

## RESEARCH ARTICLE

# The closer I am, the safer I feel: The “distance proximity effect” of COVID-19 pandemic on individuals' risk assessment and irrational consumption

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## Funding information

Natural Science Foundation of Guangdong Province, Grant/Award Number: 2020A151501530; The Key Program of National Natural Science of China, Grant/Award Number: 7183201; Youth Innovation Talent Program of General Universities of Guangdong Province, China, Grant/Award Number: 2019WQNCX106; Philosophy and Social Science Program of Shenzhen City, Grant/Award Number: SZ2021D021

## Abstract

The unprecedented crisis of COVID-19 posed severe negative consequences for consumers, marketers, and society at large. By investigating the effect of individuals' distance from the COVID-19 epicenter (i.e., the geographical area in which COVID-19 pandemic is currently most severe) on consumers' risk perception and subsequent behaviors, this research provides novel empirical findings that can offer practical insights for marketers. While intuitively, people expect individuals closer to the COVID-19 epicenter to generate a greater risk perception of the pandemic, empirical evidence from four studies provides consistent results for the opposite effect. We find that a closer (vs. farther) distance to the epicenter associates with lower (vs. higher) perceived risk of the pandemic, leading to less (vs. more) irrational consumption behaviors. We refer to this phenomenon as the “distance proximity effect,” which holds for both physical and psychological distances. We further demonstrated that this effect is mediated by consumers' perception of uncertainty and moderated by individuals' risk aversion tendency. The current research contributes to the literature of consumers' risk perception and irrational consumption by highlighting a novel factor of distance proximity. It also offers some timely insights into managing and intervening COVID-19 related issues inside and outside an epicenter.

## KEYWORDS

COVID-19 pandemic, epicenter, irrational consumption, risk perception, uncertainty

On January 23, 2020, when the Chinese government mandated the lockdown of Wuhan due to the coronavirus (COVID-19) outbreak, it officially declared the start of an unprecedented public health crisis in human history. As the virus spread quickly throughout China and ultimately became a worldwide pandemic

(World Health Organization, 2020), the world also witnessed a wave of irrational buying (Gan, 2020; Wong, 2020). Consumers were “fighting” for all sorts of items, such as toilet paper, food, and even guns (Mercer, 2020). The chaos not only created severe supply shortages but also heightened the prices for some

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everyday products. In some cities, essential products such as flour, black beans, or even pain reliever and cold remedies were priced five times higher than their regular price, but they still sold out quickly (Walker, 2020). Such a disordered consumption environment proved to be a phenomenal challenge for consumers, retailers, public policymakers, and society. Everyday shopping became a nightmare for consumers, especially the elders (Kassraie, 2020). The damage caused by uncertainty, panic, and fear seemed to be no less than that caused by the virus itself.

Irrational consumption refers to the excess consumption or unreasonable hoard of particular goods divergent from “reasonable cognitive assessment” (Loxton et al., 2020, pp. 3). Irrational consumption is more likely to occur during a crisis such as the COVID-19 pandemic. As pointed out by Loxton et al. (2020, pp. 3), the stress and uncertainty during a crisis may “lead consumers to skew their traditional patterns of spending towards purchases which might otherwise be undertaken at different times, at different volumes or perhaps not made at all.” Interestingly, such irrational consumption behavior during COVID-19 seemed to be location-dependent, with consumers inside and outside the epicenter exhibiting different levels of urgency. For instance, in the initial stages of the pandemic, while everyday shopping in Wuhan (which is the epicenter) seemed to be relatively calm and organized (Gan, 2020), many parts of China witnessed grocery supply shortage due to the panic purchasing—even with the central government control (Wernau, 2020). Similar situations happened in other countries. Residents in El Paso—a major city in Texas which is an epicenter of the pandemic in the United States (Butterfield, 2020; Washington, 2020), were reported to be calm and did not engage in panic buying behavior. The popular press reported that “the local Costco and Walmart had plenty of toilet paper, meat, hand sanitizer and more while shelves in other cities are bare due to panic buying” (Butterfield, 2020). In contrast, residents in Las Cruces were lining up in front of stores, emptying the shelves by stocking up on food, toilet paper, and cleaning products, even though Las Cruces is about 40 miles outside El Paso (Fish & Martinez, 2020).

The previously marked contrast in people's behavior in the epicenter versus those farther away from the epicenter seems counterintuitive. Although people in the epicenters (e.g., Wuhan and El Paso) should face more cognitive and emotional stress than their more distant counterparts, the chaotic and irrational consumption occurred beyond the epicenter, where the level and damage of the virus was much less severe. This type of paradoxical behavior also happened in other pandemics in history. For example, after the Sichuan earthquake in 2008, people in nondevastated areas, compared to those in the devastated area, were more anxious (Xie et al., 2011) and estimated more money and time for the reconstruction of devastated areas (Li et al., 2009). This paradox led to the current investigation.

This research examines how individuals' distance to the epicenter affects their risk perception and subsequent irrational consumption behaviors. Through the empirical investigation of four studies conducted across different countries affected by COVID-19, we show that counterintuitively, a closer (vs. farther) distance to the epicenter

reduces (vs. increases) consumers' feeling of uncertainty towards the pandemic, thus leads to a lower (vs. higher) risk perception of the virus, and less (vs. more) irrational consumption. We term this phenomenon the “distance proximity effect.”

