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# Risk Perception and COVID-19 Preventive Behaviors: Application of the Integrative Model of Behavioral Prediction

Abstract

Preventing the COVID-19 outbreak primarily depends on individuals' willingness to adopt social distancing and mask wearing behaviors. However, little is known about what drives individuals to adopt these behaviors. Guided by the Integrative Model of Behavioral Prediction, this study surveyed 590 adults in the US during the early stages of the outbreak to identify factors influencing intentions to practice social distancing and wear masks. Structural equation modeling results show that while attitudes are positively associated with intentions to perform both behaviors, perceived norms are positively associated with intentions to wear masks, and self-efficacy is positively associated with intentions to practice social distancing. Additionally, results indicate that adding personal risk perception and societal risk perception as distal variables increases the model's predictive power. Results reveal that while social risk perception is positively associated with attitudes, perceived norms, and self-efficacy for both behaviors, personal risk perception is negatively associated with attitudes toward mask wearing, and perceived norms and self-efficacy for both behaviors. Theoretical and practical implications are discussed.

*Keywords:* COVID-19; Risk perception; face mask; social distancing; integrative model

# Risk Perception and COVID-19 Preventive Behaviors: Application of the Integrative Model of Behavioral Prediction

As of mid-October 2020, the United States (US) has been the most affected country with 216,025 deaths associated with the Coronavirus disease 2019 (COVID-19, Rossen et al., 2020). Because the virus mainly spreads through human contacts, public health agencies advise people to apply social distancing and wear face masks when they are out in public to slow the spread of the virus and help those who may have contracted the virus avoid transmitting it to others (Centers for Disease Control and Prevention [CDC], 2020). However, both social distancing and mask wearing behaviors are controversial in the US. While social distancing requires a trade-off between socio-economic benefits and the risk of infection, mask wearing is hardly seen as a norm in the US. (Andrew, 2020; Eikenberry et al., 2020). Although the media reports more people are now wearing masks in public settings, many have different opinions about the health benefits of this behavior (Capatides, 2020; Gatter & Mohapatra, 2020). In some states, laws enforcing mask wearing in public have been met with resistance (Blake, 2020). Thus, the effectiveness of these preventive behaviors depends fundamentally on individuals' willingness to cooperate and comply to these preventive measures (Brug et al., 2009; Leppin & Aro, 2009).

The current study draws on the Integrative Model of Behavioral Prediction to investigate how risk perception, attitudes, perceived norms, and self-efficacy influence intentions to practice social distancing and wear masks to prevent COVID-19 disease. This study contributes to the literature in two aspects. First, it examines risk perception as an important distal variable in the model, which has thus far received scant scholarly attention. Second, it examines risk perception regarding two specific dimensions: personal risk perception and societal risk perception. Testing the Integrative Model of Behavioral Prediction and examining how both types of risk perception

might function in the model provides theoretical implications and further insights for intervention messages aiming to control the outbreak.

**Theoretical Framework**

The Integrative Model of Behavioral Prediction is a well-established and frequently used framework in various health behavior contexts (Fishbein & Ajzen, 2011; Fishbein & Yzer, 2003). Building on the assumptions and concepts from the Theory of Reasoned Action, the Theory of Planned Behavior, Social Cognitive Theory, and the Health Belief Model, the Integrative Model of Behavioral Prediction posits that individuals' intentions to perform a target behavior serve as the best predictor of behavior. The model proposes that behavioral intentions in turn are a function of individuals' attitudes toward performing the behavior, perceived norms concerning the behavior, and self-efficacy to perform the behavior. Attitudes are a function of one's behavioral beliefs about the outcome of a behavior and encompass evaluations of the behavior's instrumental aspect (i.e., cognitive evaluation) as well as its experimental aspect (i.e., affective evaluation). Perceived norms include injunctive norms (i.e., perception of social approval for a behavior) and descriptive norms (i.e., perception of the prevalence of a behavior). Self-efficacy refers to individuals' belief in their ability to perform a behavior. Theorists suggest that the Integrative Model of Behavioral Prediction can effectively explain variation in any behavior, and the model fit depends on target population and specific behavioral context (Yzer et al., 2004). More concretely, each behavior is considered as uniquely influenced by attitudes, perceived norms, and self-efficacy. For example, attitudes might have a stronger association with intentions to use condoms compared to perceived norms (Albarracin et al., 2001). However, perceived norms might have a stronger association with intentions test for HIV compared to attitudes and self-efficacy (Bekalu & Eggermont, 2014). Thus, to change a specific behavior,

practitioners should identify and target the most influential factors among attitudes, perceived norms, and self-efficacy (Fishbein & Ajzen, 2011).

