

Friend-Shield Protection From the Crowd: How Friendship Makes People Feel Invulnerable to COVID-19

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When deciding whether to eat inside a restaurant or how many health protection items to purchase, individuals in the coronavirus disease (COVID-19) era tend to consider the infection risk of crowds of generalized others. With a field study and four experiments, the present study identifies associations between COVID-19 and friendship (e.g., thinking of a friend while reading COVID-19-related news, perceiving a friend as the source of infection, noting friends' presence during potential COVID-19 exposure) that decrease both infection risk perceptions and protective behaviors. The sense of safety that stems from psychological closeness of friends reduces perceived virus infection risks associated with third-party crowds. The distinction between psychological closeness and safety toward friends versus acquaintances widens with clear in-group/out-group boundaries, such that this friend-shield effect is especially pronounced among people whose group boundaries are well established. Limiting interactions to close friends and family members is a common protective measure to reduce COVID-19 transmission risk, but the study findings demonstrate that this practice also unintentionally creates other issues, in that people tend to perceive reduced health risks and engage in potentially hazardous health behaviors. By identifying this risk and encouraging more holistic responses, this research offers implications for individuals, health officials, and policymakers.

Public Significance Statement

Even in the face of health measures designed to limit interactions to reduce coronavirus disease (COVID-19) transmission, people experience reduced risk perceptions and engage in riskier behaviors when COVID-19 is associated with their friends. Noting this link, this research shows individuals, health practitioners, and policymakers that they need to consider the effects of social distancing measures on psychological risk perceptions and behaviors when designing and implementing complementary health campaigns.

Keywords: risk perception, psychological closeness, in-group/out-group boundary clarity, social distancing, COVID-19

Friendship is an umbrella that shields you from the strongest of thunderstorms.


—Anonymous

During the coronavirus disease (COVID-19) pandemic, social distancing initiatives have advocated for restricted social interactions. After several months of recommended or legally imposed home confinement, some countries issued step-by-step guidelines for carefully extending social circles from family members to close friends (Lichfield, 2020; Ontario, 2020). Others suggested caps on social gatherings and encouraged remote work (British Broadcasting Corporation, 2020; Government of the Netherlands, 2020). Limiting

interactions to close social circles can reduce transmission (Block et al., 2020), but these social connections also may leave people oblivious to the potential risks arising from anonymous crowds in various locations as they emerge from lockdown.

When they consider the risk of exposure to crowds of generalized others, people make choices about how many health protection items to adopt (e.g., disinfectant wipes, masks, hand sanitizers), as well as whether to engage in the potentially risky behaviors in the first place, such as dining in an indoor restaurant. Such choices may be informed meaningfully by an association between COVID-19 and friendship, including whether the focal individual perceives a friend as a potential source of a prior COVID-19 infection or

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considers this friend's presence when contemplating a future visit to a restaurant. We posit that these friendship associations may decrease people's risk perceptions and increase their potentially unsafe behaviors with regard to COVID-19 infection risks involving unknown crowds. That is, psychological closeness with friends can increase feelings of safety, which may lower perceptions of infection risk involving crowds outside an immediate social circle—a phenomenon we refer to as the *friend-shield effect*. This effect is especially pronounced among people with clear in-group/out-group boundaries (e.g., individuals with a conservative vs. liberal political orientation), as the psychological closeness or safety gap between friends versus acquaintances widens with the clarity of such boundaries (Fabick, 2011; Miller et al., 2010).

The risk arising from anonymous crowds is relevant in the context of COVID-19 and potential future pandemics, especially as studies have demonstrated the possibility of virus infection through aerosol transmission from crowds who share the same space, a likely scenario when cities open up after lockdown (e.g., Centers for Disease Control & Prevention, 2021; Tang et al., 2020; Toy & Hernandez, 2020). Moreover, individuals' consideration of potential infection from anonymous crowds is salient through safety measures taken by many venues, such as operating at reduced capacity, investing in ventilation systems or outdoor seating, digitalizing multi-use physical menus into touch-free QR Code menus, and COVID-19 safety ratings on review websites (Campbell-Schmitt, 2020; Cha & Borchgrevink, 2021).

Intuitive Risk Perceptions and Friendship Associations With COVID-19

Risk perceptions stem from the severity and probability of a negative outcome (Weber & Milliman, 1997). Although sometimes people derive analytical risk judgments by calculating these separate components (Harless & Camerer, 1994), it is more common for them to infer risk from their intuitions or emotions (Loewenstein et al., 2001; Slovic et al., 2004). When events trigger strong emotional reactions in particular, people make quick, intuitive risk judgments based on associative systems rather than careful analyses (Finucane et al., 2000; Loewenstein et al., 2001; Slovic et al., 2004). For example, a disease label that triggers more rather than less affect (e.g., "Mad cow disease" vs. "Bovine spongiform encephalopathy") prompts people to rely more on their emotional reactions rather than cognitive probability assessments when making behavioral risk assessments (e.g., whether to consume beef; Sinaceur et al., 2005). Reactions to COVID-19 are no exception, as illustrated by the historic stock market volatility and rapid spread of fake news about the disease (Li et al., 2020; Morón & Biolik-Morón, 2021; Sadiković et al., 2020). Hence, we propose that emotional responses to COVID-19 likely trigger intuitive, associative risk judgments. Therefore, we anticipate that associations between COVID-19 and friendship may distort risk perceptions, even if the actual infection hazard involves crowds of others. We further predict that the friend-shield effect stems from the greater psychological closeness and safety people feel in relation to friends compared with more distant relationships.

