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Keep Your Distance: Different Roles for Knowledge and Affect in Predicting Social Distancing Behavior

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Abstract:	The current study examines predictors of social distancing behavior across populations (students and community members) and across time in the early months of the COVID-19 pandemic, focusing on two factors commonly associated with risk perception and prevention: knowledge and affect. Results showed that, despite similar levels of social distancing, student distancing was predicted only by feelings of threat about COVID-19 (not by being informed), whereas community distancing was predicted by both feeling informed and threatened. Examining longitudinal effects, students became more informed about COVID-19 over time, and increases in being informed (but not feeling threatened) predicted more social distancing.

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Abstract

The current study examines predictors of social distancing behavior across populations (students and community members) and across time in the early months of the COVID-19 pandemic, focusing on two factors commonly associated with risk perception and prevention: knowledge and affect. Results showed that, despite similar levels of social distancing, student distancing was predicted only by feelings of threat about COVID-19 (not by being informed), whereas community distancing was predicted by both feeling informed and threatened. Examining longitudinal effects, students became more informed about COVID-19 over time, and increases in being informed (but not feeling threatened) predicted more social distancing.

Keywords: COVID-19, social distancing, risk perception, knowledge, affect

The SARS-CoV-2 coronavirus disease (COVID-19) has triggered a global crisis, causing millions of deaths, widespread social and economic disruptions, and skyrocketing rates of mental health problems. Nations around the world have declared emergencies and implemented policies and practices to prevent spread of the disease. Among these preventative actions, the importance of social distancing has been strongly emphasized (WHO, 2020). Public health authorities have provided guidance on criteria and methods for effective distancing, such as minimizing face-to-face interactions, keeping adequate distance at gatherings, and prioritizing online social connection. However, wide variation exists in the extent to which people have followed this guidance, including between-person variability and within-person variability over time (Pedersen & Favero, 2020; Bierwiaczonek et al., 2020).

Noncompliance with social distancing is a risky act that threatens the health of individuals and those with whom they interact, especially pre-vaccination. During previous pandemics such as the first SARS-CoV outbreak in 2002 and the H1N1 swine flu in 2009, precautionary measures including social distancing were acknowledged as important in the absence of herd immunity and were forecasted to be important objectives when future pandemics loomed large (Cava et al., 2005; Leppin & Aro, 2009). In fact, during the current COVID-19 pandemic, social distancing has been objectively and subjectively considered effective for reducing disease transmission risk (Xu & Cheng, 2021). Thus, understanding what, and for whom, predictors of distancing compliance are influential represent critical goals for effective pandemic prevention and for basic conceptualizations of psychological responses to infectious disease. The current study examines predictors of social distancing across two populations (students vs. community members) and across time, focusing on two factors commonly associated with risk perception, attitudes, and prevention: knowledge and affect.

Knowledge and Affect in Risk Perception

Existing models of risk perception point to the distinctive contributions of knowledge and affect in judgements of risk and health-related decision-making (e.g., vaccination, health screening, handwashing). Such models include the framework of deliberative vs. affective risk perception (Ferrer et al., 2013; Portnoy et al., 2013), instrumental vs. affective beliefs (Ajzen et al., 1991; Ajzen & Fishbein, 2005), and cognitive evaluation vs. emotional reactions to risks (Loewenstein et al., 2001). A core question underlying these models is whether reason-based judgments (e.g., healthy/unhealthy, likely/unlikely) or emotion-laden judgments (e.g., pleasant/unpleasant, fearsome/calming) about targets and situations better predict risk behaviors. To date, evidence exists for effects of both cognition and affect depending on the behavior in question, though recent studies suggest a slightly stronger influence of affect (e.g., Edmonds et al., 2011; Lawton et al., 2007; Weinstein et al., 2007). For example, Brug et al. (2004) found that during the first SARS outbreak, the perceived risk of acquiring SARS (and subsequent preventive behaviors) positively correlated with feeling worried about the disease, but not with knowledge about it.

Together, these strands of research suggest that knowledge about COVID-19 risks, and affect associated with those risks, may have somewhat distinct effects on decisions to practice social distancing. Our study adapted these insights to examine how being informed (knowledge) and feeling threatened (affect) about COVID-19 predicted engagement in social distancing during early months of the pandemic in the U.S.

Regarding knowledge, being informed about COVID-19 may have been particularly important for social distancing decisions because information about the disease was often limited and rapidly changed over time. Studies on community samples have shown that perceived

understanding of the causes and the consequences of COVID-19 positively predicted social distancing (Dryhurst et al., 2020; Qazi et al., 2020; Yanti et al., 2020). Further, from an intervention standpoint, presenting people with information about COVID-19 and correcting erroneous beliefs about the virus's growth rate significantly increased support for social distancing and lockdowns (Lammers et al., 2020; Lunn et al., 2020).

Regarding affect, feeling threatened about COVID-19 also may have played an important role in social distancing behaviors. Emotional reactions to the possibility of contracting a disease often involve fear and anxiety (Leventhal et al., 1980; Traczyk et al., 2015). Levels of fear and anxiety about COVID-19 predict engagement in social distancing behaviors (Harper et al., 2020, Yıldırım et al., 2020) and acceptance of governmental restrictions (Zettler et al., 2020). Relatedly, personality traits associated with pathologically low levels of fear predict less engagement in social distancing (Blagov, 2020).

The Current Research

Drawing on existing models of risk perception, we examine the relative influence of knowledge and affect (i.e., being informed and feeling threatened) on social distancing within the same study. Departing from earlier work, we also examine whether knowledge and affect vary in (1) their relevance between groups comprised of decision-makers with different backgrounds and situational constraints as well as (2) the relevance of these factors across time within a single group of decision-makers. That is, we ask two primary questions about social distancing.

