Comparative Risk: Dread and Unknown Characteristics of the COVID-19 Pandemic Versus COVID-19 Vaccines

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This research characterizes risk perceptions of the COVID-19 pandemic and the COVID-19 vaccines based on the dread and unknown dimensions of the psychometric paradigm. We examine if mental risk comparisons of these two risk objects influence risk mitigation behaviors (vaccination intention; vaccine acceptance; preventive behaviors) and emotional responses among unvaccinated and vaccinated Americans. A survey (N = 1532) was conducted based on a nationally representative sample of U.S. adults in May 2021. Results reveal considerable impact of risk comparison, especially along the dread dimension, on the outcomes of interest. In essence, this research reveals critical insights regarding vaccine hesitancy and risk communication about vaccination.

KEY WORDS: COVID-19 pandemic; COVID-19 vaccines; dread risk; unknown risk; vaccination intention

1. INTRODUCTION

Nearly all events in everyday life carry some risk. Riding a bicycle at a park could result in an accident, taking a prescription drug might cause unpleasant side effects, and living near a factory increases the odds of contracting serious illnesses. Discrete events differ in their probability of causing death or injury, as well as the benefits they afford to society. Further, different event characteristics may hold more or less weight on people’s judgments about how risky these events appear or feel. The psychometric paradigm offers a theoretical framework to explain why risk events stir different risk perceptions (Slovic, 1987).

The psychometric paradigm explains that members of the public are intolerant of risks perceived as dreadful and unknown (Slovic, 1987). Against the backdrop of the ongoing COVID-19 pandemic, the current research centers on two risk events—the COVID-19 pandemic and the COVID-19 vaccines. Applying the psychometric paradigm, we examine whether vaccinated and unvaccinated Americans weigh the COVID-19 pandemic and the COVID-19 vaccines differentially along the dread and unknown dimensions. We additionally examine which specific risk characteristic contribute to the overall risk perception of the COVID-19 pandemic and the COVID-19 vaccines. Lastly, we investigate if this mental risk comparison influences people’s (a) vaccination intention, (b) vaccine acceptance, (c) maintenance of preventive behaviors, and (d) emotional responses.

To our knowledge, this study is the first to comparatively analyze perceptions of dread and unknown risks of the COVID-19 pandemic and the COVID-19 vaccines. Currently, over half of the American population (53.9%) have been fully vaccinated (Centers for Disease Control and Prevention [CDC], 2021b), but some divide over vaccination still persists (CDC, 2021e). For example, slightly over half (57%) of unvaccinated adults are White; Black and Hispanic Americans are less likely to have received the vaccines. In addition, Republicans, rural...
populations, and younger adults remain hesitant about getting vaccinated (Kaiser Family Foundation [KFF], 2021b). Integrating the psychometric paradigm, this research directly compares two related risk events to better understand public perceptions and behaviors. Increased understanding of risk perceptions of the COVID-19 pandemic and the COVID-19 vaccines will help risk communication scholars better understand vaccine hesitancy. Further, it will provide an avenue to encourage the American public to continue adhering to preventive behaviors until the pandemic is over.

2. LITERATURE REVIEW

2.1. Psychometric Paradigm

Risk is the probability of something bad occurring to an individual, a group of individuals, or society at large (Sjöberg, Moen, & Rundmo, 2004). Constrained not only by technical parameters and probability numbers, risk also involves psychological, social, and cultural contexts (Slovic, 2000). Risk perception is accordingly shaped by individual and social characteristics that impact how individuals react to certain risks (e.g., Barke, Jenkins-Smith, & Slovic, 1997; Braman, Kahan, Peters, Wittlin, & Slovic, 2012; Dake, 1992; Flynn, Slovic, & Mertz, 1994; Wachinger, Renn, Beg, & Kuhlcke, 2013). The well-documented attenuation or amplification of risk perception is explicated in the psychometric paradigm (Slovic, 1987). A prominent model in risk research, the psychometric paradigm constructs a taxonomy of hazards illustrating how the lay public perceive varying risks (Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Slovic, Fischoff, & Lichtenstein, 1986). Notably, it predicts public risk behavior using a quantifiable approach (Slovic, 1987).

In this paradigm, risk perception is viewed as an impediment to rational decision making. This is attributable to a difference in how experts and the lay public perceive risk (Slovic, 1987; Starr, 1969). Experts most commonly define risk based on annual fatalities, whereas the lay public more often interpret risk by considering other factors such as catastrophic potential, equity, effects on future generations, controllability, and involuntariness (Slovic, 1987; Slovic et al., 1986). The lay public therefore allot comparatively less weight to risk assessments conducted by experts (Lichtenstein, Slovic, Fischhoff, & Layman, 1978; Slovic, Fischoff, & Lichtenstein, 1979; 1985).

2.1.1. Two Primary Dimensions

Slovic’s seminal piece and his ensuing research on the psychometric paradigm demonstrate a significant relationship between the perceived need for regulation of a risk event or hazard and two primary dimensions (Slovic, 1987)—the dread factor and the unknown factor. Characteristics of the dread factor include perceived uncontrollability, bearing a catastrophic and fatal outcome, and having an inequitable distribution of risks and benefits. Characteristics of the unknown factor include delayed manifestation of probable harm and novelty (Lichtenstein et al., 1978; Slovic, Fischoff, & Lichtenstein, 1985). The public respond not only to the scientific assessments of a risk event or hazard, but also to the subjective features of risk in ways that heighten or abate their concern (e.g., Slovic et al., 1979; Slovic et al., 1985). Put another way, the higher a risk event or a hazard score on these two factors, the higher its perceived risk. Concomitantly, individuals want to see the risk attenuate, motivating demands for stricter regulation (e.g., Clahsen et al., 2018; de Vries et al., 2019; Siegrist, Earle, Gutscher, & Keller, 2005).

To explain further, Fig. 1 represents four hazards (DNA technology; microwave ovens; bicycles; commercial aviation) located in each of the four quadrants. The dread dimension (Factor 1) lies on the x-axis. The unknown dimension (Factor 2) lies on the y-axis. Less dreaded hazards appear on the left side of the plot and vice versa. For example, DNA technology (upper right quadrant) score high on both axes. Bicycles (lower left quadrant), in contrary, score low on both axes. The circumference of the circle denotes the level of risk perception; the larger the circle, the higher the level of risk perception. In our example, DNA technology is a hazard to which the public respond to most negatively. In comparison, they seem more tolerant of microwave ovens and commercial aviation and perceive very little risk about bicycles. As a result, the public demand more stringent regulations for the development and commercialization of DNA technology (e.g., Priest, 2017; Savadori et al., 2004), but embrace microwave ovens and bicycles in their everyday life. The current plot is based off the full model shown in Slovic (1987).