By investigating the distance proximity effect, the current research contributes to the literature on irrational consumption and our understanding of how consumers cope with risks. First, we contribute to the broader literature on consumers' irrational consumption. We showcase that the distance proximity effect is associated with important downstream consequences such as panic buying. As such, we offer some timely knowledge regarding the understanding of consumers' panic buying behavior under pandemics, such as the current critical situation of COVID-19 (e.g., Arslan et al., 2020; Naeem, 2021). We also answer the call by prior scholars on more research on panic buying from the perspective of crisis management (Billore & Anisimova, 2021). Second, prior research suggested that one's risk perception can be influenced by individual differences and situational factors (Venkatraman, 1989; Wachinger et al., 2013; Wahlberg & Sjoberg, 2000). The current research builds on and extends this stream of literature by being the first to show distance from an epicenter can influence individuals' risk perception. Importantly, we demonstrate that distance to an epicenter influences consumers' risk perception in a counterintuitive manner—a shorter distance reduces the level of perceived risk and subsequent irrational buying behavior. Finally, the current research also contributes to the literature by documenting how distance may influence consumers' feelings of uncertainty. It is worth noting that although the current study investigates the distance proximity effect in the COVID-19 context, the findings from this research can also be applied to other public crisis contexts, such as natural disasters (e.g., earthquakes, hurricanes) or terrorist attack. Therefore, insights from this research also offer important managerial insights and practical implications for marketers and policymakers by highlighting the importance of catering and adapting to consumers' different psychological needs and behaviors inside and outside of an epicenter or other.

## 1 | CONCEPTUAL DEVELOPMENT

### 1.1 | Distance as an antecedent for risk perception

Risk perception refers to people's “*instinctive and intuitive reactions to danger*” (Slovic & Peters, 2006, p. 322). Much prior research has shown that individuals' risk perception exerts a substantial influence on their decision-making and behaviors across various domains (e.g., Ha, 2002; Mitchell & Greatorex, 1988). Understanding the antecedents of people's risk perception and managing and mitigating the negative consequences caused by perceived and actual risk is critical for both individuals and societal well-being. Such understanding is particularly relevant in the current COVID pandemic.

Prior research suggests that both individual-centric factors and social factors can influence individuals' risk perception. The individual-centric factors include demographics (e.g., age, gender,

education level), personality differences, and personal experiences (Wachinger et al., 2013; Wildavsky & Dake, 1990). Social factors include one's community connection, media exposure, and cultural influence, to name a few (Farias, 2020; Wachinger et al., 2013; Wahlberg & Sjoberg, 2000; Yoganathan et al., 2021). Table 1 summarizes some key literature findings on risk perception influencing factors.

Interestingly, nonsocial factors, such as one's distance to a hazard (e.g., an individual's geographic proximity to the epicenter of COVID-19), have attracted little attention from researchers. This could partially be explained by how "intuitive" the answer could be: the closer to the risk center, the higher the perceived risk. According to Brewer et al. (2007), individuals' perceived risk comprises of three dimensions: *perceived likelihood* which refers to the probability that one will be harmed; *perceived susceptibility*, which refers to an individual's constitutional vulnerability to a hazard; and *perceived severity* which is the extent of harm a hazard would cause. Based on this general model, one can expect that physical closeness to a hazard center (e.g., a COVID-19 epicenter) should lead to an increased perceived likelihood of being influenced by the hazard and thereby increases one's perceived risk associated with that hazard.

However, some preliminary investigations in other domains, particularly in urban planning literature, have shown that the "intuitive answer" mentioned above may not always hold. Some research has shown that physical closeness to a hazardous plant (e.g., a nuclear plant) can decrease the perceived risk of that hazard for the residents who live nearby. For instance, Maderthamer et al. (1978) showed that in comparison to people residing near (0.5 km) a nuclear plant, residents living farther away (1.4 km) showed more negative attitudes toward the plant. Though these findings seem unrelated to marketing, we argue that they suggest a greater nuance on the impact of distance on perceived risk as we elaborate below.

## 1.2 | Distance influences risk perception in the pandemic, and the mediating role of perceived uncertainty

Building on the prior findings reviewed above and drawing from the anecdotal evidence of how residents inside (vs. outside) of Wuhan and El Paso dealt with the COVID-19 situation, we propose the presence of a "distance proximity effect." We suggest that people's risk perception is positively associated with their physical and

**TABLE 1** Antecedents and consequences of consumer risk perception

Research	Main findings	Type of factor influences risk perception
The current study	The "distance proximity effect": Individual's physical or psychological distance to an epicenter affects their perceived risk of the pandemic. A closer (vs. farther) distance to the epicenter associates with lower (vs. higher) perceived risk and leads to less (vs. more) irrational consumption behaviors.	Physical and psychological factors
Loewenstein et al. (2001)	The "risk-as-feelings" hypothesis: Individual's emotional reactions to risky situations diverge from one's cognitive assessments of the risks. When such divergence occurs, emotions rather than cognitions drive behavior.	Personal/individual factor
Slovic & Peters (2006)	The "affect heuristic": A number of aspects of perceived risk can be predicted and explained by affects. For instance, fear and anger produce different risk perceptions and responses.	Personal/individual factor
Kobbeltved et al. (2005)	Perceived risk is associated with worry but not emotional distress.	Personal/individual factor
Venkatraman (1989)	Individual differences affect consumers' risk perception: Enduringly involved consumers (e.g., hedonic driven) have a greater ability to handle risk than instrumentally involved consumers (e.g., utilitarian driven), which subsequently influences consumers' information seeking and purchase behaviors.	Personal/individual factor
Gustafsson (1998)	Risk perception is associated with gender differences (e.g., gender ideology and gender practice). Women and men perceive risks differently and respond to risks in different ways.	Personal/individual factor
Scherer & Cho (2003)	Social networks influence individuals' risk perception. Through the communication exchange over time, an individual's risk perception becomes more similar to the social network (e.g., a community) they belong.	Social influence
Fischhoff, Bostrom, & Quadrel (1993)	Communication affects risk perception. Accurate and timely risk communications help to decrease perceived risks.	Social influence
Wachinger, Renn, Begg, & Kuhlicke (2013)	Trust (in authorities and experts) has the most influential impact on people's risk perception in natural hazards. Cultural and individual factors (age, gender, education, income, SES) are not the main factors.	Social influence

perceived distance from the pandemic epicenter. Specifically, people who are further away from (vs. closer to) a hazardous event or object would interpret the hazard as more (vs. less) dangerous—because of the “fear of unknown”—one does not have a clear picture regarding the accuracy and reality of the crisis.