First, what predicts social distancing behavior in college students and community members? Research on social distancing during COVID-19 has largely looked at community samples. While community samples are important to examine, people of different demographics and lifestyles react to COVID-19 in different ways, raising questions about the generalizability

of findings to other groups, such as college students. College students are especially relevant, as they may represent "superspreaders" of COVID-19, transmitting infection to communities beyond their own (Lu et al., 2021). Students are uniquely positioned in that their everyday routine involves interacting with large groups (e.g., classes, residence halls, fraternities/sororities), and they are believed to be at relatively lower risk for COVID-19 health problems than older individuals. Existing research has not directly compared the determinants of social distancing between college students and community samples within the same study. Thus, we examined whether students differ from an older, more diverse population in their pandemic experience and adherence to social distancing.

Second, what predicts changes in social distancing behavior over time? Whereas the first question delves into group differences in the role of knowledge and affect, this question focuses on whether malleable aspects of knowledge and affect shape social distancing, and when each factor is most influential. Certainly, adherence to social distancing increased as the pandemic spread, but which psychological factors promoted this increase? To answer this, we collected data from students across two waves—when COVID-19 initially impacted their experience (Wave 1: mid-to-late-March) and approximately one month later (Wave 2: mid-to-late April). We focused only on students at Wave 2 because their course enrollment ensured accurate identification across waves.

Finally, we explored mechanisms through which being informed and feeling threatened about COVID-19 might influence social distancing. We examined whether having more accurate knowledge or more access to information sources influenced beliefs about being informed and whether chronic concerns about disease and danger influenced feelings of threat. Together, this work reveals how key predictors of a critical disease prevention behavior function in different

groups, how those predictors change in their influence over time, and factors that contribute to variation in those predictors.

Method

Participants

Students (Waves 1 and 2)

At Wave 1, 261 students from a psychology course at a university located in the Midwestern region of the United States participated in the study as part of an extra credit opportunity. One student was excluded for completing less than 50% of the survey, so the final sample size was 260. Similar to the university's general undergraduate population, participants were 19.67 years old on average (SD = 1.39), 59% female (163 women, 93 men, 1 transgender woman, 17 unknown), and approximately 38% of the participants were non-White (see Table S2 for details). The study consisted of two surveys. The initial survey was conducted from March 18th to 24th, 2020, the week after the university closed down the campus and requested students return to their permanent residences (referred to as Wave 1). The follow-up survey, which was identical to the Wave 1 survey, was conducted with the same sample of undergraduate students a month later from April 14th to 23rd, 2020 (referred to as Wave 2). Sixteen students who participated at Wave 1 did not participate at Wave 2, and 14 students who did not participate at Wave 1 participated at Wave 2, so the final sample size was 258 at Wave 2.

Community Members (Wave 1)

Two hundred sixty-four participants were recruited from Amazon's Mechanical Turk (MTurk) in exchange for monetary compensation on March 18th (referred to as Wave 1). Thirty-three participants were excluded for completing less than 50% of the survey, and three participants were excluded for failing two check questions, leaving a final sample of 228. We

refer to this pool of participants as community members because 88% were non-students and their age range is more representative of the U.S. population. All participants lived within the United States and were 17.83 years older than the student sample on average, with a mean age of 37.50 (*SD* = 12.29), 42% were female (96 women, 125 men, 1 transgender woman, 6 unknown), and approximately 32% of the participants were non-White (see Table S2 for details). Compared to students, they were more educated, $p < .001$, lower in household income and SES, $ps < .001$, and more conservative in political views, $p = .004$ (see Table S1). We did not conduct Wave 2 for the community sample.

Power Analysis

Both samples were of convenience. Sensitivity power analyses using G*Power (Faul et al., 2007) showed that our samples provided 95% power at a significance level of $\alpha = .05$ to detect an effect size of $f^2 = .050$ with students and $f^2 = .057$ with community members for a single regression coefficient in multiple regression analyses with two predictors (i.e., being informed and feeling threatened), both small effects by traditional standards. In addition, we had 95% power at a significance level of $\alpha = .05$ to detect a small-to-medium effect size of $d = 0.328$ with regard to a *t*-test comparing the difference between two independent means (i.e., sample differences).

Procedure

After providing informed consent, participants answered questions about their thoughts, feelings, and behaviors during the coronavirus outbreak (see below). These data were collected with approval from the University of Michigan Institutional Review Board (IRB).

Social Distancing

Social distancing was first defined as people maintaining space from others so that

physical contact is reduced and the risk of germ transmission is lowered. Participants reported how much social distancing they had engaged in since first learning about the outbreak on a scale ranging from 1 (*not more than prior to learning about COVID-19*) to 9 (*a large amount [self-quarantining]*). This measure will be referred to as a "summary evaluation" of social distancing. Participants also answered how much their engagement in public activities (eating out at restaurants, going to bars/clubs, spending time with friends, traveling by plane, attending public events, going to parties, using the gym) and online activities (talking by phone/text/video, using the Internet) had changed, each on a scale ranging from -4 (*I've decreased this behavior*) to 4 (*I've increased this behavior*). The scale included a separate option (*I never do this behavior*); answering this led to exclusion of those items from the analyses. In addition, participants listed, in free response format, four behaviors that they had increased their frequency of doing and four behaviors that they had decreased their frequency of doing since the COVID-19 outbreak.

Being Informed (Knowledge)

To assess knowledge about COVID-19, participants reported how informed they were about COVID-19 on a scale from 0 (*not at all*) to 6 (*very*). The survey also included measures to help validate this self-reported knowledge. Participants reported their beliefs about the amount of physical distance (in feet) recommended for social distancing by public health authorities, the number of days officially recommended for self-quarantining, and the primary reason that the public should engage in social distancing. Answers to these questions were coded as either correct (1) or incorrect (0) depending on their match to U.S. government guidelines provided at the time of Wave 1 (Centers for Disease Control and Prevention, 2020). Participants also reported which sources they had personally received information from, including news media, friends, the government, school, social media, and doctors.

