individual infection, social benefits include the prevention of the spread of the virus to family, friends, and others in the community (Kwok et al., 2021). Given that COVID-19 is highly contagious pathogenic viral infection, both personal and social benefits could play a role in vaccine intention and attitudes. In the current study we examined perceived personal benefits. Moreover, recent research has shown that individualistic appeals have been more successful in promoting the COVID-19 vaccine (Pittman, 2020; Rabb et al., 2021). As a result, participants with higher perceived benefits and exposed to the individual framed message will show higher positive attitudes and intention. Thus, our final set of hypotheses are proposed:

H5a. Perceived benefits will moderate the relationship between message frames and positive attitudes toward the COVID-19 vaccine such that participants with higher perceived benefits and in the individual framed condition will show higher positive attitudes toward the COVID-19 vaccine compared to the participants in the collective frame.

H5b. Perceived benefits will moderate the relationship between message frames and higher intention to get the COVID-19 vaccine such that participants with higher perceived benefits and in the individual framed condition will show higher intention to get the COVID-19 vaccine compared to the participants in the collective frame.

Methods

Participants

To test the proposed hypotheses an online randomized between-subject experiment was conducted. We wanted to

Table 1. Descriptive characteristics (N = 387).

Characteristics	N (%)
Age (<i>M, SD</i>)	37.1 (10.99)
Gender	
Male	221 (57.1%)
Female	166 (42.9%)
Race	
Caucasian	258 (66.7%)
African Americans	48 (12.4%)
Hispanic/Latino	35 (9%)
Others	46 (11.9%)
Flu vaccine received	160 (41.3%)
Political Ideology (Conservative)	184 (47.5%)

Age ranges between 21 to 73.

test the independent impact of each frame on the participants, and so we conducted a between-subjects design. Moreover, within-subjects design often suffer from carryover effects (Wimmer & Dominick, 2013) of the different manipulations, and to avoid such issues, we used a between-subjects design. The participants for the study were recruited from Amazon's MTurk in July 2020. The total number of participants were 387 (See Table 1 for descriptive characteristics). G*Power analysis helped to determine the number of participants (Faul, Erdfelder, Buchner, & Lang, 2009). The study consisted of four conditions. The gain and individual frame consisted of 95 participants while the gain and collective frame condition consisted of 94 participants. The loss and individual frame consisted of 100 participants and loss and collective frame included 98. The participants were from the U.S. and older than 18 years. Researchers are increasingly using MTurk for participant recruitment. MTurk participants are considered more diverse than student samples (Berinsky, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2016; Paolacci, Chandler, & Ipeirotis, 2010). The participants completed the survey via Qualtrics after the study was identified as exempt by the Institutional Research Board of a large University in the U.S.

Design and Procedure

The topic of the study is the COVID-19 vaccination. The manipulation messages were presented as screenshots from the CDC's Facebook page. The manipulations were created in Adobe Photoshop. Careful precautions were taken to create posts that look like a real Facebook post from the CDC's account. All features of a Facebook post such as number of likes or shares remained constant. The post consisted of the CDC explaining about the COVID-19 vaccination when available. The content of the Facebook post is adapted from prior research (e.g., Nan, 2012a, 2012b). The manipulations were also designed with the help of older posts from the CDC on other vaccines such as flu or HPV. The gain frame described the benefits of getting the COVID-19 vaccine when available while the loss frame highlighted the costs of not getting the vaccine.

The individual frame described the importance of taking care of one's health, while the collective frame highlighted the importance of thinking about the community's health. The stimulus materials are included in Appendix A as online supplementary materials.

Measurements

COVID-19 Vaccine Intention

Adapted from prior research (Nan, 2012a, 2012b; Park, 2012) respondents were asked to provide the extent to which they agree with the following statements on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): "How likely would you be to get the COVID-19 vaccine, as soon as it is available," "If you were faced with the decision of whether to get the COVID-19 vaccine today, how likely is it that you would choose to get the vaccine," "How likely would you be to get the COVID-19 vaccine in the future when available." The scores of the three items were averaged to construct the COVID-19 vaccine intention variable ($M = 5.25$, $SD = 1.32$, $\alpha = .86$). These items were measured after the participants were exposed to the manipulations.