2.2. The Current Research

Applying the psychometric paradigm to this context, we first unearth how the American public perceive the risk characteristics of the COVID-19,draft
pandemic and the COVID-19 vaccines. Specifically, the risk characteristics of the dread dimension comprise catastrophic potential, controllability, dread, severity, and involuntariness; the risk characteristics of the unknown factor comprise immediacy, unknown to the public, unknown to scientists, and novelty. While existing research on pandemics (e.g., H1N1—Fung, Namkoong, & Brossard, 2011; Oh, Paek, & Hove, 2015) and vaccinations (e.g., MMR—Marta et al., 2017; Raithatha, Holland, Gerrard, & Harvey, 2003) have employed this theoretical framework (partially or completely), few studies have compared two risk objects side by side to gauge how interrelated risk perceptions influence people’s subsequent decisions about risk mitigation behaviors.

Comparing the COVID-19 pandemic and the COVID-19 vaccines, we speculate that these two risk objects may take different positions on the psychometric paradigm in people’s perceptions. On the one hand, the COVID-19 vaccines became available only in December 2020 (U.S. Department of Health and Human Services, 2020). Some Americans may view them as an unfamiliar risk. Compounded by the swift development of the vaccines, concerns about their safety and efficacy remain high (see more on vaccine confidence, KFF, 2021a). Thus, the COVID-19 vaccines may score high on the unknown dimension. For certain segments of the American public, the vaccines may even score high on the dread dimension. Conversely, having lived with the pandemic for over a year, the risk of the pandemic is more familiar, or even mundane, to many. Thus, as opposed to the COVID-19 vaccines, the pandemic may score lower on the unknown dimension. Yet, emerging COVID-19 variants of concern (e.g., United Kingdom B.1.1.7 strain; delta variant strain) (Center for Disease Control and Prevention [CDC], 2021c), could still elicit dread. Nevertheless, a longitudinal research based on a nationally representative sample shows that both younger and older U.S. adults had a higher tendency to participate in risky behaviors (e.g., close contact within 6 feet with people who do not live with them; social gathering with more than 10 people) just two months into the pandemic (Kim & Crimmins, 2020). It is possible that some Americans will score the pandemic lower on the dread dimension at the time of data collection. Concluding from the theorization above, our first hypothesis is:

\[ H1: \] Americans will rate the COVID-19 pandemic and the COVID-19 vaccines differently on the dread and unknown dimensions.

To probe further into how each risk characteristic contribute to differences in risk perception of the
COVID-19 pandemic and the COVID-19 vaccines, we inquire:

RQ1: How do risk characteristics in the dread and unknown dimensions (i.e., pertaining to each event) influence Americans’ risk perception of the COVID-19 pandemic and the COVID-19 vaccines?

2.2.1. Risk Mitigation Behaviors

The present study additionally examines how dread and unknown risks of the COVID-19 pandemic, and the COVID-19 vaccines influence the American public’s COVID-19 vaccine uptake. Research on a wide range of hazards (e.g., air pollutions: Pu et al., 2019; floods: Kellens, Terpstra, & De Maeyer, 2012; food safety: You & Ju, 2016; nuclear accidents: Kim & Kim, 2017; river pollutions: Aragonés, Tapia-Fonllem, Poggio, & Fraijo-Sing, 2017) has evaluated how the interplay between the dread dimension and the unknown dimension shapes risk perception about a single risk object. However, to our knowledge, no research to date has evaluated people’s mental comparison of two interrelated risk objects and its impact on risk mitigation behaviors. Three specific outcomes are examined here. First, vaccination intention refers to individuals’ likelihood of getting a COVID-19 vaccine. Vaccine acceptance is individuals’ overall confidence in the COVID-19 vaccines. Next, maintenance of preventive behaviors refers to the degree to which individuals will continue to practice preventative personal behaviors (e.g., washing hands with soap or using hand sanitizers several times a day) or engage in risky social behaviors (e.g., having visitors such as friends, neighbors, or relatives at their residence). The opportune timeline of both the COVID-19 pandemic and COVID-19 vaccines allows us to psychometrically analyze this, which leads to the following hypotheses:

H2: Compared to the COVID-19 vaccines, Americans who rate the COVID-19 pandemic as higher on the dread dimension will be more likely to get the COVID-19 vaccine (H2a), report higher vaccine acceptance (H2b), engage more in preventive personal behaviors (H2c), and partake less in risky social behaviors (H2d).

H3: Compared to the COVID-19 vaccines, Americans who rate the COVID-19 pandemic as higher on the unknown dimension will be more likely to get the COVID-19 vaccine (H3a), report higher vaccine acceptance (H3b), engage more in preventive personal behaviors (H3c), and partake less in risky social behaviors (H3d).

2.2.2. Emotional Responses

Extending these theoretical arguments, we assess how the American public’s dread and unknown risk comparisons of the COVID-19 pandemic and the COVID-19 vaccines influence their emotional reactions. In this research, we evaluate both general affect and discrete emotions. Early scholarship on risk was largely focused on individuals’ cognitive evaluation of risk such as probability (e.g., Kahneman, Slovic, & Tversky, 1982; Tversky, 1972; Tversky & Kahneman, 1974), but more recent research increasingly recognizes the imperative role that affect and emotion play in risk appraisals (e.g., Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic, Finucane, Peters, & MacGregor, 2002; Slovic, Finucane, Peters, & MacGregor, 2007).

The affect heuristic thesis depicts how affect provides a mental shortcut, influencing people’s risk perception and risk-related decision making (Finucane et al., 2000; Slovic et al., 2007). In other words, individuals rely on affect and emotion to make judgments about risks. In a similar vein, the risk-as-feelings hypothesis postulates that emotional reactions to risks are frequently independent of cognitive evaluations, and they are often stronger predictors of individuals’ behaviors (Loewenstein, Weber, Hsee, & Welch, 2001). Taken together, this work attempts to uncover how the risk comparisons of the COVID-19 pandemic and the COVID-19 vaccines will elicit differing emotional reactions. Our next set of hypotheses are therefore:

H4: Compared to the COVID-19 vaccines, Americans who rate the COVID-19 pandemic as higher on the dread dimension will experience decreased positive affect (H4a), increased negative emotion (H4b), and decreased positive emotion (H4c) toward the pandemic. 