Feeling Threatened (Affect)

For an index of negative affect, we averaged participants' responses on how vulnerable they felt to COVID-19 and how concerned they were about potentially catching COVID-19 on a scale from 1 (*strongly disagree*) to 7 (*strongly agree), r* = .67, $p < .001$. Participants also completed a set of individual difference measures that tap into chronic levels of threat perception. One was the Perceived Vulnerability to Disease scale (PVD; Duncan et al., 2009), which comprises two subscales, perceived infectability (α = .84) and germ aversion subscale (α = .71). The perceived infectability subscale measures individuals' beliefs about their vulnerability to contracting infectious diseases, and the germ aversion subscale measures individuals' aversiveness to situations with high likelihood of pathogen transmission. Another was the Danger Invulnerability subscale adapted from the Adolescent Invulnerability Scale (Lapsley & Duggan, 2001), which measures felt-invulnerability to external danger. We excluded one item from this scale that concerned illness in order to keep the construct conceptually independent from disease threat. Participants also indicated whether their engagement in social distancing was driven by self-motives or other-motives on a scale from 1 (*wanting to protect myself*) to 7 (*wanting to protect others*).

At the end of the survey, participants completed demographic items and were debriefed. On average, the survey took (Wave 1 with students and community members: *M* = 17.57 min, *SD* = 33.24 min; Wave 2 with students: *M* = 16.24 min, *SD* = 21.06 min).

Data Sharing Statement

The current article includes the complete raw data-set collected in the study including the participants' data set, syntax file and log files for analysis. Pending acceptance for publication, all of the data files will be automatically uploaded to the Figshare repository.

Results

Data Analytic Plan

We analyzed the data with two key questions in mind: (1) What predicts social distancing behavior in college student and community samples? (2) What predicts changes in social distancing behavior over time? To address the first question, we conducted multiple regression analyses with reports of being informed and threatened as simultaneous predictors of social distancing in each sample. Tests for the two dependent measures of social distancing (amount of social distancing and frequency of public/online activities) are presented separately. Differences in degrees of freedom across the analyses are due to missing data. For the second question, we conducted multiple regression analyses with student difference scores for reports of being informed and feeling threatened (from Wave 1 to Wave 2) as simultaneous predictors of changes in social distancing. Lastly, we explored in a third question what gives rise to these sample and within-participant differences by looking at the correlates of knowledge and affect. Throughout, we examined major findings both when controlling for common individual differences and when excluding these covariates to ensure robustness. To help streamline presentation of the results, additional measures and analyses (e.g., free responses of social distancing behaviors) are found only in the Supplemental Material.

Question 1: What Predicts Social Distancing Behavior in College Student and Community Samples?

To answer Question 1, we first compared how much the two groups engaged in social distancing at Wave 1 and, next, how being informed (knowledge) or threatened (affect) about COVID-19 predicted social distancing in each group (see Table 1 for descriptive statistics and results of the primary analyses).

Self-Reports of Social Distancing

Across groups, participants did report engaging in a fair amount of social distancing since they first learned about the outbreak (M = 6.74 out of 9, SD = 2.01). However, mean distancing levels between students and community members did not statistically differ even after controlling for age, gender, education, household income, and political orientation, $t(483) = 1.68$, $p = .094$, 95% CI [-0.05, 0.67], $d = .15$ (community members directionally engaged in more social distancing). Examining specific distancing behaviors, students reported decreasing public activities and increasing online activities more than community members did, (respectively) $t(480) = 5.49$, $p < .001$, 95% CI [0.57, 1.20], $d = .50$ and $t(479) = -9.14$, $p < .001$, 95% CI [-1.52, -0.98], $d = -.84$. It seems that COVID-19 caused a bigger disruption in students' daily lives, and their specific behaviors were more responsive to COVID-19 compared to community members, but this did not lead to a higher summary evaluation of social distancing among students.

[INSERT TABLE 1]

Sample Differences in the Effect of Being Informed and Feeling Threatened on Social Distancing

On average, community members reported being better informed about COVID-19 than students, $t(484) = 3.81$, $p < .001$, 95% CI [0.19, 0.58], $d = .35$, and feeling more threatened about COVID-19 compared to students, $t(482) = 2.56$, $p = .011$, 95% CI [0.08, 0.59], $d = .23$. Further, being informed and feeling threatened had different impacts on summary evaluations of social distancing behavior for each sample. Student engagement in social distancing was predicted by feelings of threat, $t(257) = 2.88$, $p = .004$, $\beta = 0.18$, 95% CI [0.09, 0.46], but not by being informed, $p = .253$, whereas distancing for community members was predicted by both being informed and feeling threatened, (respectively) $t(224) = 3.05$, $p = .003$, $\beta = 0.18$, 95% CI [0.11,

0.71], and $t(224) = 7.44$, $p < .001$, $\beta = 0.45$, 95% CI [0.41, 0.71]. The same patterns persisted when controlling for age, gender, education, household income, and political orientation. Consistent with these effects, reports of being informed and feeling threatened were positively correlated with each other in community members, $r = .14$, $p = .038$, but this was not the case in students, $p = .743$.

Notably, both primary predictors mediated the effect of sample (students vs. community members) on the summary evaluation of social distancing. We used a bootstrapping procedure with 10,000 iterations from Hayes' PROCESS (2012; Model 4) to test the indirect effect of sample on social distancing simultaneously through being informed and feeling threatened. Although the direct effect of sample on distancing was not significant, significant indirect effects of sample were present via being informed, $b = -0.10$, $SE = 0.46$, 95% CI [-0.20, -0.02] and feeling threatened, $b = -0.15$, $SE = 0.06$, 95% CI [-0.28, -0.03]. These findings match those reported earlier, with student distancing predicted only by affect and community member distancing predicted by both knowledge and affect.