Individuals' risk perception involves “*personal exposure to or experiences with outcomes, and history of conditioning*” (Loewenstein et al., 2001, pp. 268). Prior research has shown that how individuals respond to risky situations is heavily influenced by the vividness to which they can visualize the consequences (Weber, 2013), and the accumulated experience with a situation could reduce the perceived risk with this situation (Golant & Burton, 1969; Ulqinaku et al., 2020). In the COVID-19 context, we suggest that the missing of vividness when a consumer is far away from the epicenter would increase one's perception of *uncertainty* (e.g., the severity and damage the virus may cause), which leads to greater fear about the disease. *Uncertainty* refers to the state of lack of information about an event (Bar-Anan et al., 2009). In this unprecedented worldwide health crisis of COVID-19, the “pandemic-related uncertainty is inescapable” (Prentice et al., 2020; Shiu et al., 2011) and intensify people's perceived risks associated with COVID-19 (Arenas et al., 2006; Fung et al., 2018; Sorrentino et al., 2009; Van Den Bos, Euwema, Poortvliet and Maas, 2007; Wiggins et al., 1992).

According to the uncertainty reduction theory (Berger & Calabrese, 1974), individuals are generally motivated to seek additional information to reduce uncertainties. In the context of COVID-19, given the disease is new to the human race and our knowledge about it is still very limited, the public's uncertainty facing such an unprecedented public health crisis is naturally high (Martin et al., 2020; Martin, Hanna, & Dingwall, 2020; Martin, Hanna, McCartney, et al., 2020). In this case, distance proximity augments individuals' accessibility to the reality of the crisis and plays a vital role in influencing individuals' uncertainty perception and reduction. Being closer to an epicenter enables consumers to construct the reality of the current situation through their own observations and experience (Heg et al., 2004), thereby reducing the associated uncertainties. Thus, close distance proximity helps consumers to generate a more vivid and sensible assessment of the crisis, which reduces individuals' perceived uncertainties and mitigates the perceived risk associated with COVID-19.

Conversely, an increased distance from the epicenter limits individuals' accessibility to the facts and realities of the crisis, which may hinder consumers' ability to reduce uncertainty. Without much experience and vividness of the situation, the “fear of unknown” associated with COVID-19 may make the virus's damage remain mysterious or imaginary for consumers who are further away from the epicenter. These consumers, therefore, have to rely on secondary sources (e.g., news, WOM) for information. Given the prevalence of unproven, biased, or even fake information, consumers are more likely to get exaggerated or inconsistent information, making the situation seem more serve and uncertain (Borges-Tiago et al., 2020; Di Domenico et al., 2021; Pennycook & Rand, 2019). As a result, individuals further from the crisis may evaluate the situation less objectively and are more likely to panic about the virus. Following this line of argument, we propose that a closer (vs. farther) distance to the

epicenter leads to lower (vs. higher) uncertainty perceptions. We further propose that this will, in turn, influence individuals' perceived risk level of the COVID-19.

Taken together, we hypothesize:

**H1:** Consumers' actual and perceived distances to the epicenter are positively associated with their perception of the risk level of the pandemic, such that a closer (vs. farther) distance to the epicenter associates with lower (vs. higher) perceived risk of the pandemic.

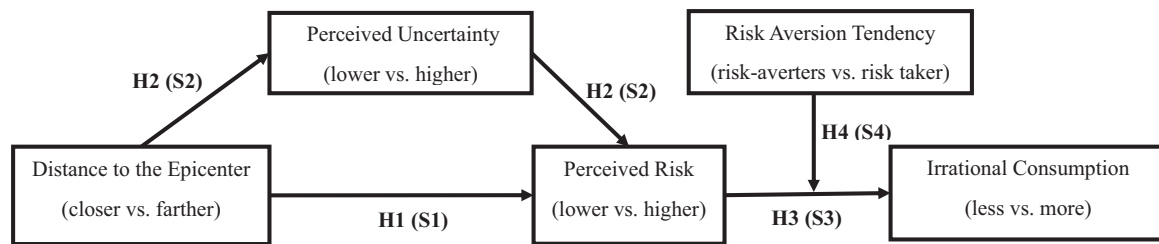
**H2:** The relationship between distance and risk perception is mediated by consumers' perception of the uncertainties associated with the pandemic.

### 1.3 | Perceived risk influences individuals' irrational consumption

Prior research has documented that perceived risk can give rise to negative affective responses, such as feelings of worry, fear, and panic, which would shift individuals' behavioral responses (Baker et al., 2016; Kobbeltved et al., 2005; Loewenstein et al., 2001). The “risk-as-feelings hypothesis” postulates that “*emotions often produce behavioral responses that depart from what individuals view as the best course of action*” (Loewenstein et al., 2001, pp. 273). LeDoux (1998, pp. 19) noted that “*emotions can flood consciousness,*” such that the negative affective responses individuals generate while facing a crisis may deviate from cognitive and reasonable evaluations, thus lead to irrational and illogical “*emotion-driven risk-related behaviors*” (Loewenstein et al., 2001, pp. 268).

In the COVID-19 context, we expect that enhanced risk perception may increase the dominance of affective-based or illogical decisions in one's consumption (Hong & Chang, 2015; Huang et al., 2015). As such, irrational purchasing, such as an impetus to purchase an unreasonable amount of the same product (e.g., storing an excessive amount of toilet paper), will occur. Irrational purchasing pertains to affective-based consumption that is not economically logical (Zafirovski, 2013). Adam Smith argued that a rational decision is an economical approach to human behavior and logic and collective action (Boudon, 2003; Parsons, 1935; Smith and Stewart, 1963). Conversely, “irrational” refers to an “*unreasonable act of choice and course of action rather than the essence and epitome of rational choices and actions*” (Zafirovski, 2013, pp. 3). While a rational choice focuses on utility maximization by using logic, individuals' irrational behaviors usually are considered to stem from sentiments (Baker et al., 2016; Pareto, 1909; Weber, 2013).

