An Online Experiment Evaluating the Effects of Social Endorsement Cues, Message Source, and Responsibility Attribution on Young Adults’ COVID-19 Vaccination Intentions

Li Chen1, Chuqing Dong2, and Yafei Zhang1

Abstract
Adopting the theory of planned behavior framework, this online experiment investigated the effects of social endorsement cues, message source, and responsibility attribution on young adults’ perceptions of COVID-19 vaccination and intentions to get vaccinated. Four major findings were identified. First, social endorsement cues positively affect attitude, subjective norms, and vaccination intentions. Second, individuals perceive an expert source as the most credible, but a media outlet source results in the most positive subjective norms. Third, responsibility attributions do not generate significant effects on the dependent variables. Finally, social endorsement cues and message source both have some interaction effects with perceived susceptibility to COVID-19 on message outcomes.

Keywords
theory of planned behavior, social endorsement cues, message source, responsibility attribution, COVID-19 vaccination

Background
When a case of pneumonia from an unknown cause in Wuhan, China, was reported to the World Health Organization (WHO, 2020) on December 31, 2019, few people could foresee that the novel disease would become a major health threat across the globe in the coming year. Very soon, hundreds of similar cases were identified and confirmed inside and outside of China. WHO (2020) declared the outbreak to be a Public Health Emergency of International Concern on January 30, 2020. On February 11, 2020, the novel disease obtained its official name, COVID-19 (WHO, n.d.). COVID-19 continued to spread globally in the following months, and WHO (n.d.) characterized it as a pandemic in March 2020.

This study focuses on individuals between the ages of 18 and 35 for two main reasons. First, even though COVID-19 has largely spared young adults between the ages of 18 and 35 from serious illness or death (Maragakis, 2020), statistics show that young adults are more likely to contract the virus (Krans, 2021). In other words, without taking preventive actions, young adults are even more likely to spread the disease to others, even if COVID-19 is not a deadly threat to them. Therefore, it is worthwhile to investigate how health educators could encourage this social group to adopt preventive measures in order to slow the spread of COVID-19 and to protect other vulnerable groups. Second, for young adults, taking preventive measures benefits others much more than themselves. The relatively high level of susceptibility to the disease and the low level of perceived threat could have made COVID-19 a unique health context to explore health message development, providing a new lens through which to examine how educators could effectively convince social groups to perform pro-social behaviors.

In addition to performing a wide variety of preventative behaviors, including wearing a face mask, washing hands often, and practicing social distancing (Centers for Disease Control and Prevention [CDC], 2020), vaccination is an effective approach to COVID-19 prevention (CDC, 2021). All the COVID-19 vaccines currently available in the United States have been shown to be highly effective (CDC, 2021). Therefore, it is worthwhile to investigate what makes a persuasive health education message regarding COVID-19

1West Texas A&M University, Canyon, USA
2Michigan State University, East Lansing, USA

Corresponding Author:
Li Chen, Department of Communication, Sybil B. Harrington College of Fine Arts and Humanities, West Texas A&M University, 2501 4th Avenue, Canyon, TX 79015, USA.
Email: lichen@wtamu.edu

Creative Commons CC BY: This article is distributed under the terms of the Creative Commons Attribution 4.0 License (https://creativecommons.org/licenses/by/4.0/) which permits any use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (https://us.sagepub.com/en-us/nam/open-access-at-sage).
vaccination. Young adults are critical stakeholders in slowing down the pandemic, but not much research has focused on COVID-19 vaccination among this audience segment. The current project addresses the research gap.

The Current Project

While a large number of factors/variables may influence the effectiveness of a persuasive message, in the current study, we focused on three major variables: social endorsement cues, message source, and responsibility attribution. The study adopted a 2 × 3 (social endorsement cues: high and low impact) × 3 (message source: peer, expert, and media outlet) × 2 (responsibility attribution: individual responsibility and societal responsibility) between-subjects experimental design. We chose to manipulate the aforementioned variables because social endorsement cues and message source have been found to affect perceived source credibility (PSC), a positive predictor of a wide variety of attitudinal and behavioral outcomes (e.g., Bernhardt & Felter, 2004; Case et al., 2018; Meulenaer et al., 2018; Nan, 2013). The third variable, responsibility attribution, is concerned with the main reason why young adults should get the COVID-19 vaccine, either for the sake of their own health or for the sake of society as a whole. Recent research has identified mixed effects of responsibility attribution in the context of COVID-19 prevention (e.g., Jordan et al., 2021; Luttrell & Petty, 2020). We aim to rely on the aforementioned variables to examine the combined effects of who the author is and what the author says on message outcomes.

Since the health topic is concerned with vaccination and COVID-19, we also took into consideration individuals’ perceived susceptibility to the disease, perceived severity of the disease (Witte et al., 1996), and existing attitudes toward vaccination (i.e., vaccine perception). Within the Theory of Planned Behavior (TPB) framework, we examined how the aforementioned variables affect young adults’ evaluations of message source credibility, perceptions of the COVID-19 vaccine, and intentions to get vaccinated. The research findings provide new insights into message development, especially messages related to vaccination and emerging infectious diseases as well as those targeting young adults.

Literature Review

TPB

Built upon the Theory of Reasoned Action, the TPB elaborates the determinants of one’s behavioral intention. Behavioral intention is a factor that directly predicts a behavior: “the stronger the intention to engage in a behavior, the more likely should be its performance” (Ajzen, 1991, p. 181).

The TPB suggests that three factors determine behavioral intention. The first factor is attitude toward the behavior. Attitude refers to one’s evaluation or appraisal of a behavior, and a favorable attitude is likely to lead to greater behavioral intention (Ajzen, 1991). The second factor is subjective norms, defined as “the perceived social pressure to perform or not to perform the behavior” (Ajzen, 1991, p. 188). Stronger behavioral intention is caused by positive subjective norms regarding a behavior. The last factor is perceived behavioral control (PBC), which refers to “the perceived ease or difficulty of performing the behavior” (Ajzen, 1991, p. 188). Greater PBC results in stronger behavioral intention. Attitude, subjective norms, and PBC can all lead to stronger intentions to act on a specific behavior (Ajzen, 1991).

The TPB variables have been found to predict a wide variety of health behaviors, such as childhood obesity prevention (Andrews et al., 2010), compliance with tobacco-free policies (Record, 2017), condom use (Guan et al., 2016), and getting the H1N1 vaccine (Yang, 2015). In particular, Yang’s (2015) study targeted young adults aged from 19 to 24, which had an overlap with the current project. These studies provided scientific evidence about the motivations of performing a health behavior by identifying different attitudes, subjective norms, and PBC associated with the target behavior. In addition, existing research has introduced other variables like media use (Andrews et al., 2010) and fear and worry (Guan et al., 2016) to the model, providing profound insights into the interplay between TPB variables and individuals’ social cognitive characteristics. Nevertheless, one research gap remains. Most TPB research centers on attitudinal and behavioral variables and message framing, but not many have linked TPB to relatively more complicated message feature variables, such as those concerned with responsibility attributions and social endorsement cues. The current study incorporates these two variables concerning message features into the analysis of the TPB model, extending the scope of TPB research. In addition, this project applies the TPB variables to COVID-19 vaccination, an emerging medical intervention whose benefits and risks are heatedly debated in the media (e.g., Kumar, 2021; Wolf, 2021). It is worthwhile to examine to what extent TPB is applicable to a highly controversial and ongoing health issue amid the outbreak of an emerging infectious disease.