Psychological closeness is critical for feelings of security and safety (Collins & Feeney, 2000, 2004; Spencer, 2007) and correlates positively with feelings of safety in friendship (Thien, Razak, & Jamil, 2012; Thien & Razak, 2013). These feelings of closeness and

security are unique to friendship compared with other peer relationships; even very young children report sharing more secrets with close friends than with other classmates (Furman & Bierman, 1984). In our research setting, people likely derive stronger feelings of safety when COVID-19 is associated with friends rather than more psychologically distant relationships, which may distort risk perceptions more broadly. That is, the feelings of safety prompted by psychologically close relationships may spill over to mitigate COVID-19 risk perceptions even when the actual virus infection risk involves anonymous crowds, not the close friends. Prior literature notes that people perceive less risk directly stemming from in-group than from out-group members because they trust fellow in-group members (Cruwys et al., 2021). However, rather than focusing on the risk directly arising from in-group members, the present research considers situations in which the actual risk comes from a third party (i.e., crowds of generalized others), while the perceived COVID-19 risk remains associated with friendship.

We further argue that this friend-shield effect occurs when COVID-19 is associated with friendship, regardless of how this association is established. For example, COVID-19 may be associated with the past, if a friend (vs. acquaintance) was a source of a prior COVID-19 infection. It also could be associated with friendship at the present moment, such as if people think about a close friend when they read COVID-19-related news. Finally, COVID-19 can be associated with future plans to visit crowded indoor spaces such as coffee shops and restaurants with a close friend (vs. acquaintance). These mere associations of friendship should drive the friend-shield effect across situations, even though friendship associations differ qualitatively across past and future contexts, such as in terms of their degrees of uncertainty and controllability. In particular, considerations of future situations are hypothetical, idealistic, and lacking in controllable factors, whereas past situations offer lessons about what to change or what can be controlled in the future (Newby-Clark & Ross, 2003; Rasmussen & Berntsen, 2013). Yet, the associations established in people's minds also endure in cognitive memory systems (Fiske, 2018; Forehand et al., 2002; Meyers-Levy, 1989), and research has shown that there is a strong connection between thinking about the past and future (Klein et al., 2002; Mullally & Maguire, 2014; Schacter & Addis, 2007). Accordingly, we expect the friend-shield effect to remain potent for friendship associations established in the past and future. Feelings of safety derived from psychologically close friendships (Collins & Feeney, 2000, 2004; Eisenberger et al., 2011; Finkel et al., 2017; Spencer, 2007), which represent a shared commonality across time points, may work as a shield against the COVID-19 infection risk perceived among crowds outside immediate social circles.

In-Group/Out-Group Boundary Clarity and the Friend-Shield Effect

Because the friend-shield effect relies on psychological closeness and safety provided by close friends rather than distant relationships, widening or narrowing the gap between friends and distant relations should strengthen or weaken this effect. As the key mechanism we predict is the felt psychological closeness and safety toward friends versus distant relations, a well-established in-group/out-group boundary would determine the perceived discrepancy between the two social groups when it comes to psychological closeness and safety. Thus, we measure in-group/out-group boundary clarity

as a moderating variable to illuminate the underlying mechanism of the predicted effect (e.g., Spencer et al., 2005). In more detail, we posit that the friend-shield effect is especially prominent for people with clear in-group/out-group boundaries because the psychological closeness and safety they feel toward various groups (friends, acquaintances, strangers) depends in part on perceived distinctiveness. This is because clear distinctions between in- and out-group members leads to stronger feelings of psychological closeness and safety with in-group members while the distance from out-group members also becomes more salient (Fabick, 2011; Miller et al., 2010). Group restrictions and exclusion of others from the in-group enable people to experience a greater sense of belonging and safety, too (Levett-Jones & Lathlean, 2008; Pickett & Brewer, 2005).

We therefore expect the friend-shield effect to strengthen or weaken, depending on the clarity of the in-group/out-group boundary. While group boundaries can be permeable, depending on context (Richmond, 1988; Tajfel & Turner, 1986), some people have more fixed boundaries than others (Schubert & Otten, 2002). Those with clearer in-group/out-group boundaries perceive a starker distinction between others with whom they feel psychologically close and those from whom they feel distant; we predict they also display stronger friend-shield effects when exposed to virus risk involving third-party others. In contrast, individuals with more blurred group boundaries may not feel particularly safer when they sense a link between COVID-19 and a friend rather than an acquaintance. Therefore, we expect that those with more ambiguous distinctions between psychologically close and distant relationships may estimate similar virus risks from crowds, regardless of with whom they associate COVID-19.

Measuring In-Group/Out-Group Boundary Clarity

Any categorization task becomes more difficult if the person performing the task perceives greater overlap across categories (e.g., Nosofsky, 1990). Accordingly, blurred in-group/out-group boundaries may make it more difficult to categorize others into in-groups versus out-groups. In contrast, if the categories are markedly distinct, it is easier to assign others to “us” versus “them” groups (Allport, 1954; Brewer, 1991, 1999). Such clarity can arise from value systems, such as those linked to political orientation. For example, people with clear boundaries tend to establish more restrictive categories, a pattern observed in conservative rather than liberal orientations (Castano et al., 2002; Rock & Janoff-Bulman, 2010). Conservatives also tend to express heightened protection orientations and seek to prevent uncertainty and threats, such as by observing clear intergroup boundaries and embracing in-group solidarity (Jost et al., 2003; Pedersen et al., 2018). In turn, conservatives are significantly more likely to categorize racially ambiguous faces to out-groups than are liberals (Krosch et al., 2013). Prior literature also indicates a correlation between a liberal political ideology and perceived interconnectedness with out-groups (Sparkman et al., 2019). Liberals’ provision orientations drive them to place greater emphasis on integrative flexibility and interdependence by acknowledging intragroup variability, too (Janoff-Bulman, 2009; Jost et al., 2003).

On the basis of these findings, we adopt two measures of in-group/out-group boundary clarity: difficulty categorizing people into the in-group versus the out-group and political orientation.