The Integrative Model of Behavioral Prediction also theorizes various distal variables that predict attitudes, perceived norms, and self-efficacy. These variables may include demographics, personality, media exposure, and risk perception (Fishbein & Cappella, 2006). When these variables are related to underlying beliefs that underpin individuals' attitudes, perceived norms, and self-efficacy, they tend to be related to the behavior. However, not all distal variables are influential to a specific behavior. Additionally, a distal variable might be influential to a particular behavior in one context but not in another (Fishbein & Cappella, 2006). Following this theorization, identifying and changing influential distal variables will likely change attitudes, perceived norms, and self-efficacy, which in turn change behavioral intentions. In some behavioral contexts, however, a distal variable might be directly associated with behavioral intentions, but the Integrative Model of Behavioral Prediction assumes that the variable must be related to one or more of the proximal variables including attitudes, perceived norms, and self-efficacy (Fishbein & Ajzen, 2011). This study focuses specifically on risk perception as an important distal variable in the Integrative Model of Behavioral Prediction to investigate social distancing and mask wearing behaviors during the early stages of the COVID-19 outbreak in the US.

**Risk Perception as a Distal Variable**

Risk perception refers to subjective judgments of the likelihood that a negative outcome associated with a risk will occur (Slovic, 2010). Several behavioral change theories, including the Health Belief Model (Rosenstock, 1966), the Protection Motivation Theory (Rogers, 1975), and the Extended Parallel Process Model (Witte, 1992) posit that risk perception is a crucial

predictor of behavior. Theorists conceptualize risk perception into two types: personal risk perception and societal risk perception (Cho & Kuang, 2014; Coleman, 1993; Tyler & Cook, 1984). The first refers to the belief people have about themselves being susceptible to a health risk, while the second pertains to the belief that others are likely to be affected by the health risk. Researchers find that when a health risk is of large scope and relevant to both self and others such as a pandemic, individuals may possess both types of risk perception. For example, Oh et al. (2015) found that individuals' fear of the H1N1 flu pandemic influences both personal risk perception and societal risk perception. Paek et al. (2016) found that exposure to information related to the mad cow disease also leads to both types of risk perception. This is consistent with the risk perception literature, which posits that societal risk perception may be influential when individuals perceive a risk as having ramifications for themselves as well as community members (Cho & Kuang, 2014; Coleman, 1993). Risk perception, in turn, can influence health behavioral intentions. Higher levels of risk perception are found to be associated with higher intentions to engage in preventive behaviors (e.g., Bish & Michie, 2010; Pask & Rawlins, 2015, Stasson & Fishbein, 1990). Regarding infectious outbreaks, researchers found that risk perception of a pandemic is associated with social and economic activities (Choi et al., 2018), hand washing, personal contact avoidance, and non-essential traveling (Ludolph et al., 2017), and mask wearing and sheltering in place (Yoo, 2019).

Some issues remain with studies related to risk perception in the context of an infectious outbreak. First, several studies tend to bundle distinct preventive behaviors into one dependent variable. This approach might fail to incorporate the perspective that each behavioral domain bears distinct attributes (Fishbein & Ajzen, 2011; Fishbein & Cappella, 2006). Considering the current COVID-19 risk in the U.S., for example, social distancing and mask wearing behaviors

might trigger dissimilar reactions by the public because these behaviors are associated with different perceived health benefits and socio-economic consequences. In other words, individuals' judgments of the COVID-19 risk might not necessarily lead to people complying with both behaviors. Second, risk perception has been operationalized differently. Specifically, while some studies measure both personal risk perception and societal risk perception as a unidimensional variable, others measure only one type of risk perception. This may obscure the distinct dimensions and roles of risk perception types, which could vary by health contexts. Recent research shows that while both personal risk perception and societal risk perception may predict behavioral intentions in one health risk context, only one type of risk perception may be influential in another situation (Duong et al., 2020; Paek et al., 2016). Thus, this study focuses on identifying the specific roles of personal risk perception and societal risk perception in predicting intentions to practice social distancing and wear masks.