H5: Compared to the COVID-19 vaccines, Americans who rate the COVID-19 pandemic as higher on the unknown dimension will experience decreased positive affect (H5a), increased negative emotion (H5b), and decreased positive emotion (H5c) toward the pandemic.
2.2.3. Vaccine Status

Further, vaccine status likely reveals people’s perceptions of these two risk events. For instance, compared to unvaccinated people, vaccinated people may perceive the pandemic as a higher risk than the vaccines:

\( H_6: \) Vaccinated Americans and unvaccinated Americans will differ significantly in their ratings of the COVID-19 pandemic and the COVID-19 vaccines on the dread and unknown dimensions.

\( H_7: \) Vaccinated Americans and unvaccinated Americans will differ significantly in their risk perception and emotional responses toward the COVID-19 pandemic and the COVID-19 vaccines.

As above, risk mitigation behaviors may also be associated with individuals’ vaccine status. At present, the U.S. Food and Drug Administration (FDA) has authorized the use of a third dose of the Pfizer-BioNTech and Moderna vaccines for immunocompromised individuals. The Biden administration also announced that after September 20th, 2021, fully vaccinated Americans would be eligible for a third dose eight months after their second shot (CDC, 2021a). Therefore, it is crucial to continue monitoring vaccinated individuals’ future intention for vaccination. Thus, our final set of hypotheses are:

\( H_8: \) Vaccinated Americans and unvaccinated Americans will differ significantly in their likelihood to get the COVID-19 (\( H_{8a} \)), preventive personal behaviors (\( H_{8b} \)), and risky social behaviors (\( H_{8c} \)).

\( H_9: \) Vaccinated Americans and unvaccinated Americans will differ significantly in their affect (\( H_{9a} \)), negative emotion (\( H_{9b} \)), and positive emotion (\( H_{9c} \)).

3. METHOD

3.1. Research Design

To test our hypotheses and address the research question, we contracted Qualtrics in May, 2021 to recruit a sample (\( N = 1532 \)) that matched the U.S. adult population on age, gender, race/ethnicity (i.e., based on the latest United States Census Bureau Data, 2019), and political affiliation (i.e., based on the American National Election Studies [ANES], 2020). All participants who completed the survey were compensated based on established agreement between Qualtrics and their opt-in panelists. The median survey completion time was 16 minutes. All research procedures were approved by the Institutional Review Board (IRB) at the authors’ institution.

3.2. Sample

Only fully completed responses were included in the final sample for analysis (\( N = 1,532 \)). All participants in this final sample passed the attention check. Participants’ age ranged from 18 to 100 (\( M = 46.89, SD = 16.80 \)). There were 864 (56.4%) females and 668 males (43.6%). The sample was predominantly White (\( n = 800, 52.2\% \)), followed by Hispanic/Latino (\( n = 321, 21.0\% \)), Black/African American (\( n = 233, 15.2\% \)), Asian/Pacific Islander (\( n = 106, 6.9\% \)), Biracial (\( n = 49, 3.2\% \)), and American Indian/Alaskan Native (\( n = 23, 1.5\% \)). In terms of political affiliation, 512 participants (33.4%) self-identified as Democrat, 509 (33.2%) self-identified as Independent, and 511 (33.4%) self-identified as Republican. We purposely screened participants to ensure an even split between unvaccinated (\( n = 827, 54.0\% \)) and (\( n = 705, 46.0\% \)) vaccinated individuals. In this sample, 755 (49.3%) received some college education or below, 605 (39.5%) received two-year associate degree or four-year bachelor’s degree, and 172 (11.2%) received a master’s degree or above. The median household income was in the bracket of $40,000 to $49,999.\(^1\) Most participants indicated that they did not have any K-12 school-age children (28.9% did).

3.3. Research Procedure

At the beginning of the survey, all participants were presented with the informed consent and a set of instructions detailing the research procedure. They first responded to questions measuring demographics and vaccine status. Then, they answered a series of questions as described in the measures section. All measures were randomized to reduce survey order effect (Day et al., 2012). An attention check appeared midway to ensure data quality. Upon completion of the survey, all participants were debriefed and compensated.

\(^1\)The median household income reported in the study was lower than the median national household income (United States Census Bureau Data, 2019).
3.4. Measures

3.4.1. Vaccine Status

Participants were asked, “Have you received at least one dose of the COVID-19 vaccine?” They selected one of the following options: (1) yes, I’m fully vaccinated against COVID-19 already; (2) yes, and I will get the second dose soon; (3) yes, but I skipped the second dose; (4) yes, but I intend to skip the second dose; (5) no, but I plan to get vaccinated soon; (6) no, and I do not plan on getting vaccinated. Those who selected options with “yes…” were coded as vaccinated participants, and those who selected options with “no…” were coded as unvaccinated participants.

3.4.2. Dread Risk and Unknown Risk

Dread risk was measured with five items (catastrophic potential [chronic—catastrophic]; controllability [totally in control—not in control at all]; dread [calmly—dread]; severity [certainly not fatal—certainly fatal]; involuntariness [voluntary—involuntary]). Unknown risk was measured with four items (immediacy: [immediate—delayed]; unknown to the public: [very well-known—not known at all]; unknown to scientists [very well-known—not known at all]; novelty [old—new]). These items were adapted from Fischhoff et al. (1978) and Siegrist, Keller, and Kiers (2006) and designed to capture the two dimensions on the psychometric paradigm. A differential score approach was used to gauge risk comparison between the pandemic and the vaccines. Specifically, differential scores for each item were first computed (e.g., severity of pandemic minus severity of vaccines). Then, each differential score was aggregated into dread risk (i.e., five items) and unknown risk (i.e., four items). A positive value indicates higher risk perception toward the pandemic. Overall, comparative dread risk was higher for the pandemic than the vaccines ($M = 0.19$, $SD = 0.89$), but comparative unknown risk was higher for the vaccines than the pandemic ($M = -0.27$, $SD = 0.88$).

3.4.3. Risk Perception

A four-item measure rated on a five-point scale from 1 = not at all concerned/serious/likely to 5 = extremely concerned/serious/likely evaluated participants’ risk perception (Leiserowitz, 2006) toward the COVID-19 pandemic ($M = 3.46$, $SD = 1.27$, $\alpha = 0.90$) and the COVID-19 vaccines ($M = 3.21$, $SD = 1.23$, $\alpha = 0.85$). Comparative risk perception was higher for the pandemic than the vaccines ($M = 0.25$, $SD = 1.83$).

3.4.4. Vaccination Intention

To assess participants’ vaccination intention, a four-item measure rated on a six-point scale from 1 = very unlikely to 6 = very likely (Gerend & Shepard, 2012) was employed ($M = 3.75$, $SD = 1.90$, $\alpha = 0.98$). An example item is, “How likely is it that you will actually get the COVID-19 vaccine when it becomes available to you?”