By demonstrating the moderating effect of in-group/out-group boundary clarity on the friend-shield effect, across two methods, we enhance the validity and reliability of the proposed interaction effect and underlying conceptual mechanism.

Conceptual Framework and Overview of Studies

When COVID-19 is associated with friendship, perceptions of psychological closeness that enhance feelings of safety should reduce the perceived virus infection risk of anonymous crowds. The friend-shield effect then may be moderated by the clarity of in-group/out-group boundaries, such that people with clearer in-group/out-group group boundaries exhibit a stronger friend-shield effect than those with more blurred boundaries (see Figure 1).

To test these predictions, in Study 1 we investigated the friend-shield effect in a real-world choice context, by assessing people’s actual, overt purchases of products that entail varying degrees of health risk, after they have been primed to think about a friend. We found that thinking about a friend when reading COVID-19-related news increases risky health behaviors, in support of our key proposition that friendship associations affect COVID-19 risk perceptions and behaviors. Studies 2 and 3 demonstrated that when a friend is the source of an initial COVID-19 infection, rather than an acquaintance or stranger, people predict a lower likelihood of reinfection and spend less on future health protection. These studies are highly relevant, considering increasing evidence that people can be reinfected with COVID-19 (Nature, 2020). Study 4 showed that the friend-shield effect persists in the context of visiting coffee shops with a friend. That is, people are more likely to agree to take this risk (due to close contact and aerosol transmissions with anonymous crowds in surrounding tables; e.g., Tang et al., 2020) with a friend rather than an acquaintance. In line with our expectations, the friend-shield effect also was most pronounced among people who had relatively little difficulty categorizing the people they know as in-group versus out-group members, reflecting their clear group boundaries. Finally, Study 5 provided additional evidence of perceived virus infection risks from crowds by measuring the perceived crowdedness. To establish the practical relevance of our findings, we relied on political orientation as a proxy for in-group/out-group boundary clarity in this study (Janoff-Bulman, 2009). It conceptually replicated our other findings and further confirmed that conservatives demonstrate a stronger friend-shield effect than do liberals. All studies reported in this article received approval from the Ethics Committee of the authors’ university.

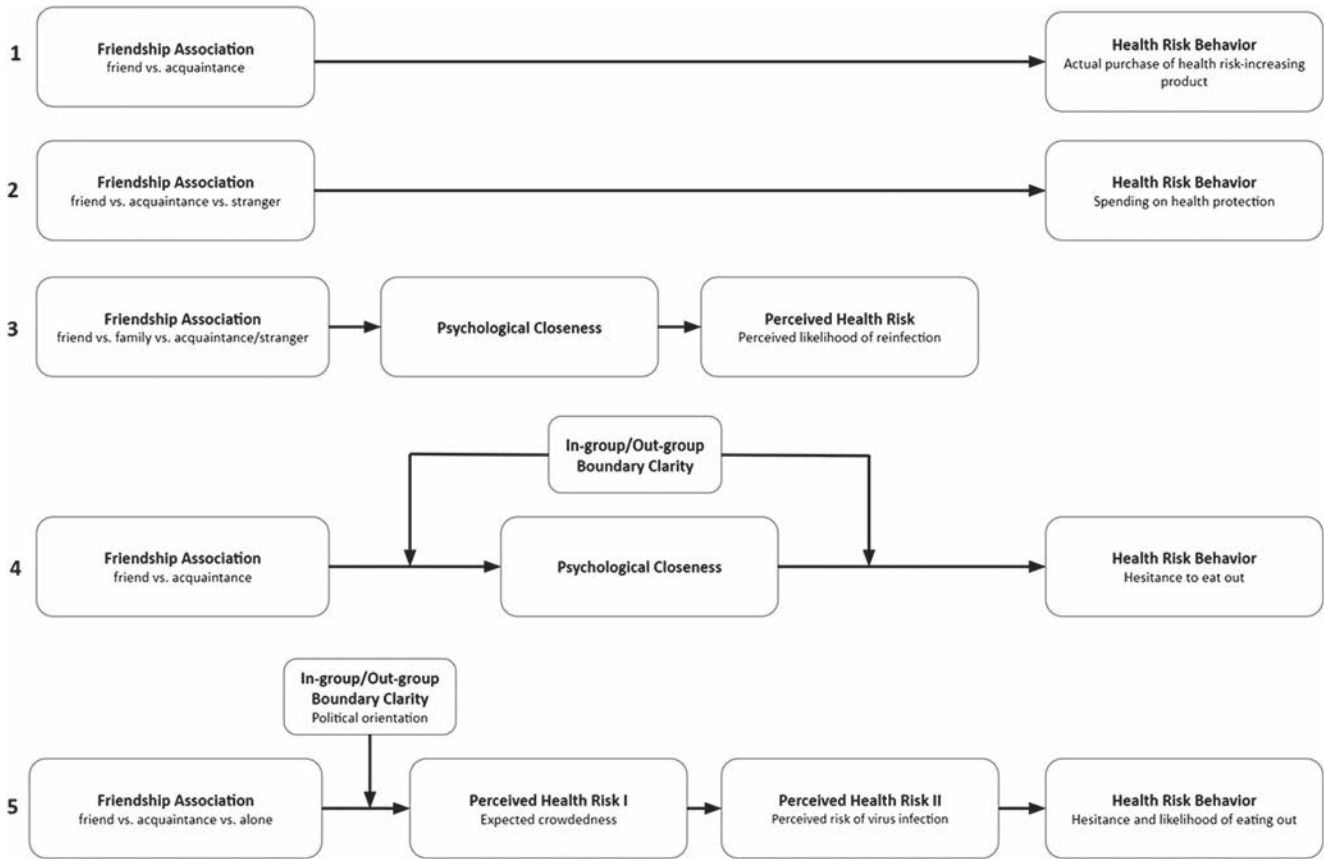
Study 1

To test for the friend-shield effect, we first attempted to capture real-world risky choice behavior by assessing actual product purchase behavior with varying degrees of health risk, after a friendship association task.