Attitude toward the COVID-19 Vaccine

To assess attitude toward a COVID-19 vaccine, we adapted the items from prior research (e.g., Chanel, Luchini, Massoni, & Vergnaud, 2011) and asked respondents how much they agree on the following statements on a 7-point scale (*strongly disagree* = 1 to *strongly agree* = 7): "The vaccination against COVID-19 is necessary because the Coronavirus has affected a lot of people and is likely to affect even more," "The vaccination against COVID-19 is necessary because it is vital to limit the risks of contagion and to protect other people." The scores of the two items were averaged to construct the attitude toward the COVID-19 vaccine variable ($M = 5.34$, $SD = 1.23$, $r = .62$). These items were measured after the participants were exposed to the manipulations.

Perceived Personal Benefits

Perceived personal benefits was also adapted from prior studies (e.g., Nan et al., 2012) and assessed by asking respondents how much they agree with the following statements on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): "I believe the COVID-19 vaccine when available will be effective in preventing the coronavirus disease," "I believe if I get the COVID-19 vaccine when available, I will be less likely to get the coronavirus disease." The scores of the two items were averaged to construct the variable ($M = 5.29$, $SD = 1.21$, $r = .53$). These items were measured before the participants were exposed to the manipulations.

Controls

Common demographic characteristics were included in the analysis—age, gender, and race. We also included additional variables that may be related to the COVID-19 vaccination intention and attitudes, such as political ideology on a 7-point scale from 1 = *very conservative* to 7 = *very liberal* (47.5% conservative), and whether they took the flu shot

(yes = 41.3%). Finally, in line with prior research (e.g., Nan et al., 2016) a set of perception variables that were expected to impact vaccination intentions and attitudes were included as control variables. They were each measured before exposure to the experimental manipulations and were adapted from prior research (e.g. Nan et al., 2012). Perceived susceptibility was assessed with two statements on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): “It is possible that I will get COVID-19,” “I am at risk for getting COVID-19.” The scores of the two items described were averaged to construct the susceptibility variable ($M = 5.34$, $SD = 1.23$, $r = .62$). Perceived severity was assessed with the following statements on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): “I believe that contracting COVID-19 causes severe health problems,” “I believe that contracting COVID-19 causes serious negative consequences” “I believe that COVID-19 is extremely harmful.” The scores of the three items were averaged to construct the severity variable ($M = 4.64$, $SD = 1.48$, $\alpha = .85$). Perceived barriers was assessed with the following statement on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): “It will be inconvenient to get the COVID-19 vaccine, even after it’s available.” ($M = 4.55$, $SD = 1.71$). Concerns about vaccine safety was assessed with the following statements on a 7-point scale (*extremely unlikely* = 1 to *extremely likely* = 7): “I worry about the short-term side effects of the COVID-19 vaccine,” “I worry that the COVID-19 vaccine might have unknown long term side effects.” The scores of the

two items were averaged to construct the concerns about vaccine safety variable ($M = 4.77$, $SD = 1.45$, $r = .66$).

Analytic Strategy

Hierarchical linear regression analysis was performed to examine the proposed hypotheses. The analysis was conducted in three steps: COVID-19 vaccine attitudes and COVID-19 vaccine intention were entered as a continuous dependent variables in separate models; control variables including demographics, political ideology, flu shot behavior, and a set of perception variables about the COVID-19 vaccination were entered in Step 1; two sets of message frames and perceived benefits in Step 2; finally, the interactions between perceived benefits and each sets of message frame were entered in Step 3. All predictors were mean-centered before they were entered in the moderated regression model. The analysis was conducted using SPSS version 26.

Results

Manipulation Checks

After reading the Facebook post, the participants answered the manipulation check questions. Participants answer the manipulation check questions first before continuing to the rest of the questionnaire. The participants were asked to respond to the question “Which of the following comes closest to the position of the original Facebook post about the COVID-19 vaccine.”

