

# Fast and Frugal: Information Processing Related to The Coronavirus Pandemic

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This research focuses on three factors that influence how individuals cognitively process information related to the coronavirus outbreak. Guided by dual-process theories of information processing, we establish how the two different information processing modes (system 1: heuristic processing; system 2: systematic processing) are influenced by individuals' responsibility attribution, discrete negative emotions, and risk perception. In an experiment, participants were exposed to a news article that either blames China ( $n = 445$ ) or does not blame China ( $n = 498$ ) for the pandemic. Results reveal that exposure to the responsibility attribution frame led individuals to engage in more heuristic processing, but it did not influence systematic processing. Discrete negative emotions and risk perception mediated the relationship between responsibility attribution and information processing. The indirect relationships suggest a more intricate process underlying heuristic processing and systematic processing. In particular, information processing styles seem to be determined by social judgment surrounding the coronavirus pandemic.

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**KEY WORDS:** Coronavirus pandemic; discrete emotions; information processing; responsibility attribution; risk perception

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## 1. INTRODUCTION

The 2019 novel coronavirus outbreak is an ongoing global pandemic. First identified in Wuhan, Hubei, in December 2019, it has since spread to other countries, some of which are currently experiencing widespread community transmission, including the United States (Lipsitch, Phil, Swerdlow, & Finelli, 2020; World Health Organization [WHO], 2020). There are now more than 18 million confirmed cases and at least 710,564 individuals have died from COVID-19, the disease caused by the novel coronavirus (WHO, 2020).

In the United States, the Center for Disease Control and Prevention (CDC) reports 4,802,491 total cases and 157,631 deaths across all 50 states (CDC,

2020). The U.S. President issued a state of national emergency over the coronavirus pandemic on March 13 (Hawkins, Berger, Iati, Kornfield, & Shammas, 2020). Responding to this crisis, public health efforts to contain and manage COVID-19 include national pandemic preparedness and response plans, travel bans and restrictions, quarantines, curfews, event postponements and cancellations, and facility closures. Further, most schools and universities have closed and/or shifted to remote learning (CDC, 2020; Goldstein, 2020).

To date, the U.S. public have demonstrated mixed responses to the coronavirus pandemic. At the societal level, social and economic instability continue to surface (Glassman, 2020). Several incidents caused by xenophobia and racism have occurred (Lee, 2020). There has also been indefinite closure of religious institutions (Bach, 2020). Misinformation and conspiracy theories about the virus are widespread online (Sharma, 2020). At the individual level, an increasing number of individuals are panic buying (i.e., irrationally stockpiling daily necessities like toilet paper) at supermarkets and grocery stores.

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[Correction added on February 4, 2021 after first online publication: The order of the fourth author's forename and surname was corrected.]

Others hoard face masks that consequently raise prices of these essential items for frontline healthcare workers who need them more (Lufkin, 2020).

Indeed, the protean nature of the coronavirus pandemic elicits these very “human” responses as deep uncertainty concerning the trajectory of the outbreak permeates the public sphere. Moreover, individuals are constantly exposed to news media that relay information on the pandemic (Fisher, 2020). Thus, there is a need to better understand how the U.S. public deals with information about the pandemic. Specifically, it is vital to examine the cognitive, psychological, and emotional precursors of information processing because it is an important communication behavior that contributes to attitude formation (Petty & Caccioppo, 1986). In particular, people’s interpretation of information influences their subsequent judgement. For instance, since systematic processing involves more cognitive effort and deliberation, it may override biases and repel against snap judgement. To illuminate our understanding of the variations in the U.S. public’s information processing, the current research focuses on three variables—responsibility attribution, discrete emotions, and risk perception.

## 2. LITERATURE REVIEW

### 2.1. Dual-Process Theories of Information Processing

Individuals process information under the constraints of their cognition. Dual-process theories explain how information processing entails two distinct processes: (1) system 1: heuristic processing, and (2) system 2: systematic processing (Chaiken, Liberman, & Eagly, 1989; Eagly & Chaiken, 1993; Kahneman, 2011).

#### 2.1.1. Heuristic Processing

Heuristic processing (system 1) is fast, intuitive, and emotional. Its nonanalytical operation involves an activation and application of heuristics, otherwise known as mental shortcuts (Chaiken et al., 1989; Eagly & Chaiken, 1993; Kahneman, 2011). These mental shortcuts, like the schemata or other knowledge structures, are learned and stored in memory (Chen, Duckworth, & Chaiken, 1999). Hence, this mode provides individuals with an economic advan-

tage as minimal cognitive resources are required (Chaiken, 1980).

Further, three conditions facilitate heuristic processing. Availability, the first condition, is the heuristic structure stored in memory for future purposes. The second condition, accessibility, is the ability to recall and retrieve the heuristic structure from memory for use at a later time. Applicability, the third condition, refers to the relevancy of the heuristic structure from memory that is applied to the judgmental task at hand (Chen et al., 1999). On the whole, the engagement of the heuristic structure means that individuals who partake in heuristic processing are likely to be in consensus with information delivered by experts or endorsed by others. Notably, they do so without the complete evaluation of the semantic content of the information (Eagly & Chaiken, 1993). In the heuristic mode, the focus is thus on a subset of information that permits individuals to employ simple decision rules to form a judgement, especially in events or situations of uncertainty (Tversky & Kahneman, 1974).

#### 2.1.2. Systematic Processing

Conversely, systematic processing (system 2) is slow, rational, and effortful. Its analytical operation depends on a careful deliberation of information by individuals (Chaiken et al., 1989; Eagly & Chaiken, 1993; Kahneman, 2011). Whereas heuristic processing makes light of the detailed assessment of information, systematic processing stresses a fully cogent evaluation of the information. Consequently, this mode of processing demands increased cognitive resources (Chaiken, 1980).