Turning to specific distancing behaviors, a mostly similar picture emerged. Student frequency of engaging in public activities was negatively predicted by feeling threatened, $t(255) = -2.36$, $p = .019$, $\beta = -0.15$, 95% CI [-0.21, -0.02], but not by being informed, $p = .989$. For community members, public activities were negatively predicted by being informed, $t(223) = -2.70$, $p = .007$, $\beta = -0.18$, 95% CI [-0.62, -0.10], but positively predicted by feeling threatened, $t(223) = 2.61$, $p = .010$, $\beta = 0.17$, 95% CI [0.61, 0.44]. Frequency of engaging in online activities was not predicted by being informed nor by feeling threatened in students, (respectively) $p = .711$ and $p = .101$. For community members, online activities were positively predicted by both being informed and feeling threatened, $t(221) = 3.67$, $p < .001$, $\beta = 0.23$, 95% CI [0.16, 0.54] and

$t(221) = 4.02$, $p = .002$, $\beta = 0.26$, 95% CI [0.14, 0.42]. Overall, these findings were similar to the pattern of results found for the summary evaluation measure of distancing, in which being informed (but not feeling threatened) guided the specific behaviors for students, whereas both being informed and feeling threatened guided the specific behaviors for community members. It was rather unexpected that frequency of public activities was positively predicted by feeling threatened among community members, however we cannot rule out the possibility that engagement in obligatory public activities (e.g., having to work in-person) increased feelings of threat.

Question 2: What Predicts Changes in Social Distancing Behavior Over Time?

Our next question focused on (only) students from Wave 1 to Wave 2. We first report changes in social distancing, being informed, and feeling threatened, and then effects of the changes in being informed and feeling threatened on increases in social distancing (again see Table 1).

Changes in social distancing from Wave 1 to Wave 2

For the summary evaluation of social distancing, students reported engaging in social distancing more at Wave 2 than at Wave 1, consistent with the spread of public health recommendations over this period, $t(240) = 10.68$, $p < .001$, 95% CI [1.02, 1.48], $d = .69$. Moreover, their frequency of public activities decreased whereas online activities increased over time, $t(239) = -11.10$, $p < .001$, 95% CI [-0.83, -0.58], $d = -.72$ and $t(238) = 2.56$, $p = .011$, 95% CI [0.05, 0.35], $d = .17$.

Effects of Changes in Being Informed and Feeling Threatened on Social Distancing

Students reported being marginally more informed about COVID-19 at Wave 2 compared to Wave 1, $t(243) = 1.92$, $p = .057$, 95% CI [0.00, 0.25], $d = .12$, but no changes in the

experience of threat occurred across waves, $p = .518$. This increased knowledge, which was supported by an overall increase in correct answers to questions about COVID-19 prevention (see Supplemental Material), also was accompanied by an expanded role for knowledge in predicting changes in student social distancing. For the summary evaluation of social distancing, increases in being informed predicted more social distancing at Wave 2, controlling for social distancing at Wave 1, $t(235) = 3.93$, $p < .001$, $\beta = 0.14$, 95% CI [0.13, 0.39]. That is, while feelings of threat predicted more social distancing for students at Wave 1, it was the *increase* in being informed that predicted more engagement in social distancing over time. In contrast, changes in feeling threatened within individuals did not predict more social distancing over time, $p = .967$. This pattern held even when age, gender, education, household income, and political orientation were entered as covariates.

As for specific distancing behaviors, decreases in public activities were marginally predicted by increases in being informed and significantly predicted by increases in feeling threatened, after controlling for public activity engagement at Wave 1, (respectively) $t(234) = -1.92$, $p = .057$, $\beta = -0.08$, 95% CI [-0.16, 0.00] and $t(234) = -2.35$, $p = .020$, $\beta = -0.10$, 95% CI [-0.15, -0.01]. In comparison, although online activities tended to increase, these were not predicted by changes in being informed, $p = .41$, nor by feeling threatened, $p = .09$, when controlling for online activity engagement at Wave 1.

Overall, these results suggest that while student social distancing engagement was associated with feeling threatened about COVID-19 at both Wave 1 and Wave 2, increases in social distancing were more associated with gains in *knowledge* rather than in negative affect over time.

Question 3: What Predicts Being Informed and Feeling Threatened About COVID-19?

In this section, we explore influences on the processes through which knowledge and affect involving COVID-19 affect social distancing. To this end, we investigated two questions: (1) Does having more objective knowledge or more access to information influence reports of being informed? and (2) Do chronic concerns about disease or danger influence how threatened people feel? We focused on Wave 1 results in the following analyses in order to compare students and community members.

Does Having More Objective Knowledge or More Access to Information Influence Reports of Being Informed?

An important question one may ask about "being informed" is whether this subjective evaluation actually reflects the quality (i.e., accuracy of information) or quantity (i.e., number of sources of information) of knowledge one has. Because the survey included a few questions assessing objective accuracy of knowledge about COVID-19, we examined how self-reported knowledge correlated with these questions. Though students (M = 2.01, SD = 0.87) and community members (M = 1.91, SD = 0.97) did not differ in their total (sum) accuracy scores (ranging from 0 to 3), p = .226, the two groups differed in how this score related to reports of being informed. When we regressed the sum scores on reports of being informed, accuracy predicted higher self-reported knowledge for community members (see Table 2 and the Supplemental Material for t-tests on individual items), $t(225) = 2.04$, p = .043, β = 0.14, 95% CI [0.01, 0.33]. However, for students, despite being directionally similar to the community sample, there was no significant effect of knowledge, p = .267. Thus, the amount of knowledge students reported did not necessarily indicate that students had more accurate information.