Responsibility Attributions in Health Messages

Attribution theory suggests that individuals are motivated to “explain, interpret, and understand their causal environments” (Lewis & Daltroy, 1990, p. 94). Individuals generate attributions to make sense of the world, and attributions make individuals feel that the world is predictable and controllable (Kelley & Michela, 1980; Lewis & Daltroy, 1990). One major method to predict one’s environment is understanding the causes of behaviors and social issues (Worthington, 2017). Therefore, the assignment of causes to social problems enables individuals to make effective management decisions and guides future actions (Lewis & Daltroy, 1990).
Attribution theory focuses on causal attribution (Lewis & Daltroy, 1990). A crucial component of causal attribution is responsibility attribution. In the context of health, “responsibility” may indicate the cause of a health outcome, one’s accountabilities for a given form of behavior or event, or one’s obligations to perform a behavior (Worthington, 2017). In a health message, appeals to personal, interdependent, and social responsibilities generate different persuasive outcomes (Worthington, 2017). Scholars have tried manipulating responsibility attribution appeals to achieve their persuasive goals.

Three types of responsibility attribution are most widely used in health messages. The first type is personal responsibility messages, which emphasize a duty to oneself (Wikler, 2002; Worthington, 2017). Personal responsibility messages normally target those who are at risk for a disease, and educators rely on these messages to encourage positive behavioral change, thus reducing the occurrence of the disease (Worthington, 2017). To achieve this persuasive goal, message developers define health as a question of choice and emphasize one’s power to influence one’s own health (Worthington, 2017). The second type, interdependent responsibility messages, focus on one’s responsibility for others’ health. These messages call on one’s responsibility to encourage health behaviors in members of their social networks, such as children, spouses, aging parents, and employees (Worthington, 2017). The third type is societal responsibility messages, which attempt to “persuade readers of society’s responsibility for a particular health outcome to increase public support for health policy changes” (Worthington, 2017, p. 1).

Each type of responsibility attribution has advantages and limitations. Overall, personal responsibility messages are most likely to motivate self-oriented health behaviors such as quitting smoking; interdependent responsibility messages encourage individuals to engage in other-oriented behaviors; and societal responsibility messages increase support for public health policy (Worthington, 2017). When it comes to specific health issues, however, scholars have identified mixed results regarding the effects of different types of responsibility attribution. For example, attributing responsibility for disease treatment either to individuals or to society had no impact on individuals’ attitudes toward medical cannabis (Lewis & Sznitman, 2017). In contrast, Vorpahl and Yang (2018), found that a message emphasizing others’ responsibilities for HPV transmission resulted in higher perceived susceptibility to HPV infection and stronger intentions to get vaccinated. Like in the research context of HPV, “others” play a crucial role in determining the spread of COVID-19. Therefore, we anticipate that responsibility attribution could shape young adults’ perceptions of COVID-19 and vaccination intentions. Nevertheless, our research context is different from that of Vorpahl and Yang (2018) such that while HPV transmits among individuals with intimate relationships, COVID-19 spreads among larger and diverse social groups. Due to the different features of HPV and COVID-19, it remains unclear if our research findings will resonate with Vorpahl and Yang’s (2018).

Avoiding COVID-19 infection can be both self-interested and prosocial (Jordan et al., 2021). COVID-19-related studies have yielded mixed outcomes. For example, Jordan et al. (2021) tested three forms of message framing, emphasizing personal, public, and a mix of personal and public benefits of disease prevention. During the early stages of the COVID-19 pandemic, messages emphasizing public benefits of protection were most effective. During the later stages of the pandemic, all three types of messages were similarly effective. Luttrell and Petty (2020), however, found that other-benefited messages were more persuasive than self-benefited ones in encouraging individuals to practice social distancing. While the aforementioned studies targeted individuals from a relatively wide age range, our project solely focuses on young adults for two reasons. First, COVID-19 does not appear to be a deadly threat to young adults, but young adults are most likely to spread them, affecting other social groups (Krans, 2021; Maragakis, 2020). Getting a COVID-19 vaccine benefits others much more than oneself, making the effects of responsibility attribution in a health message even more complicated and hard to predict. Second, researchers have examined young adults’ responses to different types of responsibility attribution in health messages, but they generated mixed results. For example, Boiarsky et al. (2013) found that individual-responsibility messages generated a slightly greater effect on young adults than social-responsibility messages. Vorpahl and Yang (2018), however, found that attributing the causes of HPV transmission to “others” resulted in stronger persuasive outcomes than those emphasizing the responsibilities of “self.” More research is needed to explore the effects of responsibility attribution on this social group regarding COVID-19 vaccination. Thus, we propose the following research question to explore if and how a message focusing on individual responsibility versus societal responsibility would influence young adults’ vaccination-related reactions differently.

RQ1. Which message is likely to result in (a) a more favorable attitude toward getting the COVID-19 vaccine, (b) more positive subjective norms regarding getting vaccinated, (c) greater PBC, (d) stronger vaccination intentions, and (e) higher PSC of a tweet, a message emphasizing individual responsibility or societal responsibility?

Source Credibility

Source credibility is composed of three elements: expertise, trustworthiness, and intention toward the receiver (McCroskey & Teven, 1999). Expertise refers to the competence of a source, trustworthiness is defined as the source having a reliable, sincere, and dependable character (Ohanian,
Communication scholars widely use PSC, a derivation of source credibility, to assess the characteristics of a message sender (Borach & Xiao, 2018). PSC is defined as “the judgments made by a perceiver (e.g., a message recipient) concerning the believability of a communicator” (O’Keefe, 2009, p. 181).

PSC is positively associated with a collection of attitudinal and behavioral variables, such as message compliance (Meulenaer et al., 2018; Umeh, 2012), attitude toward the advertised product (Berry & Shields, 2014), intention to take the advice offered in a given message (Bernhardt & Felter, 2004; Embacher et al., 2018; Hassan et al., 2007; Wang et al., 2008), perceived message credibility (Thon & Jucks, 2007), and message persuasiveness (Case et al., 2018; Nan, 2013; Pornpitakpan, 2004). Nevertheless, some research shows that high PSC does not always predict desirable communication outcomes. For example, Neubaum and Kramer (2015) found that, although a website from an official institution was perceived as more credible than a personal blog, blog readers developed more positive attitudes and higher self-efficacy toward the recommended health behavior than website readers.