3.4.5. Vaccine Acceptance

Vaccine acceptance was measured on five key facets of acceptance (Sarathchandra, Navin, Largent, & McCright, 2018) with eight items rated on a five-point Likert scale from 1 = strongly disagree to 5 = strongly agree ($M = 3.36$, $SD = 1.20$, $\alpha = 0.93$). First, perceived safety of vaccines was evaluated with one item (“COVID-19 vaccines are safe.”), and perceived efficacy of vaccines was evaluated with two items (e.g., “COVID-19 vaccines are effective at preventing infection from the virus.”). Next, acceptance of the selection and scheduling of vaccines was assessed with one item (“The speed at which the current COVID-19 vaccines were approved was appropriate.”), positive valuation of vaccines was assessed with three items (e.g., “COVID-19 vaccines are a major advancement for humanity.”), and perceived legitimacy of authorities to require vaccinations was assessed with one item (e.g., “It is legitimate for government to mandate the COVID-19 vaccinations.”).

3.4.6. Maintenance of Preventive Behaviors

Maintenance of preventive behaviors was evaluated as the likelihood to engage in preventive personal behaviors and risky social behaviors (Kim & Crimmins, 2020). All items were rated on a five-point scale from 1 = very unlikely to 5 = very likely. First, seven items measured preventive personal behaviors ($M = 3.73$, $SD = 1.22$, $\alpha = 0.90$). An example item for preventive personal behaviors is, “Wash hands with soap or use hand sanitizers several times a day.” Second, three items measured risky social behaviors ($M = 3.13$, $SD = 1.20$, $\alpha = 0.71$). An example item for risky social behaviors is, “Go to a friend, neighbor, or relative’s residence (not your own).”
3.4.7. Emotional Responses

Two items anchored by “bad–good” and “negative–positive” assessed participants’ affective response (Leiserowitz, 2006) toward the COVID-19 pandemic ($M = 2.31, SD = 1.29, \alpha = 0.87$) and the COVID-19 vaccines ($M = 3.24, SD = 1.49, \alpha = 0.93$). Comparative affect was more positive for the vaccines than for the pandemic ($M = -0.93, SD = 1.64$). Apart from affect, participants’ negative emotions (anger; disgust; fear; sadness) and positive emotions (encouraged; hope; joy; pride) were also measured (Nabi, Gustafson, & Jensen, 2018). Negative emotion toward the COVID-19 pandemic ($M = 3.23, SD = 1.14, \alpha = 0.78$) was higher than negative emotion toward the COVID-19 vaccines ($M = 2.66, SD = 1.24, \alpha = 0.85$). Comparatively, more negative emotion was expressed toward the pandemic than the vaccines ($M = 0.57, SD = 1.27$). Positive emotion toward the COVID-19 pandemic ($M = 2.60, SD = 1.18, \alpha = 0.87$) was lower than positive emotion toward the COVID-19 vaccines ($M = 2.99, SD = 1.30, \alpha = 0.91$). Comparatively, more positive emotion was expressed toward the vaccines than the pandemic ($M = -0.39, SD = 1.15$).

3.4.8. Demographics

Participants reported demographic information such as age, gender, and political affiliation. A complete document with all measures in original wording is available here on the Open Science Framework (OSF): https://bit.ly/3pAxSF4

3.5. Data Analysis

All analyses were performed in SPSS 26. Prior to performing more advanced statistical analyses, zero-order correlations were computed for the dread dimension and the unknown dimension (Table I), as well as for all key variables in the study (Table II). H1 was tested with paired-sample $t$-test, and H2–H5 were tested through a series of ordinary least squared (OLS) regressions. The remaining hypotheses related to vaccine status were tested using independent samples $t$-tests. For the various analyses, differential scores were used to effectively compare the two risk events. Lastly, to evaluate RQ1, we performed hierarchical regression analyses with demographics as control variables.

4. RESULTS

4.1. Hypotheses Testing for Unknown and Dread Risks

H1 examined whether Americans rated the COVID-19 pandemic and the COVID-19 vaccines differently on the dread and unknown dimensions. All risk characteristics on the dread and unknown dimensions significantly differed between the two risk events (see Table III for paired sample $t$-test results). Therefore, H1 was supported.

H2 focused on the dread dimension and its association with vaccination intention, vaccine acceptance, and maintenance of preventive behaviors. Relative to the vaccines, higher dread risk toward the pandemic was related to higher vaccination intention, greater vaccine acceptance, increased likelihood to practice preventive behaviors, and decreased likelihood to participate in risky social behaviors, lending support to H2.

H3 focused on the unknown dimension and its association with the aforementioned intention and behaviors. Relative to the vaccines, higher unknown risk toward the pandemic was related to higher vaccination intention, greater vaccine acceptance, and lower risky social behaviors. No significant relationship emerged between unknown risk and personal preventive behaviors. H3 was thus partially supported.

H4 and H5 investigated the relationship between emotional responses and dread and unknown risks respectively. Relative to the vaccines, participants perceived higher dread risk toward the pandemic, they reported lower positive affect, more negative emotion, and less positive emotion, lending support to H4. Concerning unknown risk, higher unknown risk toward the pandemic, relative to the vaccines, was related to less positive affect, and less positive emotion. No significant relationship was found between unknown risk and negative emotion. As such, H5 was partially supported. See Table IV for a complete summary of the regression results.

4.2. Hypotheses Testing for Vaccine Status

H6 posited that vaccinated and unvaccinated Americans would differ in their dread and unknown risk perceptions. A significant difference emerged between the two groups for dread risk, $t(1530) = 11.89, p = 0.001$. That is, vaccinated individuals perceived more dread risk toward the pandemic
Table I. Zero-order Correlations Among Dread and Unknown Risks