How does access to information affect the perception of knowledge about COVID-19? Communication through information sources is essential in promoting social distancing, and the

types of information one acquires can significantly impact the perceived risk of COVID-19 as information sources vary in features like accuracy, depth, and focus. We first examined total number of sources. An independent samples t-test revealed that students reported receiving information from a greater number of sources ($M = 4.37$, $SD = 1.36$) compared to community members ($M = 3.69$, $SD = 1.30$), $t(478) = -13.76$, $p < .007$, 95% CI [-1.92, -1.44], $d = -1.26$. Next, we conducted chi-square tests with Bonferroni corrections on individual items. Students more frequently reported getting information from interpersonal sources, including their friends, X^2 (1, $N = 502$) = 98.26, $p < .006$, school, X^2 (1, $N = 502$) = 230.12, $p < .006$, social media, X^2 (1, $N = 502$) = 25.90, $p < .006$, and doctors, X^2 (1, $N = 502$) = 7.89, $p = .030$, compared to community members. The two groups did not differ in their receipt of information from news media or the government, $ps > .05$. Interestingly, the greater overall number of information sources that students reported relative to community members did not translate into higher subjective or objective knowledge (as detailed earlier).

[INSERT TABLE 2]

Do Chronic Concerns About Disease or Danger Influence How Threatened People Feel?

In order to better understand COVID-19 threat, we probed whether chronic concerns about infectious diseases and danger were associated with feeling threatened in response to the outbreak, as well as motivations for social distancing. As shown in Table 2, perceived infectability and germ aversion were positively correlated with feelings of threat in both students ($r = .39$, $p < .001$ and $r = .33$, $p < .001$; respectively) and community members ($r = .48$, $p < .001$ and $r = .19$, $p = .004$; respectively). Individual differences in danger invulnerability also were associated with feeling threatened about COVID-19, though this association differed by sample group. With students, no significant correlation was found ($p = .206$), but interestingly with

community members, higher perceptions of invulnerability were associated with more COVID-19 threat (r = .21, p = .002). Though we cannot explain this positive correlation, the lack of significant negative correlations for this measure in both samples suggests that perceptions of COVID-19 threat are somewhat distinct from the vulnerability people perceive toward non-disease dangers. Lastly, we examined whether feelings of threat were related to social distancing because of a motivation to protect oneself vs. protect others. As threat increased, students were more likely to attribute social distancing to a desire to protect themselves (r = -.17, p = .006), but threat was not associated with differences in motives in community members (p = .721; see Table S3 for correlations between motives and other main variables).

Discussion

We tested the differential impact of knowledge and affect involving COVID-19 on social distancing behaviors across two populations and two time points during the first surge of the pandemic. We found that while both students and community members reported engaging in the same overall degree of distancing behavior, the groups differed in how being informed and feeling threatened predicted these behaviors. For students, feeling threatened by COVID-19 predicted distancing but being informed about COVID-19 did not. For community members, both feeling threatened and being informed predicted more social distancing.

What explains these different roles for knowledge and threat in social distancing behavior? Age differences between students and community members may be one possibility. After all, similar age-related differences in affective vs. instrumental risk assessments exist with other health-relevant behaviors (e.g., Lawton et al., 2007). However, the fact that knowledge and affect differentially predict social distancing even when controlling for age suggests that age differences may not tell the whole story. Another possibility may be the unique situational

constraints facing college students and community members during this time. At Wave 1, college students had recently experienced a transition to online learning and forced relocation away from campuses (Kamenetz, 2020; Rice & Londberg, 2020). Concurrently, community members were managing wholly different, though no less difficult, circumstances. For instance, community members resided in locations with fewer government restrictions, on average (e.g., large gatherings banned; see Supplemental Material), and they likely held more occupational positions that had not or could not transition to online-only work (e.g., essential workers; see Supplemental Material). In such cases, higher knowledge about the routes of COVID-19 transmission may have inspired greater motivation to socially distance, whereas students had already transitioned away from their typical, interpersonally dense environment.

Because of the mercurial and uncertain nature of the pandemic, we also tested how changes in knowledge and feelings of threat influenced social distancing behavior over time. Overall, students reported an increase in social distancing between March and April. We find that this increase was primarily predicted by changes in perceived knowledge. Would community members have displayed a similar pattern between knowledge and distancing over time? If students were relatively deprived of knowledge early in the pandemic, we would not expect to see this pattern in community members, but if this change resulted from increased availability of COVID-19 information, the community member pattern would likely have mirrored that of students. As students scored equally to community members in knowledge accuracy and reported receiving information from more sources at Wave 1, the latter prediction appears to rest on firmer ground. Interestingly, students did not feel more threatened by COVID-19 at Wave 2 compared to Wave 1. Some research suggests it may be relatively difficult to trigger feelings of safety-related threat in younger adults (e.g., Hastings et al., 2004; Tay &

Ozanne, 2002), perhaps contributing to this finding. This possibility is especially interesting in light of the fact that students reported higher perceived infectibility (i.e., more likely to catch an infectious illness) than did community members.

While both students and community members generally engaged in recommended social distancing behaviors, they did so for somewhat different reasons. This underlines the importance of recognizing existing diversity in how and why people respond to novel challenges. Focusing on single participant samples can limit generalizability in understanding risk perception and health behaviors, and thus bias broader conclusions (Henrich et al., 2010). Additionally, our longitudinal findings suggest that a predictor's effects may change as experience with a novel threat evolves (e.g., being informed did not predict student social distancing at Wave 1, but its increase over time did). Understanding how changes in such effects emerge, and the relevance of those changes for health-related interventions against hazards like contagious disease spread, will require moving beyond cross-sectional designs as well as addressing an array of moderating influences. Research has found mixed evidence for positive health outcomes resulting from threat elicitation (Kok et al., 2018), and of course, change in threat does not always occur—perceptions of COVID-19 threat did not increase in our student sample over time, and so we cannot say whether direct attempts to elevate feelings of threat in students would have conveyed social distancing benefits.