Given that the early stages of the COVID-19 outbreak in the US were characterized with controversies over preventive measures and intervention messages (Noar & Austin, 2020), individuals' estimations of the risk for themselves and others might be salient factors that influence their preventive behaviors. During an outbreak filled with extreme threat and complex preventive behaviors, researchers suggest that there might be intervening variables that interfere with the motivational properties of risk perception (Montgomery et al., 1989). That is, the association between risk perception and behavioral intentions might be mediated by other variables. In the Integrative Model of Behavioral Prediction, risk perception serves as a distal variable influencing behavioral intentions through the mediating effect of attitudes, perceived norms, and self-efficacy. Researchers argue that individuals with low-risk perception might believe that a negative outcome of not performing a behavior is unlikely, while those with high-

risk perception might believe such an outcome is likely (Yzer et al., 2004). Similarly, people might project their risk estimations onto others and subsequently infer others' approval and implementation of preventive behaviors, which affect their own perception of social norms. For example, research has found that risk perception influences perceived norms for vaping (Trumbo, 2018). Furthermore, researchers suggest that when people feel that they are susceptible to a disease, they are motivated to look for ways to cope with the risk, which might lead to perception of self-efficacy (de Vries et al., 2012). Indeed, research found that risk perception predicts attitudes, perceived norms, and self-efficacy related to marijuana use (Yzer et al., 2004), flossing (Schmiege et al., 2009), protecting children from exposing to harmful chemicals (Mello & Hovick, 2016), and sunscreen use (de Vries et al., 2012). Altogether, these studies provided empirical evidence for the role of risk perception in the Integrative Model of Behavioral Prediction across several behavioral contexts.

While scholars have identified risk perception of the COVID-19 pandemic, attitudes toward protective behaviors, self-efficacy, and perceived norms as key factors to motivate public responses to control the outbreak, they also note that research is needed to provide insights into how these variables work together to influence preventive behaviors (Noar & Austin, 2020). This study heeds this call by examining personal risk perception and societal risk perception as influential distal variables that affect intentions to practice social distancing and wear masks. From a theoretical perspective, this study extends the Integrative Model of Behavioral Prediction by incorporating the two types of risk perception as key distal variables. Moreover, it tests the model in the novel context of the COVID-19 outbreak. On a practical level, results provide implications regarding the which type of risk perception should be prioritized in crafting messages to motivate preventive behaviors during the early stages of the COVID-19 outbreak.

### Hypotheses and Proposed Model

Based on the Integrative Model of Behavioral Prediction, this study offers two sets of hypotheses related to social distancing behavior and mask wearing behavior, respectively. Specifically, we expect that positive attitudes toward social distancing behavior (*H1a*), perceived norms (*H1b*), and self-efficacy (*H1c*) will be positively associated with intentions to practice social distancing. We then predict that personal risk perception will be positively associated with attitudes (*H2a*), perceived norms (*H2b*), and self-efficacy (*H2c*). Next, we predict that societal risk perception will be positively associated with favorable attitudes (*H3a*), perceived norms (*H3b*), and self-efficacy (*H3c*). Similarly, we propose a similar set of hypotheses predicting intentions to wear masks: Attitudes (*H4a*), perceived norms (*H4b*), and self-efficacy (*H4c*) will be positively associated with intentions to wear masks; personal risk perception will be positively associated with attitudes (*H5a*), perceived norms (*H5b*), and self-efficacy (*H5c*); and societal risk perception will be positively associated with attitudes (*H6a*), perceived norms (*H6b*), and self-efficacy (*H6c*).

## Methods

### Participants and Procedures

An online survey was conducted in mid-April 2020. Approval from a University's ethics board was obtained before administering the survey. Participants were recruited through the online Amazon Mechanical Turk (MTurk) survey website. Participants were limited to only U.S. citizens who had an acceptable reputation (those who had been approved more than 100 times). Participants read and agreed with the informed consent before participating in the survey. A total of 646 responses were collected. Fifty-six participants who completed the study with excessively long or short duration (3 standard deviation above or below the mean) were excluded from the

study. The working sample comprised 590 participants (39.5% female and 60.5% male), with the majority of them having some college education or higher (91.3%). Approximately 68.5% of the participants were White, 12.4% Asian, 10% Black, 8% Hispanic, .8% Native American, and .3% identified themselves as Other. The average age of participants was 39 (*SD* = 13). The median monthly household income level was between US$ 50,000 - 60,000. Of the 590 respondents, 9.5% reported that they had been tested to detect virus infection, 8% reported that they had been in contact with someone who was infected, and 38% had heard of someone in their community getting infected with the virus.

**Measures**

Unless otherwise indicated, all continuous key variables were measured with a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

***Risk Perception Types.*** Personal risk perception and societal risk perception scales were adapted from prior research (Duong et al., 2020; Morton & Duck, 2001). Each type of risk perception was assessed with 4 items (e.g., "It is likely that I will be infected with Coronavirus" and "I am susceptible to contracting Coronavirus", *M* = 3.36, *SD* = .89). Societal risk perception was assessed by asking participants to rate the likelihood that the Coronavirus would affect their family members, friends, colleagues, and neighbors (*M* = 3.82, *SD* = .91).

