



Injunctive social norms and perceived message tailoring are associated with health information seeking

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Received: 8 July 2022 / Accepted: 18 April 2023 / Published online: 29 April 2023
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Abstract

Social norms messages may promote information seeking, especially when the norms refer to a group with which a person identifies. We hypothesized that tailored social norms messages would increase COVID-19 testing willingness and intentions. College students ($n=203$, 75% female, 87% White) were randomly assigned to one of four conditions in a 2 (Descriptive norms: *Relevant* vs. *Irrelevant* to COVID-19 testing) x 2 (Tailoring: *Specific* vs. *General* group information) experimental design. Participants reported COVID-19 testing willingness and intentions, perceived injunctive norms, and identification and connectedness with the group in the message. Although neither the norm nor tailoring manipulation worked as intended, participants who perceived greater message tailoring and injunctive norms reported greater willingness and intentions, with no effect of perceived descriptive norms on either outcome. Tailored messages as well as messages promoting injunctive norms may promote information seeking across health contexts, thereby enabling more informed decisions.

Keywords Information seeking · Social norms · Tailoring · COVID-19 · Health communication

Introduction

In the past few decades, the quantity and quality of information available about one's health has increased rapidly. This personalized health information is also more easily accessible; for example, many websites host risk calculators that people can use to learn their risk of various cancers (Waters et al., 2021). Learning health information—such as information about one's disease risk or health status—can be beneficial as it can lead to appropriate preventive behaviors. However, despite the accessibility and utility of health information, people vary in whether they decide to seek versus avoid information (Kahlor, 2010; Sharot & Sunstein, 2020; Sweeny et al., 2010). For example, people may differ in how interested they are in learning their risk of disease (Howell et al., 2016; O'Brien et al., 2022; Rauscher & Dean, 2018; Taber et al., 2015) or in engaging in behaviors such as cancer screening that may provide information about one's

health status (Emanuel et al., 2015). In the present study, we conceptualized health information seeking as intending to get a COVID-19 test when symptomatic. Despite the utility of free COVID-19 testing, many people may be unwilling to get tested; for example, only 69% of a nationally representative sample of U.S. adults reported willingness to get a free COVID-19 test (Thunström et al., 2021).

Although information seeking is arguably distinct from a lack of information avoidance (Foust & Taber, 2023), research on factors that motivate avoidance of COVID-19 information is also relevant to understanding a lack of information seeking. People may decide not to undergo COVID-19 testing because a COVID-19 diagnosis may lead to undesired action, unpleasant emotions, and changed beliefs, all of which are reasons for information avoidance (Sweeny et al., 2010). Specifically, at the time of data collection, people who were diagnosed with COVID-19 were recommended to isolate for up to two weeks—an undesired action (Centers for Disease Control and Prevention, 2020). In addition, people diagnosed with COVID-19 may report greater stress, anxiety, and depression (Gallagher et al., 2020). By declining testing for COVID-19, a person may avert these negative emotions. Finally, health misinformation and disinformation led some people to downplay or

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question the legitimacy of COVID-19 (Biddlestone et al., 2020; Pennycook et al., 2020). A diagnosis may force people to change their beliefs to reflect the personal and public health threat of COVID-19 (Romer & Jamieson, 2020). Thus, we conceptualized COVID-19 testing as an optimal domain in which to examine factors influencing information seeking when data were collected in November/December 2020 (at the end of the first year of the pandemic which began in March 2020). Although these examples and the present study use COVID-19 as the context, these reasons for information seeking should generalize to other preventative screening behaviors, such as cancer and HIV screening.

Social norms

One factor that is likely to influence information seeking is social norms. Social norms are informal social and interpersonal rules that influence how people act, think, or feel (Bicchieri, 2006; Legros & Cislighi, 2020). People tend to engage in behaviors that they believe many others engage in (i.e., descriptive norms) and when there are social expectations to engage in them (i.e., injunctive norms; Cialdini et al., 1990). Descriptive and injunctive norms may operate through different pathways: descriptive norms give people information whereas injunctive norms may lead people to reflect on the expectations of others (Legros & Cislighi, 2020). Norms have the strongest effect when descriptive and injunctive norms are congruent versus incongruent (Cialdini et al., 1990). In one study, descriptive norms and injunctive norms were both manipulated to observe the effect on energy conservation (Smith et al., 2012). The norm messages were effective when they were aligned (i.e., both descriptive norms and injunctive norms encouraged saving energy), but were not effective when they were misaligned. Finally, the Theory of Normative Social Behavior (TNSB; Rimal & Real 2005; Rimal, 2008) posits that if pressure to conform exists (i.e., injunctive norms are present), then the relationship between descriptive norms and behavioral intentions will be strengthened.

Social norms influence behavior in many health contexts, such as alcohol consumption, handwashing, cancer screening intentions, and physical activity (Ball et al., 2010; Dickie et al., 2018; Lally et al., 2011; Magnan et al., 2020; Perkins & Berkowitz, 1986; Reid & Carey, 2015; Rice & Klein, 2019; Robinson et al., 2014; Smith-McLallen & Fishbein, 2008), and more recently, COVID-19 prevention behavior such as contact tracing and temperature checks (Peterson et al., 2021). There are also social norms about learning personal health information: people tend to think that learning information is the “right” choice (Heck & Meyer, 2019). Further, people who expressed greater perceived descriptive

and injunctive norms about the target behavior were more likely to express interest in learning their own genome sequencing results (Reid et al., 2018) and reported less information avoidance (Qu et al., 2021). There is also a social element to COVID-19 as it spreads quickly and easily (Lee et al., 2020). As such, not seeking information about one’s COVID-19 status can affect the person in question and those around them. Thus, we expected that favorable COVID-19 testing norms would be associated with greater self-reported willingness and intentions to test for COVID-19.