One limitation of our work involves relying on self-reported measures of social distancing behaviors. In part, restrictions on in-person research during the data collection period produced this limitation. Yet, despite the limitations of self-report, many such measures of social distancing track with actual behaviors, like daily step counts, changes in GPS coordinates, and travel to non-essential retail stores (e.g., Gollwitzer et al., 2020). Further, self-reports offer the

benefit of targeting individuals' *perceived* risk, oftentimes a more central component of individual decision-making than *actual* risk (Smith, 2006).

In conclusion, we find that social distancing behavior was uniquely predicted by being informed vs. feeling threatened depending on population (students, adults) and pandemic time point (March 2020, April 2020). Considering the role social scientists might play in curbing future infectious disease threats (Van Bavel et al., 2020), understanding psychological processes that predict transmission-reducing behaviors is of the utmost importance.

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Table 1. Descriptive Statistics and Correlations among Social Distancing, Being Informed, and Feeling Threatened

	Wave 1			Wave 2
	Students	Community	Total	Students
Social distancing	6.60 (1.95)[a]	6.91 (2.07)[a]	6.74 (2.01)	7.80 (1.14)[c]
Feeling informed	4.01 (1.02)[a]	4.39 (1.20)[b]	4.19 (1.12)	4.12 (0.97)[a]
Feeling threatened	3.10 (1.27)[a]	3.44 (1.60)[b]	3.26 (1.44)	3.11 (1.28)[a]
Public activities	-2.84 (0.99)[a]	-1.96 (2.34)[b]	-2.08 (2.14)	-3.51 (0.70)[c]
Online activities	2.95 (1.20)[a]	1.70 (1.78)[b]	2.44 (1.58)	3.12 (1.14)[c]
Feeling informed predicts	Students	Community	Total	Students
Social distancing	.07	.18*	.14**	.10
Public activities	.00	-.18*	-.06	-.08
Online activities	.02	.23**	.07	.06
Feeling threatened predicts				
Social distancing	.18*	.44**	.32**	.15*
Public activities	-.15*	.17*	.10*	-.18*
Online activities	.10	.26**	.15**	.19*

Note. The table shows means with standard deviations in parentheses. Above the double line, unmatched superscripts within rows (students at Wave 1 vs. community members at Wave 1; students at Wave 1 vs. students at Wave 2) denote significant differences ($p < .05$) between the samples. Below the double line, relations between feeling informed/threatened and each of the social distancing indices are indicated by standardized regression coefficients (**$p < .01$, *p < .05, †$p < .10$).

Table 2. Correlates of Being Informed and Feeling Threatened about COVID-19

Being informed								
Predictors		Percent Correct	Correct responder	Incorrect responder	*df*	*t*	*p*	*d* | *β*
Physical distance for social distancing (6 ft)	Students	78%	*M* = 4.00 *SD* = 1.01	*M* = 4.07 *SD* = 1.06	258	0.40	.693	.06
	Community members	69%	*M* = 4.49 *SD* = 1.18	*M* = 4.17 *SD* = 1.21	224	-1.84†	.067	-.27
Days for quarantine (14 days)	Students	54%	*M* = 4.13 *SD* = 1.03	*M* = 3.86 *SD* = 0.98	258	-2.15*	.033	-.27
	Community members	63%	*M* = 4.42 *SD* = 1.12	*M* = 4.35 *SD* = 1.33	224	-0.42	.672	-.06
Purpose of social distancing (protecting others)	Students	69%	*M* = 4.01 *SD* = 1.03	*M* = 4.51 *SD* = 1.17	258	0.16	.874	.02
	Community members	59%	*M* = 4.03 *SD* = 0.99	*M* = 4.22 *SD* = 1.23	224	-1.81†	.072	-.25
Total (sum)	Students		*M* = 4.01 *SD* = 1.02		259	1.11	.267	.07
	Community members		*M* = 4.39 *SD* = 1.20		225	2.04*	.043	.14

Feeling threatened					
Measures	1	2	3	4	5
1. Feeling threatened about COVID-19		.189**	.480**	.209**	-.024
2. PVD germ aversion	.333**		.074	-.395**	-.210**
3. PVD perceived infectability	.388**	.298**		.198**	-.094
4. Danger invulnerability	-.079	-.322**	-.205**		.199**
5. Other-oriented motivation	-.173**	-.140*	-.125*	.004	

Note. The top panel above the double line shows three *t*-tests (with Cohen's *d*) predicting feeling informed about COVID-19 from items testing the accuracy of knowledge about COVID-19 and a regression (with standardized *β*) predicting feeling informed from the sum score of the items. The bottom panel below the double line shows a correlation table of feeling threatened about COVID-19 and relevant variables. The bottom diagonal is student data, and the top diagonal is community member data (**$p < .01$, *$p < .05$, †$p < .10$).

Supplemental Material

Table S1. Demographic Differences Between the Samples

	Students	Community Members
	Wave 1 & 2	Wave 1
Age (in years)	19.67 (1.39)	37.50 (12.29)
Education	2.97 (0.72)	3.90 (1.15)
Household income	5.42 (1.99)	3.68 (1.57)
Socioeconomic status	6.33 (2.01)	5.29 (1.98)
Political orientation	3.80 (1.77)	4.37 (2.54)

Note. The table shows means with standard deviations in parentheses. The mediation education was (3) some college or vocational training for students and (4) college/university/vocational degree. Household income was on a 7-point scale ranging from (1) less than $20,000 to (7) $150,000 or more, and socioeconomic status on a 10-point scale with a ladder figure. Political orientation was on a 9-point scale from (1) very liberal to (7) very conservative.