***Attitudes, perceived norms, and self-efficacy.*** Attitudes toward social distancing and mask wearing behaviors were assessed with a semantic differential scale, such as bad/good, foolish/wise, ineffective/effective, etc. (all scored from −3 to +3, social distancing: *M* = 5.89, *SD* = 1.08; mask wearing: *M* = 5.62, *SD* = 1.26). Perceived norms for each behavior were assessed with 4 items measuring injunctive norms (e.g., "People who are important to me would expect me to practice social distancing/wear a face mask when I am in public places" and "People

whom I respect would approve of my social distancing/wearing a face mask when I am in public places"), and 4 items gauging descriptive norms (e.g., "How many people in the US currently practice social distancing/wear face masks when they go to public places?" and "How many people in your community currently practice social distancing/ wear face masks when they go to public places?"). Guided by the Integrative Model of Behavioral Prediction (Fishbein & Ajzen, 2011), injunctive norms and descriptive norms were combined as perceived norms (social distancing: $M$ = 4.28, $SD$ = .60; mask wearing: $M$ = 3.96, $SD$ = .73). Self-efficacy for each behavior was assessed with 2 items (e.g., "I believe that I can practice social distancing/wear face masks in public places" and "I find it easy to practice social distancing/wear face masks in public places"; Social distancing: $M$ = 4.41, $SD$ = .72; mask wearing: $M$ = 3.96, $SD$ = .73). All items were adapted from previous research (Fishbein & Ajzen, 2011).

***Behavioral intentions***. Behavioral intentions for each behavior were assessed with 3 items (i.e., three items for each behavior, Fishbein & Ajzen, 2011). Participants were asked about their intentions to practice social distancing and wear masks in the next three months if the Coronavirus is still a public health threat (e.g., "I intend to practice social distancing" and "I will make it a priority to wear a face mask whenever I go to public places"; social distancing: $M$ = 4.34, $SD$ = .77; mask wearing: $M$ = 3.85, $SD$ = 1.12).

***Covariates.*** COVID-19 risk might be perceived differently among different age groups because older people are more vulnerable to severe outcomes (CDC, 2020). Research also found that men are more likely to be at risk than women (Bwire, 2020). Moreover, the disease disproportionally affects people with different income statuses and racial groups (Kim & Bostwick, 2020; Viswanath et al., 2020). Following prior research (Paek et al., 2012), past

behavior was designated as a covariate as it tends to be significantly related to behavioral intentions. Thus, age, sex, income, race, and past behavior were controlled in data analysis.

**Analyses**

Descriptive statistics and correlations between key variables were first assessed. Then, structural equation modeling (SEM) analyses using STATA 14 were conducted to test the hypotheses and the research questions. Parameters were estimated using maximum likelihood procedure. Measurement models were first fitted with a confirmatory factor analysis (CFA) to verify the factor structure. Several fit indices were assessed, including the chi-square, root-mean-square of approximation (RMSEA), standardized root-mean-square residual (SRMR), comparative fit index (CFI), and Tuck-Lewis index (TLI). These indices were considered altogether to account for the sensitivity of the Chi-square statistic to sample size and distributional misspecifications (Hu & Bentler, 1999; Holbert & Stephenson, 2002). Using conventional threshold levels, we considered a value higher than .90 and closer to 1.00 on the CFI and the TLI (Hu & Bentler, 1999), the RMSEA and the SRMR is below .08 (Browne & Cudeck, 1992; Hu & Bentler, 1999) as a good fit to the data.

Table 1 reports Pearson correlation coefficients among the key variables. Attitudes toward social distancing and mask wearing were highly correlated ($r = .69$, $p < .01$). To avoid the problem of multicollinearity, we ran separate analyses for the two behaviors. Covariates were added as exogenous variables and allowed to influence both the mediators and the criterion variables (Kline, 2015). To identify the extent to which the distal variables increased variance explained in attitudes, perceived norms, self-efficacy, and behavioral intentions, personal risk perceptions and societal risk perception were dropped from the model posthoc to test the proximal variables for each behavior.

# Results

## Social Distancing Behavior

We first fitted a measurement model that included the distal variables (personal risk perception and societal risk perception) and proximal variables (attitudes, perceived norms, self-efficacy, and intentions) with 43 indicators. The factors were allowed to correlate and the unstandardized loading of the first indicator was set to 1.0 (Kline, 2015). Overall fit of the measurement model was acceptable, $\chi^2(309) = 1281.824$ ($p < .001$), RMSEA = .07, 90% confidence interval [CI; .069, .077], CFI = .91, TLI = .90, SRMR = .06. Standardized factor loadings ranged from .45 to .91, which were higher than the threshold level of .40 (Stevens, 2012).

