

Social Norms, Referent Group Specificity, and College Students' COVID-19 Vaccination Intentions: Risk and Efficacy Perceptions as Boundary Conditions of Normative Influence

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How social norms affect people's decisions to enact protective behaviors when they encounter danger is both theoretically and practically meaningful. This research investigated how social norms varying in referent group specificity, perceived risk, and perceived efficacy affect college students' COVID-19 vaccination intention. We collected data from 640 undergraduate students during March and April 2021. The results showed that social norms in different referent groups are associated uniquely with vaccination intention. We also observed two 3-way interaction effects. Personal- and community-level norms interacted with perceived risk of COVID-19 and perceived efficacy of COVID-19 vaccines to influence participants' vaccination intention. Specifically, perceived risk attenuated the effect of personal- and community-levels of norms on vaccination intention among participants who perceived higher levels of vaccine efficacy. Theoretical and practical implications are discussed.

Keywords: social norms, risk, and efficacy perceptions, college students, COVID-19

The COVID-19 pandemic has claimed more than a million lives in the United States and more than 6 million lives globally. In efforts to end this pandemic, highly effective vaccines have been developed and distributed at a record pace. Despite the efforts to control the pandemic, however, motivating and convincing some members of the public to receive COVID-19 vaccines proved to be a daunting task, to say the least (Edwards, Biddle, Gray, & Sollis, 2021). Although young and healthy adults, such as college students, are not as susceptible to the deadly consequences of COVID-19 as their elder family members, friends, and other immunocompromised individuals, they are not immune to the virus. In fact, poor hygiene practices, high mobility, and strong desires for social gatherings can significantly increase college students' risk of

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infection and their ability to transmit diseases, as can their unrealistic optimism about not getting infected (Ding et al., 2020).

Social norms exert a strong impact on young adults' health-related decisions, such as smoking (Liu, Zhao, Chen, Falk, & Albarracín, 2017), sexual behaviors (van de Bongardt, Reitz, Sandfort, & Deković, 2015), and recent COVID-19 vaccination decisions (e.g., Schmelz & Bowles, 2021). However, given the uncertainty, ambiguous information, and competing interests embedded within social, cultural, and political discussions of COVID-19 vaccines, social norms in various referent groups are likely to be at odds with each other and therefore have distinct effects on college students' vaccination decisions. Moreover, perceived risk and efficacy are two essential factors that guide their decisions about protective behaviors against physical dangers, as posited by protection motivation theory (Rogers, 1975) and the extended parallel process model (EPPM; Witte, 1992). These two perceptions can also alter the extent to which people rely on social norms to guide their vaccination decisions. Whereas past research largely considered normative influence and risks as parallel forces driving behavior, recent research has observed that the magnitude of risk perceptions can alter the magnitude of normative influence on health behaviors (Kittel, Kalleitner, & Schiestl, 2021). This research tests the interactions among perceived risk, efficacy, and social norms in the context of COVID-19 vaccination in the hope of advancing a more precise understanding of risk and efficacy as boundary conditions for social normative influence. Hence, we pursue two goals. First, we differentiate the effects of social norms varying in referent groups on college students' intention to receive COVID-19 vaccines. Second, we test the degree to which perceived risk and efficacy moderate the associations between social norms in various referent groups and college students' COVID-19 vaccination intentions.

Theoretical Perspective

Social Norms in Various Referent Groups

Subjective norms in the theory of reasoned action (Fishbein & Ajzen, 1975) and descriptive norms and injunctive norms in the focus theory of normative conduct (Cialdini, Reno, & Kallgren, 1990) have occupied the stage of social norms research. *Subjective norms* are conceptualized as one's belief about the social expectations of significant others (e.g., family members and friends) and the extent to which the individual is motivated to comply with those significant others (Fishbein & Ajzen, 1975). Cialdini and associates (1990) later distinguished between descriptive and injunctive norms to reflect different motivations for normative compliance (Deutsch & Gerard, 1955). According to Cialdini and colleagues (1990), *descriptive norms* portray how widely a behavior is adopted and practiced (i.e., behavioral prevalence), whereas *injunctive norms* describe the extent to which the behavior is approved of in a referent group. Despite these important conceptual distinctions, researchers have shown that the distinction is not cognitively distinguishable. That is, what is commonly done (i.e., descriptive norms) and what ought to be done (i.e., injunctive norms) inform each other, are tightly intertwined, and can be simultaneously activated (Eriksson, Strimling, & Coultas, 2015). Thus, instead of teasing apart the distinct effects of different social norms on young adults' vaccination intention, we focus on delineating how social norms in different referent groups that young adults belong to vary in impact and as a function of certain boundary conditions of normative influence.

A referent group is an integral component of social norms without which information containing social norms delivers almost no meaning or exerts little impact on information recipients. Advancing an understanding of how norms operate in referent groups that vary in specificity offers greater practical guidance for social norms-based campaigns in terms of which social norms should be reinforced or rectified. The referent group in which social norms exist and the referent group specificity affect the strengths of social norms. According to Mertens and Schultz (2021), the *specificity of a referent group* refers to the social proximity to a group that individuals feel. A referent group with a higher level of specificity has a more refined connection with individuals than a generic referent group due to spatial proximity, personal connections, and similar demographics.

Social norms embraced by a referent group with higher specificity have a stronger effect on behavior than social norms existing in a referent group with lower specificity. Extant literature typically categorizes referent groups where social norms exist into proximal (i.e., important others) and distal (i.e., community or societal) groups and has observed relatively consistent findings. Park and Smith (2007) studied the effects of subjective norms, personal-level (i.e., important others) descriptive and injunctive norms, and societal-level (i.e., all Americans) descriptive and injunctive norms on college students' organ donation intention. They found that personal-level social norms had a stronger impact than societal norms (Park & Smith, 2007). Paek (2009) found that perceived norms of close peers affected college students' intention to smoke. In a similar vein, Yang (2018) observed that perceived injunctive norms among proximal peers (i.e., close friends at the university) had a positive relationship with alcohol consumption, whereas perceived injunctive norms among distant peers (i.e., typical students at the university) had a negative relationship with consumption. In the context of vaccination, Graupensperger, Abdallah, and Lee (2021) found that distal descriptive and injunctive norms (i.e., typical young adults in America) positively affected young adults' acceptance of COVID-19 vaccines. Chu and Liu (2021) observed that proximal descriptive norms (i.e., the extent to which important others would get a COVID-19 vaccine) are positively associated with vaccination intention. However, some inconsistent findings are also present in the literature. Neighbors and colleagues (2008) found that descriptive norms in a more distal group (i.e., typical students) had a greater impact on college students' alcohol consumption than descriptive norms originating from a more proximal group (i.e., typical same-sex students). Sharps, Fallon, Ryan, and Coulthard (2021) observed that in comparison with injunctive norms residing in a proximal group (i.e., significant others and friends), injunctive norms from a distal group (i.e., extended family members) were more influential for individuals' plant-based meal intake.

These mixed findings warrant further research into social norms with an emphasis on the role played by referent group specificity. In the present study, we focused on *personal-*, *community-*, and *societal-* levels of social norms. Whereas the prevalence and approval of performing a behavior among important others constitute norms at a *personal level*, whether a behavior is widely practiced and approved of among members of the community with which the individual identifies constitutes the *community level*. The *societal-level* social norms are the distal norms that exist in an entire society. We advanced our first hypothesis to test how social norms varying in referent group specificity influence vaccination intentions:

H1: Personal-, community-, and societal- levels of social norms will be positively associated with college students' COVID-19 vaccination intention.