Method

Participants and Design

In February 2021, 495 people residing in the United States (46.7% men; $M_{\text{age}} = 31.2$ years, $SD = 11.10$) and recruited through the Prolific crowdsourcing platform, participated in an online study.

Figure 1*Conceptual Framework and Overview of Five Studies*

A post hoc power analysis using G*Power 3.1 (effect size $\text{Exp}(B) = 1.85$; Faul et al., 2007) confirmed that the sample size offered 99% power to detect the focal effect. The study featured a single-factor (friendship association: friend vs. acquaintance) between-participants design.

Materials and Procedure

After providing informed consent, the participants completed a friendship association task, using an established mindset activation procedure (De Vries et al., 2018; Stillman et al., 2009). Those assigned to the friend condition wrote down the name of a close friend and, in five detailed sentences, described their relationship. The participants assigned to the acquaintance condition instead wrote down the name of a distant acquaintance and, in five detailed sentences, described this relationship. Immediately after this friendship association task, participants read a brief news article detailing the risk of severe COVID-19 symptoms, depending upon unhealthy eating and preventive measures:

We are currently in a worldwide COVID-19 pandemic. COVID-19 is a disease caused by a new coronavirus called SARS-CoV-2, causing viral pneumonia, fever, dry cough, and a loss of taste or smell, among other symptoms. The World Health Organization (WHO) warns that people of all ages can get seriously ill or die from COVID-19. Research has further shown that eating sugary foods, and more generally eating

unhealthy snack items, increases your risk of experiencing more severe COVID-19 infection symptoms. On the other hand, the regular use of hand sanitizer, face masks, and disinfecting wipes reduces your chance of getting COVID-19.

To measure real purchases, we built a web shop, PICK-N-GO, which sold a selection of unhealthy snacks and health protection items. We then informed participants of a special offer:

You can use the money that you are earning by filling out this survey to buy one product at web shop PICK-N-GO. Please take a look at the products that are offered for sale at web shop PICK-N-GO and indicate whether you want to take advantage of this offer by indicating which product (if any) you want to buy.

The purchase options included three unhealthy snack items (i.e., Twix bar, Mars bar, and bag of Cheez-Its) and three health protection products (i.e., 3M face mask, Purell hand sanitizer, and Clorox disinfecting wipes). To ensure that all the items offered similar value (according to the real market price indicated on each brand's website), the Mars and Twix bars were described as king size, and the hand sanitizer and disinfecting wipes were described as travel size. All products featured well-known brands and the same price, 0.75 USD. The study emphasized that any purchase was voluntary; participants could select a product by clicking on a button explicitly labeled "PURCHASE" or decline any purchase by

clicking on a button labeled “NO PURCHASE.” Only after the study were participants informed that they would not receive the product but instead would receive full monetary compensation for participating.

Thus, the measures of health risk behavior consisted of participants’ decision to buy an unhealthy snack item, despite warnings of the relationship between unhealthy eating and severe symptoms of COVID-19. After a purchase (or decision not to buy), participants offered responses pertaining to several control variables. The choice of health protection items also may have been influenced by perceptions of the person they wrote about, so the participants also indicated the perceived cleanliness of their friend/acquaintance on an agreement measure: “This person is clean” (1 = *totally disagree*; 7 = *totally agree*). To extract the pure effect of psychological closeness and control for physical proximity, participants also indicated the physical proximity of the person about whom they wrote: “Do you live in the same building as this person?” (0 = *no*; 1 = *yes*). Symptoms of COVID-19 or vaccination history likely influenced people’s sensitivity to COVID-19 risk too, so we also asked participants whether they had been diagnosed with COVID-19 (0 = *no*; 1 = *no*, but there has been serious suspicion that I am/ was infected with COVID-19 [i.e., maybe]; 2 = *yes*) and vaccinated against COVID-19 (0 = *no*; 1 = *yes*). The experimental stimuli and measures are listed in the Appendix.

Results

Actual Purchase of Health Risk-Increasing Versus Risk-Reducing Products

Of the 495 participants, 75 (15.2%) decided to buy a health risk-increasing product (i.e., unhealthy snack item), 236 (47.7%) decided to buy a health risk-reducing product (i.e., health protection item), and 184 (37.2%) bought nothing. A binary logistic regression analysis revealed a significant main association of friendship (0 = *acquaintance*, 1 = *friend*; $B = .62$, Wald = 3.92, $\text{Exp}(B) = 1.85$, $p < .05$) with the actual purchase of a health risk-increasing (= 1) versus a health risk-reducing (= 0) product as the outcome variable. None of the covariates we measured—COVID-19 infection,

vaccination history, physical proximity, or perceived cleanliness of the friend/acquaintance—was significant (see Table 1). That is, people were more likely to buy a health risk-increasing product rather than a health risk-reducing product after being reminded of a friend instead of an acquaintance. Among participants in the friend condition who made a purchase, 27.0% chose a health risk-increasing product, versus 21.1% in the acquaintance condition, signaling more risky health behavior when a friendship association was salient.

Actual Purchase of Health Risk-Increasing Product

To include participants who did not buy any product, which arguably was less risky than buying a health risk-increasing product, we conducted an additional analysis, repeating the procedure but using the actual purchase of a health risk-increasing product (= 1) versus the purchase of health risk-reducing product or no products (both coded 0) as the outcome variable. The results were similar, with no significant covariates and a significant main effect of the friendship association ($B = .64$, Wald = 4.85, $\text{Exp}(B) = 1.89$, $p < .05$), confirming that participants were more likely to buy health risk-increasing products after being reminded of a friend instead of an acquaintance. Among all participants, 17.5% in the friend condition decided to buy a health risk-increasing rather than a health risk-reducing product or no product at all, compared with 12.9% in the acquaintance condition.