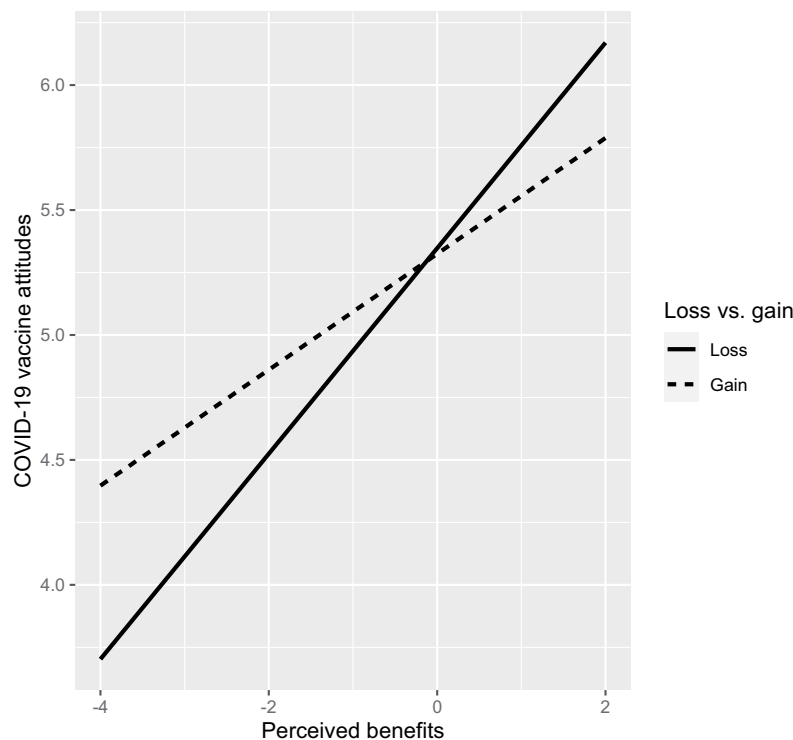


Figure 1. The interaction between perceived benefits, loss vs. gain frames, and COVID-19 vaccine attitudes.

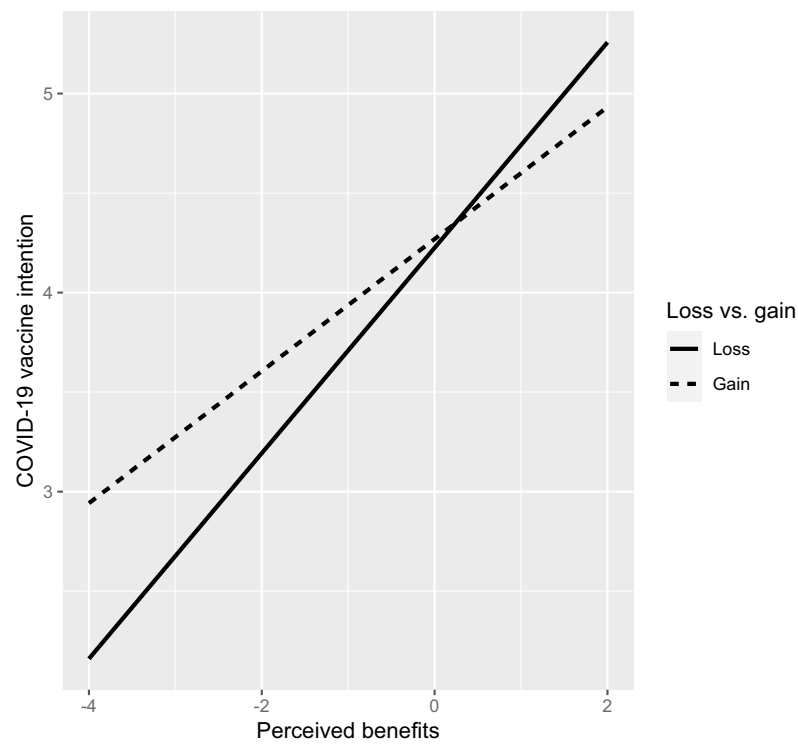


Figure 2. The interaction between perceived benefits, loss vs. gain frames, and COVID-19 vaccine intention.