In the consumption context, Loxton et al. (2020, pp. 3) argued that irrational consumption is the “*excess consumption of particular goods which consumers might have judged as sensibly purchase at the time, including those which may be unreasonably hoarded.*” These irrational consumptions are usually driven by consumers' emotional reactions to a crisis and usually lack cognitive assessments or reasonable justifications. Such irrational behaviors seem to be especially relevant to the COVID-19 crisis. The media reported several irrational behaviors among consumers, such as over-buying



**FIGURE 1** Overarching logic of the theoretical framework and studies

and stockpiling groceries such as toilet paper and pasta (Garbe et al., 2020; Lee, 2020), during the pandemic. While these irrational behaviors are difficult to explain by using economic or logical arguments, we believe that they are rooted in the increased risk perception and attendant negative affective responses.

Drawing from our argument above that distance from the epicenter will influence individuals' risk perception, we further propose that the enhanced feeling of perceived risk experienced by those who are further away from the epicenter will lead to greater irrational consumption. We thus hypothesize:

**H3:** Irrational purchasing is more likely to occur to consumers far from the pandemic epicenter than those close to the epicenter.

#### 1.4 | The moderating role of individual difference on risk aversion tendency

The literature on risk perception has documented the significant influences of personal traits and individual differences on people's evaluation and responses to the (same) hazard (Jie, 2020; Larsen & Diener, 1987; Milliman, 1997; Wachinger et al., 2013; Wahlberg & Sjöberg, 2000). In particular, one stream of research has shown that individuals' risk aversion tendency—a person's preference for risk—can significantly affect one's behavioral response to the hazards (Chiappori & Salanie, 2000; Schlesinger, 1981; Szpiro, 1985). Depending on one's level of risk aversion tendency, people can be broadly categorized as risk-aversers and risk-takers (Schmitt, Brinkley & Newman, 1999). In the consumption context, risk-aversers and risk-takers may take different preventive approaches to the (same) hazards (Arslan et al., 2020). For instance, Szpiro (1985) shows that consumers with a higher risk aversion tendency (i.e., the risk-aversers) show a higher demand for insurance to resist the potential risks.

In the current study context of the distance proximity effect, we suggest that individuals' risk aversion tendency also moderates the relationship between risk perception and irrational consumption. In particular, risk-aversers may act more proactively and are more likely to engage in irrational consumption (e.g., paying more or stocking an excessive amount of toilet paper) than risk-takers. This is because, in comparison to risk-takers, risk-aversers may use consumption as a coping mechanism to increase their sense of control (Loxton et al., 2020; Schmitt, Brinkley & Newman, 1999). We thus hypothesize:

**H4:** The relationship between perceived risk and irrational consumption is moderated by individuals' risk aversion tendency. Specifically, the effect of risk perception on irrational consumption gets stronger among risk-aversers, but it is attenuated among risk-takers.

Our full conceptual framework is presented in Figure 1.

## 2 | OVERVIEW OF STUDIES

We tested our hypotheses in four studies. Figure 1 shows the overview of the studies as well as the specific hypothesis each study tested. In particular, Study 1 provided initial evidence for our key argument that consumers' physical distance to the epicenter influences their perceived risk associated with COVID-19. We showed that individuals who were within (vs. outside) the COVID-19 epicenter perceived lower (vs. higher) risk (H1). Study 2 demonstrated the mediation role of perceived uncertainties (H2). Study 3 replicated the distance proximity effect with individuals' psychological distance to the epicenter and demonstrated the downstream consequence of irrational buying (H3). Last, in Study 4, we showed that individuals' risk aversion tendency moderates the effect of perceived risk on irrational consumption (H4).

## 3 | STUDY 1

The main goal of study 1 was to provide initial evidence of the distance proximity effect (H1). The data collection of Study 1 took place in Canada in May 2020. During the data collection, the province of Quebec was considered as the epicenter of COVID-19 in Canada as the province accounted for 55% of the confirmed COVID-19 cases (40,724 of 73,837) and 61% of the death cases in Canada (3351 of 5499) as of 15th, May 2020 (1 week before our data collection) (Goldstein, 2020). The total population of Quebec, however, only constitutes 22.6% of Canada's overall population. Thus, in this study, we treated the Quebec province as the epicenter and examined whether or not individuals within Quebec (vs. outside Quebec) perceived different levels of COVID-19 related risks.

### 3.1 | Method

#### 3.1.1 | Participants

Two hundred and seven participants (34.8% female,  $M_{age} = 30.82$  years; 103 inside of Quebec and 104 outside of Quebec) from Amazon Mechanical Turk (MTurk) participated in our survey.

#### 3.1.2 | Perceived risk

Participants were asked to indicate their perception of COVID-19 related risks by using a 6-item scale adapted from Trumbo et al. (2016) (e.g., "How much COVID-19 infection risk do you believe you personally face by living in this area?" (1 = *a little bit*, 7 = *very high*;  $\alpha = 0.60$ ; see web appendix A for details).

#### 3.1.3 | Distance proximity (within vs. outside the epicenter)

Participants indicated their geographic information after reporting their perceived risk. Specifically, participants provided their current physical address information (city and province), and we treated participants who lived in Quebec (vs. outside Quebec) as within (vs. outside) the epicenter.

#### 3.1.4 | Covariates

Since the study was conducted during the COVID 19 pandemic, individuals' personal encounter may affect their risk assessment. Thus, we also included measures of their prior encounter with COVID-19 as potential covariates. These constructs included (1) the COVID-19 infection history of the participant ("Have you had COVID-19 already?"); (2) the COVID-19 infection history of people around the participant ("Is there anyone who you know have had or is having COVID-19?"), participants' age and gender. See Appendix B for additional measures.