Hypothesized structural paths were then added to the model to test *H1* and *H2.* Guided by previous research, the two types of risk perception were allowed to correlate and so were attitudes, self-efficacy, and perceived norm. Results indicated an acceptable structural model fit, $\chi^2(488) = 1568.244$ ($p < .001$), RMSEA = .06, 90% CI [.058, .065], CFI = .91, TLI = .90, SRMR = .06. Standardized path coefficients were reported in Figure 2. Results showed that *H1a* and *H1c* were supported, while *H1b* was not. Additionally, results showed that *H3a-c* were supported. Contrary to *H2a-c,* results revealed that personal risk perception was not associated with attitudes, while having negative associations with perceived norms and self-efficacy. Model variables explained 43% of the variance in attitudes, 46% in perceived norms, 58% in self-efficacy, and 86% in intentions. A post hoc test of the model without personal risk perception and societal risk perception also provided an acceptable fit to the data, $\chi^2(271) = 998.499$ ($p < .001$), RMSEA = .07, 90% CI [.063, .072], CFI = .91, TLI = .90, SRMR = .05, but model

variables explained only 29% of the variance in attitudes, 40% in perceived norms, 48% in self-efficacy, and 83% in intentions.

**Mask Wearing Behavior**

The measurement model for mask wearing behavior had an acceptable fit, $\chi^2(335) = 1283.808$ ($p < .001$), RMSEA = .06, 90% CI [.065, .073], CFI = .92, TLI = .91, SRMR = .06. Standardized factor loadings ranged from .43 to .93. Results of the structural model also revealed an acceptable fit, $\chi^2(524) = 1701.464$ ($p < .001$), RMSEA = .06, 90% CI [.059, .065], CFI = .92, TLI = .91, SRMR = .06. Standardized path coefficients were reported in Figure 3. Results indicated that *H4a-b* were supported while *H4c* was not. Results also showed that *H6a-c* were supported. However, results revealed a significant and negative association between personal risk perception and attitudes, norms, and self-efficacy. Thus, *H5a-c* were not supported. Model variables explained 48% of the variance in attitudes, 64% in perceived norms, 42% in self-efficacy, and 78% in intentions. Posthoc results showed that the model without personal risk perception and societal risk perception provided an acceptable fit, $\chi^2(296) = 1075$ ($p < .001$), RMSEA = .07, 90% CI [.063, .071], CFI = .93, TLI = .91, SRMR = .05. The model also explained 78% in intentions, but explained only 33% in attitudes, 52% in norms, and 28% in self-efficacy.

## Discussion

This study aims to test the associations among the main constructs of the Integrative Model of Behavioral Prediction in the context of social distancing and mask wearing behaviors during the early stages of the COVID-19 outbreak in the US. Results suggest that attitudes are influential in both behavioral contexts. Results also indicate that while perceived norms are associated with intentions to wear masks, this variable has a nonsignificant association with

intentions to practice social distancing. Furthermore, self-efficacy is associated with intentions to practice social distancing but not with intentions to wear masks. Results further reveal that adding personal risk perception and societal risk perception as distal variables enhances the predictive power of the model. These two types of risk perception had different impacts on attitudes, perceived norms, and self-efficacy.

Results show a consistent pattern in the association between attitudes and behavioral intentions for both social distancing and mask wearing behaviors. That is, more favorable attitudes toward social distancing and mask wearing are associated with greater intentions to implement these preventive measures. Interestingly, the effect size of attitudes is larger than that of perceived norms and self-efficacy for mask wearing behavior. Recall that attitudes are behavioral beliefs about the outcome of a behavior. Considering that the effectiveness of face masks has been controversial among scientists, practitioners, and lay people in the US (Cheng et al., 2020; Stone et al., 2020), it is possible that individuals' beliefs of whether mask wearing would be beneficial might be salient in their minds and subsequently affect their behavioral intentions (Fishbein & Cappella, 2006).

Results are inconsistent in terms of the perceived norms - behavioral intentions association between the two behavioral contexts. Perceived norms are associated with mask wearing intentions and not with intentions to practice social distancing. We speculate that this difference might be due to behavioral attributes, with mask wearing behavior being more visible than social distancing behavior. That is, wearing a mask at the early stages of the COVID-19 pandemic could draw greater attention because the behavior has not been a norm in the US. According to the focus theory of normative conduct (Cialdini et al., 1990), this might lead to norm salience that enhances the association between perceived norms and behavioral intentions.

Additionally, one major component of social distancing behavior is staying at home, which is a private behavior that might weaken the association between perceived norms and behavioral intentions (Lapinski & Rimal, 2005). In contrast, mask wearing obviously is a public behavior, which likely enhances this association.