Table S2. Ethnic Categories of Participants

	Students	Community Members
	Wave 1 & 2	Wave 1
American Indian or Alaskan Native	1	1
Black or African American	5	38
East Asian	47	18
Hispanic/Latino/Spanish Origin	17	12
Middle Eastern or North African	14	2
Native Hawaiian or Other Pacific Islander	0	2
South Asian	26	7
White	169	153
Others (not listed above)	2	2

Note: The table shows the frequencies of ethnic categories. Participants chose all the categories that applied to them, so the sum is greater than the total number of participants.

General Wave 1 Findings Across Students and Community Members

Collapsing across the two samples, feeling informed and feeling threatened about COVID-19 both significantly predicted more social distancing at Wave 1, each $t(482) = 3.25$, $p = .001$, $\beta = 0.14$, 95% CI = [0.10, 0.40] and $t(482) = 7.56$, $p < .001$, $\beta = 0.32$, 95% CI = [0.33, 0.57]. Individuals who reported feeling more threatened reported engaging in more public

activities, $t(479) = 2.07$, $p = .039$, $\beta = 0.10$, 95% CI = [0.01, 0.23], and more online activities, $t(478) = 3.32$, $p = .001$, $\beta = 0.15$, 95% CI = [0.07, 0.27]. There was no effect of being informed on either public, $p = .179$, or online activities, $p = .115$.

Wave 2 Findings with Students

At Wave 2 with only students, a similar pattern to Wave 1 emerged in which only feeling threatened predicted overall social distancing at Wave 2, t(250) = 2.44, p = .015, β = 0.06, 95% CI = [0.03, 0.25], but not being informed, p = .107. Also, feeling threatened significantly predicted involvement in fewer public activities, t(251) = -2.85, p = .005, β = -0.18, 95% CI = [-0.17, -0.03], as well as more online activities, t(248) = 2.99, p = .003, β = 0.19, 95% CI = [0.06, 0.28], while being informed did not, ps > .05.

Objective Knowledge and Reports of Being Informed

Individual Item Analysis

T-tests showed that to a question asking what the amount of physical distance public health authorities recommend for effective social distancing is, students who answered correctly (6 feet) did not differ in the self-reported knowledge ($n = 214$, $M = 4.00$, $SD = 1.01$) from those with incorrect answers ($M = n = 46$, $M = 4.07$, $SD = 1.06$), $p = .693$. Community members who answered correctly reported feeling marginally more informed ($n = 157$, $M = 4.49$, $SD = 1.18$) compared to those with incorrect answers ($n = 69$, $M = 4.17$, $SD = 1.21$), $t(224) = -1.84$, $p = .067$, 95% CI = [-0.66, 0.02], $d = -.27$. To a question asking how many days the official recommendation to self-quarantine for is, students who had the correct answers (14 days) reported feeling more informed ($n = 148$, $M = 4.13$, $SD = 1.03$) than those with incorrect answers ($n = 112$, $M = 3.86$, $SD = 0.98$), $t(484) = -2.15$, $p = .033$, 95% CI = [-0.52, -0.02], $d = -.27$, while there was no difference between community members with correct ($n = 143$, $M = 4.42$, $SD = 1.12$) and incorrect ($n = 83$, $M = 4.35$, $SD = 1.33$) answers. Lastly, to a question asking what the primary reason for engaging in social distancing is according to public health recommendations, students with correct answers (to protect others from becoming infected) did not differ in feeling informed ($n = 188$, $M = 4.01$, $SD = 1.03$) from those with incorrect answers ($n = 72$, $M = 4.03$, $SD = 0.99$), $p = .874$, whereas community members with correct answers felt marginally more informed ($n = 135$, $M = 4.51$, $SD = 1.17$) than those with incorrect answers ($n = 91$, $M = 4.22$, $SD = 1.23$), $t(224) = -1.81$, $p = .072$, 95% CI = [-0.61, 0.03], $d = -.25$.

Changes from Wave 1 to Wave 2 in Students

Students reported being marginally more informed about COVID-19 at Wave 2 compared to Wave 1, $t(243) = 1.92$, $p = .057$, 95% CI = [0.00, 0.25], $d = .12$, and this was supported by the overall increase in correct answers to questions about COVID-19, $t(273) = 1.94$, $p = .053$, 95% CI = [-0.00, 0.28], $d = .12$ (McNemar's test for individual questions: physical distance for social distancing: X^2 (1, $N = 274$) = 9.19, $p = .002$; days for quarantine: X^2 (1, $N = 274$) = 6.63, $p = .010$; purpose of social distancing: X^2 (1, $N = 274$) = 2.81, $p = .094$), as well as increases in the number of sources of information, $t(240) = 2.75$, $p = .006$, 95% CI = [0.05, 0.30], $d = .18$.