Group identity

According to the TNSB, group identity can moderate the effect of social norms on outcomes (Rimal, 2008). Supporting this theory, people adhere to social norms more when they identify more strongly with the group that the norms are about (Lede et al., 2019; Neighbors et al., 2010; Terry & Hogg, 1996). For example, in one study researchers randomly assigned hotel rooms to have one of five messages promoting towel re-usage to save the environment, and recorded how often guests reused towels (Goldstein et al., 2008). Social norms promoting towel re-usage that referenced a group that the hotel patron would identify with (i.e., guests that had previously stayed in the same room) led to greater towel re-usage than norms that referenced a group the guest identified with less (i.e., general hotel patrons or citizens). People may also be more likely to adhere to social norms when they are more psychologically connected with a group (Hummer et al., 2012). Yet, identifying strongly with a reference group does not always lead to compliance with a normative behavior (Banas et al., 2016; Liu & Higgs, 2019). For example, across three studies of eating behavior, participants who identified more strongly with the group ate healthier when told that unhealthy eating was the norm and ate less healthy when told that healthy eating was the norm (Banas et al., 2016). These contradictory findings highlight the need for additional research on group identity and its role in the relationship between social norms and health behaviors.

Tailoring

Tailoring refers to crafting messages that are more specific and personal for the recipient, often based on individual-level characteristics of the recipient (Hawkins et al., 2008; Kreuter & Skinner, 2000). Social norms messages could be tailored—that is, by providing information about a group that one identifies with—or not tailored—that is, by providing information about people more generally. It is possible that the combination of social norms and tailoring could increase the persuasiveness of a message. Tailoring

in general increases persuasiveness: in a meta-analysis of 57 studies, tailored health messages led to greater health behavior change than non-tailored health messages, but the effect size was small ($r = .07$; Noar et al., 2007). The authors did not report whether group identity moderated the effect of tailored health communication on behavior change. Tailored messages tend to outperform non-tailored messages (Noar et al., 2007), in part, because they are more personal for people (Kreuter & Wray, 2003), increase motivation, and enable people to make personal connections with the content of the message (Kreuter et al., 1999).

The present study and hypotheses

Using a 2×2 experimental design, participants were randomly assigned to read 1 of 4 messages in which we manipulated the presence of relevant descriptive norms (i.e., the message provided either *relevant norms* about COVID-19 testing behavior or *irrelevant norms* about gratitude) and the extent of message tailoring (i.e., the message was either *specific*—about a group the participant identified with—or *general*—about students in general) to test the effect of these messages on COVID-19 testing willingness and intentions. However, neither manipulation was successful (see *Manipulations and manipulation checks* section in the discussion). Thus, we tested hypotheses using perceived descriptive norms and perceived tailoring following the manipulation rather than randomly assigned descriptive norms and tailoring conditions. Guided by the Theory of Normative Social Behavior, we had several hypotheses:

1. Participants who perceived the descriptive norms message as more relevant would indicate greater COVID-19 testing willingness and intentions. Further, descriptive norms and tailoring would interact such that greater perceived descriptive norms would be most effective at encouraging COVID-19 testing willingness and intentions when participants also perceived the messages as more tailored.
2. Participants who believed others think they should get tested for COVID-19 (i.e., greater versus lower injunctive norms) would indicate greater COVID-19 testing willingness and intentions. Additionally, and consistent with TNSB, injunctive norms would moderate the effect of perceived descriptive norms. Specifically, participants who perceived greater descriptive norms and greater injunctive norms would report greater willingness and intentions to get a COVID-19 test compared to any other combination (i.e., low descriptive norms and high injunctive norms; high descriptive norms and

low injunctive norms; low descriptive norms and low injunctive norms).

3. The relationship between perceived descriptive norms and COVID-19 testing willingness and intentions would be stronger when participants reported (a) greater versus lower strength of group identification and (b) greater versus lower group connectedness.

Methods

Participants

Participants ($n = 248$) were recruited using the Department of Psychological Sciences' participant pool at Kent State University and completed the study online between November 10 to December 9, 2020. During this time, in-person COVID-19 testing was available free of charge via the university health center and at local pharmacies for symptomatic and asymptomatic individuals (rapid at home tests were not yet widely available). Kent State University's IRB approved the study. Eligibility criteria included at least 18 years of age and fluency in English. Participants' data were excluded from analyses ($n = 19$) if they failed two out of three attention checks or if they completed the study in < 10 min or > 90 min (one third of or three times the expected length, respectively). Participants were also excluded from analyses ($n = 26$) if they did not have complete data for the full set of pre-registered covariates (i.e., gender, race and ethnicity, and political orientation). The final sample ($n = 203$) was on average 19.60 years old ($SD = 2.49$, range = 18–44). The majority identified as female (74.9%), White (86.7%), heterosexual (77.3%), and politically Liberal (60.6%). See Table 1 for more detailed information.

Sample size was determined based on an a priori power analysis in *g*power* (Faul et al., 2007) which yielded a sample size of 199 to identify a small-medium effect ($f = 0.20$) with 80% power and $\alpha = 0.05$ when conducting a 2×2 fully-crossed factorial ANOVA (the original experimental design). The target effect size was based on effects found in meta-analyses for social norms ($d = 0.36$; Sheeran et al., 2016) and tailoring ($g = 0.17$; Krebs et al., 2010; $d = 0.14$; Lustria et al., 2013) on health behavior. The obtained sample of 203 allowed us to detect a small effect size of $f^2 = 0.07$ with 0.80 power using linear regression analyses with main effects, interactions, and three covariates.