### 3.2 | Results

#### 3.2.1 | Perceived risk

An analysis of variance using distance proximity (within or outside the epicenter) as the independent variable and perceived risk as the dependent variable revealed a significant main effect of distance proximity on perceived risk. Specifically, we found that participants who were located within the epicenter indicated a significantly lower perceived risk in comparison to those who were located outside the epicenter ( $M_{epicenter} = 3.91$ , 95% confidence interval [CI] = [3.73,

4.08],  $SD = .89$  vs.  $M_{nonepicenter} = 4.30$ , 95% CI = [4.12, 4.48],  $SD = .93$ ;  $F(1, 205) = 9.66$ ,  $p = 0.002$ ,  $d = .43$ ). Moreover, the effect holds even after we control for the influence of covariates (age, gender, infected conditions of the participant self, and infected condition of people around) ( $F(1, 201) = 6.17$ ,  $p = .01$ ).

### 3.3 | Discussion

Consistent with our main hypothesis (H1), results from study 1 showed that individuals who were within the epicenter (vs. outside the epicenter) perceived less (vs. more) risk of COVID-19. However, by categorizing participants as within (vs. outside) the epicenter, distance is treated as a binary factor when in reality, the distance may vary continuously. Therefore, instead of categorizing participants into two conditions (within vs. outside of the epicenter), we measured participants' exact distances to the epicenters as the distance proximity in Study 2 and their psychological distances in Studies 3 and 4.

## 4 | STUDY 2

The goal of Study 2 was threefold. First, we applied a different operationalization of distance proximity to test the reliability of this effect. Specifically, we calculated individuals' exact distance to the epicenters to provide a continuous distance variable. Second, we aimed to examine the mechanism behind the distance proximity effect (H2) and show that individuals closer to (vs. farther from) the epicenter would have a lower (vs. higher) perceived uncertainty and risk perception about COVID-19. Third, we aimed to replicate the distance proximity effect with a different population. Hence we conducted this study in a different country—the United States.

### 4.1 | Method

#### 4.1.1 | Participants

One thousand and fourteen participants (48.9% female,  $M_{age} = 39.5$  years) from Amazon Mechanical Turk (MTurk) participated in our survey.

#### 4.1.2 | Perceived risk

Prior research (Ganzach et al., 2008) has shown that a single question—"How risky is the situation?"—captures the concept of risk perception more accurately than the multiple-item measure. Thus, we adopted a single-item measurement of perceived risk in this study. Specifically, participants reported their perceived risk associated with COVID-19 by answering, "How would you rate the COVID-19 infection risk?" (1 = *very low*; 7 = *very high*).

#### 4.1.3 | Perceived uncertainty

Adapted from prior research (Li et al., 2021), we asked participants to report their perceived uncertainty about COVID-19 to a three-item scale: "How uncertain do you think the epidemic of COVID-19 will be in the near future?," "How unpredictable do you think the epidemic of COVID-19 will be in the near future?," and "How much do you think the epidemic of COVID-19 will be difficult to predict in the near future?" (1 = not at all, 7 = completely;  $\alpha = 0.92$ ).

#### 4.1.4 | Distance proximity

We calculated each participant's distance proximity (to the epicenters) based on their geographical coordinates. First, we determined individual participant's location information by the geographical coordinates recorded automatically on Qualtrics. Second, we referred to the report released by the Centers for Disease Control and Prevention (2020) to determine the epicenters in the United States. During the time of data collection (October 2, 2020), five states with the highest infected rates of COVID-19 were Louisiana, Mississippi, Florida, Alabama, and Arizona in descent order (the infected rates of these five states are 3.59%, 3.31%, 3.28%, 3.17%, and 3.05%, respectively). Therefore, we treated the five states with the highest infection rates as the epicenters and calculated each participant's average distance to those epicenters. In particular, we used Google API technology (Google APIs Explorer, 2020) and calculated the sphere distances of a participant's geographical coordinate to each of the epicenters mentioned above. The distances (to the five states) were then averaged to generate average distance proximity, which was used as the independent variable for the analysis.

#### 4.1.5 | Covariates

We assessed several constructs as potential covariates. These constructs included (1) participants' level of optimistic-pessimistic level towards the epidemic by using a 4-item scale ( $\alpha = 0.68$  adapted from Creed et al. (2002) (see web appendix C for details); (2) the COVID-19 infection history of the participant ("Have you had COVID-19 already?"); (3) the COVID-19 infection history of people around the participant ("Is there anyone who you know have had or is having COVID-19?"), participants' age and gender (see Table 2 for details).

### 4.2 | Results

#### 4.2.1 | Perceived risk

We conducted an ordinary linear square (OLS) regression with perceived risk as the dependent variable and distance proximity as the

**TABLE 2** Effect of distance on perceived uncertainty and risk

	OLS risk	OLS av_uncertainty
<i>dist5</i>	0.000121*** (2.75)	0.0000687* (1.84)
<i>optimistic</i>	-0.137** (-2.51)	-0.234*** (-5.06)
<i>is_infected</i>	0.763*** (3.69)	0.571*** (3.25)
<i>is_friend_infected</i>	0.580*** (5.56)	0.323*** (3.65)
<i>age</i>	-0.00182 (-0.44)	-0.00687** (-1.97)
<i>gender</i>	-0.320*** (-3.12)	-0.332*** (-3.81)
<i>constant</i>	5.269*** (17.23)	6.085*** (23.43)
<i>N</i>	1014	1014
<i>adj. R<sup>2</sup></i>	0.070	0.067

Note: *t* Statistics in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .  
Abbreviation: OLS, ordinary linear square.

independent variable. The results indicated that participants who were closer to (vs. farther from) the epicenters indicated significantly lower (vs. higher) perceived risk ( $B = 0.0001$ ,  $p = 0.01$ ;  $\eta^2 = 0.007$ ). These results again supported H1.