In addition, individuals usually turn to the semantic content of the information to ascertain its validity. In the systematic mode, the arrival of judgement for individuals is heavily reliant on the scrutiny of whether relevant information is congruent with content that is already provided (Chen et al., 1999). As information on the pandemic proliferates, individuals are inundated with different news from various media outlets at an unprecedented rate (WHO, 2020). Therefore, it is important to examine psychological processes that influence information processing modes. Below, we review three relevant processes.

## 2.2. Attribution of Responsibility

Extant research across disciplines has examined how society attributes responsibility toward social

problems (e.g., climate change; gender inequality; obesity) (Niederdeppe, Roh, & Shapiro, 2015; Rickard et al., 2017). Since Iyengar's (1991) seminal study of responsibility framing and Weiner's (1995) work on attribution theory, subsequent studies have focused on both societal-level and individual-level consequences of responsibility attribution. The question of responsibility is one of the principal concepts in the understanding of policy making, social behavior, and interactions, and most importantly, the appraisal of other individuals. In framing of responsibility, the primary function is to present/elevate the salience of specific issues (i.e., suggesting what the issue concerns, who is the cause of it, and offering potential solutions) to the public. In turn, this prompts schemas that reorient individuals to process information in a certain way (Entman, 2007; Kim, Scheufele, & Shanahan, 2002; mental disabilities of the abused) that negates the necessity of societal intervention (Mastin, Choi, Barboza, & Post, 2007; Weiner, 1995). For example, a content analysis of media coverage on elder abuse from 2003 to 2005 found that most news frames elder abuse as an individual-level problem (i.e., describing it as individuals' misbehaviors such as fraud). With the power to frame the question of responsibility, media portrayals thus influence how individuals think, feel, and form social judgments on the causes of and solutions to social problems (Iyengar, 1991).; Further, two competing views on responsibility attribution exist (Weiner, 1995). The first view states that the root cause of a social problem is attributed to the deficiencies of individuals (e.g., the lack of effort), especially those who are affected by the problem. The opposing view states that the root cause of a social problem is attributed to faults in social conditions (e.g., unethical business practices, unsafe environments) (Weiner, 1995). In line with Weiner's postulation, Iyengar (1991) contends that the media regularly employ episodic framing, in which the selected topic applies to a specific event or an individual case. Therefore, attention is focused on other individuals' accountabilities and accordingly displaces attention away from larger social conditions. Conversely, thematic framing is less commonly employed, as the selected topic entails a more abstract social context that requires individuals to interpret socially oriented causes and solutions (Iyengar, 1991). In other words, attention and problem-solving responsibilities are placed on the society at large, rather than borne by individuals.

Applied to research, numerous studies in health and risk communication have investigated the ef-

fects of responsibility attribution. In particular, Griffin et al. (2008) conceptualized attribution as contributing to perceived hazard characteristics, a key concept in the risk information seeking and processing (RISP) model (Griffin, Dunwoody, & Neuwirth, 1999). For instance, a health causation study found that participants recognize different layers of responsibility (i.e., government; individual) toward health disparity (Lundell, Niederdeppe, & Clarke, 2013). In particular, compared to individual responsibility attribution, governmental responsibility attribution promotes greater support for obesity prevention in children. Another study reveals that responsibility attribution contributes to individuals' perception about flooding risks in an urban watershed, which subsequently influence the way in which they process relevant information (Griffin et al., 2008). However, Griffin et al. (2008) do not report the unique contribution of attribution to information processing. Other works on responsibility attribution in risk management focus on risk perception and behavior response in distinct contexts ranging from floods (e.g., Kievik & Gutteling, 2011), earthquakes (e.g., Paton, Bajek, Okada, & McIvor, 2010), to hurricanes (e.g., Rickard et al., 2017). While these studies provide a solid foreground for our study, they also highlight the scant research related to the relationship between responsibility attribution and information processing. Most of the studies reviewed above focus on risk perception and policy support.

In early days of the coronavirus pandemic, several U.S.-based news media outlets published articles that attributed the responsibility of the outbreak to people in China and the Chinese government. For example, a news article in the *New York Times* by Buckley and Myers (2020) reported that "At critical turning points, Chinese authorities put secrecy and order ahead of openly confronting the growing crisis and risking public alarm or political embarrassment" (p. 1). Many other examples of these media portrayals and frames exist, such as the widely shared and criticized *Wall Street Journal* opinion piece titled "China is the Real Sick Man of Asia" (Mead, 2020). It is interesting to note that these patterns of responsibility attribution are posted by news media outlets that boast high readerships among the U.S. public. Importantly, individuals are spurred by their inherent desire to understand why unexpected and adverse events occur. In this process, they consult trusted information sources to help them understand the causes of events in order to maintain a good understanding of their world (Weiner, 1983).

However, news stories that apply a clear responsibility attribution framing do more than just informing people, they also influence people's decision making through information processing (Nisbet, 2009; Tversky & Kahneman, 1981).

The current study examines a potential causal relationship between responsibility attribution framing and information processing. Linking dual-process theories of information processing and responsibility attribution, we contend that participants exposed to a news article on the coronavirus pandemic that offers clear attribution of responsibility will engage in heuristic processing because this attribution framing offers a mental shortcut. The sheer volume of information on the pandemic determines that people will have to rely on mental shortcuts to process information. Moreover, people are inclined to apply heuristics during times of uncertainty (Tversky & Kahneman, 1974). Conversely, participants exposed to a news article on the coronavirus pandemic that does not offer clear attribution will engage in less heuristic processing or even more systematic processing. That is, without a clear attribution of responsibility frame, people may direct more cognitive resources to understand the semantic content of the article. Thus, we propose the first set of hypotheses:

**H1:** Compared to participants in the no-attribution condition, participants in the attribution of responsibility condition will engage in more heuristic processing.

**H2:** Compared to participants in the no-attribution condition, participants in the attribution of responsibility condition will engage in less systematic processing.