Social Norms, Risks, and Efficacy

Understanding how social norms guide behavior under circumstances where individuals encounter dangers, such as a global pandemic, has theoretical value. Researchers have observed inconsistencies in the direct effects of social norms on behaviors, especially concerning descriptive norms (Lapinski & Rimal, 2005). As a result, scholars have devoted substantial efforts toward identifying moderating factors that strengthen or attenuate the effects of descriptive norms, including moderators at the individual level (e.g., self-monitoring), interpersonal and societal level (e.g., group identity), and behavioral levels of influence (e.g., behavioral attributes; Rimal & Lapinski, 2015).

Nevertheless, these efforts are far from conclusive, and questions remain as to whether individuals are more motivated to comply with social norms when they encounter increasing risk and whether the perceived efficacy of a protective behavior would alter the magnitude of the compliance. Indeed, there is a void in the literature concerning how individuals interpret and act on social norms when they are in danger, and answers to this question can advance social norms research by expanding and delineating boundaries of normative influence.

People seek behavioral guidance when they encounter sudden and unforeseen danger. From an evolutionary perspective, a basic motive of self-protection is acutely activated when external stimuli indicate danger (Plutchik, 1980), and the self-protection motivation facilitates and demands behavioral decisions that will yield greater survival success (Maner et al., 2005). To avoid dangers, people are motivated to engage in protective behaviors. Many of these demand group cohesiveness, and therefore, mimicry and imitation are natural responses to danger (Hamilton, 1971).

In studying why some cultures expect strong social norms and compliance with them whereas others tolerate loose social norms and violations of them, Gelfand and Harrington (2015) posited that external threats, which trigger uncertainty about safety, motivate people to rely on observing what others do to make effective behavioral decisions. Due to a need for closure, individuals are motivated to perform norm-consistent behaviors as they want to mitigate perceptions of threat (Gelfand & Harrington, 2015).

Griskevicius, Goldstein, Mortensen, Cialdini, and Kenrick (2006) researched how compliance with group norms was affected by whether people perceived dangers. They found that in comparison with participants who were not exposed to threatening situations, participants who were led to believe that their situation was dangerous displayed stronger conformity with the majority of the group's point of view (Griskevicius et al., 2006). Likewise, Jonas and colleagues (2008) found that when participants were primed with mortality threats, their adherence to salient norms increased. Barth, Masson, Fritsche, and Ziemer (2018) reported that when participants were primed with climate change threats, their conformity with in-group norms intensified.

A common problem existing within these aforementioned studies is the disconnect between the content of the threat and the norms. For example, in Barth and associates' (2018) study, the threat was related to climate change, whereas the norms referenced racial aggression. In Griskevicius and colleagues' (2006) work, the threat was about being left alone in a dark room but the norms were about group members'

opinions about a painting. This methodological caveat emerging from these studies begs a more accurate and consistent test of this reasoning in the context of COVID-19 vaccines in which the content of the threat and the social norms are congruent with each other. As such, we proposed the following hypothesis:

H2: Perceived risk will interact with social norms to affect college students' intentions to vaccinate for COVID-19, such that as the perceived threat increases, the effect of social norms strengthens.

Concomitant with assessments of risk are assessments of efficacy in seeking and obtaining potential tools to mitigate the risk (Rogers, 1975; Witte, 1992). Not only are perceptions of efficacy critical for promoting health behaviors (Bandura, 1977) but they may also enhance the effects of social norms on health behaviors. For instance, Jang, Rimal, and Cho (2013) examined how drinking refusal self-efficacy may interact with descriptive norms to influence drinking intention. They found that when refusal self-efficacy was high, individuals were less susceptible to the influence of descriptive norms as opposed to when efficacy was low. Similarly, Park, Klein, Smith, and Martell (2009) reported that perceived behavioral control to limit alcohol consumption, which is conceptually comparable with self-efficacy, mitigated the association between descriptive norms and college students' alcohol consumption intention. Park and Smith (2007) also found that perceived behavioral control strengthened the effect of personal-level descriptive norms on intention to register as an organ donor, as well as the effect of subjective norms on intentions to discuss organ donation with family. Collectively, these findings suggest that the effect of social norms strengthens as individuals' efficacious beliefs increase.

However, if social norms act as behavioral guidelines in threatening situations, a mitigating effect of social norms can be anticipated when individuals gain an increasingly clear understanding of what to do and whether they can actually do it. That is, when people know the next step of action and how to proceed to the next step, how the action is practiced in their social networks may become less important in comparison with situations in which people know less about what to do. For instance, Cheng, Liu, and Foerster (2022) showed that self-efficacy mitigated the effect of descriptive norms on handwashing and face masking. Even less is known about the extent to which response efficacy, or the extent to which a recommended behavior can prevent or alleviate severe outcomes, interacts with social norms to affect behavior. However, the same logic may still hold. When people believe a recommended behavior is effective in mitigating risks, they may be less likely to follow social norms because the uncertainty about which course of action to take to reverse the danger has been reduced. Thus, following this logic and more general research findings related to efficacy and social norms, we advanced a third hypothesis:

H3: Efficacy will interact with social norms to affect college students' COVID-19 vaccination intention such that, as efficacy increases, the effect of social norms on behavioral intention decreases.

Although researchers often separate assessments of risk and efficacy when investigating their associations with social norms and health behaviors, in reality, perceptions of both are likely to co-occur, according to protection motivation theory (Rogers, 1975) and the EPPM (Witte, 1992). The interplay between risk and efficacy perceptions is likely to jointly influence the degree to which social norms affect vaccination intention. According to protection motivation theory (Rogers, 1975), when encountering a physical threat, individuals' risk perceptions increase, and they are motivated to seek tools for self-protection. The EPPM (Witte, 1992) further delineates behavioral changes under different circumstances of risk and efficacy perceptions.

Specifically, individuals are likely to engage in a recommended behavior when they perceive great risk, believe that the recommended behavior can mitigate the risk, and that they are efficacious in performing the behavior.

At times when risks emerge, social norms can function as decisional guidance for individuals when determining how to act on the risk, especially when the course of action to mitigate and prevent risk is unclear. However, the effect of social norms on guiding protective behavior may erode as people become more cognizant about the correct course of action, especially when the action is easy to adopt. Such an effect may alter depending on individuals' risk perceptions. In the context of COVID-19 vaccines, people may strongly rely on social norms to seek behavioral guidance when little is known about vaccine efficacy, and they do not perceive an overwhelmingly strong risk of COVID-19. As the information about the effectiveness of vaccines in preventing COVID-19 infections grows and vaccines become more readily available to the public, the reliance on social norms to derive the effectiveness of COVID-19 vaccines may decrease. Therefore, instead of relying on perceived social norms, people base their decision about vaccination largely on the extent to which they perceive they are at risk of contracting COVID-19 and whether they think COVID-19 vaccines can prevent them from being sick. On the other hand, for individuals who lack access to COVID-19 vaccines and related information, their decision about vaccination may still be largely affected by their observation of what others do. To test this line of reasoning, we advanced a fourth hypothesis:

H4: There is a three-way interaction among perceived social norms, risks, and efficacy to influence college students' COVID-19 vaccination intention, such that the extent to which perceived risk interacts with social norms to affect vaccination intention depends on the perceived efficacy of the vaccine.