While most scholars take all three components of source credibility as a whole in their research, some argue that different components of source credibility might have different weights in affecting communication outcomes (Pornpitakpan, 2004). A meta-analysis of health source credibility research shows that source expertise plays a more important role in affecting message credibility than trustworthiness (Yang & Beatty, 2016). Accordingly, messages attributed to an expert source are more likely to effectively change individuals’ attitudes (Pornpitakpan, 2004; Yang & Beatty, 2016).

Some message sources are perceived as more credible than others. Empirical research has identified mixed results regarding if expert sources are more likely to be trusted than other sources. For example, mothers of young children preferred health information presented by clinical professionals more than information from other parents (Bernhardt & Felter, 2004). College students, however, found a peer source of health information about drinking to be more credible than a personal blog, blog readers developed more positive attitudes and higher self-efficacy toward the recommended health behavior than website readers.

In general, social endorsement cues are positively correlated with intentions to read a news story (Yang, 2016), time spent reading a story (Knobloch-Westerwick, et al., 2005), and the perceived credibility of the message source (Turcotte, 1990); and intention refers to the source having “good will” (McCroskey & Teven, 1999).

Among the numerous factors to shape PSC, our study focused on social endorsement cues. While most interpersonal communication cues, such as facial expressions and voices, no longer exist in cyberspace (Walther, 1992), social media have generated new indicators of online information quality and message popularity (Yang, 2016), such as number of contacts (Sundar, 2008), number of followers (Westerman et al., 2011), number of webpage visitors (Yang, 2016), and number of views a message has received (Yang, 2016). These system-generated cues (Westerman et al., 2011) have become crucial social cues (Dvir-Gvirsman, 2019) that affect message effectiveness and users’ perceptions of source credibility (Sundar, 2008).

### Social Endorsement Cues

The Modality, Agency, Interactivity, and Navigability (MAIN) model suggests that major affordances of media—specifically modality, agency, interactivity, and navigability—convey certain cues that can influence online information processing (Sundar, 2008). The current project focuses on agency cues, because agency cues are most closely related to PSC. Agency refers to message source, and in the digital media environment, it encompasses message author, social media platform, and “other users” (Sundar, 2008). Social media messages that users find to be trustworthy are more likely to be recommended by websites, resulting in “other users” collaboratively evaluating and filtering the information one receives (Knobloch-Westerwick et al., 2005). Since one tends to “assume that the support of others is likely to predict personal relevance and utility” (Mensing & Westwood, 2014, p. 1047), other users’ comments and evaluations largely shape one’s evaluation of a social media message. Sundar (2008) defines this kind of information processing, in which one judges the credibility and quality of a piece of information by other users’ judgments, as the bandwagon heuristic.

On social media, the bandwagon heuristic is most likely to be triggered by social endorsement cues (Mensing & Westwood, 2014). User comments, ratings (Dvir-Gvirsman, 2019), and “likes” (Borach & Xiao, 2018) are typical forms of social endorsement cues. These cues result in different message outcomes. On a typical news site, for example, individuals prefer to read the most-viewed stories more than their counterparts without identical social endorsement cues (Yang, 2016).

In general, social endorsement cues are positively correlated with intentions to read a news story (Yang, 2016), time spent reading a story (Knobloch-Westerwick, et al., 2005), and the perceived credibility of the message source.
et al., 2015). Since all these variables are associated with stronger persuasive effects of health education messages, we predict that COVID-related messages with higher social endorsement cues result in more desired attitudinal outcomes. Built upon the above literature, we propose the following hypotheses and ask the following research question:

H1. Exposure to a tweet with high social endorsement cues results in (a) more favorable attitude toward getting the COVID-19 vaccine, (b) more positive subjective norms regarding getting vaccinated, (c) greater PBC, (d) stronger vaccination intentions, and (e) higher PSC of the tweet.

H2. Message source has an impact on (a) attitude toward getting the COVID-19 vaccine, (b) subjective norms regarding getting vaccinated, (c) PBC, (d) vaccination intentions, and (e) PSC of the tweet.

RQ2. How do social endorsement cues and message source interact to affect (a) attitude, (b) subjective norms, (c) PBC, (d) vaccination intentions, and (e) PSC?

To further examine the predictors of one’s vaccination intentions, we introduce three additional variables, perceived susceptibility, perceived severity (Witte et al., 1996), and existing attitude toward vaccination (i.e., one’s general perception of vaccines and vaccination, not limited to the COVID-19 vaccine), and ask two more research questions. RQ3 examines if the message feature variables and psychographic variables interact to affect the dependent variables. There might be more than one interaction effect. Since we do not know what interaction effects are likely to be identified, we list all of them in the research question.

RQ3. How do any two of the following variables, social endorsement cues, responsibility attribution, message source, vaccine perception, perceived susceptibility, and perceived severity, if any, interact to affect (a) attitude, (b) subjective norms, (c) PBC, (d) vaccination intentions, and (e) PSC?

Finally, we explore the major predictors of COVID-19 vaccination intentions:

RQ4. Among the demographic variables, TPB variables, and the vaccine perception variables measured in the questionnaire, which ones predict one’s intentions to get a COVID-19 vaccine?

Table 1. Participant Demographics and COVID-19 Experiences.

| Age          | M = 29.37 | SD = 3.64 |
|--------------|-----------|-----------|
| Gender (%)   |           |           |
| Male         | n = 365 (67.7) |
| Female       | n = 167 (31.0) |
| Other        | n = 1 (0.2) |
| No disclosure| n = 6 (1.1) |
| Race/ethnicity (%) |       |           |
| White        | n = 265 (49.2) |
| Black or African American | n = 67 (12.4) |
| Hispanic     | n = 40 (7.4) |
| Asian        | n = 146 (27.1) |
| Other        | n = 5 (0.9) |
| More than one race | n = 16 (3.0) |
| Education (%) |           |           |
| High school graduate | n = 42 (7.8) |
| Some college but no degree | n = 37 (6.9) |
| Associate degree in college | n = 27 (5.0) |
| Bachelor’s degree in college | n = 331 (61.4) |
| Master’s degree | n = 94 (17.4) |
| Doctoral degree | n = 3 (0.6) |
| Professional degree | n = 3 (0.6) |
| No disclosure | n = 2 (0.4) |
| Have you been infected with COVID-19? (%) | | |
| Yes          | n = 96 (17.8) |
| No           | n = 435 (80.7) |
| No disclosure| n = 8 (1.5) |
| Has any of your family members been infected with COVID-19? (%) | | |
| Yes          | n = 169 (31.4) |
| No           | n = 361 (67.0) |
| No disclosure| n = 9 (1.7) |
| Has any of your close friends been infected with COVID-19? (%) | | |
| Yes          | n = 248 (46.0) |
| No           | n = 274 (50.8) |
| No disclosure| n = 17 (3.2) |

Methods

Participants and Procedure

The online questionnaire used by this study was hosted by Qualtrics.com. Young adults between the ages of 18 and 35 who had not received the COVID-19 vaccine were invited to participate in the study. Participants were recruited by Amazon Mechanical Turk (MTurk), one of the largest crowdsourcing marketplaces in the United States. MTurk participants are slightly more demographically diverse than standard Internet samples and data obtained are “at least as reliable as those obtained via traditional methods” (Buhrmester et al., 2011, p. 3). Each participant received $1.00 in monetary compensation upon the completion of the questionnaire. The research procedure was approved by the university’s institutional review board.