Results indicate that self-efficacy is positively associated with intentions to practice social distancing but not with mask wearing intentions. Self-efficacy in the Integrative Model of Behavioral Prediction refers to levels of perceived behavioral control over the targeted behavior (Ajzen, 2002), which could be an attribute that makes these two behaviors become distinct in this respect. Specifically, social distancing behavior might not only incorporate factors that come from within the individuals (e.g., motivation and ability) but also factors that are outside of individuals (e.g., others' willingness to keep an appropriate social distance and socio-economic pressures to go outside of the home). Mask wearing behavior, however, might not bear similar attributes and people are likely feel that the behavior is within their volitional control. Theorists posit that self-efficacy might have no contribution to behavioral intentions in situations where volitional control is high (Ajzen, 1991, Armitage & Conner, 2001). That is, when a behavior is fully under one's control and there are no constraints on its implementation, self-efficacy might not be helpful to predict behavioral intentions (Godin et al., 2001). The results of this study, therefore, suggest that self-efficacy might be more influential for social distancing behavior.

Results reveal that for both preventive behaviors, the inclusion of personal risk perception and societal risk perception increases variance explained in attitudes, perceived norms, and self-efficacy. These two types of risk perception, therefore, contribute to predicting intentions to apply COVID-19 preventive behaviors. Interestingly, results show different directions of effect for personal risk perception and societal risk perception. More concretely,

while personal risk perception is not associated with attitudes toward social distancing, it is negative associated with attitudes toward mask wearing, perceived norms, and self-efficacy for both behaviors. Prior research has found similar results for the effect of risk perception on attitudes and self-efficacy (i.e., risk perception was operationalized as personal risk perception, Klein et al., 2007; Schmiege et al., 2009). Researchers explain that the observed negative relationships among these variables might not necessarily imply that greater personal risk perception is associated with less behavioral intentions (Schmiege et al., 2009). They argue that the negative association between personal risk perception and behavior might be attributed to the hypothesis that higher levels of engagement in an action reduces personal risk perception (i.e., accuracy hypothesis, Brewer et al., 2004; Gerrard et al., 1996; Weinstein & Nicolich, 1993). That is, if individuals have already engaged in conducting the behavior, the associated perception of a risk to themselves might be a result of their behavior rather than a predictor of the behavior (Renner et al, 2008; Schmiege et al., 2009). Additionally, high personal risk perception may be associated with more cautious appraisals of the benefits of a behavior for self and others (Cameron & Reeve, 2006), leading to underestimations of social norms related to these behaviors. Because data of this study are cross-sectional, it is not possible to test this hypothesis. However, results of this study might offer an interesting finding for future research given the novel context of the COVID-19 outbreak.

In contrast, results reveal that societal risk perception is positively associated with attitudes, perceived norms, and self-efficacy for both behaviors. Although this seems counterintuitive, explanations for this association might be related to participants' demographics, optimistic bias, and media exposure. First, data showed that approximately 90 percent of participants in our sample were below the age of 60. According to the CDC (2020), older adults

of 65 and above are at a higher risk for severe illness. It is possible that our participants were aware of this information and presumed that others were more susceptible to severe illness. This might lead to participants' forming comparative optimism, or beliefs about individuals' chances of experiencing a negative event being lower than their peers (Weinstein, 1989). Research found that people overestimate the risk of an infectious disease for others, while underestimating the risk for themselves to increase their sense of personal control of the risk (Cho et al., 2013; Wei et al., 2007). Indeed, data show that participants rate COVID-19 risk as being higher for others ($M$ = 3.82; $SD$ = .91) than for themselves ($M$ = 3.36; $SD$ = .89, $t(589) = -12.519$, $p < .001$). Thus, participants might be motivated to form attitudes, perceived norms, and self-efficacy for the two preventive behaviors to protect others, who they thought would be more vulnerable to the disease. Additionally, this finding might be attributed to how COVID-19 has been reported in the media. Ludolph et al. (2017) found that media content that highlight the risk of an infectious disease increases individuals' concerns for others in their immediate social environment, which in turn influence their preventive behaviors. Additionally, data on societal risk perception are based on proximal others such family members and friends, and not on a typical American. Previous research found that perception of proximal others' thoughts, feelings, and behaviors motivate individuals' behaviors to respond to a health issue reported in media messages (Paek & Gunther, 2007; Sun et al., 2008). Thus, these factors might explain why societal risk perception is positively associated with attitudes, perceived norms, and self-efficacy.