#### 4.2.2 | Perceived uncertainty

Using a similar OLS regression with perceived uncertainty as the dependent variable and distance proximity as the independent variable, we found that participants who were closer to (vs. farther from) the epicenters indicated a marginally significant lower (vs. higher) perceived uncertainty regarding COVID-19 ( $B = 0.0001$ ,  $p = 0.09$ ;  $\eta^2 = 0.003$ ).

#### 4.2.3 | The mediation role of perceived uncertainty

To test whether perceived uncertainty mediates the effect of distance proximity on perceived risk, we conducted a mediation analysis with 5000 bootstrapped samples using Model 4 of the PROCESS macro for SPSS (Hayes, 2017). We included the distance proximity as the independent variable, perceived uncertainty as the mediator, perceived risk as the outcome variable for the analysis. We found that participants who were closer to (vs. farther from) the epicenter indicated significantly lower (vs.

higher) perceived uncertainty ( $B = 0.0001$ ,  $SE = 0.0001$ ,  $t(1012) = 1.72$ ,  $p = 0.08$ ), and lower (vs. higher) perceived uncertainty, in turn, led to lower (vs. higher) perceived risk ( $B = 0.62$ ,  $SE = 0.03$ ,  $t(1012) = 19.87$ ,  $p < 0.001$ ). The CI of the indirect effect of distance proximity on risk perception through perceived uncertainty excluded zero (indirect effect = 0.0285,  $SE = 0.0131$ , 95% CI = [0.0048, 0.0560]) and the residual direct effect of distance proximity on risk perception was positive and significant ( $B = 0.0001$ ,  $SE = 0.0001$ ,  $t(1011) = 2.00$ ,  $p = 0.05$ ), indicating a partial mediation (Zhao et al., 2010).

#### 4.2.4 | Results after controlling for the covariates

To test the robustness of our results, we conducted additional analyses controlling for several important covariates, as shown in Table 2. First, we estimated the effect of perceived risk based on model 1 below. In this model, the  $\beta$ s represent the parameter coefficients, and the  $\varepsilon$  reflects the error term. Risk (perceived risk) is the dependent variable, and  $dist_i$  (distance proximity) is the main explanatory variable. As for control variables, we incorporated participant's optimistic-pessimistic rating about the pandemic (*optimistic*), age (*age*), gender (*gender*, 0 = female; 1 = male), and infected history of the participant himself or herself (*is\_infected*) as well as the people around (*is\_friend\_infected*). The results showed that after controlling for the covariates,  $dist_i$  had a significant positive impact on  $Risk_i$  ( $B = 0.001$ ,  $p = 0.01$ ;  $\eta^2 = 0.007$ ). These results replicated our main finding that individuals who are closer to (vs. farther from) the epicenters perceived less (vs. more) risk (H1).

Similarly, we estimated the effect of perceived uncertainty based on Model 2 and found a good replication of H2: individuals who are closer to (vs. farther from) the epicenters perceive lower (vs. higher) feeling of uncertainty ( $B = 0.0007$ ,  $p = 0.07$ ;  $\eta^2 = 0.003$ ). More importantly, the mediation analysis yielded 95% CIs that excluded zero (indirect effect = 0.0279,  $SE = 0.0123$ , 95% CI = [0.0045, 0.0528]), thus suggesting a significant mediation of perceived uncertainty.

$$risk_i = \beta_0 + \beta_1 dist5_i + \beta_2 optimistic_i + \beta_3 is\_infected_i + \beta_4 is\_friend\_infected_i + \beta_5 age_i + \beta_6 gender_i + \varepsilon_1 \quad (1)$$

$$av\_uncertainty_i = \beta_0 + \beta_1 dist5_i + \beta_2 optimistic_i + \beta_3 is\_infected_i + \beta_4 is\_friend\_infected_i + \beta_5 age_i + \beta_6 gender_i + \varepsilon_1 \quad (2)$$

### 4.3 | Discussion

Study 2 provided further evidence for the distance proximity effect using more accurate distance proximities. Besides, study 2 demonstrated the mediation role of perceived uncertainty. Consistent with our hypothesis 2, we found that individuals who were closer to (vs. farther from) the epicenter had a lower (vs. higher) feeling of uncertainty about the epidemic, thus perceived a lower (vs. higher) risk associated with COVID-19.

## 5 | STUDY 3

The main goal of Study 3 was to demonstrate the downstream consequence of the distance proximity effect that consumers who are farther away from the epicenters are more likely to engage in irrational consumptions (H3). We also aimed to replicate the effect by using a different measure of distance proximity—psychological distance. This approach helped us accommodate the presence of multiple epicenters and further validate the effect's robustness (Kreilkamp, 1984; Stephan et al., 2010).

### 5.1 | Method

#### 5.1.1 | Participants

One hundred and fourteen US participants (51.8% female,  $M_{age} = 40.2$  years) were recruited from MTurk to participate in this study.

#### 5.1.2 | Distance proximity

Adapted from prior research (Slovic, 1999), we measured participants' psychological distance from the COVID-19 epicenter by asking, "how far do you think you are away from the novel coronavirus (COVID-19) epidemic center?" (0 = very close, 100 = very far away).

#### 5.1.3 | Perceived risk

We asked participants to complete the same 6-items risk assessment scale ( $\alpha = 0.71$ ) used in Study 1.

#### 5.1.4 | Irrational consumption

The spread of COVID-19 has unleashed significant irrational behaviors among consumers. Among these behaviors, stockpiling groceries, especially toilet paper and food, seems to a prominent phenomenon during the pandemic (Garbe et al., 2020; Lee, 2020). Therefore, we used the intention of purchase the quantity of toilet paper as the proxies of irrational consumption in this study. To this end, we asked participants to indicate how many rolls of toilet paper are they willing to buy, which served as the downstream consequence measure of irrational consumption.

## 5.2 | Results

#### 5.2.1 | Perceived risk

Linear regression with psychological distance to the epicenter as the independent variable and perceived risk as dependent variable



showed that participants who felt closer to (vs. farther from) the epicenter indicated significantly lower (vs. higher) perceived risk ( $B = 0.01$ ,  $t(112) = 2.63$ ,  $p = 0.01$ ). These results served as a reasonable replication of the distance proximity effect, supporting H1.