|                      | M   | SD  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  |
|----------------------|-----|-----|----|----|----|----|----|----|----|----|----|
| **COVID-19 Pandemic**|     |     |    |    |    |    |    |    |    |    |    |
| **Dread risk**       |     |     |    |    |    |    |    |    |    |    |    |
| 1. Catastrophic potential | 3.00 | 1.31 |  -  |    |    |    |    |    |    |    |    |
| 2. Controllability    | 2.89 | 1.20 |  0.05* |  -  |    |    |    |    |    |    |    |
| 3. Dread             | 3.15 | 1.27 |  0.21*** |  0.21*** |  -  |    |    |    |    |    |    |
| 4. Severity          | 3.39 | 1.22 |  0.33*** |  0.11*** |  0.26*** |  -  |    |    |    |    |    |
| 5. Involuntariness   | 2.76 | 1.20 |  -0.04 |  0.21*** |  0.06* |  -0.04 |  -  |    |    |    |    |
| **Unknown risk**     |     |     |    |    |    |    |    |    |    |    |    |
| 6. Immediacy         | 3.00 | 1.17 |  -0.03 |  -0.15*** |  -0.02 |  -0.16*** |  -0.05 |  -  |    |    |    |
| 7. Unknown to the public | 2.64 | 1.27 |  -0.16*** |  0.14*** |  -0.02 |  -0.23*** |  0.16*** |  0.14*** |  -  |    |    |
| 8. Unknown to scientists | 2.56 | 1.21 |  -0.13*** |  0.14*** |  -0.07*** |  -0.18*** |  0.14*** |  0.09*** |  0.49*** | -  |    |
| 9. Novelty           | 3.20 | 1.30 |  0.25*** |  0.10*** |  0.17*** |  0.29*** |  -0.06 |  -0.10*** |  -0.16*** |  -0.18** | -  |
| **COVID-19 Vaccines**|     |     |    |    |    |    |    |    |    |    |    |
| **Dread risk**       |     |     |    |    |    |    |    |    |    |    |    |
| 1. Catastrophic potential | 2.77 | 1.23 |  -  |    |    |    |    |    |    |    |    |
| 2. Controllability    | 2.97 | 1.24 |  -0.08*** |  -  |    |    |    |    |    |    |    |
| 3. Dread             | 2.93 | 1.23 |  0.22*** |  0.19*** |  -  |    |    |    |    |    |    |
| 4. Severity          | 2.88 | 1.22 |  0.23*** |  0.07*** |  0.35*** |  -  |    |    |    |    |    |
| 5. Involuntariness   | 2.68 | 1.23 |  -0.04 |  0.21*** |  0.12*** |  0.06* |  -  |    |    |    |    |
| **Unknown risk**     |     |     |    |    |    |    |    |    |    |    |    |
| 6. Immediacy         | 3.10 | 1.19 |  -0.03 |  0.04 |  0.13*** |  0.05* |  0.03 |  -  |    |    |    |
| 7. Unknown to the public | 3.09 | 1.32 |  -0.10*** |  0.30*** |  0.14*** |  0.08*** |  0.25*** |  0.20*** |  -  |    |    |
| 8. Unknown to scientists | 2.81 | 1.30 |  -0.01 |  0.22*** |  0.10*** |  0.10*** |  0.21*** |  0.16*** |  0.51*** | -  |    |
| 9. Novelty           | 3.34 | 1.23 |  0.16*** |  0.04 |  0.15*** |  0.18*** |  -0.08*** |  0.03 |  -0.06* |  -0.05 | -  |

Note.
* * p < 0.05.
** ** p < 0.01.
*** *** p < 0.001.
Table II. Zero-order Correlations Among Key Variables

|                        | 1          | 2          | 3          | 4          | 5          | 6          | 7          | 8          | 9          | 10         | 11         | 12         |
|------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 1. Risk perception of COVID-19 pandemic | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          |
| 2. Risk perception of COVID-19 vaccines | −0.08**    | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          |
| 3. Affect toward COVID-19 pandemic | 0.06*      | 0.01      | –          | –          | –          | –          | –          | –          | –          | –          | –          | –          |
| 4. Affect toward COVID-19 vaccines | 0.44**     | −0.53**    | 0.31**     | –          | –          | –          | –          | –          | –          | –          | –          | –          |
| 5. Negative emotion toward pandemic | 0.23**     | 0.14**     | −0.24**    | −0.08**    | –          | –          | –          | –          | –          | –          | –          | –          |
| 6. Negative emotion toward vaccines | 0.07**     | 0.48**     | −0.05     | −0.43**    | 0.44**    | –          | –          | –          | –          | –          | –          | –          |
| 7. Positive emotion toward pandemic | 0.21**     | −0.09**    | 0.43**     | 0.39**     | −0.20**    | −0.03     | –          | –          | –          | –          | –          | –          |
| 8. Positive emotion toward vaccines | 0.46**     | −0.36**    | 0.25**     | 0.67**     | 0.04      | −0.33**    | 0.58**    | –          | –          | –          | –          | –          |
| 9. Vaccination intention | 0.47**     | −0.53**    | 0.15**     | 0.73**     | 0.01      | −0.35**    | 0.29**    | 0.60**    | –          | –          | –          | –          |
| 10. Vaccine acceptance | 0.55**     | −0.52**    | 0.19**     | 0.77**     | −0.01    | 0.40**    | 0.36**    | 0.69**    | 0.74**    | –          | –          | –          |
| 11. Preventive personal behaviors | 0.70**     | −0.17**    | 0.07**     | 0.43**     | 0.13**    | −0.14**    | 0.20**    | 0.43**    | 0.48**    | 0.54**    | –          | –          |
| 12. Risky social behaviors | −0.32**    | 0.20**     | 0.15**     | −0.17**    | −0.06**   | 0.15**    | 0.11**    | −0.10**   | −0.19**   | −0.20**   | −0.38**   | –          |

Note.
* p < 0.05.  
** p < 0.01.  
*** p < 0.001.
Table III. Paired Sample t-Test Results for H1

|                     | COVID-19 pandemic | COVID-19 vaccines | Paired sample t-test |
|---------------------|-------------------|-------------------|---------------------|
| **Dread risk**      |                   |                   |                     |
| Catastrophic potential | \( M = 3.00, \) | \( M = 2.77, \) | \( t(1531) = 5.89, p = 0.001 \) |
| \( SD = 1.31 \)     | \( SD = 1.23 \)   |                   |                     |
| Controllability     | \( M = 2.89, \) | \( M = 2.97, \) | \( t(1531) = -2.37, p = 0.018 \) |
| \( SD = 1.20 \)     | \( SD = 1.24 \)   |                   |                     |
| Dread               | \( M = 3.15, \) | \( M = 2.93, \) | \( t(1531) = 5.66, p = 0.001 \) |
| \( SD = 1.27 \)     | \( SD = 1.23 \)   |                   |                     |
| Severity            | \( M = 3.39, \) | \( M = 2.88, \) | \( t(1531) = 12.20, p = 0.001 \) |
| \( SD = 1.22 \)     | \( SD = 1.22 \)   |                   |                     |
| Involuntariness     | \( M = 2.76, \) | \( M = 2.68, \) | \( t(1531) = 2.17, p = 0.001 \) |
| \( SD = 1.20 \)     | \( SD = 1.23 \)   |                   |                     |
| **Unknown risk**    |                   |                   |                     |
| immediacy           | \( M = 2.99, \) | \( M = 3.10, \) | \( t(1513) = -2.83, p = 0.005 \) |
| \( SD = 1.17 \)     | \( SD = 1.19 \)   |                   |                     |
| Unknown to the public| \( M = 2.64, \) | \( M = 3.09, \) | \( t(1531) = -13.48, p = 0.001 \) |
| \( SD = 1.27 \)     | \( SD = 1.32 \)   |                   |                     |
| Unknown to scientists| \( M = 2.56, \) | \( M = 2.81, \) | \( t(1531) = -8.22, p = 0.001 \) |
| \( SD = 1.21 \)     | \( SD = 1.30 \)   |                   |                     |
| novelty             | \( M = 3.20, \) | \( M = 3.34, \) | \( t(1531) = -3.85, p = 0.001 \) |
| \( SD = 1.30 \)     | \( SD = 1.23 \)   |                   |                     |