### 2.3. Discrete Emotions

An important consequence of responsibility attribution is emotional arousal. For instance, Griffin *et al.* (2008) found that attribution of flooding risks to poor government management was positively related to anger toward managing agencies, while attribution to people living near the river was negatively related to anger toward managing agencies. Discrete emotions are a transitory intense phenomenon directed at external stimulus (Nabi, 2003). Not to be confused with affect, discrete emotions are categorical feeling states that can stem from past events (e.g., Ebola) and/or prevailing events (e.g., COVID-19) (Angie, Connelly, Waples, & Kligyte, 2011). Such events have certain qualities that

stimulate the experience of specific emotions, each possessing distinct action tendencies. In this study, we propose discrete negative emotions as the first mediator between responsibility attribution and information processing.

Copious scholarship on discrete emotions and information processing suggests that the two modes of processing are affected by appraisal tendencies (Nabi, 2003; Tiedens & Linton, 2001). For example, Tiedens and Linton (2001) found that although both anger and sadness are negative emotions, anger leads to more heuristic processing because it is characterized by certainty appraisal, while sadness leads to more systematic processing when it is linked to an uncertain appraisal. Further, some emotions (e.g., fear, worry, hope, surprise) are generally associated with uncertainty, while others occur with a sense of certainty (e.g., anger, disgust, happiness, and content) (Ortony, Clore, & Collins, 1988; Roseman, 1984; Scherer, 1984; Smith & Ellsworth, 1985).

Further, risk communication research shows that discrete emotions influence individuals' attitudes and behaviors on social issues ranging from climate change (e.g., Chu & Yang, 2019) to immigration (e.g., Lecheler, Bos, & Vliegenthart, 2015). Specific to discrete emotions in a public health crisis context, one study found that undergraduate participants experienced more positive emotions such as interest and curiosity (i.e., measured as a general state experienced during the crisis as opposed to emotions directed at specific actors) than negative emotions during the H1N1 influenza pandemic (Kim & Niederdeppe, 2013). Not only were valenced emotions strongly associated with responsibility attribution, they also mediate the relationship between responsibility attribution and relational trust and willingness to seek information (Kim & Niederdeppe, 2013), corroborating Weiner's (1983) postulation that responsibility attribution influences emotions evoked by crisis-related events. Taken together, we expect responsibility attribution to influence discrete emotion, which is the first mediator in our proposed theoretical model.

### 2.4. Risk Perception

Risk perception is proposed as a second mediator between responsibility attribution and information processing. Since Fischhoff, Slovic, Lichtenstein, Read, and Combs (1978) pivotal work on the psychometric model, the interaction between emotions and risk perceptions is often examined. The

psychometric paradigm states that risk is characterized by the *unknown* factor and the *dread* factor (Slovic, 1987). Specifically, the dread factor involves people's emotional reactions to risk. Events such as the coronavirus pandemic are inextricably tied to perceived uncontrollability, catastrophic potential, fatal consequences, and involuntary exposure (Slovic, 2010). Subsequent models (e.g., risks-as-feelings by Loewenstein, Weber, Hsee, & Welch, 2001; affect heuristics by Finucane, Alhakami, Slovic, & Johnson, 2000) underline the significant contribution of emotion in risk perception.

Several studies have demonstrated the close connection between emotions and risk perception. For example, a study on safety in an industrial company shows that worry is a significant predictor of employees' risk judgment (Rundmo, 2000). Another study demonstrates that participants' emotional responses toward food safety incidents elevate their risk perception (Mou & Lin, 2014). Of more relevance to the current research context, a recent study on discrete emotions indicates that fear, anger, anxiety, disgust, and sadness positively correlate with the U.S. public's risk perception about the Ebola outbreak (Yang & Chu, 2016). Taken together, these studies suggest that risk perception is shaped by emotions, and it subsequently influences how people process risk-related information. Thus, we expect discrete emotion to influence risk perception, which is the second mediator in our proposed model.

To summarize our theoretical arguments, recall the hypotheses that participants who are exposed to a news article with an overt responsibility attribution framing will engage in more heuristic processing and less systematic processing. Accordingly, we expect that discrete emotions may also serve as mental shortcuts that influence information processing. Second, the coronavirus pandemic provides a unique context to examine people's reliance on discrete emotions in information processing because emotions offer an efficient pathway for people to navigate a complex, uncertain, and risky event (Slovic & Peters, 2006). Research also suggests that discrete emotions guide individuals' general risk perception as people make risk judgment not only based on probabilities or actuaries (i.e., benefits and costs), but also based on how they feel about it (Alhakami & Slovic, 1994; Slovic & Peters, 2006). Therefore, we further hypothesize:

**H3:** Discrete negative emotions and risk perception will mediate the relationship be-

tween attribution of responsibility and information processing in a serial manner.

### 3. METHOD

#### 3.1. Research Design

At the end of February 2020, we conducted a one-way between-subjects experiment to test the hypotheses. Based on random assignment, all participants were exposed to one of two versions of a news story about the coronavirus outbreak. Data were collected from a U.S.-based adult sample ( $N = 1,303$ ) recruited through Amazon's Mechanical Turk (MTurk), an online crowdsourcing platform that allows researchers to recruit workers registered on the site to complete tasks (Paolacci, Chandler, & Ipeirotis, 2010). We specified greater than 95% past approval rate to ensure high-quality responses. All participants who completed the study received \$1 as compensation. The median study completion time was approximately 15 minutes. All research procedure was approved by the institutional review board (IRB) at the authors' institution. We included an attention check question to filter out participants who were not able to correctly answer whether the WHO says that China is responsible for the coronavirus outbreak based on the article they read, which reduced the effective sample size to 943.