Results provide support for the utility of the Integrative Model of Behavioral Prediction in the early stages of the COVID-19 outbreak. As theorists argue that the effects of these proximal variables vary across behavioral contexts (Fishbein & Ajzen, 2011), this study reveals that perceived norms and self-efficacy might be influential for one preventive behavior but not

for another. Thus, results of this study corroborate this important proposition in the model. Results also bring to fore the role of personal risk perception and societal risk perception as influential distal variables in the COVID-19 outbreak, which influence underlying beliefs shaping attitudes, perceived norms, and self-efficacy. These two types of risk perception have not been delved into in prior research using the Integrative Model of Behavioral Prediction in the context of infectious outbreaks. This is another theoretical contribution of this study.

Results provide some implications for practitioners seeking to develop intervention messages to encourage adoption of these preventive behaviors. Threat-based strategies focusing on the risk of an infectious disease to an individual might not be effective as effective as strategies focusing on the risk to others because our results show that the latter motivates preventive behaviors through changes in attitudes, perceived norms, and self-efficacy. Additionally, it might be important to address the issue of optimistic bias that could be prevalent among individuals regarding COVID-19 risk because younger populations might perceive a strong sense of themselves being capable of controlling the risk. Previous research also shows that messages conveying a risk for proximal others encourage preventive behaviors against infectious diseases more than messages aiming at one's own risk (Grant & Hofmann, 2011). Thus, results suggest that it might be reasonable to capitalize on proximal others' risk to motivate younger individuals to adopt preventive behaviors. If people believe that they could be unexpected carriers of COVID-19 and spread it to people around them, they may be more likely to comply with behavioral change messages.

Another implication for practitioners is that helping people to form positive attitudes toward COVID-19 preventive behaviors might change behaviors. Because attitudes are primarily formed by evaluations of the outcomes of a behavior, one approach is to use scientific findings

about the effectiveness of social distancing and mask wearing in protecting community members from COVID-19 infection. For example, Cheng et al. (2020) found that non-surgical masks worked effectively to prevent the Coronavirus from spreading through the emission of infected saliva and respiratory droplets. Meanwhile, social distancing practice has been found to reduce the speed of COVID-19 infection (Thunström et al., 2020). Changing perception of the health benefits of face masks and social distancing practice, therefore, might change attitudes and in turn behavior. Moreover, practitioners should seek to change perceived norms of mask wearing. Observing others wearing masks can be a powerful normative cue that induces behavioral compliance. In social distancing context, however, our study suggests practitioners to pay attention to people's perception of their ability to control of external factors, such as others' compliance to social distancing rules or manage the time one should go to public places. Obviously, this is a challenging task considering the pandemic has been ongoing for months and might be even longer. Nevertheless, scholars recommend that clear communication emphasizing that social distancing does indeed reduce disease transmission and keep self and others from getting sick can build public's sense of efficacy (Noar & Austin, 2020).

The current study has several limitations. First, it employs a cross-sectional design using self-reported data and thus does not allow inferences about causal links among key variables. The study's hypotheses, however, are derived from a well-established theoretical framework that has been studied in previous pandemics. Future studies should use experimental and longitudinal designs to provide further evidence to the causal directions. Second, hand washing behavior is not assessed, while it is also an important preventive behavior. Future studies should incorporate hand washing behavior. Third, given the disparities in COVID-19 mortality, it may be important to compare the differences in risk perception, attitudes, perceived norms, self-efficacy, and

preventive behaviors among populations of varying socioeconomic statuses in the US. Future research should consider these disparities.

Despite these limitations, it was important to note that this study gathers data at a crucial snapshot in time (mid-April 2020). Thus, it adds empirical evidence to the association between important factors pertaining to two pivotal preventive behaviors during a critical phase of an outbreak, when the "new normal" lifestyle has not been established and individuals' behaviors are likely guided by uncertainty and fear. From a public health perspective, results of this study suggested that messages that convey the risk for proximal others and promote positive attitudes, as well as selectively targeting perceived norms and self-efficacy toward each preventive behavior might be effective to motivate the adoption of preventive behaviors. More research is needed to support practitioners to consider efficacious behavioral change strategies.

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*Table 1*. Pearson correlations among key variables

| | **Social Distancing Behavior** | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Personal risk perception | _ | | | | | | |
| 2. Social risk perception | .49* | _ | | | | | |
| 3. Attitudes | .22** | .46** | _ | | | | |
| 4. Norms | .08 | .34** | .53** | _ | | | |
| 5. Self-efficacy | .06 | .40** | .60** | .69** | _ | | |
| 6. Behavioral intent | .19** | .51** | .66** | .66** | .77** | _ | |
| 7. Past behavior | .96** | .30** | .42** | .53** | .57** | .56** | _ |

| | **Mask Wearing Behavior** | | | | | | |
|---|---|---|---|---|---|---|---|
| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Personal risk perception | _ | | | | | | |
| 2. Societal risk perception | .49** | _ | | | | | |
| 3. Attitudes | .26** | .43** | _ | | | | |
| 4. Norms | .19** | .42** | .60** | _ | | | |
| 5. Self-efficacy | .12** | .34** | .48** | .48** | _ | | |
| 6. Behavior intent | .27** | .43** | .71** | .70** | .46** | _ | |
| 7. Past Behavior | .19** | .30** | .56* | .65** | .38** | .74** | _ |

*$p$ <.*05*(two-tailed). ** $p$ < .01

Figure 1. The conceptual model.