Design and procedure

The study design, exclusion criteria, hypotheses, data collection termination rule, and analytic plan were preregistered on Open Science Framework (OSF; <https://osf>.

Table 1 Demographic characteristics of participants, $n = 203$

Demographic Characteristic	<i>n</i>	%
Gender		
Female	152	74.9
Male	49	24.1
Non-binary	3	1.0
Race/Ethnicity		
White	176	86.7
Black or African American	14	6.9
Hispanic/Latino	7	3.4
Asian or Asian-American	5	2.5
A different race/ethnicity	1	0.5
Sexuality		
Heterosexual/Straight	157	77.3
Bisexual	32	15.8
Gay Man	4	2.0
Lesbian Woman	3	1.5
Pansexual/Heteroflexible	6	3.0
Prefer not to answer	1	0.5
Year in School		
Freshman	98	48.3
Sophomore	47	23.2
Junior	36	17.7
Senior	22	10.8
Political Orientation		
Liberal	123	60.6
Moderate	46	22.7
Conservative	34	16.8
Religion		
Catholic	66	32.5
Agnostic/Atheist/None	61	30.0
Protestant	11	5.4
Jewish	3	1.5
Muslim	1	0.5
Buddhist	1	0.5
Prefer not to answer	10	4.9
Other	50	24.6
	<i>M</i>	<i>SD</i>
Age in years	19.60	2.49

io/6c392/?view_only=d8681701ce4846d88e38c64d8aa525a1). Participants were invited to take part in a follow-up assessing behavior four months after baseline, but we do not report these data due to a low sample size ($n = 42$) and thus high rate of attrition from baseline to follow-up. Furthermore, we do not describe measures that are not relevant to present analyses and hypotheses (e.g., optimism and spontaneous self-affirmation).

Figure 1 presents an overview of the study flow and methods, including the experimental design. The study employed a 2 (Descriptive norms: *Relevant* vs. *Irrelevant* to COVID-19 testing) x 2 (Tailoring: *Specific* vs. *General*) factorial design. Participants provided informed consent then answered demographic questions. They were then asked to rank with which of 12 groups they most strongly identified.

Next, participants in all four conditions read a description of COVID-19 from the CDC and a list of symptoms. Participants then read a message based on their randomly assigned condition followed by manipulation and reading checks. They then reported COVID-19 testing willingness and intentions, followed by measures of perceived injunctive norms, strength of group identity, and connectedness. Participants were compensated with course credit for completing the approximately 25-minute study.

Experimental manipulation

Mass testing

At the start of the Fall 2020 semester, we collected data from 696 participants enrolled in the Kent State University Department of Psychological Sciences participant pool. Participants reported their intentions to get a COVID-19 test if they had symptoms, how often they felt grateful to have experienced a positive moment during a negative time in their life, demographics, and how much they identified with each of 16 different groups. We used these data to select the normative groups used in the messages for the main study (see Electronic Supplementary Materials [ESM] section 2 for a list of these groups) and to generate percentages for the manipulated messages (see *Main Study* section).

Main study

Participants were randomly assigned to read one of four messages (see ESM for a description of pilot testing and the rationale for the control conditions). Though neither manipulation was successful, we describe the conditions to provide context about the information to which participants responded.

As shown in Fig. 1, which contains example messages for each condition, the message in all conditions began with the phrase, “Based on data from a group of over 600 college students at the beginning of the Fall 2020 semester...” followed by the percentage of people in a group that engaged in a behavior. In the *relevant norms* conditions, the behavior was willingness to get a COVID-19 test if one had symptoms. In the *irrelevant norms* conditions, the behavior was feeling grateful to have experienced a positive moment during a negative time in one’s life. To manipulate message tailoring, participants in the *general tailoring* conditions were presented with the percentage of “students in this sample” (referring to the 600 college students) who engaged in the behavior; all participants in the general tailoring conditions were shown the same percentage, derived from mass testing data. In the *specific tailoring* conditions, participants were presented with the percentage of students in a specific