From March 17 to March 20, 2021, 704 individuals responded to the questionnaire. After removing ineligible responses, including those that failed to correctly answer two attention check questions and those that claimed to be above the age of 35, a total of 539 valid responses were included in the final dataset. Basic demographic information about participants is listed in Table 1.

During the pretest, participants responded to a set of survey questions measuring (1) their perceived susceptibility to COVID-19, (2) the perceived severity of COVID-19, and (3) their attitude toward vaccination. After completing the pretest, participants were randomly assigned to 1 of 12 conditions in a 2 (social
endorsement cues: high and low) × 3 (message source: peer, expert, and media outlet) × 2 (responsibility attribution: individual and societal) between-subjects online experiment. Of the final sample, the number of observations in each condition was roughly even, ranging from 43 to 49 cases in each. Chi-square and ANOVA tests did not identify statistically significant differences in demographics or pretest variables between conditions.

During the posttest, participants responded to manipulation check questions and another set of survey questions. The posttest survey questions measured TPB variables, PSC, personal experiences with COVID-19, and demographics.

**Experimental Stimulus Materials and Manipulation Check**

An online tweet generator (https://www.tweetgen.com/create/tweet.html) was used to produce stimulus materials. In each experimental condition, participants viewed a tweet. The tweet in the individual responsibility conditions read, “Young adults are largely spared from serious illness, but they are most likely to contract COVID-19. Young adults are responsible for protecting themselves from being infected. Please get vaccinated as soon as COVID-19 vaccines are authorized for use in your age group.” In the societal responsibility conditions, the tweet read, “Young adults are largely spared from serious illness, but they are most likely to contract COVID-19. Young adults are responsible for slowing the spread of the virus. Please get vaccinated as soon as COVID-19 vaccines are authorized for use in your age group.” A timer was set to ensure that each participant stayed on the tweet for at least 8 seconds before proceeding to the posttest questionnaire.

In the peer source conditions, in line with existing research (e.g., Niu et al., 2020), a peer source was alleged to be a layperson to whom message recipients could relate themselves. The author of the tweets was alleged to be “Alex Merrill, a community representative of Manchester Citizens Corporation.” This was a gender-neutral fake name and identity. A medical professional is often chosen as an expert source in existing research (e.g., Bernhardt & Felter, 2004; Niu et al., 2020). Therefore, in the expert source conditions, the author of the tweets was Dr. Anthony Fauci, one of the world’s leading experts on infectious diseases. In addition to his expertise in his profession, we chose Dr. Fauci as an example of “expert source” because he became even more influential during the COVID-19 pandemic and was occasionally labeled as “America’s doctor” (e.g., Specter, 2020). In the media outlet source conditions, the author of the tweets was The New York Times, a major news outlet in the United States.

Regarding social endorsement cues, we referred to similar research projects to determine how many “likes” and “retweets” were needed to distinguish between high and low social endorsement (e.g., Borach & Xiao, 2018; Westerman et al., 2011). In the high social endorsement conditions, each tweet had more than 1,000 “likes” and “retweets.” The exact number of “likes” and “retweets” for each tweet was randomly generated by random.org. Table 2 displays several examples of stimulus materials.

Right after reading the designated tweet, participants responded to several manipulation check questions in multiple choice format. They were asked to indicate: (1) the author of the tweet: peer user, expert, or media outlet [χ²(4, N = 539) = 359.92, p < .001, V = .58]; and (2) the main reason why young adults should get a COVID-19 vaccine as suggested by the tweet: self, society, or other [χ²(1, N = 539) = 134.10, p < .001, V = .50]. Participants were also asked to indicate to what extent they agreed with the following statements: “the tweet has obtained a high number of likes,” “the tweet has obtained a high number of retweets,” “the tweet has been ‘liked’ by a large number of Twitter users,” and “a large number of Twitter users support the author’s view on COVID-19 prevention.” Those who were assigned to the high social endorsement conditions scored significantly higher on the above items, α = .93, M̄[subscript]high = 3.41, SD[subscript]high = 1.70, M̄[subscript]low = 2.73, SD[subscript]low = 1.13, t(1) = 5.41, p < .001.

| Condition | Message |
|-----------|---------|
| Peer + individual responsibility + high impact | Young adults are largely spared from serious illness, but they are most likely to contract COVID-19. Young adults are responsible for protecting themselves from being infected. Please get vaccinated as soon as COVID-19 vaccines are authorized for use in your age group. |
| Expert + societal responsibility + high impact | Young adults are largely spared from serious illness, but they are most likely to contract COVID-19. Young adults are responsible for slowing the spread of COVID-19. Please get vaccinated as soon as COVID-19 vaccines are authorized for use in your age group. |
| Media outlet + societal responsibility + low impact | Young adults are largely spared from serious illness, but they are most likely to contract COVID-19. Young adults are responsible for slowing the spread of COVID-19. Please get vaccinated as soon as COVID-19 vaccines are authorized for use in your age group. |

Table 2. Experimental Stimulus Material Examples (Not an Exhaustive List).
Primary Measures

Unless otherwise noted, all multiple-item constructs were measured using 7-point Likert scales. Reverse coding was conducted where necessary.

Independent variables. Perceived susceptibility to COVID-19 ($\alpha = .94, M=5.14, SD=1.24$) and perceived severity of COVID-19 ($\alpha = .94, M=5.71, SD=1.73$) were measured using six risk-perception questions (e.g., “I am at risk for contracting COVID-19,” “I think that COVID-19 is a severe threat”) adapted from Witte et al. (1996).

Vaccine perception was measured using seven items (e.g., “I can rely on vaccines to stop serious infectious diseases”) from the Vaccine Attitudes Examination Scale by Martin and Petrie (2017). With the completion of reverse coding, higher scores indicated more positive perceptions of vaccines and vaccination, $\alpha = .81, M=4.25, SD=1.13$.

Before exiting the questionnaire, participants were asked to indicate their personal COVID-19 experiences: (1) if they had been infected with COVID-19, (2) if their family members had been infected with COVID-19, and (3) if their close friends had been infected with COVID-19. A summary of participants’ responses can be found in Table 1.