#### 3.2. Sample

Participants' age ranged from 19 to 87 years ( $M = 40.50$ ,  $SD = 12.94$ ). The sample was predominantly White ( $n = 697$ , 75.1%), followed by Black or African American ( $n = 86$ , 9.3%), Asian ( $n = 62$ , 6.7%), Hispanic or Latino ( $n = 59$ , 6.4%), and other ( $n = 24$ , 2.6%). There was a fairly even split between females ( $n = 463$ , 50.1%) and males ( $n = 465$ , 49.9%). Among the participants, the majority ( $n = 400$ , 43.1%) held a four-year college degree, 21.2% ( $n = 197$ ) received some college education, 14.3% ( $n = 133$ ) had a Master's degree, 9.2% ( $n = 85$ ) held a high two-year college degree, 8.9% ( $n = 83$ ) received high school/GED, 3% ( $n = 28$ ) had a doctoral degree, and 0.2% ( $n = 2$ ) received less than high school education. In addition, the median household income was in the bracket of \$50,000–\$74,999. In terms of political ideology, the majority of ( $n = 413$ , 44.6%) of participants were liberal, 296 (32%) were independent, and 216 (23.4%) were conservative.

Our sample demographics are reflective of individual characteristics associated with MTurk workers such as being more highly educated (Follmer, Sperling, & Suen, 2017) and more liberal (Berinsky, Huber, & Lenz, 2012). Table I shows demographic composition of our sample as compared to the latest census data (Gallup, 2019; United States Census Bureau, 2019).

### 3.3. Procedure

At the beginning of the study, all participants ( $N = 943$ ) were presented with the informed consent form and a set of instructions regarding the procedure of the experiment. They were then randomly assigned to read either a news article on COVID-19 with the responsibility attribution ( $n = 445$ ) or a news article on COVID-19 without the responsibility attribution ( $n = 498$ ). The experimental stimulus with the responsibility attribution was titled “When it comes to Coronavirus, China is very different from America, and WHO says China is responsible,” and concluded with a statement that read, “In the midst of the chaos, the WHO has released a statement that the people in China *should take responsibility* for the coronavirus outbreak.” The other condition was titled “When it comes to Coronavirus, China is very different from America, and WHO says China is not responsible,” and concluded with a statement that read, “In the midst of the chaos, the WHO has released a statement that the people in China *should not be blamed* for the coronavirus outbreak.” The news articles follow the format of a standard Associated Press story. See the experimental stimuli in the Appendix. Having read the stimuli message, participants then answered a four-item measure on responsibility attribution that served as manipulation check.

Following the manipulation check, they completed the questionnaire in the following order: (1) information processing, (2) risk perception, (3) discrete emotions, and (4) demographics/other control variables. Upon completion of the study, all participants were directed to a debriefing page detailing the purpose of the experiment and informed of the manipulated component in the stimuli. They also received validation codes for MTurk verification.

### 3.4. Measures

#### 3.4.1. Manipulation Check

A four-item measure (Cronbach’s  $\alpha = 0.86$ ) rated on a 7-point Likert scale from 1 = strongly

disagree to 7 = strongly agree assessed participants’ attribution of responsibility ( $M = 3.73$ ,  $SD = 1.57$ ). An example item is, “In my opinion, the Chinese people are responsible for the coronavirus outbreak.” A higher mean on this scale reflects a higher level of responsibility attribution.

#### 3.4.2. Information Processing

Ten items adopted from previous research (Kahlor, Dunwoody, Griffin, Neuwirth, & Giese, 2003; Yang, 2019) were employed to measure information processing (seven-point Likert scale from 1 = strongly disagree to 7 = strongly agree). We conducted an exploratory factor analysis to verify measurement validity (Table II). Based on the factor analysis, two composite indices were created to evaluate heuristic processing ( $M = 2.70$ ,  $SD = 1.17$ ,  $\alpha = 0.79$ ) and systematic processing ( $M = 5.38$ ,  $SD = 0.90$ ,  $\alpha = 0.72$ ). A higher score on these indices reflects higher levels of heuristic processing or systematic processing respectively.

#### 3.4.3. Risk Perception

A four-item measure ( $\alpha = 0.85$ ) rated on a 7-point Likert scale from 1 = not at all concerned/serious/likely to 7 = extremely concerned/serious/likely assessed participants’ risk perception (Leiserowitz, 2006). These items capture both the personal and impersonal aspects of risk perception (Kahlor, Dunwoody, Griffin, & Neuwirth, 2006), which was deemed appropriate because the coronavirus outbreak had not affected the United States as much as it has now at the time of data collection. A higher mean on these scales reflect a higher level of risk perception ( $M = 4.37$ ,  $SD = 1.31$ ).

#### 3.4.4. Discrete Negative Emotions

A seven-item measure ( $\alpha = 0.91$ ) rated on a 10-point scale from 1 = none of this feeling to 10 = a lot of this feeling evaluated participants’ discrete emotions (Nabi, Gustafson, & Jensen, 2018). See Table III for exploratory factor analysis result, which indicates all seven discrete negative emotions loaded on the same factor ( $M = 4.33$ ,  $SD = 2.20$ ).

Table IV shows all measures in their original wording and descriptive statistics.

**Table I.** Sample Demographics as Compared to the 2019 Census Data

	Sample Demographics (N = 943)		2019 Census Data (N = 308,745,538)	
	N	%	N	%
<b>Race</b>				
White	697	75.1	235,572,845	76.3
Black or African American	86	9.3	41,371,902	13.4
Asian	62	6.7	18,215,987	5.9
Hispanic or Latino	59	6.4	57,117,925	18.5
Other	24	2.6	50,325,523	16.3
<b>Gender</b>				
Female	463	50.1	156,842,733	50.8
Male	465	49.9	151,902,804	49.2
<b>Education</b>				
Four-year college degree	400	43.1	97,254,844	31.5
Some college education	197	21.2	270,769,837	87.7
Master's degree	133	14.3		
Two-year college degree	85	9.2		
High school/GED	83	8.9		
Doctoral degree	28	3		
Less than high school education	2	0.2		
<b>Household Income</b>				
Median		\$50,000–\$74,999		\$60,293
<b>Political Ideology<sup>a</sup></b>				
Liberal	413	44.6	1,810	24
Independent	296	32	10,150	35
Conservative	216	23.4	10,730	37

<sup>a</sup>Data for political ideology came from the 2019 Gallup survey.