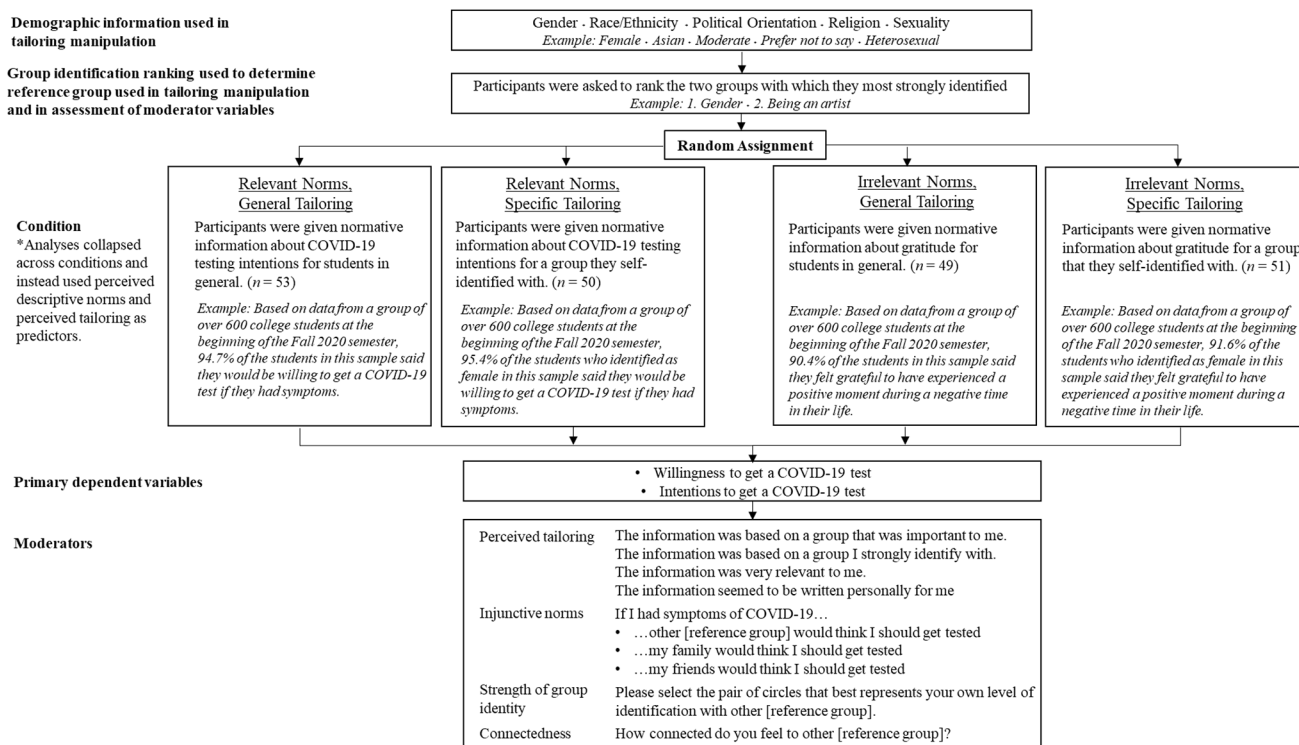


Fig. 1 Study design flow chart

reference group that engaged in this behavior. This reference group was taken from participants’ ranking of groups at the beginning of the study (i.e., typically the group with which a participant most identified with), and the corresponding percentage was taken from mass testing respondents who identified as a member of that group. Thus, all information shown to participants was accurate and no deception was involved. For example, for a participant who ranked “gender” as their most important group, selecting “male” in response to the gender demographic items yielded the percentage of males from mass testing engaging in a behavior, whereas selecting “female” yielded the percentage of females. Normative statistics for willingness to get a COVID-19 test ranged from 89.4% to 100% and normative statistics for gratitude ranged from 80.0% to 96.2%. An Excel document with each possible message and criteria for displaying each message is on OSF (https://osf.io/6c392/?view_only=d8681701ce4846d88e38c64d8aa525a1).

Measures

Measures are described in the order they were administered.

Demographic and related factors

Participants reported their age in years. Gender was assessed with, “What is your gender?” Participants were instructed to

select the option that they most identified with (*male* coded as 1 and *female, nonbinary, a different gender identity*, and *prefer not to answer* coded as 0). Race and ethnicity were assessed with, “What race/ethnicity do you most identify with?” *White* was coded as 1 and all other responses were coded as 0. People who identify as White and/or male may be more likely to underestimate their risk than people who identified as another gender or racial identity, respectively (Finucane et al., 2000). These psychological differences are not grounded in biology, but instead in centuries of systemic racism in the U.S. (Williams et al., 2019), including in the health domain (Boulware et al., 2003), as well as via interpersonal and societal factors that disproportionately affect women (Homan, 2019). Specific to COVID-19, women reported greater perceived COVID-19 severity, greater worry about COVID-19, greater precautionary behaviors, and perceived quarantine restrictions more favorably than men (Prati et al., 2021). Political orientation was assessed from 1 = *extremely liberal* to 7 = *extremely conservative* with *don’t know* and *prefer not to answer* as other options (Jost, 2006). The latter two responses were treated as missing in analyses. We included this covariate because people who identify as politically conservative may be less likely to take COVID-19 preventive actions including getting a COVID-19 test (Barrios & Hochberg, 2020). Participants also reported their sexuality, religious affiliation, and year in school (see Table 1 for response options).

Reference group

Participants were shown a list of the 12 groups identified during mass testing (gender, race/ethnicity, political orientation, religion, sexuality, living in Ohio, living in the US, athlete, musician, artist, psychology major, parent) and were asked to rank the two with which they most strongly identified. The top ranked reference group was subsequently used as part of the manipulation for participants in the *specific tailoring* conditions and in subsequent questions assessing injunctive norms, strength of group identity, and connectedness.

Manipulation and reading checks

Immediately after the manipulated message, participants responded to three descriptive norms manipulation check items: “What proportion of people do you think would be willing to get a COVID-19 test if they experienced symptoms?” (1 = 0–9% to 10 = 90–100%); “Most people would be willing to get a COVID-19 test if they experience symptoms” (1 = *do not agree at all* to 7 = *agree completely*); and “People think it is important to get a COVID-19 test if they experience symptoms” (1 = *do not agree at all* to 7 = *agree completely*; $\alpha = 0.83$). Participants also responded to four tailoring manipulation check items on a scale from 1 = *strongly disagree* to 7 = *strongly agree*: “The information was based on a group that was important to me/that I strongly identify with,” and “the information was very relevant to me/seemed to be written personally for me.” ($\alpha = 0.88$; adapted from Altendorf et al., 2020 and Rains et al., 2019). Reading check items about the target group, the behavior, and the percentage of students in the message were included to confirm participants read the manipulated information (see [ESM](#) section 4 Table 1a for information about the reading check items; results are not reported here because analyses did not include experimental condition).