Dependent variables. The measures of TPB variables, including attitude, subjective norms, PBC, and behavioral intentions, were adapted from the works of Ajzen (1991) and Boudewyns and Paquin (2011). Six questions measured attitude toward getting a COVID-19 vaccine (e.g., “I think that getting a COVID-19 vaccine as soon as it is available to my age group is [worthless – worthwhile]”), $\alpha = .94, M=5.67, SD=1.23$. Three questions measured subjective norms regarding getting vaccinated (e.g., “most people whose opinions I value would approve of my getting a COVID-19 vaccine as soon as it is available to my age group”), $\alpha = .89, M=5.61, SD=1.13$. Three questions measured PBC (e.g., “I am sure that if I wanted to, I could get a COVID-19 vaccine as soon as it is available to my age group.”), $\alpha = .89, M=5.39, SD=1.11$. Four questions measured behavioral intentions (e.g., “How willing are you to get a COVID-19 vaccine as soon as it is available to your age group?”), $\alpha = .94, M=5.31, SD=1.53$.

PSC was measured using the 7-point semantic differential scale from Ohanian (1990). Four survey questions measured two major dimensions of source credibility, including trustworthiness and expertise (e.g., “the author of the tweets looks knowledgeable/unknowledgeable”). Higher scores indicated higher PSC, $\alpha = .89, M=5.64, SD=1.06$. H1 predicted that those who were assigned to the high social endorsement conditions would develop (a) more favorable attitude toward getting the COVID-19 vaccine, (b) more positive subjective norms regarding getting vaccinated, (c) greater PBC, (d) stronger vaccination intentions, and (e) higher PSC of the tweet. The hypothesis is partially supported. Controlling personal COVID-19 experiences, ANCOVA tests suggest that exposure to a high social endorsement tweet results in (a) more favorable attitude, $M_{\text{high}}=5.81, SD_{\text{high}}=1.12$, $M_{\text{low}}=5.52, SD_{\text{low}}=1.30$, $F(1, 536)=7.82, p=.005$, partial $\eta^2=.01$; (b) more positive subjective norms, $M_{\text{high}}=5.83, SD_{\text{high}}=0.96$, $M_{\text{low}}=5.40, SD_{\text{low}}=1.25$, $F(1, 536)=22.00, p<.001$, partial $\eta^2=.04$; and (d) stronger vaccination intentions, $M_{\text{high}}=5.49, SD_{\text{high}}=1.44$, $M_{\text{low}}=5.13, SD_{\text{low}}=5.60$, $F(1, 536)=8.01, p=.005$, partial $\eta^2=.02$.

H2 predicted that message source would have an impact on dependent variables. ANCOVA tests controlling personal COVID-19 experiences show that only H2(b) and H2(e) are supported. There are significant differences in mean scores on subjective norms (H2b) and on PSC (H2e) between different conditions. Regarding H2(b), a media outlet source results in the most positive subjective norms ($M=5.82, SD=1.15$), followed by an expert source ($M=5.56, SD=1.09$), and a peer source results in the least positive subjective norms ($M=5.46, SD=1.13$), $F(2, 536)=5.75, p=.003$, partial $\eta^2=.02$. Regarding H2(e), an expert source results in the highest PSC ($M=5.88, SD=0.97$), followed by a media outlet source ($M=5.67, SD=1.09$), and a peer source results in the lowest PSC ($M=5.39, SD=1.07$), $F(2, 536)=10.40, p<.001$, partial $\eta^2=.04$.

Regarding RQ2, two-way ANOVA tests did not identify interaction effects of social endorsement cues and message source on dependent variables.

RQ3 sought to explore the interaction effects of independent variables on dependent variables. To answer RQ3, vaccine perception, perceived susceptibility, and perceived severity were separated into two tiers with cutoff points at the median (3.86, 5.33, 5.80, respectively). Two-way ANOVA tests reveal several statistically significant interaction effects.

First, there is a statistically significant interaction between the effects of social endorsement cues and vaccine perception on PBC, $F(2, 536)=5.51, p=.02$, partial $\eta^2=.01$. After splitting the dataset, in the high social endorsement group, low vaccine perception individuals score higher on PBC ($M=5.56, SD=0.86$) than high vaccine perception individuals ($M=5.22, SD=1.32$), $F(1, 267)=6.43, p=.01$, partial $\eta^2=.02$. There is no statistically significant difference in PBC scores in the low social endorsement group.

Second, social endorsement cues and perceived susceptibility have an interaction effect on subjective norms, $F(2, 539)=4.27, p=.04$, partial $\eta^2=.01$. After splitting the dataset, in the high social endorsement group, high perceived susceptibility individuals score higher on subjective norms ($M=5.98, SD=0.74$) than low perceived susceptibility individuals ($M=5.66, SD=1.15$), $F(1, 267)=7.65, p=.006$, partial $\eta^2=.03$. In the low social endorsement group, the gap between high and
low perceived susceptibility individuals’ subjective norms is even larger (\(M_{\text{high}} = 5.75\), \(SD_{\text{high}} = 1.05\), \(M_{\text{low}} = 5.04\), \(SD_{\text{low}} = 1.33\)), \(F(1, 272) = 23.70, p < .001\), partial \(\eta^2 = .08\).

Finally, there is a statistically significant interaction between the effects of message source and perceived susceptibility on PSC, \(F(2, 539) = 3.28, p = .04\), partial \(\eta^2 = .01\).

After splitting the dataset, in the peer source group, high perceived susceptibility individuals score higher on PSC (\(M = 5.66, SD = 0.86\)) than low perceived susceptibility individuals (\(M = 5.05, SD = 1.20\)), \(F(1, 180) = 16.15, p < .001\), partial \(\eta^2 = .08\). No statistically significant differences are identified in expert and media source groups.

RQ4 asked about predictors of one’s intentions to get a COVID-19 vaccine. Hierarchical multiple linear regression was conducted to further examine the factors that predict behavioral intentions. The independent variables were entered into the regression model in three blocks. The first block includes demographic variables, including age, gender, educational background, ethnicity, and personal experiences with COVID-19. The second block includes perceived susceptibility, perceived severity, and vaccine perception. The last block includes TPB variables. The results are displayed in Table 3.

Block 1, the demographics block, accounts for 4% of the total variance in the outcome variable. Age, education, and COVID-19 experiences are significant predictors. Younger adults are more willing to get vaccinated than older adults, and educational background is positively associated with vaccination intentions. COVID-19 experiences are negatively associated with vaccination intentions: those who have not gotten infected with COVID-19 and have fewer infected individuals in their personal networks present stronger intentions to get vaccinated.

In Block 2, three demographic variables, including age, education, and ethnicity, predict behavioral intentions. Based on self-reported ethnicity, the white ethnic group presents stronger behavioral intentions than other ethnic groups. Psychographics, including perceived susceptibility, perceived severity, and vaccine perception, are positive predictors of behavioral intentions. The second block accounts for 44% of the total variance. The third block explains 58% of the total variance in behavioral intentions. Age, education, ethnicity, perceived susceptibility, and vaccine perception remain strong predictors. Among the TPB variables, attitude and subjective norms are significant predictors, while PBC is not found to affect behavioral intentions.