### 5.2.2 | Irrational consumption

Linear regression analyses revealed that participants who felt closer to (vs. farther from) the epicenter indicated significantly smaller (vs. larger) purchase quantity of toilet paper ( $B = 1.32$ ,  $t(112) = 2.57$ ,  $p = 0.01$ ). Consistent with our prediction, these results showed that participants who are farther away from the epicenter were more likely to consume irrationally, supporting H3.

### 5.2.3 | Mediation analysis

We conducted a mediation analysis with 5000 bootstrapped samples using Model 4 of the PROCESS macro for SPSS (Hayes, 2017). We included psychological distance to the epicenter as the independent variable, perceived risk as the mediator, and purchase quantity of toilet paper as outcome variable. Regression analysis showed that participants who felt closer to (vs. farther from) the epicenter indicated significantly lower (vs. higher) perceived risk ( $B = 0.01$ ,  $SE = 0.005$ ,  $t(112) = 2.63$ ,  $p = 0.01$ ), and lower (vs. higher) perceived risk, in turn, led to less (vs. more) irrational consumption behavior ( $B = 41.13$ ,  $SE = 9.79$ ,  $t(112) = 4.20$ ,  $p < 0.001$ ). The CI of the indirect effect of psychological distance to the epicenter on irrational consumption behavior through risk perception excluded zero (indirect effect = 0.08, boot SE = 0.04; 95% CI = [0.0030, 0.1705]) and the residual direct effect of psychological distance to the epicenter on irrational consumption behavior was positive and significant ( $B = 0.87$ ,  $SE = 0.50$ ,  $t(112) = 1.73$ ,  $p = 0.09$ ), indicating a partial mediation (Zhao et al., 2010).

## 5.3 | Discussion

Study 3 provided further evidence for the distance proximity effect with individuals' psychological distance to COVID-19. Moreover, we also demonstrated the downstream consequences of irrational consumption associated with the distance proximity effect (H3). It is noteworthy that this effect was replicated across different populations in different countries and three different operationalizations of distance proximity (within/outside the epicenter, physical and psychological distances to the epicenter).

## 6 | STUDY 4

The goal of study 4 was to explore the proposed moderator of individuals' risk aversion tendency (H4). We empirically showed that the effect of risk perception on irrational consumption is stronger

among consumers with high-risk aversion tendency (i.e., the risk-averse) but is attenuated for those with low-risk aversion tendency (i.e., the risk-takers).

## 6.1 | Method

### 6.1.1 | Participants

Three hundred and thirty-two participants located in the United States (44.0% female,  $M_{age} = 40.64$  years) were recruited from MTurk to participate in this study.

### 6.1.2 | Distance proximity (psychological distance)

Distance proximity was measured as the same as in Study 3.

### 6.1.3 | Irrational consumption

Similar to Study 3, participants were asked to indicate the number of rolls of toilet paper they would like to purchase.

### 6.1.4 | Risk aversion tendency

We measured participants' risk aversion tendency by using a 3-item scale from Gray & Durcikova, 2005. Items include "I am a cautious person who generally avoids risk," "I am very willing to take risks when choosing a job or project to work on" (reversed), and "I usually play it safe, even if it means occasionally losing out on a good opportunity" (1 = strongly disagree, 7 = strongly agree;  $\alpha = 0.69$ ).

## 6.2 | Results

### 6.2.1 | Moderated mediation analysis

We conducted moderated mediation analysis (PROCESS Model 14) with irrational consumption tendency as the dependent variable, psychological distance from the epicenter as the independent variable, individuals' risk aversion tendency as the moderator, and perceived risk as mediator. The results revealed a significant index of moderated mediation ( $B = 0.08$ ,  $SE = 0.06$ , 95% CI = [0.002, 0.24]). The interaction effect of perceived risk  $\times$  risk avoidance tendency on irrational consumption tendency was significant ( $B = 12.29$ ,  $SE = 3.36$ ,  $t(325) = 3.66$ ,  $p < 0.001$ ). Specifically, the effect of perceived risk on irrational consumption tendency was significant among risk-averse (vs. risk-takers) ( $B = 32.59$ ,  $SE = 6.08$ ,  $t(325) = 5.36$ ,  $p < 0.001$ ) but not among risk-takers ( $B = 3.12$ ,  $SE = 6.72$ ,  $t(325) = 0.46$ ,  $p = 0.64$ ). The indirect effect of psychological distance on irrational consumption via perceived risk was significant among risk-averse (i.e., 1 SD above the mean;

$B = 0.22$ ,  $SE = 0.13$ , 95% CI = [0.02, 0.52]) but not among risk-takers (i.e., 1SD below the mean;  $B = -0.02$ ,  $SE = 0.06$ , 95% CI = [-0.12, 0.12]), confirming the expected mediation of the moderated effect of psychological distance on irrational consumption. These results support H4.

### 6.3 | Discussion

Study 4 demonstrated the moderating role of individuals' risk aversion tendency on the relationship between perceived risk and irrational consumption. We found that the effect of risk perception on irrational consumption gets stronger among people with a high-risk aversion tendency (the risk-aversers). However, this effect was attenuated when people's risk aversion tendency is low (the risk-takers).

## 7 | GENERAL DISCUSSION

In this research, we identified a new phenomenon of the "distance proximity effect." In four studies, we showed that in the context of COVID-19, a closer (vs. farther) distance to the epicenter leads to a lower (vs. higher) perceived risk of the pandemic (Studies 1–4), and this can lead to irrational consumption behaviors (Studies 3 and 4). We demonstrated that perceived uncertainty mediates this effect (Study 2), and individuals' risk aversion tendency moderates this effect (Study 4). Notably, we found that the distance proximity effect holds for both physical and psychological distances.