Discussion

Study 1 provided initial evidence of the impact of a psychological association between COVID-19 and friendship on risky health behavior. Using a measure of real purchases, this experiment demonstrated that people are more likely to purchase health risk-increasing products if, in the context of COVID-19, they are thinking of a friend instead of an acquaintance. Because Study 1 used real brands and a real web shop, it provided a strong indication that the friend-shield effect manifests in real purchase situations.

Table 1

Binary Logistic Regression Analyses, Study 1

Outcome variable	Predictor or covariate	<i>B</i>	Wald	$\text{Exp}(B)$	<i>p</i> value
Actual purchase of health risk-increasing vs. health risk-reducing product	Friendship association	.62	3.92	1.85	.048**
	COVID-19 infection history (no)	—	1.85	—	.396
	COVID-19 infection history (maybe)	.18	.23	1.20	.631
	COVID-19 infection history (yes)	.72	1.75	2.06	.186
	Vaccination history	-.33	.52	.72	.469
	Physical proximity	-.92	1.34	.40	.247
	Perceived cleanliness	-.14	1.68	.87	.196
	Friendship association	.64	4.85	1.89	.028**
	COVID-19 infection history (no)	—	1.36	—	.508
Actual purchase of health risk-increasing product	COVID-19 infection history (maybe)	.14	.17	1.15	.682
	COVID-19 infection history (yes)	.56	1.28	1.75	.257
	Vaccination history	-.01	.00	1.00	.993
	Physical proximity	-1.06	1.95	.35	.163
	Perceived cleanliness	-.14	2.11	.87	.146

Note. COVID-19 = coronavirus disease.

** Significant at $p < .05$.

Study 2

In this study, we investigated the influence of psychological closeness on subsequent health protection behavior by manipulating three infection sources with varying psychological closeness and then examined participants' spending on health protection products after the expiration of a (partial) city lockdown. Future spending on health protection is an indicator of health risk behavior (Appel et al., 1990; Fischer, 1979; Hammitt & Graham, 1999), in that the greater possibility of encounters with crowds after lockdown heightens the risk of COVID-19 infection in the absence of protection. We intentionally collected data from participants without any actual COVID-19 infection history to keep the manipulation as clean as possible. Moreover, we included additional control variables to rule out potential alternative explanations. Because the main dependent measure of Study 2 was spending on health protection products, and promotion-focused individuals tend to take greater risk than prevention-focused individuals (e.g., Gino & Margolis, 2011; Werth & Förster, 2007), we measured individuals' promotion versus prevention focus to control for this individual tendency. In addition, we measured general trait-level risk-taking as well as experienced positive and negative emotion to control for other variables that may be relevant within a COVID-19 risk-taking context.

Method

Participants and Design

This experiment, conducted in May 2020, included 262 participants from the Prolific platform resident in the United States (40.1% men; $M_{\text{age}} = 32.7$ years, $SD = 12.12$), none of whom had been diagnosed with or suspected an infection of COVID-19. The post hoc power analysis using G*Power 3.1 (effect size $f = 0.34$; Faul et al., 2007) indicated that this sample size yielded 99% power to detect the focal effect. Different countries imposed distinct social distancing measures, so we focused on a single country to ensure a similar context. With a single-factor (friendship association: friend vs. acquaintance vs. stranger) between-subjects design, we examined spending on health protection items in a scenario in which cities had begun to open up again, after lockdown measures. Thus, we gaged health risk perceptions and behaviors in situations in which the virus infection risk from generalized crowds had increased. Different states in the United States applied different lockdown measures when this study was conducted, so the situation described in Study 2 is hypothetical for some participants and realistic for others.

Materials and Procedure

After providing their informed consent, the participants read that the survey consisted of several unrelated parts. In the first part, all participants indicated their general feelings of closeness to a friend, acquaintance, and stranger, using three separate scales (1 = *not at all close*; 7 = *very close*), ostensibly as part of a study to examine the psychological closeness of various categories of others in people's lives. Then the second part described a partial lockdown due to COVID-19. Thereafter, participants were randomly assigned to one of three conditions, in which they imagined they had contracted the COVID-19 virus from a friend, an acquaintance, or a stranger. We asked: "During the first 2 months after your city has reopened

(when the lockdown in your area has ended), how much are you planning to spend on hand sanitizer and health protection in general? Indicate the amount in U.S. dollars." We calculated the average to measure protective health behavior. With the recognition that prevention-focused individuals perceive greater risk and engage in fewer risky behaviors than do promotion-focused individuals (Gino & Margolis, 2011; Werth & Förster, 2007) and that positive emotions can make people relatively oblivious to risks and likely to engage in risky behavior (Rhodes & Pivik, 2011; Sjöberg, 2007; Slovic & Peters, 2006), we gathered a measure of general, trait-level risk-taking (based on Zuckerman, 1979; 7-point scale, three items, $\alpha = .77$): "Generally speaking, do you consider yourself a risk-taker?"; "Generally speaking, how much risk do you feel comfortable taking in health-related situations?"; and "Generally speaking, how much risk do you feel comfortable taking in social situations?," as well as self-assessments of promotion focus ("I ceaselessly strive to become a better person every day"; based on van Kleef et al., 2005) and prevention focus ("My major goal in life right now is to avoid becoming a failure," adapted from Lockwood et al., 2002). To gauge mood, we used two items (Dolsen & Harvey, 2018): "How positive [negative] do you feel right now?" These items all ranged from 1 (*not at all*) to 7 (*very much*). Using the measure from Study 1, we also asked participants if they had been diagnosed with COVID-19.