### Discussion

Adopting an experimental design, this study examined the effects of social endorsement cues, message source, and responsibility attribution on young adults’ perceptions of the COVID-19 vaccine, vaccination intentions, and PSC of a health message. We also explored the possible interaction effects of the above message content variables and individuals’ existing perceptions of vaccination and COVID-19. Both expected and unexpected findings were identified.

First, consistent with existing literature, social endorsement cues are positively associated with a more favorable attitude toward getting the COVID-19 vaccine, more positive subjective norms, and stronger vaccination intentions. In online communication where most interpersonal communication cues are no longer available (Walther, 1992), social endorsement cues, such as the number of “likes” and “retweets,” have become strong indicators of information quality and message popularity (Sundar, 2008; Yang, 2016).
Social endorsement cues affect individuals’ perceptions of a message through triggering the bandwagon heuristic (Sundar, 2008). Despite a small number of situations in which social endorsement cues have negatively affected message outcomes (e.g., Lin et al., 2016), most empirical research has suggested that social endorsement cues generate a positive impact (e.g., Borach & Xiao, 2018; Turcotte et al., 2015; Yang, 2016). Our research findings show that social endorsement cues contribute to the effectiveness of health messages regarding COVID-19 vaccination. In particular, subjective norms were found to be most affected by social endorsement cues. The bandwagon heuristic is a process through which one evaluates the quality of a message by others’ evaluations (Sundar, 2008), and subjective norms are about one’s perceptions of others’ attitudes toward a behavior (Ajzen, 1991). Both concepts are concerned with “others.” Therefore, it is not surprising that social endorsement cues strongly affect subjective norms. The close association between social endorsement cues and subjective norms has implications beyond the COVID-19 context. Peer pressure has been found to be a crucial factor that motivates individuals to perform unhealthy behaviors, such as binge drinking (e.g., Johnston & White, 2003; Niu et al., 2020). Educators have been trying hard to change subjective norms in order to foster desired behavioral change. Social endorsement cues can be utilized as an external indicator of peer pressure to alter one’s subjective norms.

Nevertheless, not all the dependent variables are affected by social endorsement cues. PBC is not affected because the perceived ease or difficulty of performing a behavior (Ajzen, 1991) is determined by numerous external and internal factors, while whether or not others support a message is not likely to exert a direct influence on PBC. When this online experiment was implemented, COVID-19 vaccines were available to specific populations only and at a relatively small number of locations. The limited supply of COVID-19 vaccines appeared to be a more prominent factor than social endorsement cues in determining one’s PBC.

PSC is not affected by social endorsement cues either. This is partially because the tweet authors in our stimulus materials had drastically different professional identities, so, the authors’ professional identities played a more crucial role in determining PSC than social endorsement cues.

In line with the previous point, message source generates a major impact on PSC. PSC encompasses expertise, trustworthiness, and intention toward the receiver (Mcroskey & Teven, 1999). In the context of health, due to the knowledge gap between experts and lay individuals, an expert source has more expertise, and a peer source has less expertise. Most media effects research has shown that expert sources are more trusted (Bernhardt & Felter, 2004; Yang & Beaty, 2016), but some studies on college students’ drinking behaviors (e.g., Niu et al., 2020) have suggested that individuals tend to trust a peer source more. Our research findings resonate with the former.

We argue that whether individuals trust an expert or a peer source more may be determined by the extent to which a health behavior/problem is purely a “health” problem. Infectious diseases and most illnesses are mainly related to one’s health. Contracting such diseases brings about no benefits. Therefore, most people want to know how to avoid being infected, which is an area where experts have the most expertise. Three dimensions of source credibility, including expertise, trustworthiness, and intention, have different weights in determining communication outcomes (Pornpitakpan, 2004). In this case, expertise (Pornpitakpan, 2004) has the most weight in affecting PSC. Behaviors that are rooted in the cultural ramifications of a society, such as binge drinking (e.g., Niu et al., 2020), however, are motivated by numerous health- and non-health-related factors, including community culture and peer pressure. Performing these behaviors imposes a threat to one’s health, but one obtains other forms of gratifications from them. Therefore, individuals make tradeoffs between staying healthy and adapting themselves to their community culture. During conversations about community culture, a peer source appears to have a more reliable and sincere character than an expert source. In this case, another dimension of source credibility, trustworthiness (Ohanian, 1990; Pornpitakpan, 2004), has the most weight during the persuasion process.

Even though a media outlet source is not perceived as the most credible in this study, it results in the most positive subjective norms, followed by an expert source, and a peer source results in the least positive subjective norms. This can be partially explained by the fact that a nationwide media outlet has obtained the advantages that an expert and a peer source have: like an expert source, a credible media outlet is perceived as trustworthy in delivering factual information about an emerging infectious disease; and like a peer source, a media outlet has some abilities to represent the voices of ordinary individuals. “Scoring” the average on both items results in the strongest persuasive effects on subjective norms.

During different stages of the COVID-19 pandemic, messages emphasizing personal, public, and a mix of personal and public benefits of disease prevention yielded different outcomes (Jordan et al., 2021). Regarding practicing social distancing, other-benefited messages were found to be more effective than self-benefited ones (Luttrell & Petty, 2020). In this study, we expected to identify some effects of responsibility attribution on message outcomes, but no statistically significant results were identified. Since COVID-19 prevention is both self-interested and prosocial (Jordan et al., 2021), it is likely that responsibility attribution does not make a prominent difference.

Existing literature suggests that one-sided responsibility attribution, either individual or societal responsibility, may not be sufficient to convince individuals to adopt desired behaviors. This is because individuals believe that both individual and societal factors have some impact on the causes of and the solutions to health problems (Worthington, 2017). Instead, recent research shows that mentioning both individual and societal responsibilities while emphasizing one of them is most likely to make a message effective. For example, messages emphasizing environmental causes of obesity while acknowledging personal responsibilities for addressing the problem most effectively
encouraged individuals to engage in healthy diet and exercise behaviors (Niederdeppe et al., 2013). Future research could examine if the combination of two types of responsibility attribution in a vaccine-related persuasive message generates a stronger impact than one-sided responsibility attribution.

In addition to examining the effects of message content features, we explored the interaction effects of a collection of independent variables. Several interaction effects were identified.

While no statistically significant difference in PBC scores was identified in the low social endorsement group, in the high social endorsement group, those who scored lower on pretest vaccine perception presented greater PBC. This shows that social endorsement cues are likely to boost one’s confidence in performing a behavior that one is normally hesitant to perform.

Two other interaction effects involved perceived susceptibility to the disease. The high perceived susceptibility group developed more positive subjective norms regarding getting vaccinated than the low perceived susceptibility group. Social endorsement cues enlarged the gap between the two groups. Additionally, in the peer source group, perceived susceptibility was positively associated with PSC. These results provide new insights into the effects of psychographics, such as existing perceptions of a disease, on the persuasiveness of a message.