Dependent variables

Information Seeking: Willingness. To assess information seeking, we created a measure of behavioral willingness, consistent with the Prototype/Willingness Model, which posits that willingness to engage in a behavior may be greater than more explicit, premeditated intentions to engage in a behavior in a situation that involves some degree of risk (Gerrard et al., 2008). Participants read three scenarios in which they were asked to imagine they had some symptoms of COVID-19 but not others (i.e., coughing and headache but not fever; Scenario 1), that they had the same symptoms and also had plans to see a friend in three days but could not do so with a positive test (Scenario 2),

and that they were exposed to someone with COVID-19 but had no symptoms themselves (Scenario 3). These scenarios were written to involve ambiguity in whether testing should occur because people are more likely to comply with social norms messages in ambiguous situations (Rimal, 2008). After each scenario, participants responded to items about their willingness to get a COVID-19 test (1 = *not at all willing* to 5 = *extremely willing*); each subsequent item asked after each of the three scenarios required slightly greater personal investment (i.e., the test requires an anterior nasal swab or there was a long wait time to get a test), consistent with how behavioral willingness has been assessed previously (Gerrard et al., 2008). See [ESM](#) section. 6 for exact wording of scenarios and willingness items. The nine items were averaged, consistent with research in which behavioral willingness is assessed by combining across different behavioral scenarios (Gibbons et al., 1998; $\alpha = 0.94$).

Information Seeking: Intentions. One item assessed information seeking intentions: “If you experienced symptoms consistent with COVID-19 (for example, fever or chills, a cough), how likely would you be to seek testing for COVID-19?” (1 = *not at all likely* to 5 = *extremely likely*). Previous research has found that participants’ willingness and intentions may independently predict behavior despite being positively correlated (Gerrard et al., 2008). People may be willing to engage in a behavior even if they do not plan to engage in the behavior. Therefore, willingness may capture a more reactive process (and may predict more unintentional actions) whereas intentions may capture a more deliberative process. For example, a person may be willing to drink once at a bar with friends, but they may not have intended to drink that night. Thus, people may report greater willingness to engage in a behavior compared to intentions. In a series of studies examining the relationship between behavioral intentions and behavioral willingness, behavioral willingness had greater predictive validity for participants with less experience with a behavior, whereas behavioral intentions had greater predictive validity for participants with more experience with a behavior (Pomery et al., 2009). Because the behavioral willingness items were written for this study and thus not validated, we also tested hypotheses using this more traditional method of information seeking intentions.

Moderators

See Fig. 1 for specific wording of moderator items.

Injunctive Norms. Three items assessed perceived injunctive norms (see Fig. 1, adapted from Reid et al., 2018): “If I had symptoms of COVID-19, [reference group/my family/my friends] would think I should get tested” on a scale from 1 = *do not agree at all* to 5 = *agree completely*.

The group participants most identified with was piped in as the reference group for one of the three questions (regardless of participants' randomly assigned condition). A composite score was created as the average of the three items ($\alpha=0.76$).

Strength of Group Identity. Participants were presented with seven pairs of circles with different degrees of overlap ranging from no overlap (1) to nearly complete overlap (7; Tropp & Wright 2001; adapted from the Inclusion of Other in the Self Scale, Aron et al., 1992). The item differed across participants, as participants were asked to select the pair of circles that best described their level of identification with their specific reference group.

Connectedness. Participants responded to one item (adapted from Hummer et al., 2012) on a scale from 1 = *not at all connected* to 5 = *extremely connected*, "How connected do you feel to [reference group]?" in which [reference group] was replaced with the group the participant identified with most strongly.

Of note, 15 participants did not see an injunctive norms, strength of group identity, or connectedness item for the group with which they identified with most strongly because they indicated *other* or *prefer not to answer* in the demographic questions for that reference group. These participants all viewed items referring to their second-choice reference group.

Overview of analyses

First, we tested whether the descriptive norms and tailoring manipulations were effective. Then, we examined bivariate associations among study variables. We used hierarchical linear regressions to test hypotheses with behavioral willingness and, although not preregistered, information seeking intentions as the outcomes. Regressions controlled for gender, race, political orientation, and experimental condition (as two separate dummy codes of 0 and 1 for the descriptive norms and tailoring manipulations) in Step 1. We entered main effects in Step 2 using mean-centered continuous predictors. Finally, we entered interaction terms in Step 3 (the mean-centered continuous variables were used to compute interaction terms; Aiken & West 1991).

Results

Manipulation checks

As previously stated, neither the descriptive norms nor the tailoring manipulation were effective (see details in [ESM](#)). Thus, subsequent analyses used perceived descriptive norms

and perceived tailoring as predictors rather than experimentally manipulated conditions.

Associations among variables

See Table 2 for zero-order correlations among all continuous variables. Unlike previous research indicating moderate correlations (Gerrard et al., 2008), behavioral willingness and information seeking intentions were strongly correlated in the present study ($r=.71, p<.001$). Consistent with hypotheses, participants who reported greater injunctive norms also reported greater willingness ($r=.63, p<.001$) and intentions ($r=.67, p<.001$) to get a COVID-19 test. As expected, neither group identity nor connectedness were significantly associated with behavioral willingness ($ps>.05$). Connectedness was also not associated with intentions ($r=.05, p=.247$); however, unexpectedly, stronger group identity was significantly positively associated with intentions ($r=.12, p=.044$). Additionally, perceived tailoring was significantly associated with all other continuous variables except for political orientation (all $|rs|\geq 0.11$), whereas the descriptive norms manipulation check measure was not significantly associated with any other continuous variables (all $|rs|\leq 0.10$) except for perceived tailoring ($r=.15, p=.018$).