Table IV. Summary of Regression Analyses Results for H2 Through H5

| Measures                  | **Dread Risk** | **Unknown Risk** |
|---------------------------|----------------|-----------------|
|                           | \( B \)        | \( B \)         | \( p \) | \( 95\% CI \) | \( B \) | \( B \) | \( p \) | \( 95\% CI \) |
| Vaccination intention     | 0.78           | 0.36            | 0.001 | 0.68, 0.88    | 0.24    | 0.11    | 0.001 | 0.13, 0.34 |
| Vaccine acceptance        | 0.55           | 0.41            | 0.001 | 0.49, 0.61    | 0.14    | 0.11    | 0.001 | 0.08, 0.21 |
| Preventive personal behaviors | -0.30       | -0.22           | 0.001 | -0.34, 0.46   | 0.05    | 0.04    | 0.001 | -0.02, 0.11 |
| Risky social behaviors    | -0.68          | -0.37           | 0.001 | -0.77, -0.60  | -0.09   | -0.06   | 0.001 | -0.15, -0.02 |
| Affect                    | 0.47           | 0.33            | 0.001 | 0.40, 0.54    | 0.02    | 0.01    | 0.675 | -0.05, 0.08 |
| Negative emotions         | -0.42          | -0.32           | 0.001 | -0.48, -0.36  | -0.11   | -0.08   | 0.001 | -0.17, -0.05 |
| Positive emotions         | -                  |                   |       |                |                  |                   |       |                  |

**Note.** Significant relationships are bolded.

\( (M = 0.47, SD = 0.90) \), but unvaccinated individuals perceived more dread risk toward the vaccines \( (M = -0.05, SD = 0.80) \). They also differed on unknown risk, \( t(1530) = 5.58, p = 0.001 \). The unvaccinated group perceived increased unknown risk toward the vaccines than the vaccinated group \( (M = -0.39, SD = 0.87 vs. M = -0.14, SD = 0.88) \), lending support to H6.

H7 inquired if vaccine status would be associated with risk perception. Unsurprisingly, H7 was supported. A significant difference emerged between the two groups, \( t(1530) = 23.27, p = 0.001 \). Specifically, vaccinated individuals reported higher risk perception toward the pandemic \( (M = 1.26, SD = 1.44) \) while unvaccinated individuals reported higher risk perception toward the vaccines \( (M = -0.62, SD = 1.68) \).

H8 asked if the two groups are distinct in their various risk mitigation behaviors. Indeed, the two groups differed in their vaccination intention, \( t(1530) = 48.22, p = 0.001 \), preventive personal behaviors, \( t(1530) = 13.06, p = 0.001 \), and risky social behaviors, \( t(1530) = -3.42, p = 0.001 \). As opposed to their unvaccinated counterparts, vaccinated individuals reported higher vaccination intention \( (M = 5.35, SD = 0.91 vs. M = 2.38, SD = 1.41) \) and practiced more preventive personal behaviors \( (M = 4.11, SD = 0.86 vs. M = 3.40, SD = 1.21) \); they also participated in fewer risky social activities \( M = 3.02, SD = 1.19 vs. M = 3.22, SD = 1.20 \). Thus, H8 was supported.
H9 examined differences in emotional responses between the two groups. The two groups differed on both affect, $t(1530) = -18.23, p = 0.001$, negative emotions, $t(1530) = 10.82, p = 0.001$, and positive emotions, $t(1530) = -12.19, p = 0.001$. Compared to unvaccinated individuals, vaccinated individuals felt more positive affect ($M = -1.68, SD = 1.67$ vs. $M = -0.29, SD = 1.31$), more positive emotion toward the vaccines ($M = -0.76, SD = 1.25$ vs. $M = -0.08, SD = 0.95$), and more negative emotion toward the pandemic ($M = 0.93, SD = 1.38$ vs. $M = 0.26, SD = 1.07$). Therefore, H9 was supported.

4.3. Research Question

Finally, we queried how risk characteristics along the dread and unknown dimensions influenced Americans’ risk perception of the COVID-19 pandemic and the COVID-19 vaccines. All models included demographics as control variables. First, catastrophic potential, uncontrollability, dread, and severity were positively associated with risk perception of the pandemic. Second, whereas immediacy and unknown to the public were negatively associated with risk perception of the pandemic, novelty was positively associated with risk perception of the pandemic. In both models, participants who were females, non-White, Democrat, with K-12 school-aged children reported higher risk perception of the pandemic. In comparison, dread, severity, immediacy, unknown to the public, unknown to scientists, and novelty were positively associated with risk perception of the vaccines. These models revealed that participants who were females, White, Republican, with lower income and K-12 school-aged children reported higher risk perception toward the vaccines. Table V presents these regression results.

5. DISCUSSION

Applying the psychometric paradigm to an ongoing public health crisis, the present research theoretically establishes the characterization of dread and unknown risks of the COVID-19 pandemic and the COVID-19 vaccines. We first test if Americans perceive different risk characteristics for the two risk events. Indeed, our participants state each characteristic of dread risk (catastrophic potential; uncontrollability; dread; severity; involuntariness) and unknown risk (immediacy; unknown to the public; unknown to scientists; novelty) as distinct between the pandemic and the vaccines. Overall, they report more dread risk toward the pandemic and more unknown risk toward the vaccines. Specific risk characteristics associated with the pandemic and the vaccines are also interesting. On the one hand, it makes sense that evaluations of the pandemic as an event high in catastrophic potential (i.e., killing a large number of people all at once), dreadful, severe, and out of control increase participants’ risk perception of the pandemic. On the other hand, delayed manifestation of harm (i.e., low immediacy) and more known to the public decrease their risk perception of the pandemic. This seems conceivable because most Americans have lived alongside the pandemic for over a year. Nevertheless, belief that the pandemic still involves novelty, perhaps due to the new variants, is positively associated with risk perception of the pandemic. As expected, when participants appraise the vaccines as dreadful, with fatal consequences, as well as unknown and novel, they are more likely to report higher risk perception of the vaccines.