Perceived susceptibility and perceived severity are two components of perceived risk (Witte et al., 1996), and they are often treated as one variable in media effects research. In the current research context, however, while perceived susceptibility has some interactions with other variables, perceived severity does not. Perceived susceptibility appears to play a more prominent role in shaping one’s vaccination intentions. This finding resonates with some recent studies on COVID-19 vaccination intentions (e.g., Wong et al., 2020). Since the idea that young adults are largely spared from serious illnesses caused by COVID-19 has spread widely in the media (e.g., Krans, 2021), young adults do not tend to think of COVID-19 as a deadly threat to them. Instead, the perceived likelihood of being infected plays a more important role in determining young adults’ vaccination intentions.

The last research question was concerned with the predictors of one’s intentions to get a COVID-19 vaccine. Younger adults and those who have better educational backgrounds present stronger intentions to get vaccinated. Somewhat surprisingly, those with fewer COVID-19 experiences were more willing to get vaccinated. This phenomenon might have two explanations. First, those who have been infected do not think that they are in urgent need of vaccination. Second, having fewer COVID-19 experiences and developing stronger vaccination intentions are caused by the same set of factors, such as strong awareness and active performance of disease prevention behaviors.

Conclusion

Within the TPB framework, this online experiment investigated how health messages regarding COVID-19 vaccination can be manipulated to achieve desired attitudinal outcomes. In addition to manipulating message content, we considered individuals’ existing perceptions of vaccination and COVID-19. We explored the possible interaction effects of all the above variables.

Four major findings were identified. First, social endorsement cues were found to positively affect three major TPB variables: attitude, subjective norms, and behavioral intentions. In particular, the association between social endorsement cues and subjective norms has the most practical implications. Second, message source was found to generate different effects on outcome variables. Individuals perceived an expert source as the most credible, but a media outlet source resulted in the most positive subjective norms. Third, individual and societal responsibility attribution did not generate significantly different effects on dependent variables. Finally, social endorsement cues and message source both had some interaction effects with perceived susceptibility on dependent variables.

This study has several limitations. First, we only examined the effects of individual and societal responsibility attributions, while the third type of responsibility attribution, interdependent responsibility (Worthington, 2017), was not examined. Future research can further analyze the main effect of interdependent responsibility attribution and its interaction with other variables in health promotions. In addition, due to the word limit of a tweet, we created a short message to state individual and societal responsibilities in the stimulus materials, which might result in participants’ insufficient cognitive engagement with the message based on a single text-based message exposure. The younger generation is digital savvy and they may be more used to other forms of messages on social media, such as storytelling and visual communication. Future research may consider designing COVID-19 vaccine messages in different forms to improve the message engagement with young adults. Besides that, we did not ask participants about their backgrounds in health or health education. Those who had more medical knowledge or had studied in health-related fields might respond to our experimental stimulus differently. Variables like need for cognition and health literacy, can be controlled in the future research. Finally, even though “Alex” is a gender neutral name, it is more often used as a male name. This might explain why more than 60% of the valid responses were from male participants, resulting in a slightly biased sample. Nevertheless, since the project solely focused on message effectiveness and we did not attempt to seek a nationally representative public opinion on COVID-19, this sampling issue is not likely to cause a major defect in the whole project.

The research findings have both practical and theoretical implications. First, since social endorsement cues remain strong predictors of several attitudinal outcomes and behavioral intentions, it is worthwhile for health educators to monitor and increase the social endorsement that their social media messages receive. A message with a larger number of “likes”...
and “retweets” not only suggests that it has reached out to a large audience, but it can generate stronger persuasive outcomes. Both outcomes positively contribute to the success of health education, effectively killing one bird with two stones. Second, in our research context, research participants found an expert source to be most credible. Niu et al. (2020) argued that an expert source can be effective in addressing complicated and sensitive health issues, while our study further suggests that people tend to find an expert source to be most trustworthy regarding a novel health problem with few cultural ramifications.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the WTAMU Killgore Faculty Research Grant [2021, “Effectiveness of message features in COVID-related health education messages”].

Ethical Approval
The research procedure was approved by the WTAMU Institutional Review Board [#2021.03.001].

ORCID iD
Li Chen https://orcid.org/0000-0002-6628-9105

References
Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.
Andrews, K., Silk, K., & Eneli, I. (2010). Parents as health promoters: A theory of planned behavior perspective on the prevention of childhood obesity. Journal of Health Communication, 15(1), 95–107.
Bernhardt, J. M., & Felter, E. M. (2004). Online pediatric information seeking among mothers of young children: Results from a qualitative study using focus groups. Journal of Medical Internet Research, 6, e7.
Berry, T. R., & Shields, C. (2014). Source attribution and credibility of health and appearance exercise advertisements: Relationship with implicit and explicit attitudes and intentions. Journal of Health Psychology, 19(2), 242–252.
Boiarisky, G., Rouner, D., & Long, M. (2013). Effects of responsibility attribution and message source on young adults’ health attitudes and behaviors. Journal of Health Communication, 18(7), 881–894.
Borach, P., & Xiao, X. (2018). The importance of “likes”: The interplay of message framing, source, and social endorsement on credibility perceptions of health information on Facebook. Journal of Health Communication, 23(4), 399–411.
Boudewyns, V., & Paquin, R. S. (2011). Intentions and beliefs about getting tested for STDs: Implications for communication interventions. Health Communication, 26(8), 701–711.
Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon’s mechanical turk: A new source of inexpensive, yet high-quality, data? Perspectives on Psychological Science, 6(1), 3–5.
Case, K. R., Lazard, A. J., Mackert, M. S., & Perry, C. L. (2018). Source credibility and e-cigarette attitudes: Implications for tobacco communication. Health Communication, 33(9), 1059–1067.
Centers for Disease Control and Prevention (CDC). (2020, November 27). How to protect yourself & others. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html
Centers for Disease Control and Prevention (CDC). (2021, January 5). Benefits of getting a COVID-19 vaccine. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits.html
Dvir-Gvirsman, S. (2019). I like what I see: Studying the influence of popularity cues on attention allocation and news selection. Information, Communication & Society, 22(2), 286–305.
Embacher, K., McGloin, R., & Richards, K. (2018). When women give health advice online, do we listen? The effect of source sex on credibility and likelihood to use online health advice. Western Journal of Communication, 82(4), 439–456.
Guan, M., Coles, V. B., Samp, J. A., Sales, J. M., DiClemente, R. J., & Monahan, J. L. (2016). Incorporating communication into the theory of planned behavior to predict condom use among African American women. Journal of Health Communication, 21(9), 1046–1054.
Hassan, L. M., Walsh, G., Shiu, E. M. K., Hastings, G., & Harris, F. (2007). Modeling persuasion in social advertising: A study of responsible thinking in antismoking promotion in eight Eastern EU (European Union) member states. Journal of Advertising, 36(2), 15–31.
Johnston, K. L., & White, K. M. (2003). Binge-drinking: A test of the role of group norms in the theory of planned behaviour. Psychology & Health, 18, 63–77.
Jordan, J., Yoeli, E., & Rand, D. (2021). Don’t get it or don’t spread it? Comparing self-interested versus prosocially framed COVID-19 prevention messaging. Scientific Reports, 11(1), 1–17. https://doi.org/10.31234/osf.io/yuq7x
Kelley, H. H., & Michela, J. L. (1980). Attribution theory and research. Annual Review of Psychology, 31(1), 457–501.
Knobloch-Westerwick, S., Sharma, N., Hansen, D. L., & Alter, S. (2005). Impact of popularity indications on readers’ selective exposure to online news. Journal of Broadcasting & Electronic Media, 49(3), 296–313.
Krans, B. (2021). If you’re young or healthy, you may need to wait until summer for COVID-19 vaccine. Healthline. https://www.healthline.com/health-news/if-youre-young-or-healthy-you-may-need-to-wait-until-summer-for-covid-19-vaccine
Kumar, K. B. (2021, May 17). Vaccine patents debate risks becoming a sideshow in the global battle against COVID-19. https://www.rand.org/blog/2021/05/vaccine-patents-debate-risks-becoming-a-sideshow-in.html
Lewis, F. M., & Daltroy, L. H. (1990). How causal explanations influence health behavior: Attribution theory. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), Health education and health behavior: Theory, research, and practice (pp. 92–114). Jossey-Bass.
Lewis, N., & Sznitman, S. R. (2017). You brought it on yourself: The joint effects of message type, stigma, and responsibility attribution on attitudes toward medical cannabis. Journal of Communication, 67(2), 181–202.
Lin, X., Spence, P. R., & Lachlan, K. A. (2016). Social media and credibility indicators: The effect of influence cues. Computers in Human Behavior, 63, 264–271.