**Table II.** Factor Analysis of Information Processing Items

Items	Factor Loadings	
	Factor 1 Heuristic Processing	Factor 2 Systematic Processing
I thought about what actions I might take based on what I read.	0.013	0.787
I thought about how the article related to other things I know.	-0.015	0.691
I tried to think about the importance of the information.	-0.348	0.641
I tried to relate the ideas in the article to my life.	-0.068	0.800
I read the article carefully.	-0.509	0.299
I skimmed through the article.	0.801	0.013
I did not spend much time thinking about what I read.	0.802	-0.123
I did not think about how the article related to my life.	0.598	-0.387
I did not think about the arguments presented in the article.	0.753	-0.056
I focused on only a few points.	0.650	0.056
Sum of squared loadings	3.02	2.41
Percentage of variance	30.2	24.1

Note. Principle components extraction. Varimax rotation with Kaiser rotation.

**Table III.** Factor Analysis of Discrete Negative Emotions

Items	Factor Loadings Factor 1
Sadness	0.676
Fear	0.903
Anxiety	0.873
Anger	0.730
Disgust	0.660
Worry	0.880
Distressed	0.905
Sum of squared loadings	4.60
Percentage of variance	65.7

Note. Principle components extraction.

### 3.5. Data Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 26. Before performing more advanced statistical analyses, we used one-way ANOVA and chi-square tests to ascertain successful random assignment and experimental manipulation, as well as to evaluate the first two hypotheses. Then, serial mediation analyses were conducted using SPSS PROCESS macro version 3.4 Model 6 (Hayes, 2018) to test the third hypothesis, using 5,000 bootstrap resamples with a 95% confidence interval.

## 4. RESULTS

### 4.1. Manipulation Check

One-way ANOVA confirmed a significant mean difference between the two conditions on attribution

of responsibility,  $F(1, 941) = 58.36, p = 0.001$ , and  $\eta^2 = 0.06$ . Participants in the responsibility attribution condition were more likely to blame China for the coronavirus outbreak ( $M = 4.13, SD = 1.48$ ) than participants in the no-attribution manipulation ( $M = 3.37, SD = 1.57$ ).

### 4.2. Hypotheses

**H1** proposes that participants in the responsibility attribution condition will report more heuristic processing. One-way ANOVA confirms a significant mean difference between the two conditions for heuristic processing,  $F(1, 941) = 15.46, p = 0.001$ , and  $\eta^2 = 0.01$ . Participants in the responsibility attribution condition engaged in more heuristic processing ( $M = 2.84, SD = 1.17$ ) than participants in the no-attribution condition ( $M = 2.58, SD = 1.01$ ). Thus, **H1** was supported.

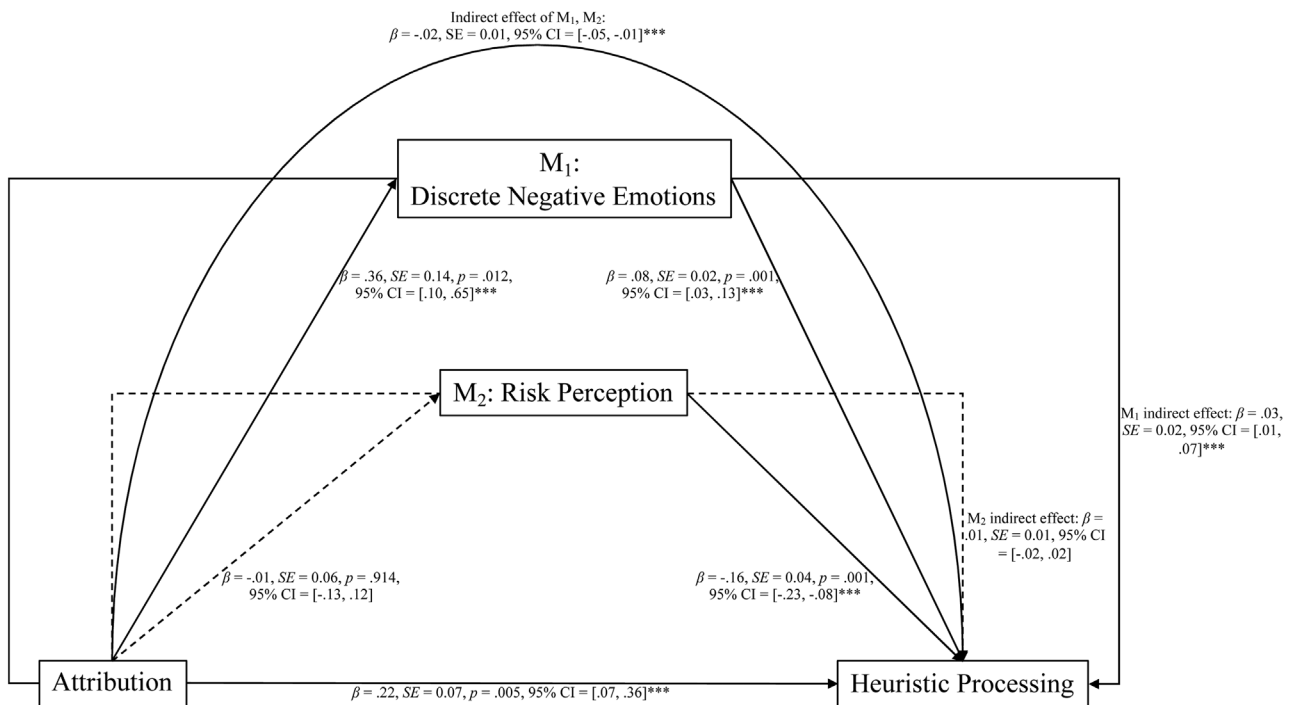
**H2** posits that participants in the responsibility attribution condition will report lower systematic processing. The same analytic procedure revealed no significant mean difference between the two conditions, lending no support to **H2**.