Regarding the covariates, males reported lower willingness (Male $M=3.42$, Non-Male $M=3.79$; $t(201)=-2.20, p=.029$) and intentions (Male $M=3.80$, Non-Male $M=4.21$; $t(201)=-2.50, p=.013$) to get a COVID-19 test compared to those who did not identify as male. Participants who were more politically conservative reported lower willingness ($r=-.42, p<.001$) and intentions ($r=-.34, p<.001$) compared to those who were more politically liberal. Race was not associated with willingness ($p=.14$) or intentions ($p=.42$).

Perceived descriptive norms and perceived message tailoring

We ran two hierarchical linear regressions controlling for gender, race, political orientation, and experimental conditions to test the main effects and interactions of perceived descriptive norms and perceived tailoring on willingness and intentions (see Table 3). When all covariates were entered in the first step of the model, race was associated with willingness such that White participants reported greater willingness to get a COVID-19 test compared to non-White participants ($p=.026$) and participants who were more politically Liberal reported greater willingness and intentions ($ps<.001$). No other covariates were statistically associated with the outcomes. Inconsistent with our hypothesis, participants who perceived more relevant descriptive norms

Table 2 Correlations among continuous variables and descriptive statistics

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	1												
2. Gender	0.01	1											
3. Race	0.03	0.12*	1										
4. Political Orientation ^a	-0.01	0.22***	0.08	1									
5. Behavioral Willingness	-0.09	-0.15*	0.11	-0.42***	1								
6. Intentions	-0.03	-0.17**	0.06	-0.34***	0.71***	1							
7. Norms Condition	0.01	0.19**	0.02	0.05	0.01	0.12*	1						
8. Tailoring Condition	-0.02	0.08	-0.02	0.06	-0.08	-0.12*	-0.03	1					
9. Perceived Descriptive Norms	0.06	-0.09	0.09	-0.01	0.02	0.08	0.12*	-0.16*	1				
10. Perceived Tailoring	-0.13*	-0.12*	0.10	-0.11	0.34***	0.35***	0.12*	0.0004	0.15*	1			
11. Injunctive Norms	-0.12*	-0.15*	-0.04	-0.36***	0.63***	0.67***	0.03	-0.11	0.10	0.29***	1		
12. Group Identity	-0.06	-0.02	-0.07	-0.10	-0.07	0.12*	0.07	-0.10	0.07	0.15*	0.08	1	
13. Connectedness	-0.09	-0.10	0.01	0.05	-0.03	0.05	0.02	-0.07	-0.08	0.17**	0.12*	0.53***	1
Mean	19.60	0.24	0.87	3.09	3.70	4.11	0.51	0.50	0.00	4.87	4.14	4.63	3.58
SD	2.49	0.43	0.34	1.46	1.02	1.04	0.50	0.50	0.86	1.38	0.84	1.78	0.95

Note. The perceived descriptive norms scale was standardized. Thus, the average of the three items is zero.

^a From 1 = *extremely liberal* to 7 = *extremely conservative*

* $p < .05$. ** $p < .01$. *** $p < .001$

did not report greater willingness ($B = -0.09$, $p = .158$, 95% CI [-0.21, 0.04]) or intentions ($B = -0.03$, $p = .593$, 95% CI [-0.15, 0.09]). Participants who believed the message was more tailored to them reported greater behavioral willingness ($B = 0.12$, $p < .005$, 95% CI [0.04, 0.20]) and intentions ($B = 0.11$, $p = .009$, 95% CI [0.03, 0.19]). Consistent with hypotheses, perceived descriptive norms did interact with perceived tailoring to predict intentions ($B = -0.11$, $p = .028$, 95% CI [-0.21, 0.01]). However, because this interaction would not be significant with an adjusted p -value (see *Sensitivity analyses*), we do not describe or discuss it further. Inconsistent with hypotheses, perceived descriptive norms and perceived tailoring did not interact to predict willingness ($B = -0.05$, $p = .309$, 95% CI [-0.15, 0.05]).

Injunctive norms, group identity, and connectedness

We next ran two hierarchical linear regressions controlling for gender, race, political orientation, and experimental conditions to test the main effects of perceived descriptive norms and injunctive norms, and their interaction, on willingness and intentions (see Table 3). Participants who reported greater injunctive norms reported greater willingness ($B = 0.62$, $p < .001$, 95% CI [0.48, 0.75]) and greater intentions ($B = 0.69$, $p < .001$, 95% CI [0.56, 0.83]). However, inconsistent with hypotheses, injunctive norms did not interact with perceived descriptive norms and injunctive norms to predict willingness ($B = 0.06$, $p = .505$, 95% CI [-0.11, 0.23]) or intentions ($B = 0.13$, $p = .138$, 95% CI [-0.04, 0.29]).

Finally, we ran four hierarchical linear regressions controlling for gender, race, political orientation, and experimental conditions to test whether group identity and connectedness moderated the relationship between descriptive norm condition and willingness and intentions (see *ESM* section 7 for regression results). Inconsistent with hypotheses, perceived descriptive norms were not associated with willingness or intentions in any of the models, and neither perceived group identity nor connectedness predicted willingness or intentions as a main effect ($ps > .05$). Furthermore, none of the interactions were statistically significant ($ps > .05$).