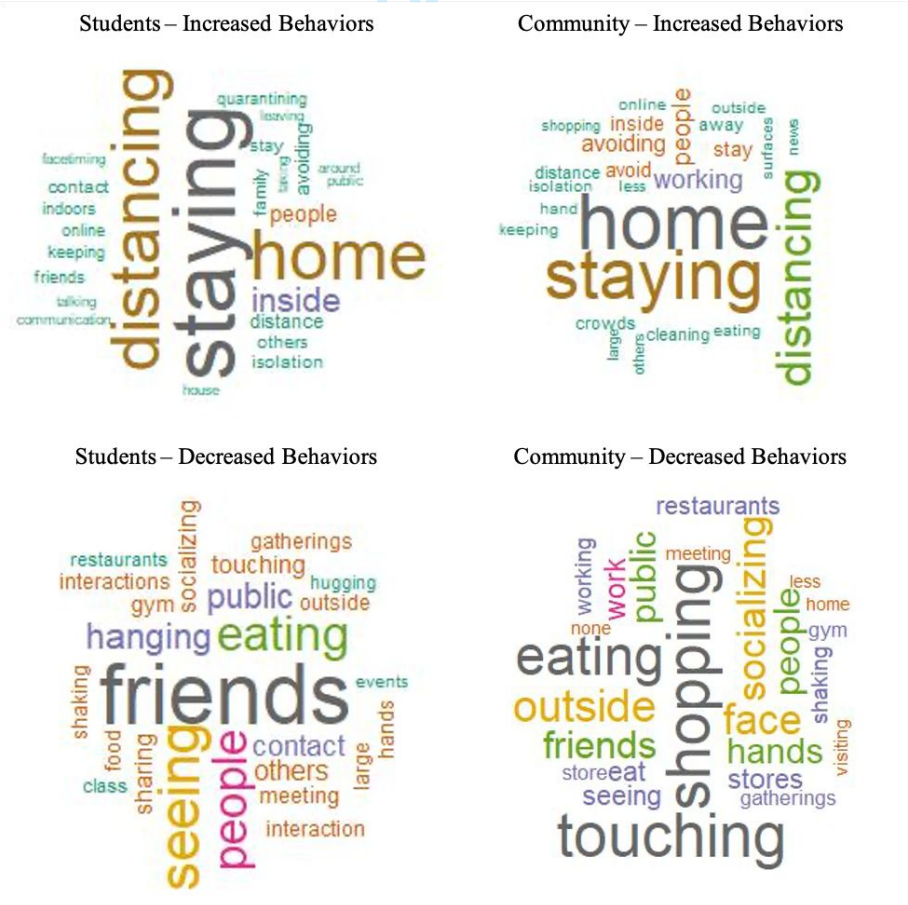
Table S3. Bivariate Correlations Among Other-Oriented Motivation, Social Distancing, Being Informed, and Feeling Threatened

Measures	1	2	3	4
1. Other-oriented motivation		.02	.03	-.02
2. Social distancing	.06		.24**	.46**
3. Being informed	.06	.07		.14*
4. Feeling threatened	-.17**	.18**	-.02	

Note. The other-oriented motivation scale ranges from 1 (*wanting to protect myself*) to 7 (*wanting to protect others*). The bottom diagonal is student data, and the top diagonal is the community member data (**$p < .01$, *$p < .05$, †$p < .10$).

Word Clouds on the Increased and Decreased Behaviors Since the COVID-19 Outbreak

Participants listed, in a free response, four behaviors that they have increased their frequency of doing and four behaviors that they have decreased their frequency of doing since the COVID-19 outbreak. See Figure S2 below for word clouds representing the common behaviors listed. The larger the word, the more times it was listed as a behavior. Overall, both students and community members reported more behaviors that they've decreased (377 and 368, respectively) than increased (160 and 188, respectively).



Differences in Situational Constraints Facing College Students and Community Members

Government Restrictions

Community members reported having fewer governmental restrictions in their local areas active to ensure social distancing (e.g., large gatherings banned, movement restrictions on people leaving their homes; $M = 2.31$, $SD = 0.89$) compared to students ($M = 2.73$, $SD = 0.91$), $t(441) = -4.85$, $p < .001$, 95% CI = [-0.59, -0.25], $d = -0.46$. To one of the items asking whether all non-essential stores are closed, community members replied with a significantly lower percentage of "yes" than students, $X^2 (1, N = 502) = 13.45$, $p < .001$.

Occupations

The student sample consisted of 100% undergraduate students, whereas the community sample consisted of 86% non-students and 12% students (2% unknown).

Other Measures in the Survey

Listed below are variables that were excluded from analysis. These variables were not central to the main research question, and some were included in the survey for use in other projects. All materials and data can be found at https://osf.io/9wgq8/?view_only=4c9812d39b8e4b1d91a17ac73a954107 (link anonymized for review).

- Recentill: When was the last time you were sick with an infectious illness that you think is/was not COVID-19?
- Chronicill: Do you have any condition that impacts your immune functioning, making you more susceptible to illness (ex - chronic disease; taking medication that suppresses your immune system; genetic condition; etc.)?
- Disknowl: How would you rate your own knowledge and expertise about infectious diseases in general?
- CVknow: Do you personally know anyone who has or had COVID-19?
- CVhave: Have you been medically diagnosed with COVID-19?
- SDmotother: What do you think has primarily motivated other people to engage in social distancing (assuming they do)?
- SQhowlong: If you were at risk of personal exposure to COVID-19, but had no symptoms and had not been tested, how many days would you actually self-quarantine for?
- SQcurrent: Have you previously, or are you currently, self-quarantined during the COVID-19 outbreak?
- Percinflocal: In your opinion, what percent of people in your local community are currently infected with COVID-19 (even if they are not showing symptoms)?
- Percdie: The COVID-19 virus is thought to be worse than the seasonal flu in terms of the number of infections that result in death. From what you know or have heard about COVID-19, what percent of people who become infected will likely die?
- Transmit: From what you know or have heard about the COVID-19 virus, what increases your risk of becoming infected? Select all that apply.
- CVdistance: How close or distant do you feel that COVID-19 is? (in general, to your community, to you personally)
- Vaccine: What is your opinion about vaccinations used against common infectious diseases?

- Policies: What is your opinion about the following types of legislation/policies in the U.S.?
- Postelect: If the COVID-19 virus is still prevalent in the fall, should the U.S. elections be postponed?
- Clean: What are some things in your everyday life that you should be careful to clean regularly?
- Contact: How often are you in physical contact with each of these things on a daily basis?
- Politorient: What is your typical political orientation on (a) social policies/attitudes, (b) economic policies/attitudes?
- Politparty: What is your political party identification?
- Popdens: Which of the following best describes the place where you now live?
- Child: How many biological, adopted, foster, or step children do you have?