Finally, the three-way interaction predicted in H4 may further depend on social norms specificity. That is, the three-way interaction may manifest within a certain referent group but not others. It is also plausible that the three-way interaction exhibits different patterns depending on the referent group. Hence, we asked the following research question:

RQ: Does the three-way interaction between social norms, risks, and efficacy vary by the specificity of referent groups (i.e., personal, community, and societal levels)?

Method

Participants and Procedure

The data were collected from March 16 to April 30, 2021, as part of a larger investigation of social norms, risk and efficacy perceptions, and college students' information management related to COVID-19 vaccinations. Before the data collection, the U.S. Food and Drug Administration (FDA) had issued emergency use authorizations (EUA) to Pfizer, Moderna, and Jensen COVID-19 vaccines (i.e., in December 2020). Although priorities were given to health-care workers, first responders, elderly individuals, and people who were immunocompromised (Centers for Disease Control and Prevention, 2023), the decision about whether to receive the COVID-19 vaccine occupied the center of public attention and discourse.

A cross-sectional survey was administered to an initial sample of 679 undergraduate students enrolled in a Southwestern private university and a Southeastern public university, all of whom had not received the COVID-19 vaccine at the time of participating in the research. Responses from 640 participants (31.9% males, 66.9% females; 73.0% from the private university) were retained after data quality checks. The average age of the final sample was 19.8 years ($SD = 1.53$). Eighty-one percent of the participants identified themselves as White Americans, followed by 5.9% as Black Americans, 5.0% as multiracial, 3.9% as Asian/Asian Americans, and 1.1% as American Indian or Alaska Native. Close to half of the participants (49.4%) identified as Republicans, followed by 21.9% as Independents and 21.7% as Democrats. A quarter of the participants reported health conditions listed as risk factors for COVID-19 by the Centers for Disease Control and Prevention (2023), such as chronic lung diseases, diabetes, and asthma. Ninety-three percent of the participants knew someone who had tested positive for COVID-19, and 33.8% of the participants knew someone who had died from COVID-19. Twenty-two percent of the participants were living with someone who was at higher risk of COVID-19 (e.g., 65 years and older, having underlying health conditions).

The research was approved by the institutional review boards at Texas Christian University and the University of Arkansas, where data were collected. We invited participants to complete an online survey in which a Web-based information search in Qualtrics was embedded. This study only included data from the survey items completed *before* the Web search (which was part of an experimental manipulation used in the larger project). Participants received extra credit or research credit based on the instructor's discretion. The questionnaire, which included the following measures listed below, demographic items, and other measures unrelated to the present study (e.g., uncertainty discrepancy, negative emotions, information seeking, and family communication patterns), took approximately 30 minutes to complete. Participation was voluntary, survey responses were anonymized, and participants were thanked and debriefed after completing all phases of the full project.

Measures

Unless noted otherwise, all measures were administered using a 7-point Likert scale (1 = *Strongly Disagree*, 7 = *Strongly Agree*). Confirmatory factor analyses were performed using the Lavaan package in R to demonstrate convergent and divergent validity for each of the measures before composite scores were calculated.

Main Predictors

The main predictors were personal-, community-, and societal- levels of social norms, which differed in referent group specificity. Personal-level norms consisted of descriptive and injunctive norms *among important others*, which portrayed what is typical and acceptable among important others. Subjective norms were also a personal-level normative pressure as they reference the extent to which individuals feel pressure from important others to engage in a certain behavior (Ajzen, 1988). The community-level social norms consisted of descriptive and injunctive norms *among others in one's community*, and the societal-level social norms included descriptive and injunctive norms *among people in the United States*.

Descriptive Norms

Descriptive norms at personal-, community-, and societal- levels were measured using the same four-item scale but with different levels referenced within each set of items (Park & Smith, 2007). Participants rated the extent to which each referent group *planned/intended/would attempt/was going to* receive the COVID-19 vaccine as soon as the vaccine became available.

Injunctive Norms

Injunctive norms were measured using a five-item scale for each referent group (Park & Smith, 2007). Participants evaluated the extent to which personal- and community-level referent groups would *approve of/support/endorse/back up/defend* their decision to receive the COVID-19 vaccine and *defend* them if they were criticized for receiving the vaccine. At the societal level, the injunctive norms were measured as the extent to which most people in the United States *approve of COVID-19 vaccination, would support each other's effort to receive the COVID-19 vaccine as soon as it became available, endorse getting vaccinated against COVID-19, believe that everyone should be vaccinated against COVID-19, and think it is important to be vaccinated against COVID-19 as soon as vaccines became available.*

Subjective Norms

Subjective norms were measured with a four-item scale (Park & Smith, 2007), including "People who are important to me *think I should receive/want me to/believe that I should/expect me to* receive the COVID-19 vaccine."

Moderators

Perceived Risk

Perceived risk consisted of perceived susceptibility and severity. Whereas perceived susceptibility was measured with a three-item scale (e.g., "It is likely that I will contract COVID-19"), perceived severity was measured using a four-item scale (e.g., "COVID-19 is a severe disease"; Witte, 1996).

Perceived Efficacy

Perceived efficacy was assessed using Witte's (1996) five-item response efficacy scale (e.g., "COVID-19 vaccines are effective in preventing the disease") and five-item self-efficacy scale (e.g., "It is convenient for me to get the COVID-19 vaccine").

Dependent Variable

Behavioral Intention to Receive the COVID-19 Vaccine

Behavioral intention was measured using a four-item scale adapted from Fishbein and Ajzen (2010; e.g., "I will receive the COVID-19 vaccine as soon as it is available to me").

Possible Covariates

Prior research has shown that vaccine hesitancy and vaccine conspiracy beliefs are strongly related to general vaccination intention (Shapiro, Holding, Perez, Amsel, & Rosberger, 2016). In addition, *Christian nationalism*, an ideology that "idealizes and advocates a fusion of American civic life with a particular type of Christian identity and culture" (Perry, Whitehead, & Grubbs, 2020, p. 406), is associated with cautious behaviors related to COVID-19, such as eating in restaurants and attending large gatherings (Perry et al., 2020). Hence, we included vaccine hesitancy, vaccine conspiracy beliefs, and Christian nationalism as potential covariates in the present study.

Vaccine Hesitancy

Vaccine hesitancy was measured with an established scale consisting of nine items (Shapiro et al., 2018). Although the original scale was developed to assess parents' vaccine hesitancy in relation to their children, we modified the items to reflect college students' vaccine hesitancy. Example items included "Vaccines are important for my health" (reverse-coded) and "I am concerned about the serious adverse effects of vaccines." A higher score indicated greater vaccine hesitancy.

Vaccine Conspiracy Beliefs

Vaccine conspiracy beliefs were measured using Shapiro and colleagues' (2016) seven-item scale. Example items included "Vaccine safety data are often fabricated" and "People are deceived about vaccine efficacy."