Sensitivity analyses

To examine the consistency of results, we ran four sets of regression analyses that varied in terms of whether covariates were included and whether experimental conditions versus manipulation checks were used as the predictors. The rationale for these analyses along with detailed results are presented in *ESM*. To summarize, greater perceived tailoring and greater perceived injunctive norms predicted greater

Table 3 Hierarchical linear regression ($n = 203$) with perceived descriptive norms, perceived tailoring, and injunctive norms predicting behavioral willingness and intentions

Variable	Behavioral Willingness				Intentions			
	<i>B</i>	<i>t</i>	<i>p</i>	95% CI	<i>B</i>	<i>t</i>	<i>p</i>	95% CI
Step 1								
Gender	-0.20	-1.23	0.220	[-0.51, 0.12]	-0.33	-1.97	0.051	[-0.65, 0.001]
Race	0.43	2.24	0.026	[0.05, 0.81]	0.28	1.60	0.160	[-0.11, 0.68]
Political Orientation	-0.28	-6.21	<0.001	[-0.37, -0.19]	-0.23	-4.79	<0.001	[-0.32, -0.13]
Norms Condition	0.07	0.56	0.579	[-0.19, 0.33]	0.32	2.34	0.020	[0.05, 0.59]
Tailored Condition	-0.08	-0.64	0.522	[-0.34, 0.17]	-0.17	-1.28	0.202	[-0.44, 0.09]
Step 2								
Perceived Descriptive Norms	-0.09	-1.42	0.158	[-0.21, 0.04]	-0.03	-0.54	0.593	[-0.15, 0.09]
Perceived Tailoring	0.12	2.87	0.005	[0.04, 0.20]	0.11	2.66	0.009	[0.03, 0.19]
Injunctive Norms	0.62	8.87	<0.001	[0.48, 0.75]	0.69	9.98	<0.001	[0.56, 0.83]
Step 3								
Perceived Descriptive Norms x Perceived Tailoring	-0.05	-1.02	0.309	[-0.15, 0.05]	-0.11	-2.21	0.028	[-0.21, -0.01]
Perceived Descriptive Norms x Injunctive Norms	0.06	0.67	0.505	[-0.11, 0.23]	0.13	1.49	0.138	[-0.04, 0.29]

intentions and willingness in all of the models. In addition, participants randomly assigned to see a relevant (vs. irrelevant) descriptive norms message reported greater intentions with covariates included but not without covariates, with no effects on willingness with or without covariates in the model. We also ran analyses without political orientation as a covariate (because political orientation was one of the groups participants could choose, which may have influenced results), and results were consistent with those reported for the primary analyses.

Of note, if we correct alpha by the number of sensitivity analyses conducted for each regression (i.e., 7), the only effects that do not meet the adjusted p -value of .007 is race as a covariate ($p = .026$) and the interaction between perceived descriptive norms and perceived tailoring in predicting information seeking intentions ($p = .028$). Also, the effect of perceived tailoring on intentions reported as the main analysis (i.e., controlling for gender, race, political orientation, and experimental conditions; and including tailoring and injunctive norms in the same model) becomes marginally significant at $p = .009$ according to this new cutoff. Of note, when entering perceived tailoring and injunctive norms in separate models, perceived tailoring has a p -value that meets the new cut-off ($p < .001$). Thus, despite the large number of analyses, we have confidence in the reliability of the effects of perceived tailoring ($p = .005$, $p = .009$) and injunctive norms ($ps < .001$) on willingness and intentions, respectively.

Discussion

In prior research, social norms information and tailoring have both increased the persuasiveness of health-related messages (Neighbors et al., 2010; Noar et al., 2007; Reid et

al., 2018). Furthermore, according to the TNSB, injunctive norms may act as a moderator that strengthens the relationship between descriptive norms and behavioral intentions. In the present study, college students who believed a message was more tailored to them and who believed others think they should get tested (i.e., injunctive norms) reported greater willingness and intentions to get a COVID-19 test. However, the extent to which participants believed others were getting tested (i.e., descriptive norms) was not associated with willingness or intentions to get tested.

Message tailoring

In the present study, half of the participants were randomly assigned to read a message describing norms about a group with which they strongly identified; the specific group varied across participants. Although this tailoring manipulation was ineffective, participants who indicated that the message was more specific to them reported greater willingness and intentions to get a COVID-19 test. Interestingly, this effect occurred when collapsing across participants who received normative information about COVID-19 testing and who received normative information about gratitude. Although we hypothesized an interaction between descriptive norms and tailoring, greater perceived tailoring was associated with greater willingness and intentions regardless of perceived descriptive norms, consistent with previous research arguing the importance of more tailored and personalized messages in reducing maladaptive behaviors (e.g., Buckner et al., 2019; Saxton et al., 2021). Given previous research demonstrating the effectiveness of tailored messages and the findings from the present study, future research may explore the effectiveness of designing tailored messages in promoting health behaviors for college students. For instance, many universities encouraged students to get the

COVID-19 vaccine. Future research might examine the effects of sending students more personalized emails rather than a generic email from the provost's office. However, one challenge may be identifying which groups are sufficiently meaningful to participants to be motivating.

Injunctive norms

Participants who reported greater (vs. lesser) injunctive norms consistently reported greater willingness and intentions to get a COVID-19 test. However, contrary to hypotheses, injunctive norms did not significantly interact with perceived descriptive norms to increase message effectiveness. Injunctive norms may have been associated with behavioral willingness and intentions because young adults—the age demographic in the present study—undergo COVID-19 testing to protect those around them and maintain social approval (consistent with injunctive norms; Cialdini & Jacobson 2021). Since young adults are more focused on protecting those around them, they may be more receptive to an injunctive norms message that emphasizes others' perceived importance of COVID-19 testing, rather than a descriptive norms message which, in the present study, merely provided the proportion of people who intended to get tested. Furthermore, research has supported injunctive norms as more influential for screening behaviors (Reid et al., 2010), which may explain our findings in the current context of getting a COVID-19 test.