**H3** is focused on the mediation effect of discrete negative emotions and risk perception. First, and as expected, the serial mediation analysis showed support for the indirect effects of discrete negative emotions and risk perception as mediators between responsibility attribution and heuristic processing, after controlling for individual characteristics,  $\beta = -0.02, SE = 0.01, 95\% CI = [-0.05, -0.01]$ . That is, the effect of responsibility attribution on heuristic processing worked through discrete negative emotions



**Table IV.** Survey Measures and Descriptive Data

Concept	Measures	M	SD	
Manipulation Check (1–7 scale)	Please indicate how much you agree or disagree with the following statements:			
	In my opinion, the Chinese government should be blamed for the coronavirus pandemic.	4.28	1.89	
	In my opinion, the Chinese government is responsible for the coronavirus pandemic.	4.29	1.86	
	In my opinion, the Chinese people should be blamed for the coronavirus pandemic.	3.06	1.84	
	In my opinion, the Chinese people is responsible for the coronavirus pandemic.	3.29	1.88	
	Averaged scale	3.73	1.57	
	Information Processing (1–7 scale)	Now, please tell us your experience when reading the article:		
		Systematic Processing		
		I thought about what actions I might take based on what I read.	4.76	1.51
		I thought about how the article related to other things I know.	5.02	1.46
I tried to think about the importance of the information.		5.76	1.14	
I tried to relate the ideas in the article to my life.		5.02	1.43	
I read the article carefully.		6.36	0.85	
Averaged scale		5.38	0.90	
Heuristic Processing				
I skimmed through the article.		2.08	1.44	
I did not spend much time thinking about what I read.	2.36	1.55		
I did not think about how the article related to my life.	3.03	1.67		
I did not think about the arguments presented in the article.	2.69	1.54		
I focused on only a few key points.	3.34	1.68		
Averaged scale	2.70	1.17		
Risk Perception (1–7 scale)	Using the scale below, please tell us your general thoughts about the coronavirus pandemic:			
	How concerned are you about the coronavirus pandemic?	4.33	1.75	
	How serious of a threat do you believe the coronavirus pandemic is?	5.00	1.53	
	How serious are the current impacts of the coronavirus pandemic?	5.12	1.44	
	How likely do you think the coronavirus outbreak will affect you?	3.04	1.56	
	Averaged scale	4.37	1.31	
Discrete Negative Emotions (1–10 scale)	Now, we would like to understand how you feel about the coronavirus outbreak. Please use a number from 1–10, where 1 means you have “none of this feeling” and “10 means you have a lot of this feeling.”			
	Sadness	5.27	2.91	
	Fear	4.45	2.72	
	Anxiety	4.40	2.73	
	Anger	3.48	2.65	
	Disgust	3.38	2.69	
	Worry	5.06	2.76	
	Distressed	4.26	2.69	
	Averaged scale	4.33	2.20	



**Fig. 1.** Statistical model of the mediation effects of discrete negative emotions and risk perception. The curved line depicts the significant indirect effect on heuristic processing.

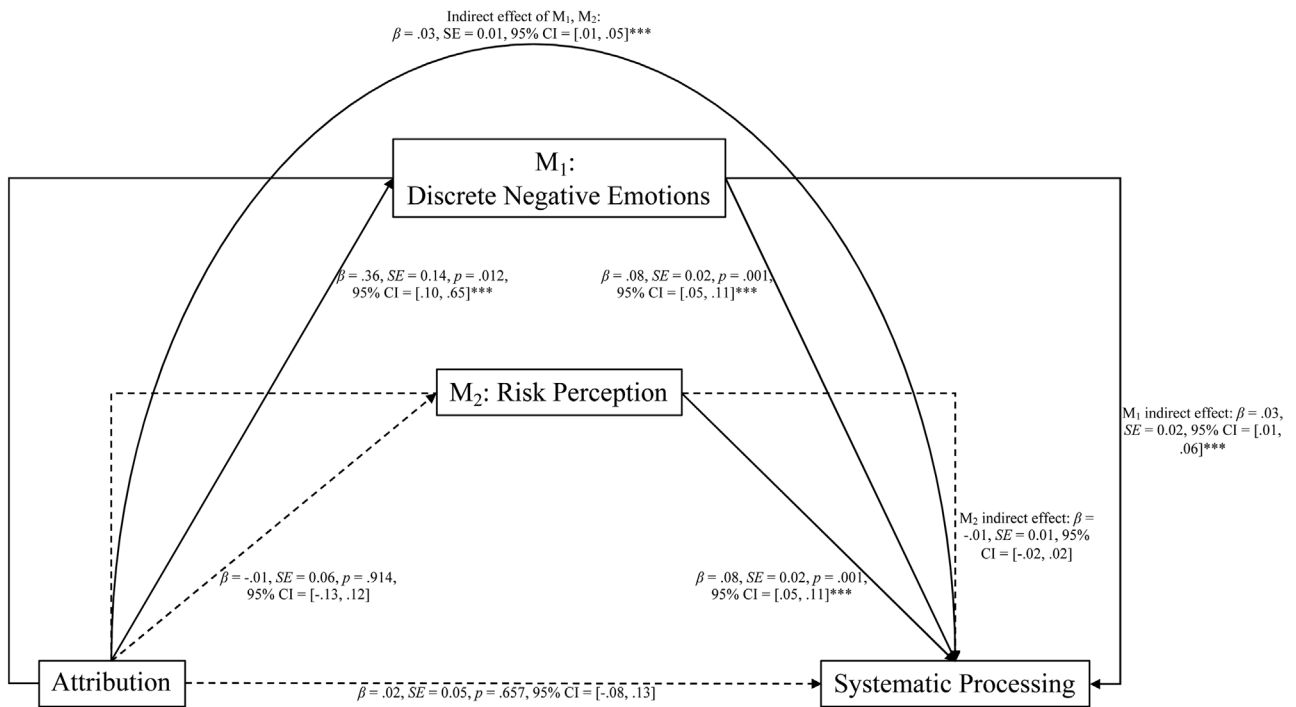
and risk perception (Fig. 1). Further, our mediation model revealed that younger participants ( $\beta = -0.10, p < 0.05$ ), those who were more highly educated ( $\beta = 0.10, p < 0.05$ ), as well as conservatives ( $\beta = 0.11, p < 0.05$ ) engaged in more heuristic processing.