Christian Nationalism

Christian nationalism was measured using a six-item scale (Whitehead, Perry, & Baker, 2018). An example item was "The federal government should declare the United States as a Christian nation."

Results

Preliminary Analyses

We first conducted independent sample *t*-tests and chi-squared analyses to compare participants from the two universities in their demographics, normative perceptions, perceived risk and efficacy, and vaccination intention. Participants from the two universities did not differ in terms of gender, age, and race, and there was no difference between these two subpopulations in their normative perceptions, reports of perceived risk and efficacy, and vaccination intention. More participants from the private university identified as Republican (52.2%) than participants from the public university (45.2%), $\chi^2(3) = 8.54, p = .04$. Bivariate correlations and one-way analyses of variance (ANOVAs) were conducted to determine the extent to which participants' demographics, vaccine hesitancy, vaccine conspiracy beliefs, and Christian nationalism were associated with their intention to receive COVID-19 vaccines. The results indicated that political identity, $F(3, 634) = 30.52, p < .001, \eta^2 = .13$, and race, $F(7, 632) = 2.15, p = .03, \eta^2 = .02$, were related to vaccination intention. Thus, we included political identity and race, along with Christian nationalism, vaccine hesitancy, and vaccine conspiracy, as covariates in subsequent statistical analyses. Descriptive statistics, scale reliabilities as assessed by McDonald's omega, and zero-order correlations are reported in Table 1.

Table 1. Zero-Order Correlations Between Focal Variables (N = 640).

		<i>M</i>	<i>SD</i>	ω	1	2	3	4	5	6	7	8	9	10	11
1.	BI	4.61	1.98	.99	—										
2.	PN	5.03	1.44	.98	.74**	—									
3.	CN	5.16	1.13	.97	.35**	.44**	—								
4.	SN	4.79	1.02	.97	.16**	.19**	.42**	—							
5.	RISK	4.75	1.19	.80	.50**	.49**	.28**	.10*	—						
6.	EFFIC	4.81	0.93	.87	.57**	.59**	.34**	.17**	.52**	—					
7.	CHN	3.64	1.18	.75	-.32**	-.25**	-.06	.10*	-.27**	-.25**	—				
8.	VAH	2.78	1.00	.88	-.63**	-.62**	-.32	-.12**	-.45**	-.59**	.35**	—			
9.	VAC	3.66	1.38	.96	-.43**	-.44**	-.15**	.04	-.32**	-.43**	.47**	.64**	—		
10.	POLI	—	—	—	-.16**	-.16**	-.05	.01	-.15**	-.16**	.19**	-.18**	.16**	—	
11.	RACE	—	—	—	-.03	-.02	-.01	-.04	.02	-.01	-.03	.05	-.03	.03	—

Note. Means and standard deviations are displayed in the diagonal. BI = behavioral intention to be vaccinated, PN = personal-level norms, CN = community-level norms, SN = societal-level norms, RISK = risk perceptions, EFFIC = efficacy perceptions, CHN = Christian nationalism, VAH = vaccine hesitancy, VAC = vaccine conspiracy beliefs. POLI = political identity, RACE = ethnicity. * $p < .05$, ** $p < .01$.

Hypothesis Testing

Before testing the hypotheses, we first examined the factor structure of perceived social norms in each referent group. We predicted that perceived norms at personal-, community-, and societal- levels

would form a three-factor solution and conducted confirmatory factor analysis with maximum likelihood (ML) estimation procedures using the Lavaan package in *R* to examine the model fitness, without allowing error covariances. The three-factor solution specifying referent groups without differentiating norms within each group produced an excellent model fit, according to the model fitness evaluation criteria posed by Kline (2016), $\chi^2_{(385)} = 749.80$, $\chi^2/df = 1.94$, $p < .001$, comparative fit index (CFI) = .98, root mean square error of approximation (RMSEA) = .05, standardized root squared residual (SRMR) = .07. We also examined this three-factor model against (1) a seven-factor model that differentiated types of social norms in all referent groups, and (2) a three-factor model that collapsed descriptive norms and injunctive norms across three referent groups and treated subjective norms as the third factor. The seven-factor model fit the data adequately, $\chi^2_{(465)} = 1436.24$, $\chi^2/df = 3.09$, $p < .001$, CFI = .96, RMSEA = .07, SRMR = .11. The three-factor solution that specified the three types of norms (i.e., descriptive, injunctive, and subjective norms) but did not consider referent groups produced poor model fit, $\chi^2_{(431)} = 15962.36$, $p < .001$, CFI = .45, RMSEA = .24, SRMR = .27. Using the ANOVA procedure in the Lavaan package to compare models, we found that the three-factor solution that grouped social norms within each specified referent group outperformed the seven-factor solution [$\chi^2_{(84)} = 838.5$, $p < .001$] and the other three-factor solution [$\chi^2_{(46)} = 15013.56$, $p < .001$]. Hence, the results supported testing the hypotheses about the interactive effects of perceived risk, efficacy, and norms in different referent groups on college students' vaccination intention.

Hypotheses H1 through H4 predicted direct effects of personal-, community-, and societal- level norms, as well as two- and three-way interactions among perceived norms, risks, and efficacy, on the intention to receive COVID-19 vaccines. The RQ asked whether these interactions varied depending on the specificity of social norms. We used item parceling (Little, Cunningham, Shahar, & Widaman, 2002) to create three parcels for perceived norms at each level, and risk and efficacy perceptions, respectively, to facilitate just-identification. We applied the orthogonalization procedure (Little, Card, Bovaird, Preacher, & Crandall, 2007) to create the three two-way interactions (i.e., perceived norms \times risk, perceived norms \times efficacy, and risk \times efficacy) and one three-way (i.e., perceived norms \times risk \times efficacy) interaction at each level of social norms to completely remove multicollinearity. We then used structural equation modeling with ML estimation procedures to test H1 through H4, separated by referent group specificity. In each model, perceived norms in each referent group, risk, and efficacy served as main effect terms, followed by three two-way interaction effects (i.e., norms \times risk, norms \times efficacy, risk \times efficacy) and one three-way interaction effect (i.e., norms \times risk \times efficacy), controlling for the effects of political identity, race, vaccine hesitancy, vaccine conspiracy beliefs, and Christian nationalism. The measurement models were first assessed, and we employed CFIs, RMSEA, SRMRs, and relative χ^2/df as the indicators of model fit (West, Taylor, & Wu, 2012). The analyses were conducted using the Lavaan package in the *R* analytic environment. We organized and presented the results at each specific level of referent groups, as summarized in Tables 2–4.

Personal-Level Norms

The measurement model indicated an acceptable model fit, $\chi^2_{(386)} = 1132.21$, $\chi^2/df = 2.93$, CFI = .96, RMSEA = .06 [90%CI = .057, .064], SRMR = .075. The structural model showed an acceptable model fit, $\chi^2_{(859)} = 2132.29$, $\chi^2/df = 2.48$, CFI = .96, RMSEA = .05 [90%CI = .046, .051], SRMR = .06. After controlling for the covariates, perceived norms in important others emerged as a positive predictor of vaccination intent ($b = .54$, $SE = .05$, $t = 16.99$, $p < .001$). There were no significant two-way interactions, but a significant three-

way interaction emerged, $b = -.11$, $SE = .02$, $t = -4.88$, $p < .001$. The three-way interaction was decomposed and displayed in Figure 1. The interaction between personal-level norms and risk did not influence behavioral intention when efficacy was at the mean ($b = .01$, $t = 0.14$, $p = .89$). When participants' efficacy was 1 *SD* below the mean ($b = .11$, $t = 2.48$, $p = .01$) and 1 *SD* above the mean ($b = -.12$, $t = -2.65$, $p = .01$), perceived risk moderated the effect of personal-level norms on behavioral intention but in opposite patterns. As shown in Figure 1, perceived risk strengthened the effect of norms on vaccination intention when perceived efficacy was low but attenuated the effect when efficacy was high. Taken together, the model specifying personal-level norms, perceived risk and efficacy, and the interactions among them predicted 59% of the shared variance in participants' intention to vaccinate against COVID-19.