Luttrel, A., & Petty, R. E. (2020). Evaluations of self-focused versus other-focused arguments for social distancing: An extension of moral matching effects. Social Psychological and Personality Science, 12, 946–954.

Maragakis, L. L. (2020, December 2). Coronavirus and COVID-19: Younger adults are at risk, too. https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-and-covid-19-younger-adults-are-at-risk-too

Martin, L. R., & Petrie, K. J. (2017). Understanding of dimensions of anti-vaccination attitudes: the VAX vaccination attitudes examination (VAX) scale. Annals of Behavioral Medicine, 51(5), 652–660. https://doi.org/10.1007/s12160-017-9888-y

McCroskey, J., & Teven, J. (1999). Goodwill: A reexamination of the construct and its measurement. Communication Monographs, 66, 90–103.

Messing, S., & Westwood, S. J. (2014). Selective exposure in the age of social media: Endorsements trump partisan source affiliation when selecting news online. Communication Research, 41(8), 1042–1063.

Meulemaer, S., Pelsmacker, P., & Dens, N. (2018). Power distance, uncertainty avoidance, and the effects of source credibility on health risk message compliance. Health Communication, 33(3), 291–298.

Nan, X. (2013). Perceived source credibility and advertising persuasiveness: An investigation of moderators and psychological processes. Journal of Current Issues & Research in Advertising, 195–211.

Neubaum, G., & Kramer, N. C. (2015). Let’s blog about health! Exploring the persuasiveness of a personal HIV blog compared to an institutional HIV website. Health Communication, 30(9), 872–883.

Niederdeppe, J., Roh, S., Shapiro, M. A., & Kim, H. K. (2013). Effects of messages emphasizing environmental determinants of obesity on intentions to engage in diet and exercise behaviors. Preventing Chronic Disease: Public Health Research, Practice, and Policy, 10, E209.

Niu, Z., Jeong, D., & Willoughby, J. (2020). Friends over doctors? The influences of source and perceived customization on college drinking. Health Communication, 36, 671–681. https://doi.org/10.1080/10410236.2020.1712034

Ohanian, R. (1990). Construction and validation of a scale to measure celebrity endorsers’ perceived expertise, trustworthiness, and attractiveness. Journal of Advertising, 19(3), 39–52.

O’Keefe, D. J. (2009). Theories of persuasion. In R. L. Nabi & M. B. Oliver (eds.), The SAGE handbook of media processes and effects (pp. 269–282). SAGE.

Pompeian, C. (2004). The persuasiveness of source credibility: A critical review of five decades’ evidence. Journal of Applied Social Psychology, 34(2), 243–281.

Record, R. A. (2017). Tobacco-free policy compliance behaviors among college students: A theory of planned behavior perspective. Journal of Health Communication, 22(7), 562–567.

Specter, M. (2020, April 10). How Anthony Fauci became America’s doctor. The New Yorker. https://www.newyorker.com/magazine/2020/04/20/how-anthony-fauci-became-americas-doctor

Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger & A. J. Flanagin (eds.), Digital media, youth, and credibility (pp. 72–100). MIT Press.

Thon, F., & Jucks, R. (2007). Believing in expertise: How authors’ credentials and language use influence the credibility of online health information. Health Communication, 32(7), 828–836.

Turcotte, J., York, C., Irving, J., Scholl, R. M., & Pingree, R. J. (2015). News recommendations from social media opinion leaders: Effects on media trust and information seeking. Journal of Computer-Mediated Communication, 20(5), 520–535.

Umeh, K. (2012). Does a credible source also need a fearful audience? Journal of Applied Social Psychology, 42(7), 1716–1744.

Vorpahl, M. M., & Yang, J. Z. (2018). Who is to blame? Framing HPV to influence vaccination intentions among college students. Health Communication, 33(5), 620–627.

Waltzer, J. B. (1992). Interpersonal effects in computer-mediated interaction: A relational perspective. Communication Research, 19, 52–90.

Wang, Z., Walther, J. B., Pingree, S., & Hawkins, R. P. (2008). Health information, credibility, homophily, and influence via the Internet: Web sites versus discussion groups. Health Communication, 23(4), 358–368.

Westerman, D., Spence, P. R., & Van Der Heide, B. (2011). A social network as information: The effect of system generated reports of connectedness on credibility on Twitter. Computers in Human Behavior, 28(1), 199–206.

Wickler, D. (2002). Personal and social responsibility for health. Ethics & International Affairs, 16, 47–55.

Witte, K., Cameron, K. A., McKeon, J. K., & Berkowitz, J. M. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. Journal of Health Communication, 1, 317–342.

Wolf, Z. B. (2021, November 9). Covid-19 vaccine debate takes a strange turn. CNN. https://www.cnn.com/2021/11/08/politics/covid-vaccine-debate-what-matters/index.html

World Health Organization (WHO). (n.d.). Coronavirus. https://www.who.int/health-topics/coronavirus

World Health Organization (WHO). (n.d.). Coronavirus. https://www.who.int/health-topics/coronavirus