Results

Preliminary Checks

A paired-sample t test confirmed that participants felt closer to friends, $M = 5.09$; $SD = 1.45$, than to either acquaintances, $M = 3.15$; $SD = 1.26$; $t(261) = 22.72$, $p < .001$, or strangers, $M = 1.79$; $SD = 1.13$; $t(261) = 32.97$, $p < .001$. They also felt closer to acquaintances than to strangers, $t(261) = 21.60$, $p < .001$.

Main Analysis

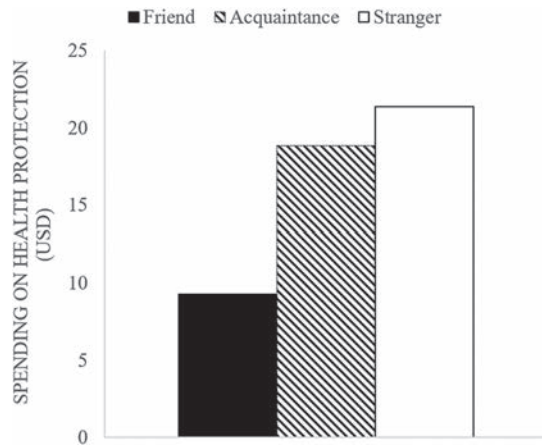
In a one-way analysis of variance (ANOVA), with future spending on health protection products as a function of friendship association, the main analysis revealed the predicted effect, $F(2, 259) = 4.01$, $p < .05$; $\eta^2 = .03$. In line with our predictions, post hoc tests based on the least significant difference (LSD) confirmed that participants who imagined being infected with the COVID-19 virus by a friend reported less future spending on health protection products ($M = \$9.28$, $SD = 14.10$) than those who imagined being infected by an acquaintance ($M = \$18.84$, $SD = 35.75$; $LSD\ SE = 4.54$, $p < .05$) or stranger ($M = \$21.36$, $SD = 33.75$; $LSD\ SE = 4.47$, $p < .01$). The amount of future spending on health protection products did not vary across acquaintance and stranger conditions, though ($LSD\ SE = 4.46$, NS; see Figure 2). To control for the nonnormal, positively skewed distribution of spending data, Kolmogorov-Smirnov (262) = .29, $p < .001$, we repeated the ANOVA after log transforming these data, but the results remained the same, indicating a significant main effect of friendship association, $F(2, 259) = 4.02$, $p < .05$; $\eta^2 = .03$.

Alternative Explanations

We also conducted five separate one-way ANOVAs with trait-level risk-taking, promotion focus, prevention focus, positive mood, and negative mood as functions of friendship association, but they

Figure 2

Average Future Spending on Health Protection Products (USD) as a Function of Friendship Association, Study 2



revealed no differences across conditions (Table 2). When we included these constructs as covariates in the main analysis, it also did not alter the significance of the friendship association for determining future spending on health protection products, $F(2, 256) = 3.60, p < .05$. In a mediation analysis with friendship association as the independent variable, future spending on health protection products as the dependent variable, and prevention focus as a mediator, we found no mediation of prevention focus (Process Model 4, bias-corrected bootstrapping, 5,000 resamples, point estimate: .37, $SE = .38$, 95% confidence interval [CI] includes 0 [−.28, 1.23]; Hayes, 2018). Thus, we could rule out participants' trait-level risk-taking, promotion focus, prevention focus, and mood as alternative explanations.

Discussion

These findings suggested that associating an imagined virus infection with friendship may lead to less protective (i.e., riskier) health behavior, as indicated by reduced future spending on health protection products when the initial (imagined) virus infection is transmitted by a friend rather than by more distant others.

Study 3

To confirm whether we could replicate these findings in the field, for Study 3, we recruited people who had been infected with COVID-19. Furthermore, we added both friends and family as psychologically close infection sources, to reflect reality. Thus, we could assess perceived virus reinfection risk from anonymous crowds, when the city reopened after lockdown, and formally examine how the relationship between friendship association and perceived health risks emerging from third-party others may be mediated by psychological closeness.

Method

Participants and Design

We recruited 247 people who had experienced an actual COVID-19 infection from the crowdsourcing platform Prolific in May 2020.

The post hoc power analysis using G*Power 3.1 (effect size $f = 0.31$; Faul et al., 2007) affirmed that the sample size yielded 83% power to detect the focal effect. All participants lived in the United States (49.0% men; $M_{\text{age}} = 33.9$ years, $SD = 12.01$), and their COVID-19 infection had been either diagnosed by testing or indicated by their symptoms.

Materials and Procedure

We asked participants to indicate the source of their infection: friend, family member, acquaintance, or stranger. We measured psychological closeness with this infection source in terms of liking (Sedikides et al., 1999; Sprecher et al., 2013), using the statement, "I like this person a lot" (1 = *totally disagree*; 7 = *totally agree*). For the outcome variable of interest, perceived health risk, participants indicated their perception of "the likelihood of getting the virus again" on a scale from 1 (*not at all likely*) to 7 (*very likely*). In addition to testing for perceived virus reinfection risk after lockdown measures are eased, we thus formally examined the potential mediation of the relationship between friendship association and perceived health risk from others by psychological closeness. Participants completed the trait-level risk-taking ($\alpha = .75$), promotion focus, prevention focus, and positive and negative mood measures from Study 2.

Results

Preliminary Checks

Because they did not know how or from whom they contracted the virus, and thus could not indicate their psychological closeness with this source, we excluded 138 participants before the analysis. Moreover, prior research also identified different responses when a person knows the source of an infection; not knowing triggers more abstract thoughts, and thus may result in lower risk perceptions (Lerner et al., 2016).