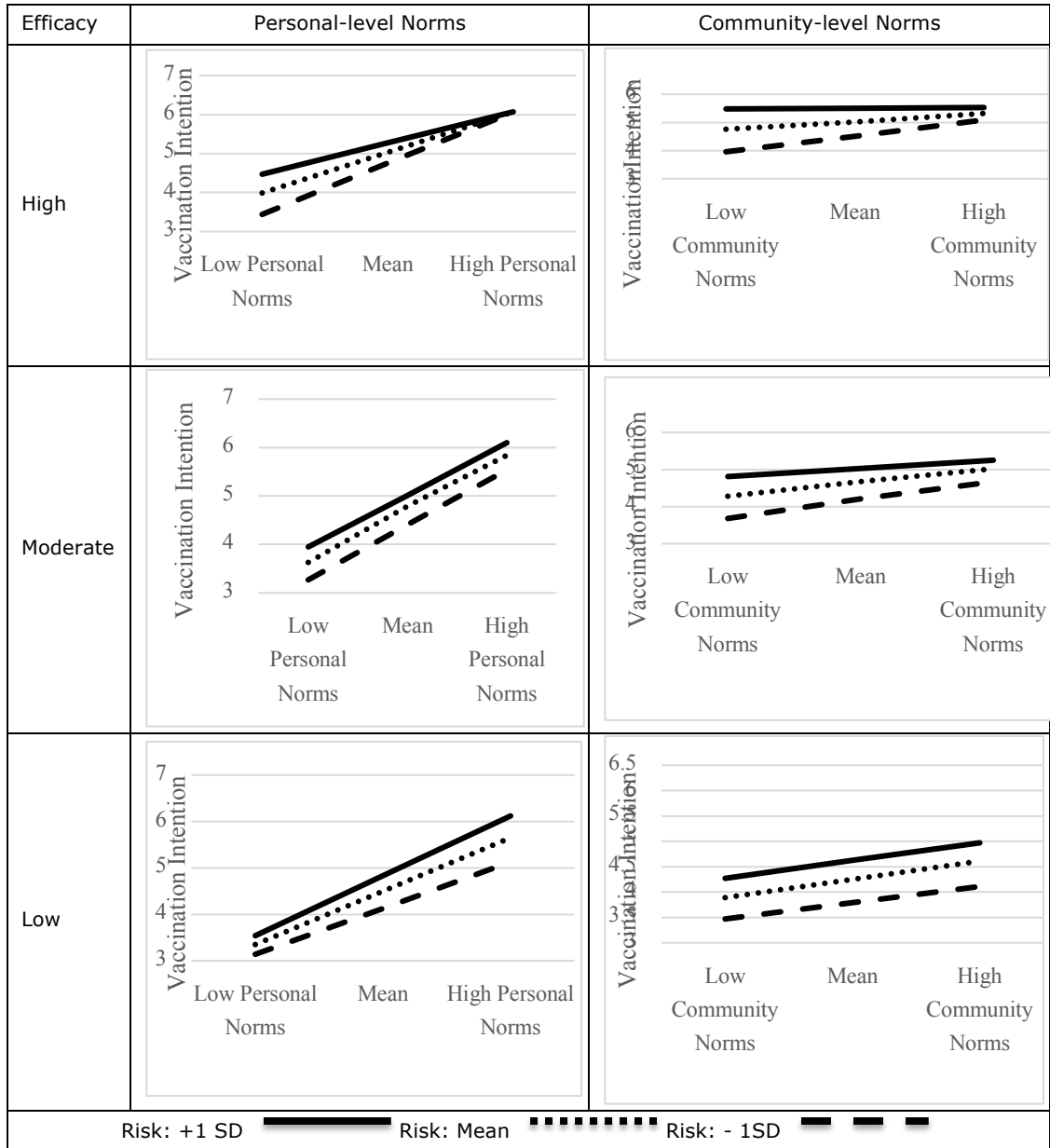


Figure 1. Three-way interaction between perceived risk, perceived efficacy, and personal-level norms.

Table 2. Structural Equation Modeling Results of Personal-Level Social Norms, Perceived Risk, and Perceived Efficacy Predicting Vaccination Intention.

	<i>b</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
PN	.54	0.80	.05	16.99	<.001
PR	.12	0.28	.06	5.06	<.001
PE	.11	0.39	.08	4.97	<.001
PN × PR	-.02	-0.02	.04	-0.14	.89
PN × PE	-.01	-0.03	.06	-0.64	.52
PR × PE	-.02	-0.03	.12	-0.54	.59
PN × PR × PE	-.11	-0.12	.02	-4.88	<.001
POLI	-.16	-0.13	.03	-4.00	<.001
RACE	-.004	-0.01	.06	-0.12	.91
CHN	-.31	-0.33	.05	-7.23	<.001
VAH	-.52	-0.61	.05	-12.70	<.001
VAC	-.43	-0.48	.04	-10.61	<.001

Note. PN = personal-level norms, PR = perceived risk, PE = perceived efficacy, POLI = political identity, RACE = ethnicity, CHN = Christian nationalism, VAH = vaccine hesitancy, VAC = vaccine conspiracy beliefs.

Community-Level Norms

The measurement model indicated an acceptable model fit, $\chi^2_{(386)} = 1119.34$, $\chi^2/df = 2.90$, CFI = .96, RMSEA = .06 [90%CI = .054, .061], SRMR = .071. The structural model showed a good model fit, $\chi^2_{(934)} = 2129.44$, $\chi^2/df = 2.28$, CFI = .96, RMSEA = .045 [90%CI = .042, .047], SRMR = .045. Like personal-level norms, perceived norms at the community level positively predicted vaccination intention ($b = .12$, $SE = .06$, $t = 3.54$, $p = .001$). We did not observe significant two-way interactions, but we did observe a significant three-way interaction, $b = -.12$, $SE = .05$, $t = -4.79$, $p < .001$. Specifically, the interaction between community-level norms and perceived risk when perceived efficacy was 1 SD below the mean was not significant ($b = .01$, $t = -0.57$, $p = .88$), whereas the two-way interaction was significant when efficacy was at the mean ($b = -.10$, $t = -2.29$, $p = .02$) and 1 SD above the mean ($b = -.22$, $t = -4.03$, $p < .001$). As shown in the right panel of Figure 1, as perceived efficacy increased, perceived risk attenuated the effect of community-level norms on vaccination intention. The model explained 49.9% of the shared variance in participants' intention to vaccinate.