By investigating a novel factor that influences consumers' risk perception of COVID-19, the current research makes critical theoretical contributions to the literature. First, we underscore an important downstream consequence associated with the distance proximity effect, namely, consumers' irrational consumption. Therefore, the current research contributes to the broader literature on consumer panic buying literature (see review, Billore & Anisimova, 2021) by showing how perceived risk caused by COVID-19 influences consumer's pandemic buying tendency. Thus, we add insights into understanding consumers' panic buying behavior during the pandemic (e.g., Arslan et al., 2020; Naeem, 2021) and answer the call by prior scholars on more research on panic buying from the perspective of crisis management (Billore & Anisimova, 2021).

Second, to the best of our knowledge, this research is the first empirical work to understand how distance from a disease epicenter influences individuals' risk perception. Prior research generally suggests that individuals' risk perception can be influenced by situational factors or individual differences (Wachinger et al., 2013; Wahlberg & Sjöberg, 2000). The current research contributes to this stream of literature by offering a novel insight into how distance from an epicenter can also filter down to influence individuals' risk perception and lead to augmented irrational purchasing.

In addition, our findings contribute to the emerging literature on consumer uncertainty. Prior research documented ambiguity and credibility as the two major antecedents of consumer uncertainty

(e.g., Faraji-Rad & Pham, 2017; Shiu et al., 2011; Sun et al., 2012). Adding to this stream of research, we theoretically demonstrate and empirically show that distance proximity also serves as a factor to influence consumers' uncertainty perception toward a hazard, which serves as the mechanism underlying the distance proximity effect.

Through the unique lens of distance proximity to an epicenter, we offer several practical implications that are particularly important to marketers and public policymakers. First, our findings highlight the importance for marketers and policymakers to realize, prepare for and correspond to the different psychological needs and behaviors for consumers who are close to or farther from an epicenter. Within an epicenter, expeditious crisis communication helps increase individuals' awareness of the seriousness of the situation and enhances proper preparations for it. Outside the epicenter, fact-based, judicious information will aid individuals in recognizing and understanding the crisis in a more objective and unbiased manner. The different psychological needs inside and outside the epicenter also require marketers and policymakers to tailor the information and make corresponding communication strategies accordingly. Store policies, restrictions, or even law enforcement should also put the "distance proximity effect" into consideration. Thus specific actions can be more targeted (i.e., more law enforcement outside the epicenter rather than inside) to avoid "unexpected" panic or chaos.

Second, as demonstrated in the current research, the "distance proximity effect" comes from the feeling of uncertainty. Policymakers should be more aware of the importance of accurate and transparent information to the public during critical times. Indeed, the United Nations has warned the "infodemic" in the COVID-19 crisis as fake news "spreads faster and more easily than this virus" (United Nations, 2020). Therefore, a more comprehensive examination and stricter regulation regarding how real (and "fake") information is generated, communicated, and spread out in public are needed. For example, because some new reports initially tried to "tone down" the severity of COVID-19 by describing it as a "flu," provision of inaccurate and misleading information in the incipient stage of a major crisis may backfire by causing augmented panic later on and losing precious time required for preparing and preventing the virus (or crisis) from spreading (Lutz, 2020).

Third, the current research highlights crucial public policy implications regarding how well-prepared emergency plans and proper disaster education and training may alleviate the distance proximity effect and potentially help the chaotic situations caused by a public crisis. For example, although an earthquake is a frequent natural disaster in Japan, prominent publicity and proper education have taught the Japanese the needed knowledge and skills to protect themselves during a crisis. Accordingly, irrational consumption and other adverse impacts caused by the disaster have been mitigated (Dayman, 2018; Foster, 2011; Fujioka & Sakakibara, 2019).

The current study has limitations that may be future research opportunities. First, we focused on the "distance proximity effect" in the current context of COVID-19. Whether this effect would hold or even get stronger/weaker in other more common disasters (such as earthquakes, forest fires, or wars) is unknown. Therefore, subsequent

empiricism could explore how this effect may change with different types and magnitudes of disasters. Second, from a methodology perspective, both physical and psychological distances were measured rather than manipulated in the current study. To obtain a more accurate causal effect, future research could try to experimentally manipulate distance. This approach may further improve the validity of the proximity effect we found. Third, irrational consumption in the current study was captured by only one downstream behavior (i.e., the purchase amount of toilet paper). To generalize the findings, future research could examine the distance proximity effect with other irrational consumption proxies. In addition, the distance proximity effect may be related to other types of consequences, such as increased drug and alcohol usage, enhanced violence and crimes, etc. Therefore, future research may also extend the distance proximity effect to other aspects of consumer behavior at a broader level. Last, the current study mainly examined the distance proximity effect *during* the pervasion of COVID-19. However, as the pandemic progresses and hopefully gets into a more manageable phase soon, the significance and intensity of the distance proximity effect may vary. Therefore, the evolving situation of the pandemic (e.g., before and after the mass vaccination campaigns) offers abundant opportunities for future research to explore how the proximity effect may change at different stages of the pandemic.

Warrant Buffett once said, "Risk comes from not knowing what you're doing." Our findings show the same: The closer one gets to the risk, the more one knows what to do and behaves more rationally.

## ACKNOWLEDGEMENTS

This research was supported by research funds from the Key Program of National Natural Science of China (No. 71832010), Natural Science Foundation of Guangdong Province, China (No. 2020A151501530) and Youth Innovation Talent Program of General Universities of Guangdong Province, China (No. 2019WQNCX106) awarded to Shaobo Li, and the Philosophy and Social Science Program of Shenzhen City (No. SZ2021D021).

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### SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

**How to cite this article:** Li, S. (K), Zhang, Z., Liu, Y., & Ng, S. (2021). The closer I am, the safer I feel: The "distance proximity effect" of COVID-19 pandemic on individuals' risk assessment and irrational consumption. *Psychol Mark*, 38, 2006–2018. <https://doi.org/10.1002/mar.21552>