A second serial mediation analysis provides support for the indirect effect of discrete negative emotions and risk perception as mediators between responsibility attribution and systematic processing, after controlling for individual characteristics,  $\beta = 0.03, SE = 0.01, 95\% CI = [0.01, 0.05]$ . Similarly, the effect of responsibility attribution on systematic processing worked through discrete emotions and risk perception (Fig. 2). In this mediation model, more highly educated participants ( $\beta = 0.09, p < 0.05$ ) partook in more systematic processing. Taken together, **H3** was supported.

## 5. DISCUSSION

Guided by dual-process theories of information processing, we examine how three psychological processes—responsibility attribution, discrete negative emotions, and risk perception influence heuristic and systematic information processing (Eagly & Chaiken, 1993; Kahneman, 2011) in the context

of the COVID-19 pandemic. First, we found that exposure to a responsibility attribution frame leads to more heuristic processing. We speculate that the recurrent media rhetoric blaming the Chinese government and people in China for the coronavirus outbreak (i.e., responsibility framing; Iyengar, 1991) contributes to this ready reliance on attribution of responsibility as a mental shortcut for information processing. Past research has shown that in time of uncertainty, people are more susceptible to heuristic cues (Feigenson & Park, 2006; Tversky & Kahneman, 1974). The ongoing COVID-19 pandemic inevitably contributes to a fast and frugal way of information processing. Moreover, when attribution of responsibility is explicitly stated in the news article, it may trigger other preexisting heuristics that are readily available, accessible, and applicable (Eagly & Chaiken, 1993). That is, for participants who already view people in China or the Chinese government as responsible for the COVID-19 pandemic, this responsibility attribution cue will lead them to process the news article in a heuristic manner. This finding has important practical implications for communication researchers and practitioners such as journalists, politicians, and other members of the issue publics that contribute to agenda building



**Fig. 2.** Statistical model of the mediation effects of discrete negative emotions and risk perception. The curved line depicts the significant indirect effect on systematic processing.

(e.g., Kim et al., 2002; Scheufele & Tewksbury, 2007). In particular, when specific language of blame is used to describe the COVID-19 pandemic, media audiences and other members of the public may draw quick judgment that will influence their causal interpretation, moral evaluation, and treatment recommendation (Entman, 1993; 1995; Weiner, 1995).

The main contribution of the current research is that discrete negative emotions and risk perception mediate the relationship between responsibility attribution and heuristic processing. First, corroborating other research on responsibility attribution and discrete emotions (Entman, 1993; Feigenson & Park, 2006; Kim & Niederdeppe, 2013; Tiedens & Linton, 2001), individuals are vulnerable to emotional cues inherently entangled within the process of responsibility attribution. In this research, an element of blame associated with the judgement of responsibility (Slovic, 1987; Weiner, 1995) appears to intensify negative emotions. Nonetheless, as the psychometric paradigm suggests, risk perception not only arises from the *unknown* factor, but also from the *dread* factor (Fischhoff et al., 1978). Our results support the affect heuristic hypothesis in that negative emo-

tions influence information processing through risk perception. Our findings are also consistent with the large volume of risk perception research that demonstrates a close association between negative emotions and risk perception (Chu & Yang, 2019; Mou & Lin, 2014; Rundmo, 2000).

In essence, this finding is imperative as it illustrates a certain degree of social judgment involved in people’s information processing related to the COVID-19 pandemic. Discrete negative emotions and risk perception serve as intermediate pathways that lead to heuristic processing during this particular public health crisis. Applied to the real-world context, consider how the sheer volume of information prompts diverse interpretations and meanings for individuals—discrete emotions and risk perception act as a subconscious organization of information that transpires at the instant of perception (Sherif & Hovland, 1961). This swift automatic social judgement connected to responsibility attribution is enabled by rapid information processing based on heuristic cues. Future studies should also extrapolate the findings here to other public health crises. In particular, dealing with the COVID-19 pandemic and other similar disasters require community-level

responses, which will likely elevate other emotions such as sympathy, compassion, or even a sense of solidarity. Therefore, future research should also examine the role of positive emotions in influencing information processing (Isen, 2008).

Interestingly, a clear attribution of responsibility does not reduce systematic processing. In fact, systematic processing is slightly higher in the attribution condition than in the no-attribution condition. Moreover, our participants also report higher level of systematic processing than heuristic processing in general. Given the urgency and magnitude of the coronavirus pandemic, it is not surprising that most of our participants expend a fair amount of cognitive resources to process the stimulus message. The indirect effect found through discrete negative emotions and risk perception also supports this conjecture. In particular, exposure to the news article triggers strong emotional responses among our participants, which elevates their risk perception and subsequently leads them to process the message content in a more systematic manner. This cognitive pathway has been evidenced numerous times in risk communication literature. For example, in the aforementioned Ebola study, sadness is positively associated with both risk perception and systematic processing (Yang, 2019). Nevertheless, we acknowledge that it paints a more complex picture of information processing and urge future research to consider other antecedent variables to information processing such as those delineated in the RISP model (Griffin *et al.*, 1999; Yang, Aloe, & Feeley, 2014), including informational subjective norms and perceived information gathering capacity.