To some degree, these findings parallel the volatile nature of this crisis. In May 2021, when our data were collected, more COVID-19 variants have emerged globally (Berger, 2021; Kottasová & McKenzie, 2021). In the United States, the pandemic already claimed a death toll higher than many recent wars combined (Waxman & Wilson, 2021). Together, these facts could elicit strong visceral reactions of dread among the participants. Conversely, news of blood clots associated with the Johnson & Johnson vaccine (Ledford, 2021; World Health Organization [WHO], 2021) probably increased perceived unknownness of the vaccines. We also note some demographic differences in risk perception that are consistent with empirical research (e.g., Rana, Bhatti, Aslam, Ahmad, & Shah, 2021) and public opinion polls (e.g., CDC, 2021c; KFF, 2021b). In particular, females, minorities, and Democrats tend to report higher risk perception toward the pandemic. Those who earn lower income frequently cite concerns about fair distribution of health services, which in turn may increase their risk perception of the vaccines. Moreover, as vaccines for younger children have not been approved by the FDA, it is natural for parents to perceive higher risk perception toward both risk events.

Another prime contribution of this work is the direct comparison of the COVID-19 pandemic and the COVID-19 vaccines to efficaciously gauge risk perception and decision making related to vaccination. For vaccination intention and maintenance of preventive behaviors, results highlight that dread
Table V. Hierarchical Regression Analyses Evaluating Dread and Unknown Risks as Predictors of Risk Perception

| Measures                          | $R$  | $R^2$ | $\Delta R^2$ | $\Delta F$ | $\beta$ |
|-----------------------------------|------|-------|---------------|------------|---------|
| 1. Demographic                    | 0.17 | 0.16  | 0.17          | 43.87      | ***     |
| Age                              | 0.01 | **    |               |            |         |
| Female                           | 0.07 | ***   |               |            |         |
| White                            | −0.11| ***   |               |            |         |
| Political affiliation             | 0.33 | **    |               |            |         |
| Education                         | 0.02 | ***   |               |            |         |
| Household income                  | −0.01| ***   |               |            |         |
| K-12 school-aged children         | 0.08 | ***   |               |            |         |
| Children                         | 0.13 | ***   |               |            |         |
| 2. COVID-19                       | 0.36 | 0.36  | 0.20          | 92.10      | ***     |
| Pandemic dread risk               | 0.08 | **    |               |            |         |
| Catastrophic potential            | 0.10 | **    |               |            |         |
| Controllability                   | 0.34 | ***   |               |            |         |
| Dread                             | −0.04| **    |               |            |         |
| Severity                          |       |       |               |            |         |
| Involuntariness                   |       |       |               |            |         |

| Measures                          | $R$  | $R^2$ | $\Delta R^2$ | $\Delta F$ | $\beta$ |
|-----------------------------------|------|-------|---------------|------------|---------|
| 1. Demographic                    | 0.41 | 0.17  | 0.17          | 43.87      | 0.01    |
| Age                              | 0.07 | **    |               |            |         |
| Female                           | −0.11| ***   |               |            |         |
| White                            | 0.33 | ***   |               |            |         |
| Political                         | 0.02 | **    |               |            |         |
| Affiliation                       | −0.01| ***   |               |            |         |
| Education                         | 0.08 | ***   |               |            |         |
| Household income                  | −0.12| ***   |               |            |         |
| Income                           | −0.16| ***   |               |            |         |
| K-12 school-aged children         | −0.04| **    |               |            |         |

(Continued)
Table V. (Continued)

| Measures                  | R    | R²   | ΔR²  | ΔF    | β     | Measures                  | R    | R²   | ΔR²  | ΔF    | β     |
|---------------------------|------|------|------|-------|-------|---------------------------|------|------|------|-------|-------|
| 1. Demographic            | 0.29 | 0.08 | 0.08 | 19.36 | −0.05 | 1. Demographic            | 0.28 | 0.08 | 0.08 | 18.55 | −0.05 |
| Age                       | 0.07 | *    |      |       |       | Age                       | 0.07 | *    |      |       |       |
| Female                    | 0.10 | ***  |      |       |       | Female                    | 0.07 | ***  |      |       | ***   |
| White                     | −0.18| ***  |      |       |       | White                     | 0.10 | ***  |      |       | ***   |
| Political affiliation     | −0.02| ***  |      |       |       | Political affiliation     | −0.17| ***  |      |       | ***   |
| Education                 | −0.11| ***  |      |       |       | Education                 | −0.02| ***  |      |       | ***   |
| Household income          | 0.14 | ***  |      |       |       | Household income          | −0.11| ***  |      |       | ***   |
| K-12 school-aged children | 0.02 | ***  |      |       |       | Household income          | 0.14 | ***  |      |       | ***   |
| children                  | 0.05 | ***  |      |       |       | income                    | 0.03 | **   |      |       |       |
| 2. COVID-19 vaccines      | 0.48 | 0.23 | 0.15 | 57.19 | 0.18  | 2. COVID-19 vaccines      | 0.39 | 0.15 | 0.08 | 31.69 | 0.14  |
| dread risk                | 0.26 |      |      |       |       | dread risk                | 0.08 |      |      |       |       |
| Catastrophic potential    | 0.03 |      |      |       |       | Catastrophic potential    |      |      |      |       |       |
| Controllability           |      |      |      |       |       | Controllability           |      |      |      |       |       |
| Dread                     |      |      |      |       |       | Dread                     |      |      |      |       |       |
| Severity                  |      |      |      |       |       | Severity                  |      |      |      |       |       |
| Involuntariness           |      |      |      |       |       | Involuntariness           |      |      |      |       |       |

Note.
*p < 0.05.
**p < 0.01.
***p < 0.001.
risk seems more salient than unknown risk in determining risk perception. Perception of higher dread risk toward the pandemic influences risk mitigation behaviors. On the contrary, there are mixed results for unknown risk; higher unknown risk of the pandemic is not correlated with preventive personal behaviors. Although quite unexpected, this set of results is not surprising due to the fluctuating guidelines from the CDC for vaccinated individuals (CDC, 2021d). Further, emotional responses stimulated by the two dimensions are also interesting. Again, dread risk appears to be the stronger predictor. As participants experience more dread risk toward the pandemic, they feel less positive affect, less positive emotion, and more negative emotion toward the pandemic, as opposed to unknown risk. In addition, higher unknown risk toward the pandemic is not associated with participants’ negative emotion toward the pandemic, which could be attributed to the positive trajectory of vaccination rates in the United States in May (CDC, 2021b).