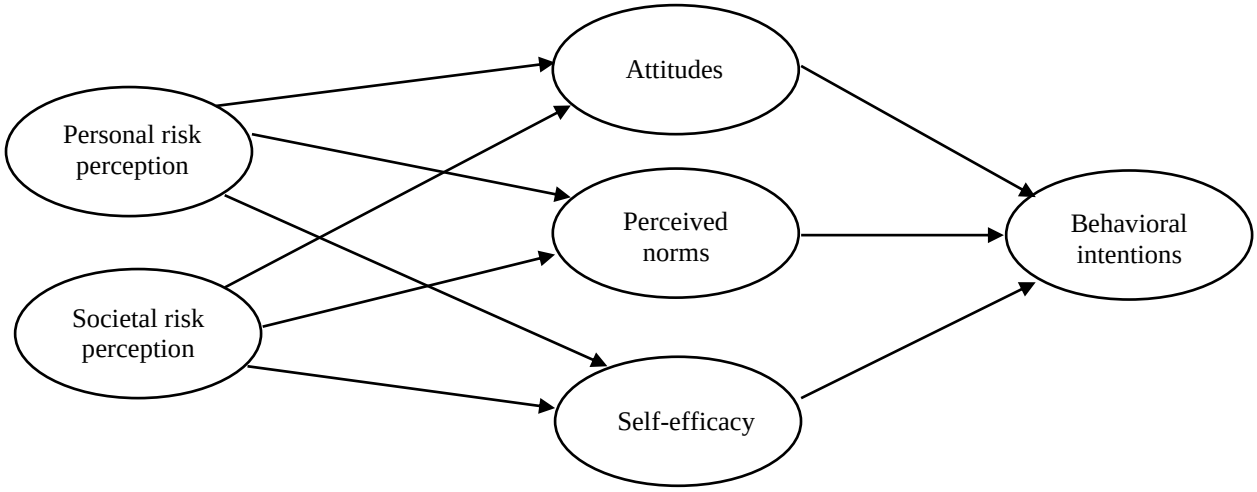

Figure 2. Standardized path coefficients for social distancing model

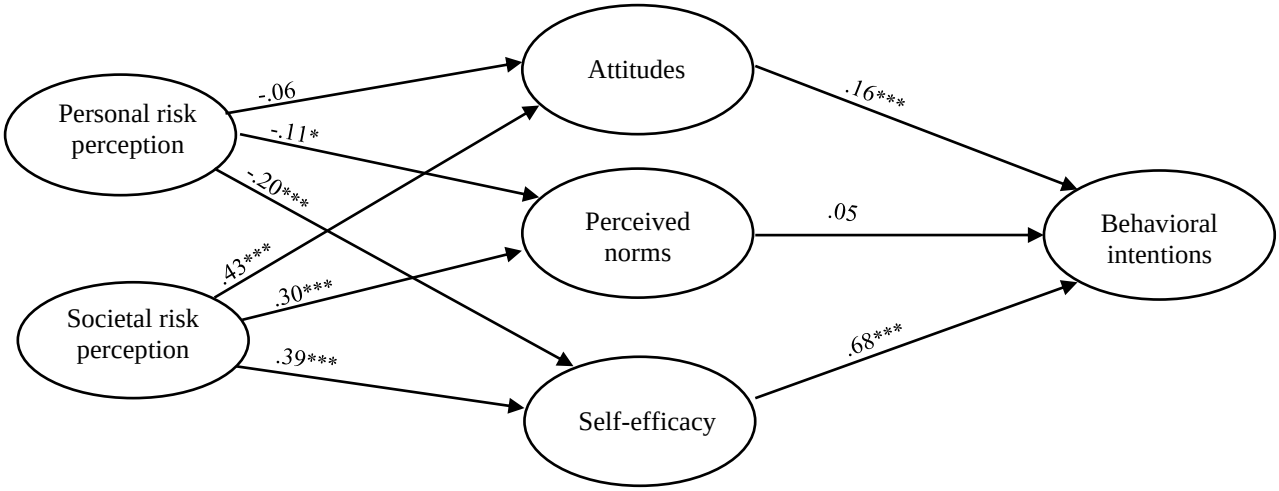


Figure 3. Standardized path coefficients for mask wearing model