Lastly, we note some interesting contribution from individual characteristics. First, younger participants are more likely to engage in heuristic processing. Corroborating research from developmental psychology, age is associated with metacognitive reasoning abilities (Piaget, 1972). As individuals age, their ability to think more analytically increases (Kokis, Macpherson, Toplak, West, & Stanovich, 2002). Therefore, it is not surprising that younger participants seem to favor heuristic processing more. Second, conservatives are more likely to process the information heuristically. This is consistent with past research showing that liberals and conservatives process information in distinct ways (Miller, Krochik, & Jost, 2009). In this context, given the political divide in public opinion on the COVID-19 pandemic (Public Agenda/USA Today/Ipsos, 2020), it is perhaps

not surprising that conservatives are more likely to process the stimuli message in a heuristic manner. This finding may also reflect a form of motivated reasoning (Kunda, 1990) in that conservatives are more likely to reach quick conclusions without analyzing the information systematically based on their existing position toward this issue. Interestingly, more highly educated participants are likely to partake in both heuristic and systematic processing. One explanation here is that heuristic and systematic processing may occur concomitantly (Chen *et al.*, 1999). In this case, highly educated individuals may be more likely to rely on their general knowledge structure and process the information heuristically, but they may also invest in more cognitive resources to analyze the story carefully when sufficiently motivated by a need to maintain a positive social image or defend their existing position (Eagly & Chaiken, 1993).

Like all research, this study has limitations. As mentioned above, we conducted this research at the end of February 2020, when the United States just began seeing imported COVID-19 cases. Although our results are promising, the rapidly developing situation renders limited generalizability to our findings. Next, past research has encouraged researchers to continue to refine survey measures for information processing (Griffin *et al.*, 2008). Although our items achieve good measurement validity and reliability, they seem to position heuristic processing and systematic processing as opposites. They also do not fully capture all aspects of information processing, such as relying solely on the information at hand, which indicates heuristic processing. Future research should continue to explore other alternatives to measure information processing (Smerecnik, Mesters, Candel, De Vries, & De Vries, 2012). Other methods such as thought-listing technique or behavioral measures may also substantiate our information processing measures.

In conclusion, this study draws from dual-process theories of information processing to examine the impact of responsibility attribution, discrete negative emotions, and risk perception on information processing. Our results show that discrete negative emotions and risk perception mediate message effect in a serial manner, which suggests that responsibility attribution framing indeed serves as a heuristic cue that influences the way in which people deal with information about the COVID-19 pandemic. This result has important theoretical and practical implications. In particular, given the agenda-setting function

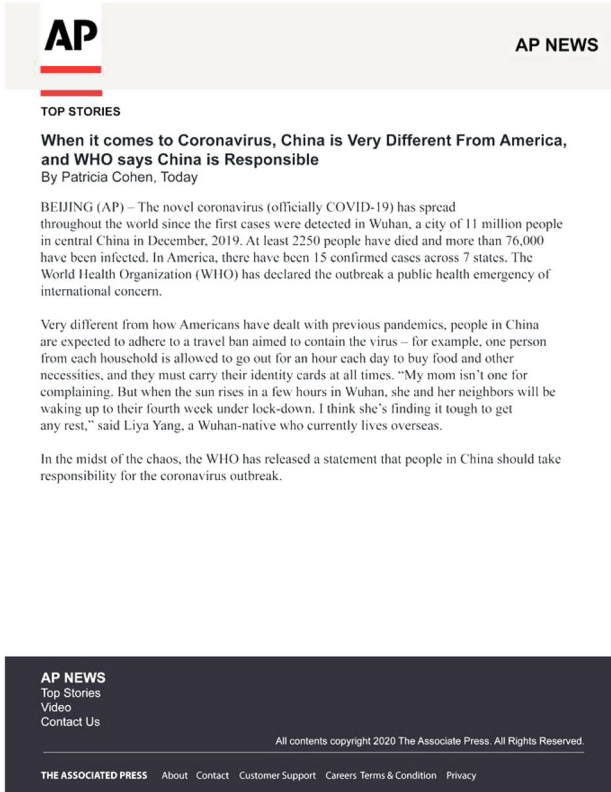
of media, communication scholars need to pay attention to the impact of similar rhetoric in the media on public perception of the pandemic and support for disaster response measures.

APPENDIX A

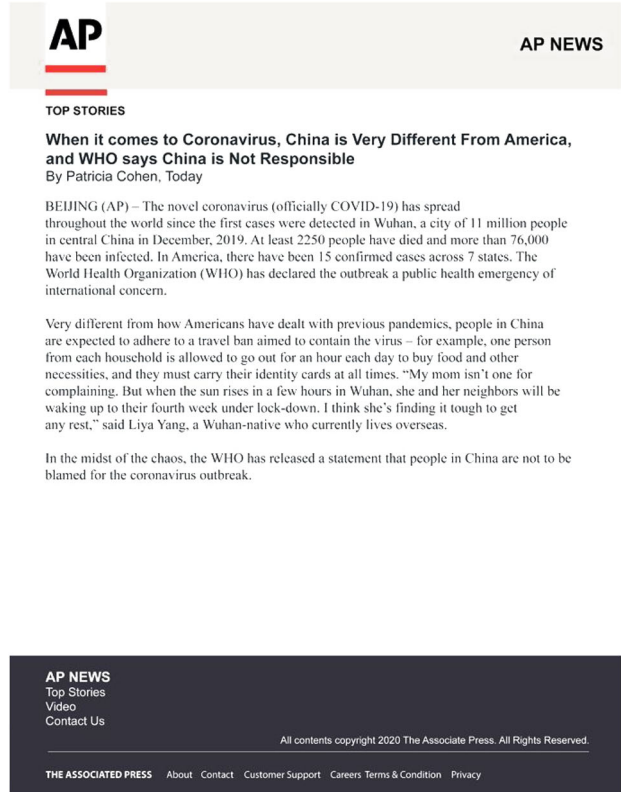
This was the experimental stimuli of the study.

ACKNOWLEDGEMENT

This research was funded by the National Science Foundation, #NSF2020597.



Responsibility attribution condition



No responsibility attribution condition

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