Theoretically speaking, the findings of the current research hitherto add to the extensive literature on the psychometric paradigm (Clahsen et al., 2018; de Vries et al., 2019; Priest, 2017; Savadore et al., 2004; Siegrist et al., 2005). Corroborating other scholarships on pandemics (Fung et al., 2011; Oh et al., 2015) and vaccinations (Marta et al., 2017; Raithatha et al., 2003), the current study extends the paradigm by comparing two interrelated risk objects while attempting to appraise them in parallel. Results on emotional responses toward the pandemic and the vaccines additionally support the importance of affect, emotion, and risk perception in these complex relationships (Finucane et al., 2000; Loewenstein et al., 2001; Slovic et al., 2002; Slovic et al., 2007).

In this research, we also query if vaccine status correlates with risk perception and risk mitigation behaviors. Indeed, there are significant differences between vaccinated and unvaccinated individuals across both samples. The two groups are distinct on all key variables. Most noteworthy are the mean differences between the two groups. For instance, regarding unknown risk, while vaccinated and unvaccinated individuals hold increased risk perception toward the vaccines, this effect was stronger among unvaccinated individuals. Whereas both groups experience more positive affect and positive emotion toward the vaccines, the vaccinated group indicates a stronger emotional response.

Taken together, this study bears important practical implications. First, it becomes apparent that dread risk reprises its role as a stronger predictor of risk perception and risk mitigation behavior. To this end, risk communication practitioners need to be aware of the unique risk attributes that influence people’s risk perception to better craft public health messaging in times of crisis. In the COVID-19 context, severity of consequences, catastrophic potential, controllability, and voluntariness are all important attributes that shape the public’s view of the pandemic as highly dreadful. Therefore, communication messaging should monitor the extent to which the target audiences see the pandemic as bearing severe future consequences that are uncontrollable. These perceptions are likely to determine whether people engage in adaptive or maladaptive behaviors (Witte & Donohue, 2000). That is, excessive dread and fear responses may activate defensive motivation and reduce people’s efficacy to engage in danger-control behaviors.

More importantly, there are differences in how vaccinated and unvaccinated individuals view the two risk events. For one, unvaccinated individuals perceive the vaccine as more “unknown,” therefore, communication messaging could leverage on this insight (e.g., highlight that mRNA technology has existed for a decade and is not completely novel) (e.g., Fanlund, 2021). Conversely, since vaccinated individuals perceive the pandemic as more “unknown,” they might be more sensitive to the new variants of the COVID-19 virus or daily developments related to the pandemic. For instance, despite the CDC’s current recommendation that fully vaccinated individuals can now resume the same activities as prior to the pandemic such as not needing to wear a mask or staying six feet apart from others (CDC, 2021d), it is highly likely that this group will continue to adhere to preventive guidelines (e.g., Green, 2021; Sanchez & Vargas, 2021). Moreover, in an increasingly hyper-partisan society like the United States (Slovic, 2021), emerging research shows that difference in risk perception and preventive behaviors in the context of COVID-19 are often motivated by political ideology (Gallup, 2021; see also Nowlan & Zane, 2020). It is therefore inherently critical to first understand the audience prior to any dissemination of health and risk related information to the public.

Leveraging on insights from our research, we offer two communication strategies to promote COVID-19 vaccine uptake. The first is to source for a common adversary. Amalgamating two
dissimilar groups (e.g., vaccinated versus unvaccinated; Republicans versus Democrats) may depend on locating a third, more loathed common adversary. The clear adversary here is the virus. Nevertheless, portraying the pandemic as something that is threatening will only work if the two groups recognize it as real and dangerous. Currently, the vaccinated group perceive the pandemic as more dreadful, and the unvaccinated group perceive the vaccines as more unknown. Therefore, the most applicable adversaries might be downstream effects such as concentrating on vaccines as a solution to restart the economy by getting Americans back to work or making a communal effort to rival other countries to return to normalcy.

The second strategy is to avoid delivering fragmented risk information. Information about vaccine development is typically disseminated slowly to the public in a good effort to expand transparency for the scientific community (e.g., Petersen, Bor, Jørgensen, & Lindholt, 2021). Nonetheless, new research (Wood & Schulman, 2021) shows that relaying such information in a piecemeal fashion may harm the potential adoption of biotechnological innovations. The lay public are less likely to embrace a new technology if risk information is given in a fragmented way because they are highly reactive to probable side effects. Though the discussion of the efficacy and safety of the COVID-19 vaccines is essential, policymakers and practitioners should recognize that feeding information bit by bit can inexplicably impact the public. Further, many participants in this study view the vaccines as a highly unknown intervention, perhaps due to the immediate media frenzy in praising the novel application of the mRNA technology when the vaccines were first introduced. Altogether, heeding to the unintended effects of risk communication may prove helpful to aid COVID-19 vaccination uptake.

As with all studies, this research has its limitations. The constantly evolving nature of the COVID-19 pandemic and the COVID-19 vaccines, including the frequent updates in health recommendations from the CDC (2021d) render limited generalizability to our findings. Second, we acknowledge the cross-sectional nature of our survey. Future research should consider longitudinal surveys with panel design or experimental works to establish causality. Utilizing thought-listing measures could also substantiate quantitative results related to the psychometric paradigm. Lastly, we used age, gender, race, and political affiliation as quota variables, but the household income of the final sample was lower than census data (United States Census Bureau Data, 2019). Therefore, our sample overrepresented Americans with lower household income. Readers should use caution when interpreting our findings.

In conclusion, this study characterized risk perceptions of the COVID-19 pandemic and the COVID-19 vaccines along the dread and unknown dimensions of the psychometric paradigm. We examine if mental risk comparisons of the two risk events would spur various vaccine-related decisions among unvaccinated and vaccinated Americans. Our results reveal critical differences in the types of risk characteristics that determine risk perception. In particular, dread risk appears to be more prominent in influencing risk perception and risk mitigation behaviors. As COVID-19 vaccination continues to roll out in the United States, we must comprehend why a segment of the population remain reluctant to get vaccinated. Results from this study indicate that difference in the way in which people perceive the pandemic versus the vaccines may contribute to this vaccine hesitancy. Barring the common reasons cited for not getting vaccinated (e.g., side effects; lack of trust, KFFa, 2021), the current research presents an alternative angle to understand vaccine hesitancy during an ongoing crisis.

ACKNOWLEDGEMENTS

This research was funded by the National Science Foundation, #2117257.

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