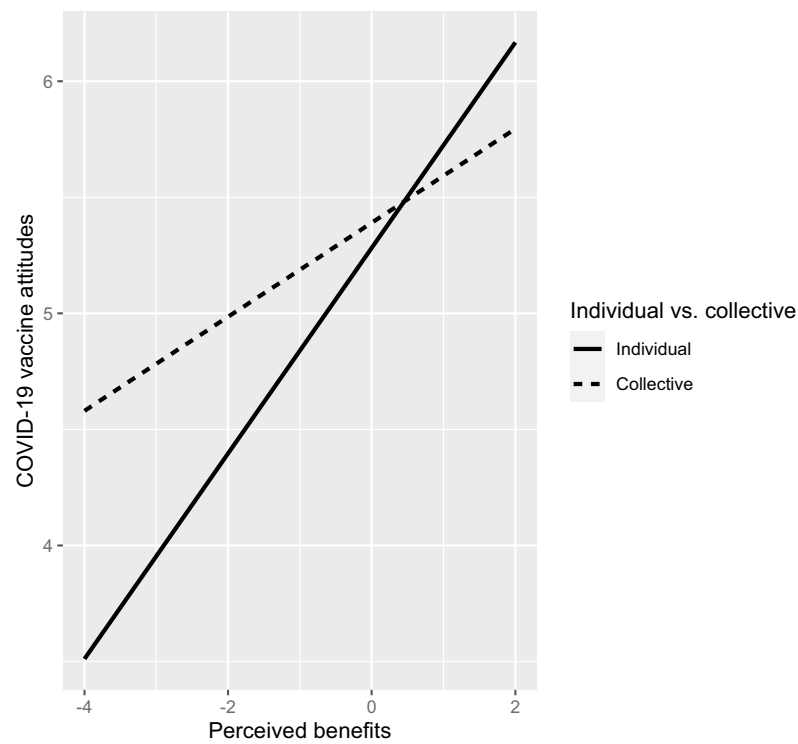


Figure 3. The interaction between perceived benefits, individual vs. collective frames, and COVID-19 vaccine attitudes.

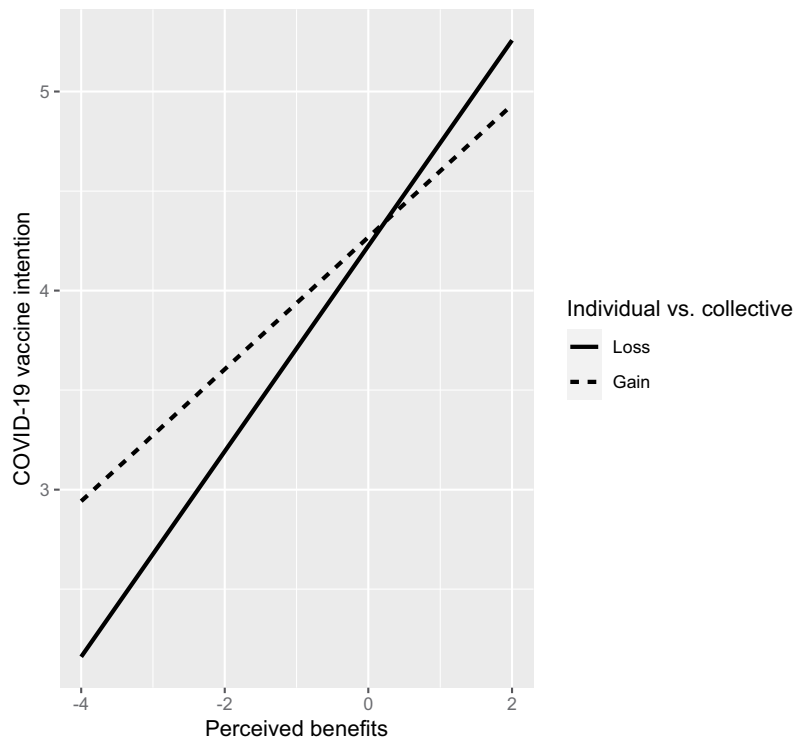


Figure 4. The interaction between perceived benefits, individual vs. collective frames, and COVID-19 vaccine intention.

The options were “The post highlighted the benefits of getting the COVID-19 vaccine for me when available,” “The post highlighted the benefits of getting the COVID-19 vaccine for the community when available,” “The post highlighted the costs of not getting the COVID-19 vaccine for me when available” and “The post highlighted the costs of not getting the COVID-19 vaccine for the community when available.” A chi-square analysis was conducted, and the results showed that the manipulations were successful ($\chi^2(3, 387) = 39.94, p < .001$).

Findings

The mean age of respondents was 37.1 and slightly more than half of the participants were male ($N = 221, 57.1\%$). The majority of respondents were white ($N = 258, 66.7\%$). Respondents were 47.5% ($N = 184$) conservative.

Bivariate Pearson correlations among all variables included in this analysis are presented in Table 2. Among the control variables, perceived severity and concerns about the vaccine safety were significant. Specifically, the higher the perceived severity,

Table 2. Pearson correlation coefficients for all variables.