Among the 109 participants who knew the source of their virus infection, 45.0% contracted the virus from a family member, 26.6% from a friend, 14.7% from an acquaintance, and 13.8% from a stranger. For the analysis, we combined data from participants who contracted the virus from acquaintances ($n = 16$) and strangers ($n = 15$), which helped create more equivalent sample sizes across conditions and ensured a minimum sample size of about 30 participants per condition, in line with recent recommendations in the "new statistics" stream of literature (Cumming, 2014; Simmons et al., 2011). This combination was reasonable, in that both strangers and acquaintances are psychologically distant individuals. Moreover, in Study 2, the acquaintance and stranger conditions did not differ on the key dependent measure of future spending on health protection products. Thus, in Study 3, we compared acquaintances/strangers ($n = 31$, coded as 1), family members ($n = 49$, coded as 2), and friends ($n = 29$, coded as 3) as the three infection sources.

Main Analyses

To determine whether the effect of friendship association on perceived health risk (i.e., likelihood of reinfection) was mediated by psychological closeness, we performed two ANOVAs and applied Process Model 4 (Hayes, 2018). The one-way ANOVA

Table 2*Analysis of Variance (ANOVA) Results for Alternative Explanations, Studies 2 and 3*

Study	Dependent measure	Condition	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
2	Trait-level risk-taking	Friend	3.35	1.32	.67	.512
		Acquaintance	3.36	1.25		
		Stranger	3.16	1.29		
	Promotion focus	Friend	5.02	1.54	.74	.478
		Acquaintance	4.93	1.44		
		Stranger	4.77	1.24		
	Prevention focus	Friend	4.87	1.82	1.15	.320
		Acquaintance	4.47	1.80		
		Stranger	4.54	1.97		
	Positive mood	Friend	4.66	1.48	.79	.454
		Acquaintance	4.69	1.13		
		Stranger	4.45	1.46		
3	Promotion focus	Friend	3.18	1.54	.38	.687
		Acquaintance	3.19	1.34		
		Stranger	3.35	1.64		
	Prevention focus	Friend	5.24	1.22	.20	.817
		Family	5.18	1.30		
		Acquaintance/stranger	5.03	1.49		
	Positive mood	Friend	4.86	2.17	.26	.774
		Family	4.53	1.96		
		Acquaintance/stranger	4.65	1.80		
	Negative mood	Friend	4.71	1.13	.60	.552
		Family	4.43	1.60		
		Acquaintance/stranger	4.71	1.13		
	Negative mood	Friend	3.69	1.80	1.48	.233
		Family	3.29	1.71		
		Acquaintance/stranger	2.97	1.30		

with perceived health risk as a function of friendship association revealed the predicted effect, $F(2, 106) = 5.35, p < .01; \eta^2 = .09$. In line with our expectations, post hoc tests confirmed that participants infected by a friend ($M = 3.31, SD = 1.83$) reported a lower likelihood of reinfection than those infected by an acquaintance/stranger ($M = 4.32, SD = 1.38$; $LSD SE = .34, p < .01$). Participants infected by a family member ($M = 3.27, SD = 1.35$) also reported a lower perceived likelihood of reinfection than participants infected by an acquaintance/stranger ($LSD SE = .39, p = .01$). Notably, the perceived likelihood of reinfection did not differ between friends or family members as infection sources ($LSD SE = .35, NS$).

Another one-way ANOVA with psychological closeness as a function of friendship association, $F(2, 106) = 57.12, p < .0001; \eta^2 = .52$, indicated that those who contracted the virus from a friend ($M = 5.69, SD = 1.63$) or family member ($M = 6.53, SD = 1.04$) reported greater psychological closeness with that person than those who were infected by an acquaintance or stranger ($M = 2.97, SD = 1.85$; $LSD SE = .38, p < .001$; $LSD SE = .34, p < .001$, respectively). The psychological closeness felt toward a family member versus a friend differed too, though, such that the greatest psychological closeness involved family members ($LSD SE = .35, p < .05$).

With the Process macro, we tested for mediation using bias-corrected bootstrapping and 5,000 resamples (Model 4; Hayes, 2018). Friendship association was the independent variable, the perceived likelihood of reinfection was the dependent variable, and psychological closeness was a mediator. The effect of friendship association on the perceived likelihood of reinfection appeared mediated by psychological closeness (point estimate: $-.21, SE = .12$; 95% CI $[-.48, -.0003]$; completely standardized indirect effect: $-.10, SE = .06, 95\% CI [-.2, -.001]$).

Alternative Explanations

To check for systematic differences in trait-level variables that could provide an alternative explanation for our findings, we performed several analyses. In two one-way ANOVAs, with promotion focus or prevention focus as a function of friendship association, we found no effects, and neither did any effects emerge from the two one-way ANOVAs with positive or negative mood as a function of friendship association (see Table 2). Another one-way ANOVA with trait-level risk-taking as a function of friendship association indicated that participants who had contracted COVID-19 from a friend were more risk-taking at the trait level ($M = 4.22, SD = 1.41$) than participants whose COVID-19 infection came from a family member ($M = 3.33, SD = 1.13$) or an acquaintance/stranger, $M = 3.47, SD = 1.07$; $F(2, 106) = 5.35, p < .01$. However, including trait-level risk-taking as a covariate in the main analyses did not change the significance of the friendship association for either perceived health risk, $F(2, 105) = 5.41, p < .01$, or psychological closeness, $F(2, 105) = 56.78, p < .0001$. This finding supported our proposition that a friendship association effect exists, above and beyond the effect of trait-level risk-taking tendencies. Finally, in a mediation analysis (Process Model 4, bias-corrected bootstrapping, 5,000 resamples; Hayes, 2018) with friendship association as the independent variable, perceived likelihood of reinfection as the dependent variable, and trait-level risk-taking as the mediator, we found no mediation (point estimate: $.04, SE = .06, 95\% CI [-.05, .20]$). We repeated this mediation analysis with friendship association as the independent variable, perceived likelihood of reinfection as the dependent variable, and prevention focus as the mediator, but we found no mediation by prevention focus either

(point estimate: .006, $SE = .03$, 95% CI $[-.04, .07]$). In line with Study 2, the results confirmed that trait-level risk-taking, promotion focus, prevention focus, and mood can be ruled out as alternative explanations.