Societal-Level Norms

The measurement model indicated an acceptable model fit, $\chi^2_{(441)} = 1312.42$, $\chi^2/df = 2.97$, CFI = .96, RMSEA = .056 [90%CI = .052, .059], SRMR = .075. The structural model showed a good model fit, $\chi^2_{(943)} = 1940.86$, $\chi^2/df = 2.06$, CFI = .96, RMSEA = .041 [90%CI = .038, .043], SRMR = .061. Although societal-level norms positively predicted vaccination intention ($b = .07$, $SE = .06$, $t = 2.34$, $p = .02$), there were no significant two- or three-way interactions among societal-level norms, perceived risk, and perceived efficacy. The

model explained 41.6% of the shared variance in participants' intention to vaccinate. The findings were consistent with H1, but inconsistent with H2 and H3. The results were partially consistent with H4.

Table 3. Structural Equation Modeling Results of Community-Level Social Norms, Perceived Risk, and Perceived Efficacy Predicting Vaccination Intention.

	<i>b</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
CN	.12	0.36	.06	3.54	.001
PR	.22	0.39	.07	5.45	<.001
PE	.24	0.76	.09	5.43	<.001
CN × PR	-.05	-0.06	.06	-1.04	.30
CN × PE	.06	0.01	.06	1.43	.15
PR × PE	.06	0.03	.10	1.59	.11
CN × PR × PE	-.12	-0.14	.05	-4.79	<.001
POLI	-.16	-0.13	.03	-3.94	<.001
RACE	.004	-0.01	.06	-0.09	.93
CHN	-.31	-0.32	.05	-7.28	<.001
VAH	-.52	-0.61	.05	-12.52	<.001
VAC	-.43	-0.48	.04	-10.63	<.001

Note. CN = community-level norms, PR = perceived risk, PE = perceived efficacy, POLI = political identity, RACE = ethnicity, CHN = Christian nationalism, VAH = vaccine hesitancy, VAC = vaccine conspiracy beliefs.

Table 4. Structural Equation Modeling Results of Societal-level Social Norms, Perceived Risk, and Perceived Efficacy Predicting Vaccination Intention.

	<i>b</i>	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>
SN	.07	0.14	.06	2.34	.02
PR	.22	0.36	.07	5.23	<.001
PE	.26	0.81	.14	5.71	<.001
SN × PR	-.001	-0.04	.06	-0.64	.52
SN × PE	-.01	-0.06	.12	-0.55	.58
PR × PE	.05	0.06	.05	1.24	.22
SN × PR × PE	-.04	-0.11	.08	-1.83	.07
POLI	-.04	-0.05	.05	-1.09	.27
RACE	-.004	-0.01	.06	-0.64	.52
CHN	-.05	-0.06	.05	-1.17	.24
VAH	-.15	-0.20	.06	-3.11	.01
VAC	-.11	-0.15	.04	-2.50	.03

Note. SN = societal-level norms, PR = perceived risk, PE = perceived efficacy, POLI = political identity, RACE = ethnicity, CHN = Christian nationalism, VAH = vaccine hesitancy, VAC = vaccine conspiracy beliefs.

In response to the RQ, looking broadly across the findings for H2 through H4, the patterns of the three-way interactions varied depending on the referent group that was specified. That is, we observed significant three-way interactions among norms, risk, and efficacy at personal- and community- levels, with patterns that differed between the two types of norms, but no such three-way interaction at the societal-level of norms.

Discussion

Public health measures for controlling COVID-19 have encountered furious debates, and COVID-19 vaccines are no exception. Significant proportions of different populations refuse to be vaccinated or are uncertain about whether they would even consider vaccination (Wouters et al., 2021). Therefore, strategically and effectively encouraging COVID-19 vaccinations has been the priority for many health officials, researchers, and practitioners.

This research extended our understanding of social norms in two ways. First, in the context of COVID-19 vaccinations, social norms are differentially construed at varying levels of one's social environment, justifying the need to examine the effects of social norms in different referent groups. Second, this research bridges the divided bodies of literature on how social norms influence protective behavior in circumstances of rising risk of infectious diseases and varying levels of efficacy perceptions of newly developed public health measures, which can exceed beyond the COVID-19 context.

The first set of findings is pertinent to the specificity of referent groups in social norms. Our findings suggest that personal-level norms had the strongest effect on college students' vaccination intention, followed by community-level norms and societal-level norms. This finding is consistent with the notion that as the distance from a referent group increases, normative influence weakens (Mertens & Schultz, 2021). The factor structure of perceived social norms suggests that at each level of one's social circle, perceived descriptive norms (i.e., commonness) and injunctive norms (i.e., rightness) are tightly intertwined, inform each other, and conjointly influence behavior (Eriksson et al., 2015). Instead of making a distinction between the commonness and morality of COVID-19 vaccinations, participants strongly associated the *prevalence* of COVID-19 vaccination in a referent group with the *endorsement* of COVID-19 vaccination in that group. These findings, along with previous research (Eriksson et al., 2015), suggest that future intervention efforts can focus on either descriptive or injunctive norms residing within the same referent group as it is highly plausible that individuals will associate the two types of social norms and act on the association. Thus, instead of choosing which specific type of social norms to change, the focus of social norm-based interventions may be shifted to identifying the referent group whose norms are influential for vaccine uptake and can be shaped and rectified by providing information. Moreover, given the challenge of changing personal-level perceived social norms, appeals to individuals' community-level (e.g., schools, neighborhoods, and workplaces) or societal-level (i.e., a geographic region) norms to motivate people to vaccinate may be a viable and promising option for future vaccination interventions.

The second set of findings illuminates the two three-way interactions among perceived risk, perceived efficacy, and social norms in two referent groups (i.e., personal- and community- levels). The three-way interactions indicated that perceived risk attenuated the effects of social norms when perceived

efficacy was high. On the contrary, as perceived efficacy decreased, perceived risk strengthened the effects of norms, especially personal-level norms on vaccination intention. The literature on information processing and elaboration sheds light on these findings. Prior research has argued that social norms, especially descriptive norms, serve as heuristic cues and promote peripheral information processing (Cialdini & Trost, 1998). It is possible that when faced with an increasing physical threat like COVID-19, people are motivated to elaborate received information more systematically, thereby rendering social norms insufficient to meet one's need for closure and self-protection. As individuals' beliefs about the efficacy of COVID-19 vaccines and their ability to receive the vaccine increase, their reliance on social norms when deciding whether they will be vaccinated decreases. On the contrary, when people perceive low risk and efficacy, they peripherally process information, and the effect of social norms tends to be magnified.

It is important to note that these findings run somewhat contrary to previous research, at least among participants who held high efficacy beliefs. As mentioned earlier, a mismatch between the content of norms and the nature of the threat was present in previous studies (e.g., Barth et al., 2018; Griskevicius et al., 2006), whereas in this research, the threat is COVID-19, and the norms are directly related to behaviors enacted to combat the disease. Additionally, prior research either used a hypothetical and imagined threat (Griskevicius et al., 2006) or a distal threat (Barth et al., 2018), whereas the current research focused on an immediate health risk that participants have been facing for more than a year at the point of data collection. The methodological and topical differences may explain the inconsistent findings although we maintain that aligning the content of norms and the threats is necessary to illuminate the complex relationships.