Variables	1	2	3	4	5	6	7
1. Perceived susceptibility	—	—	—	—	—	—	—
2. Perceived severity	.44***	—	—	—	—	—	—
3. Perceived benefits	.33***	.55***	—	—	—	—	—
4. Perceived barriers	.34***	.33***	.32***	—	—	—	—
5. Concerns about vaccine safety	.26***	.32***	.08	.50***	—	—	—
6. Vaccine attitudes	.12*	.28***	.46***	.05	-.18***	—	—
7. Vaccine intention	.17**	.36***	.45***	.08	-.08	.65***	—

The correlation coefficient was not shown as it was shown in the asymmetrically diagonal position of the table.

Table 3. Hierarchical regression analysis examining the relationships between frames, and COVID-19 attitudes and vaccine intention.

	Vaccine attitudes (β)	Vaccine intention (β)
<i>Block1: Control variables</i>		
Age	-.012	.019
Gender (Male = 0, Female = 1)	-.002	.024
Race (Caucasian = 1, Others = 0)	-.048	.071
Flu shot (Yes = 1, No = 0)	-.020	.028
Political Ideology (1 = Conservative to 7 = Liberal)	-.031	-.040
Perceived susceptibility	.045	.012
Perceived severity	.259***	.154*
Perceived barrier	-.061	-.020
Concerns about vaccine safety	-.177***	-.259***
R ²	18%	17.9%
<i>Block2: Frames</i>		
Individual vs. collective	.045	-.062
Loss vs. gain	.014	-.015
Perceived benefits	.426*	.532**
R ²	23.9%	27.4%
<i>Block4: Interactions</i>		
Individual vs. collective \times perceived benefits	-.406**	-.432**
Loss vs. gain \times perceived benefits	.286*	.278*
R ²	25.9%	29.5%
Total R	50.9%	54.3%

All the coefficients are standardized. Predictors are mean-centered.

* $p \leq .05$, ** $p \leq .01$, *** $p < .001$.

the more likely participants were to perceive COVID-19 vaccine positively ($\beta = .259, p < .001$) and intend to get vaccinated against COVID-19 ($\beta = .154, p < .05$). Moreover, lower concerns about vaccine safety were related to positive attitude toward the COVID-19 vaccine ($\beta = -.177, p < .001$) and higher intention to get the COVID-19 vaccine ($\beta = -.259, p < .001$). Regarding H1a-b, the results revealed that participants in the loss frame condition did not show significantly positive attitude toward the COVID-19 vaccine ($\beta = .014, p > .05$) nor higher intention to get the COVID-19 vaccine ($\beta = -.015, p > .05$) compared to participants in the gain frame condition (see Table 3). Thus, H1 was not supported. For H2a-b, the findings showed that participants in the individual frame condition did not show positive attitude toward the COVID-19 vaccine ($\beta = .045, p > .05$) nor higher intention to get the COVID-19 vaccine ($\beta = -.062, p > .05$) compared to the collectivism frame condition. Thus, H2 was not supported.

In case of H3a-b, the results indicated that higher perceptions of benefits were associated with a) positive attitude toward the COVID-19 vaccine ($\beta = .426, p < .05$) and b) higher intention to get the COVID-19 vaccine ($\beta = .532, p < .01$). Thus, H3 was supported. Examining H4a-b, our findings demonstrated that participants with higher perceived benefits showed a) higher positive attitude toward the COVID-19 vaccine ($\beta = .286, p < .05$) and b) higher intention to get the COVID-19 vaccine ($\beta = .278, p < .05$) in the loss frame

condition compared to the gain framed condition. Thus, H4 was supported.

Finally, regarding H5a-b, the findings showed that participants with higher perceived benefits showed a) positive attitudes toward the COVID-19 vaccine ($\beta = -.406, p < .01$) and b) higher intention to get the COVID-19 vaccine ($\beta = -.432, p < .01$) when they were in the individual frame compared to the collective frame. Thus, H5 was supported.