Manipulations and manipulation checks

Though pilot tested, the manipulations were not successful. This could have been for several reasons. First, the descriptive norm manipulation may have used groups that were too broad. For example, country of residence may have been difficult for a participant to meaningfully identify with. However, the groups used in the manipulations were chosen because many students indicated that they strongly identified with them in mass testing. Furthermore, a review of research on personalized norms highlighted several studies that provided participants with very large reference groups, such as gender identity (Lewis & Neighbors, 2006). However, Lewis and Neighbors (2006) also state that proximal groups are likely to have a stronger effect on behavior. Thus, perhaps limiting the groups to smaller, more proximal identities may have boosted the effect of the descriptive norms intervention. Additionally, political orientation—one of the groups participants could have identified with—was included as a covariate, perhaps reducing variance that could have been explained by the norms manipulation. However, we ran analyses not including political orientation as a covariate and results remained the same. Second,

the manipulations of descriptive norms and tailoring were not orthogonal, which is supported by the significant correlation between perceived tailoring and perceived descriptive norms. Third, while the decision to use accurate normative information meant that we were not deceiving participants about peers' COVID-19 testing behavior and gratitude, the percentage of people referenced in the social norms message who engaged in COVID-19 testing behavior and who felt gratitude were relatively high in each of the four experimental conditions. Thus, we were manipulating the relevance of the norms rather than whether the norms suggested that the majority of people did or did not engage in COVID-19 testing behavior. Perhaps if we had manipulated high versus low norms, we would have found an effect consistent with previous descriptive norms research (although that approach would have involved deceiving participants by presenting untrue norms). Finally, perhaps priming participants with the positive emotion of gratitude increased intentions to test—arguably a prosocial behavior—when participants perceived the message as more specific to them.

The manipulation check items also had limitations. First, the descriptive norms manipulation was about a specific group for participants in the *specific* tailoring condition but was about students in general for participants in the *general* tailoring condition. However, the descriptive norms manipulation check items were about people in general, rather than about the group the participant identified with or—if they were in the general tailoring condition—students. This mismatch may partially explain why the descriptive norms manipulation check was not significantly associated with willingness or intentions. Additionally, the norms manipulation check was only weakly correlated with the norms condition ($r = .12$) and the tailoring manipulation check was not correlated with the tailoring condition ($r = .0004$).

In previous meta-analyses of the Theory of Planned Behavior (Armitage & Conner, 2001; McEachan et al., 2011) subjective norms was the weakest predictor of behavioral intentions compared to attitudes and perceived behavioral control. Perhaps the weaker relationship between social norms and behavioral intentions in previous meta-analyses may explain why perceived descriptive norms were not associated with willingness and intentions to get a COVID-19 test in the present study.

Strengths and limitations

There were some limitations of the present study. We cannot draw causal conclusions about perceived injunctive norms. Previous research has manipulated injunctive norms (Cialdini et al., 1990; Reid & Aiken, 2013), which may be a promising avenue for interventions aimed at increasing information seeking. In addition, COVID-19 differs from

other diseases in a variety of ways, but in large part due to its extreme political polarization in the U.S. Thus, the findings from the present study may not translate to other health contexts. As a result, future research may continue to examine social norms and disease testing. The present study also featured limitations widespread in social psychology research such as using a non-representative, WEIRD (Henrich et al., 2010) sample. Specifically, our sample was entirely English-speaking college students from the United States. Most of the sample identified as White and female. By assessing COVID-19 testing willingness and intentions in our specific sample, we cannot generalize to older U.S. adults, or to individuals in other countries in which COVID-19 testing availability differs. However, we selected the current sample because college-aged students are an important demographic to target for COVID-19 testing: they are susceptible to COVID-19, yet perceive lower risk than older adults (Cohn et al., 1995).

A strength of the present study is that we assessed information seeking in terms of both behavioral willingness and intentions. Thus, we could compare the effectiveness of normative messages on information seeking operationalized as both willingness and intentions. Another strength was that the method used to tailor the messages ensured that individual participants in the specific conditions received information about a group that was that was meaningful to them, rather than about a group that may have been less meaningful (such as other people who are the same age). Whereas previous studies have provided group-specific normative information, none of which we are aware have asked participants which group was most important to them and then provided information about that group immediately afterward. Future research may fine-tune this strategy and engage in greater pilot testing to ensure the effectiveness of the messages.

Conclusion

In the present study, participants who perceived greater injunctive norms about COVID-19 testing reported greater willingness and intentions to undergo testing when symptomatic. In addition, participants who perceived that a message about COVID-19 testing or about feeling gratitude was more tailored to them reported greater testing willingness and intentions. By harnessing the power of injunctive norms and tailored messages, we may encourage people to take an active role in understanding personal information, which may prevent and mitigate disease risk for themselves and others.

Supplementary Information The online version contains supplementary material available at [https://doi.org/10.1007/s10865-](https://doi.org/10.1007/s10865-023-00413-x)

[023-00413-x](https://doi.org/10.1007/s10865-023-00413-x).

Authors' contributions JLF led the study conception and design with input from JMT. JLF led data collection and statistical analysis. JLF conducted the literature review and created tables. JLF wrote the manuscript with input from JMT. Both authors contributed to the interpretation of the findings and read and approved the final manuscript.

Funding We have no financial support to declare.

Data availability Study design, exclusion criteria, hypotheses, data collection termination rule, analytic plan, and data are published on Open Science Framework (<https://osf.io/vbsuw>).

Code availability SPSS syntax is available on Open Science Framework (<https://osf.io/vbsuw>).

Declarations

Conflicts of interest/Competing interests Jennifer Taber is an associate editor for the Journal of Behavioral Medicine.

Ethics approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by Kent State University's Institutional Review Board (IRB # 20–420).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent for publication Not applicable.

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