The findings of this study yield meaningful practical implications and possible directions for future research. They suggest the importance of considering perceived risk and efficacy when interventions use social norms to promote vaccine uptake. Specifically, our findings suggest that segmenting the target audience based on their risk and efficacy perceptions is one possible pathway for enhancing the influence of social norm-based interventions. Such interventions are particularly effective in motivating a desired behavior when recipients question the efficacy of a recommended course of action and/or perceive obstacles preventing them from engaging in the action. Social norm-based interventions are also influential for audiences who do not perceive health threats as serious or perceive that they are less vulnerable to the harms posed by the threats. The interactions among social norms, perceived risk, and perceived efficacy observed in this research may be a function of the unique timing of data collection when the vaccines were under the FDA EUA and not widely available to the public. A different interaction pattern could emerge as a result of greater vaccine accessibility and/or as a function of the vaccines obtaining full FDA approval. Future research may explore this possibility.

Limitations, Implications, and Conclusions

Our results should be interpreted with caution given three limitations. First, although we were able to collect data at an opportune time from a specific population for whom the implementation of COVID-19 vaccines was new and important for mitigating community spread, we used a convenience sample that consisted primarily of White, politically conservative female college students. During a time when vaccinations are furiously debated and highly politicized, our findings are bound by the ethnic, political, and

socioeconomic characteristics of these college students. Future research can gather data from other populations and examine the extent to which the findings still hold. The second limitation is related to how participants may have defined "significant others." As Neighbors and colleagues (2008) noted, who constitutes "significant others" may alter people's normative perceptions. Future research can gain greater clarity by asking participants to specify significant others. Third, the measures employed to assess injunctive norms at the personal and community levels focused on social acceptance of participant vaccination, whereas the measures of societal injunctive norms focused on perceived approval of vaccination against COVID-19. Although the measures were drawn directly from the existing literature (Neighbors et al., 2008; Park & Smith, 2007), the difference in the object under evaluation may have influenced how participants responded to the questions.

These limitations notwithstanding, this research identifies perceived risk and efficacy as important boundary conditions for social norms related to COVID-19 vaccinations, and the interactions vary depending on specific referent groups. Consequently, the findings offer directions for future research. For instance, this research did not separate different types of norms within each referent group to investigate whether perceived risk and efficacy conditioned the effects of norms on behavioral intention. Despite its conceptual and statistical grounding, this approach may have missed the opportunity to further explore nuances in the interactions. Future researchers may try to bridge this gap by employing experimental designs to examine how different norms interact with risk and efficacy to influence health behaviors. This research shows that especially for issues on which considerable social divisions exist, participants likely perceive vastly different social norms in different referent groups. Hence, inquiries into how individuals perceive social norms in different referent groups and make decisions when normative perceptions are incongruent and counteract each other are crucial for social norm-based health interventions.

The landscape of COVID-19 vaccinations is complex. Social norms have been a mainstay for health intervention efforts targeting college students (Rimal & Real, 2005), but their effects are small (Rhodes, Schuman, & McClaran, 2020) and attention to them during the pandemic is inadequate (Rimal & Storey, 2020). Consequently, efforts to mobilize college students' vaccinations can target community-level norms, consider the audience's risk and efficacy perceptions, and caution against the counterproductivity of incongruent social norms.

References

- Ajzen, I. (1988). *Attitudes, personality, and behavior*. London, UK: Open University Press.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*(2), 191–215. doi:10.1037/0033-295X.84.2.191
- Barth, M., Masson, T., Fritsche, I., & Ziemer, C.-T. (2018). Closing ranks: Ingroup norm conformity as a subtle response to threatening climate change. *Group Processes & Intergroup Relations*, *21*(3), 497–512. doi:10.1177/1368430217733119

- Centers for Disease Control and Prevention. (2023, February 9). Underlying medical conditions associated with higher risk for severe COVID-19: Information for healthcare professionals. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-care/underlyingconditions.html>
- Centers for Disease Control and Prevention. (2023, March 15). *CDC museum COVID-19 timeline*. Retrieved from <https://www.cdc.gov/museum/timeline/covid19.html>
- Cheng, Y., Liu, R. W., & Foerster, T. A. (2022). Predicting intentions to practice COVID-19 preventive behaviors in the United States: A test of the risk perception attitude framework and the theory of normative social behavior. *Journal of Health Psychology, 27*(12), 2744–2762.
doi:10.1177/13591053211057382
- Chu, H., & Liu, S. (2021). Integrating health behavior theories to predict American's intention to receive COVID-19 vaccine. *Patient Education and Counseling, 104*(8), 1878–1886.
doi:10.1016/j.pec.2021.02.031
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58*(6), 1015–1026. doi:10.1037/0022-3514.58.6.1015
- Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 2, pp. 151–192). Boston, MA: McGraw-Hill.
- Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *The Journal of Abnormal and Social Psychology, 51*(3), 629–636.
doi:10.1037/h0046408
- Ding, Y., Du, X., Li, Q., Zhang, M., Zhang, Q., Tang, X., & Liu, X. (2020). Risk perception of coronavirus disease 2019 (COVID-19) and its related factors among college students in China during quarantine. *PLoS One, 15*, e0237626. doi:10.1371/journal.pone.0237626
- Edwards, B., Biddle, N., Gray, M., & Sollis, K. (2021). COVID-19 vaccine hesitancy and resistance: Correlates in a nationally representative longitudinal survey of the Australian population. *PLoS One, 16*, e0248892. doi:10.1371/journal.pone.0248892
- Eriksson, K., Strimling, P., & Coultas, J. C. (2015). Bidirectional associations between descriptive and injunctive norms. *Organizational Behavior and Human Decision Processes, 129*, 59–69.
doi:10.1016/j.obhdp.2014.09.011
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York, NY: Taylor & Francis.
- Gelfand, M. J., & Harrington, J. R. (2015). The motivational force of descriptive norms: For whom and when are descriptive norms most predictive of behavior? *Journal of Cross-Cultural Psychology*, *46*(10), 1273–1278. doi:10.1177/0022022115600796
- Graupensperger, S., Abdallah, D. A., & Lee, C. M. (2021). Social norms and vaccine uptake: College students' COVID vaccination intentions, attitudes, and estimated peer norms and comparisons with influenza vaccine. *Vaccine*, *39*(15), 2060–2067. doi:10.1016/j.vaccine.2021.03.018
- Griskevicius, V., Goldstein, N. J., Mortensen, C. R., Cialdini, R. B., & Kenrick, D. T. (2006). Going along versus going alone: When fundamental motives facilitate strategic (non)conformity. *Journal of Personality and Social Psychology*, *91*(2), 281–294. doi:10.1037/0022-3514.91.2.281
- Hamilton, W. D. (1971). Geometry for the selfish herd. *Journal of Theoretical Biology*, *31*(2), 295–311. doi:10.1016/0022-5193(71)90189-5
- Jang, S. A., Rimal, R. N., & Cho, N. (2013). Normative influences and alcohol consumption: The role of drinking refusal self-efficacy. *Health Communication*, *28*(5), 443–451. doi:10.1080/10410236.2012.691455
- Jonas, E., Martens, A., Niesta Kayser, D., Fritsche, I., Sullivan, D., & Greenberg, J. (2008). Focus theory of normative conduct and terror-management theory: The interactive impact of mortality salience and norm salience on social judgment. *Journal of Personality and Social Psychology*, *95*(6), 1239–1251. doi:10.1037/a0013593
- Kittel, B., Kalleitner, F., & Schiestl, D. W. (2021). Peers for the fearless: Social norms facilitate preventive behaviour when individuals perceive low COVID-19 health risks. *PLoS One*, *16*, e0260171. doi:10.1371/journal.pone.026171
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). New York, NY: Guilford.
- Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, *15*(2), 127–147. doi:10.1111/j.1468-2885.2005.tb00329.x
- Little, T. D., Card, N. A., Bovaird, J. A., Preacher, K. J., & Crandall, C. S. (2007). Structural equation modeling of mediation and moderation with contextual factors. In T. D. Little, J. A. Bovaird, & N. A. Card (Eds.), *Modeling contextual effects in longitudinal studies* (pp. 207–230). Mahwah, NJ: Lawrence Erlbaum Associations.

- Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to parcel: Exploring the question, weighing the merits. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 151–173. doi:10.1207/S15328007SEM0902_1
- Liu, J., Zhao, S., Chen, X., Falk, E., & Albarracín, D. (2017). The influence of peer behavior as a function of social and cultural closeness: A meta-analysis of normative influence on adolescent smoking initiation and continuation. *Psychological Bulletin*, 143(10), 1082–1115. doi:10.1037/bul0000113
- Maner, J. K., Kenrick, D. T., Becker, D. V., Roberston, T. E., Hofer, B., Neuberg, S. L., . . . Schaller, M. (2005). Functional projection: How fundamental social motives can bias interpersonal perception. *Journal of Personality and Social Psychology*, 88(1), 63–78. doi:10.1037/0022-3514.88.1.63
- Mertens, S. N., & Schultz, P. W. (2021). Referent group specificity: Optimizing normative feedback to increase residential recycling. *Journal of Environmental Psychology*, 73, 101541. doi:10.1016/j.jenvp.2020.101541
- Neighbors, C., O'Connor, R. M., Lewis, M. A., Chawla, N., Lee, C. M., & Fossos, N. (2008). The relative impact of injunctive norms on college student drinking: The role of reference group. *Psychology of Addictive Behaviors*, 22(4), 576–581. doi:10.1037/a0013043
- Paek, H.-J. (2009). Differential effects of different peers: Further evidence of the peer proximity thesis in perceived peer influence on college students' smoking. *Journal of Communication*, 59(3), 434–455. doi:10.1111/j.1460-2466.2009.01423.x
- Park, H. S., Klein, K. A., Smith, S., & Martell, D. (2009). Separating subjective norms, university descriptive and injunctive norms, and U.S. descriptive and injunctive norms for drinking behavior intention. *Health Communication*, 24(8), 746–751. doi:10.1080/10410230903265912
- Park, H. S., & Smith, S. W. (2007). Distinctiveness and influence of subjective norms, personal descriptive and injunctive norms, and societal descriptive and injunctive norms on behavioral intent: A case of two behaviors critical to organ donation. *Human Communication Research*, 33(2), 194–218. doi:10.1111/j.1468-2958.2007.00296.x
- Perry, S. L., Whitehead, A. L., & Grubbs, J. B. (2020). Culture wars and COVID-19 conduct: Christian nationalism, religiosity, and Americans' behavior during the coronavirus pandemic. *Journal for the Scientific Study of Religion*, 59(3), 405–416. doi:10.1111/jssr.12677
- Plutchik, R. (1980). A general psycho-evolutionary theory of emotion. In R. Plutchik & H. Kellerman (Eds.), *Theories of emotion* (pp. 3–33). New York, NY: American Press.
- Rhodes, N., Shulman, H. C., & McClaran, N. (2020). Changing norms: A meta-analytic integration of research on social norms appeals. *Human Communication Research*, 46(2–3), 161–191. doi:10.1093/hcr/hqz023

- Rimal, R. N., & Lapinski, M. K. (2015). A re-explication of social norms, ten years later. *Communication Theory, 25*(4), 393–409. doi:10.1111/comt.12080
- Rimal, R. N., & Real, K. (2005). How behaviors are influenced by perceived norms: A test of the theory of normative social behavior. *Communication Research, 32*(3), 389–414. doi:10.1177/0093650205275385
- Rimal, R. N., & Storey, J. D. (2020). Construction of meaning during a pandemic: The forgotten role of social norms. *Health Communication, 35*(14), 1732–1734. doi:10.1080/10410236.2020.1838091
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology, 91*(1), 91–114. doi:10.1080/00223980.1975.9915803
- Schmelz, K., & Bowles, S. (2021). Overcoming COVID-19 vaccination resistance when alternative policies affect the dynamics of conformism, social norms, and crowding out. *Proceedings of the National Academy of Sciences, 118*(25), e2104912118. doi:10.1073/pnas.2104912118
- Shapiro, G. K., Holding, A., Perez, S., Amsel, R., & Rosberger, Z. (2016). Validation of the vaccine conspiracy beliefs scale. *Papillomavirus Research, 2*, 167–172. doi:10.1016/j.pvr.2016.09.001
- Shapiro, G. K., Tatar, O., Dube, E., Amsel, R., Knauper, B., Naz, A., . . . Rosberger, Z. (2018). The vaccine hesitancy scale: Psychometric properties and validation. *Vaccine, 36*(2), 660–667. doi:10.1016/j.vaccine.2017.12.043
- Sharps, M. A., Fallon, V., Ryan, S., & Coulthard, H. (2021). The role of perceived descriptive and injunctive norms on the self-reported frequency of meat and plant-based meal intake in UK-based adults. *Appetite, 167*, 105615. doi:10.1016/j.appet.2021.105615
- van de Bongardt, D., Reitz, E., Sandfort, T., & Deković, M. (2015). A meta-analysis of the relations between three types of peer norms and adolescent sexual behavior. *Personality and Social Psychology Review, 19*(3), 203–234. doi:10.1177/1088868314544223
- West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. In R. H. Hoyle (Ed.), *Handbook of structural equation modeling* (pp. 209–231). New York, NY: Guilford Press.
- Whitehead, A. L., Perry, S. L., & Baker, J. O. (2018). Make American Christian again: Christian nationalism and voting for Donald Trump in the 2016 presidential election. *Sociology of Religion, 79*(2), 147–171. doi:10.1093/socrel/srx070
- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs, 59*(4), 329–349. doi:10.1080/03637759209376276

- Witte, K. (1996). Predicting risk behaviors: Development and validation of a diagnostic scale. *Journal of Health Communication, 1*(4), 317–342. doi:10.1080/108107396127988
- Wouters, O. J., Shadlen, K. C., Salcher-Konrad, M., Pollard, A. J., Larson, H. J., Teerawattananon, Y., & Jit, M. (2021). Challenges in ensuring global access to COVID-19 vaccines: Production, affordability, allocation, and deployment. *The Lancet, 397*(10278), 1023–1034. doi:10.1016/S10140-6736(21)00306-8
- Yang, B. (2018). The moderating role of close versus distal peer injunctive norms and interdependent self-construal in the effects of descriptive norms on college drinking. *Health Communication, 33*(6), 762–770. doi:10.1080/10410236.2017.1312202