Discussion

The U.S. has been hit by the COVID-19 pandemic with the highest number of cases and deaths in the world (Elkind, 2020). Yet, the anti-vaccination movement is strongly advocating against the COVID-19 vaccine. We use experimental data to examine the impact of four different types of messages and the moderating role of perceived benefits on COVID-19 vaccine attitudes and intention to get vaccinated against the COVID-19 virus. Our findings did not show main effects of the message frames; however, we find that both sets of frames interact with perceived benefits about the COVID-19 vaccine in meaningful ways. Participants with higher perceived benefits and exposed to the loss frame showed higher positive attitudes toward the COVID-19 vaccine and higher intention to vaccinate. Similar patterns were revealed in case of the individual frame message.

Our findings have significant implications for framing research. In case of both sets of frames, loss vs. gain and individual vs. collective, we did not find any main effects. This is in line with prior research (e.g., Nan, 2012b; Nan et al., 2012), which reported no main effects of framing messages but revealed moderating influence of multiple variables. Our findings show that participants' perceived benefits about the COVID-19 vaccine play a significant role in these relationships. These findings reveal the nuances of framing effects. The messages might not always seem to directly impact individuals, but these frames interact with other variables such as perceptions of benefits. These findings are at the heart of media effects research where studies show that the influence of media messages is conditioned upon other variables (McQuail, 2010; Perse, 2001).

Prior research has shown that in general, loss frames are more impactful for vaccination behavior (e.g., Kim et al., 2020; Nan, 2012b; Nan et al., 2012). Our study confirms these findings in relation to the COVID-19 vaccination. The findings from the moderation analysis with individual vs. collective frame message show that the message emphasizing the individual is more impactful for vaccine attitudes and intention when participants perceive higher benefits of COVID-19 vaccine. These results perhaps speak to the individualistic culture of the U.S. (Finkelstein, 2010; Oyserman et al., 2002; Triandis, 1989, 2001; Uskul et al., 2009). In general, in individualistic cultures, people are more independent compared to collective cultures and people "give priority to their personal goals over the goals of their in-groups" (Triandis, 2001, p. 909). Public health organizations can use evidence provided by our study for facilitating the public understanding of vaccines. It seems

people are more impacted by messages that highlight the possible loss and individual health consequences. Public health organizations can also implement these elements in their communication with the public.

Our findings offer insights for vaccination research and public health promotions. Perceived benefits of COVID-19 vaccine matters. Among the most common misperceptions are that vaccination risks outweigh the benefits (DeRoo, Pudalov, & Fu, 2020; Kostoff et al., 2020), and these misperceptions could be particularly salient in the context of the COVID-19 vaccine due to the rapid development and testing process. Our findings resonate with this concern because the main effect of perceived benefits was shown to be significantly associated with both positive attitudes and intention of COVID-19 vaccine behavior. Based on our findings, public health organizations should include information about the contribution of vaccination into their messages that promote the COVID-19 vaccine uptake. Similarly, the public should be informed about the benefits of COVID-19 vaccine based on its rigorous testing and ongoing monitoring required by the vaccine approval process (DeRoo et al., 2020). These findings are particularly critical at a time when misinformation is remnant on social media platforms and health information is increasingly discussed in these platforms (Himmelboim, Xiao, Lee, Wang, & Borah, 2020).

Our study is not without limitations. CDC was used as the source for the Facebook post. Future research should use other sources for their stimulus materials in order to disregard possible biases against the CDC. Our study did not measure the participants' individual or collective pre-attitudes. Future studies should control for those attitudes. The individual vs. collective message frame is not as commonly studied as the loss vs. gain frames. The importance of cultural variables is much discussed (Dutta, 2007) in the literature. Future research should pay greater attention to these variables and how they might impact health behavior. Our study also examined the perceived personal benefits of the participants. Future research can examine perceived benefits at the collective level as well. Our study depended on self-reports, which means there is possibility of response-bias. Considering the timeline of the COVID-19 vaccination, our dependent variable measured vaccine intention. Future research should examine COVID-19 vaccination behavior with the help of survey research.

Despite these limitations, the current study takes one of the first attempt to examine the relationship between four message frames, and perceived benefits on COVID-19 vaccination attitudes and behavior. We are confident in our findings as the results are consistent with two dependent variables; attitudes toward the COVID-19 vaccination and vaccine intention. Our findings show the importance of the interplay among message content and individuals' perceptions.

ORCID

Porismita Borah  <http://orcid.org/0000-0002-1140-4233>
Juwon Hwang  <http://orcid.org/0000-0002-5155-1000>

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