Discussion

Among actual COVID-19 sufferers, Study 3 demonstrated a mediating role of psychological closeness in the relationship between friendship association and perceived health risk. Participants who had been infected by a friend or family member reported higher psychological closeness with the infection source, which lowered their perceived risk of reinfection, compared with those infected by an acquaintance or a stranger. Although family and friends evoked different levels of reported psychological closeness, both earned high ratings, resulting in similarly low perceived risks of reinfection. Accordingly, both friends and family psychologically shielded people from feelings of vulnerability to COVID-19 health risks.

Study 4

In Study 4, we aimed to replicate the role of psychological closeness identified in Study 3, then establish a boundary condition for these effects. Specifically, we investigated whether the friend-shield effect is more prominent among people who perceive clear or more blurred in-group/out-group boundaries. Studies 2 and 3 focused on friendship associations with the person responsible for the initial virus infection, and Study 4 extended these findings by examining whether the friend-shield effect holds when a psychologically close person is physically present in the same space as a crowd of others (third parties). We investigated whether the feelings of safety derived from psychologically close relationships (Cruwys et al., 2021) spill over to COVID-19 infection situations associated with friendship, due to the presence of a friend, even though the actual risk involves anonymous crowds. We predicted that the friend-shield effect would not only occur with friendship associations established in the past, but also through the (imagined) future, because the feelings of safety derived from friendship (Collins & Feeney, 2000, 2004; Spencer, 2007) work as a shield against perceived COVID-19 infection risk from third-party crowds irrespective of when or how the friendship association was established.

Method

Participants and Design

This online experiment included 176 participants from the United States (48.9% men; $M_{\text{age}} = 31.0$ years, $SD = 11.25$; data collected in August 2020 via Prolific). The post hoc power analysis using G*Power 3.1 (effect size $f^2 = 0.04$; Faul et al., 2007) showed that this sample size yielded 85% power to detect the focal effect. This study used a between-participants factor (friendship association: friend vs. acquaintance) and measured the clarity of in-group/out-group boundaries as a continuous moderator.

Materials and Procedure

The participants started by providing informed consent and reporting the name of their favorite burger restaurant in their city. In line with reality at that time, participants were informed

that their city was currently affected by the COVID-19 pandemic but that restaurants were open for dining. Depending on the randomly assigned condition, participants had to imagine that a friend or an acquaintance called to meet sometime that week to eat at their favorite burger restaurant. The acquaintance, though only vaguely known through an online hobby sharing group, was described as likely to offer good rapport, to ensure that the participants felt positive toward the acquaintance but that a difference in psychological closeness, relative to friends, remained. As an indicator of psychological closeness, we asked "How close does this person feel to you?" with a scale from 1 (*not at all close*) to 7 (*very close*). As a measure of health risk behavior, we asked the participants how hesitant they would be to go to the restaurant, given the COVID-19 pandemic (7-point scale, reverse coded for the main analysis, so higher scores mean less hesitant and riskier behavior). Next, we provided brief definitions of in-groups and out-groups and explained that people can be categorized into them, then asked the participants to create two lists: people within their in-group and people in their out-group. When participants had more blurred boundaries, such that they perceived more overlap across categories, they should have had more difficulty engaging in this categorization task (e.g., Nosofsky, 1990). Therefore, to measure the clarity of in-group/out-group boundaries, we asked participants how easy or difficult it was for them to build the two lists (7-point scale, reverse coded; higher scores meant more ease and clearer in-group/out-group boundaries). Finally, we checked whether participants had contracted COVID-19.

Results

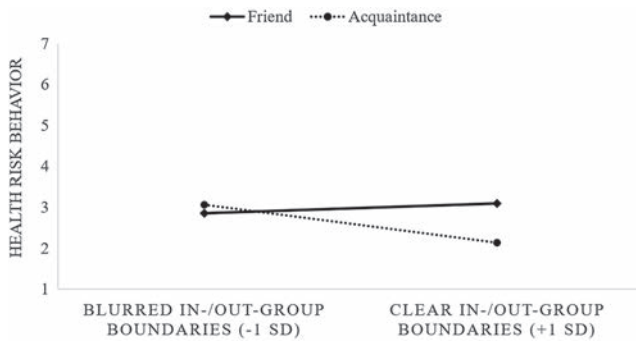
Only 1.7% of the participants indicated that they had been previously diagnosed with COVID-19, 10.2% indicated suspicion without an official diagnosis, and 88.1% said they had not experienced any COVID-19 symptoms in the previous year. That is, the vast majority of participants had never suffered from COVID-19.

For the main analysis, we expected that the effect of friendship association (*friend* = 1; *acquaintance* = 2) on health risk behavior would be mediated by psychological closeness and moderated by the clarity of in-group/out-group boundaries (Figure 1). Friendship association was a categorical variable; the moderator, mediator, and dependent variables were continuous. To obtain evidence of moderated mediation, we conducted two analyses. The first regression (Process Model 1; Hayes, 2018), on health risk behavior as a function of friendship association and clarity of in-group/out-group boundaries, indicated no main effects of friendship association, $B = .61$, $t(175) = 1.45$, $p = .15$, or clarity of in-group/out-group boundaries, $B = .07$, $t(175) = .61$, $p = .54$. The predicted interaction between friendship association and clarity of in-group/out-group boundaries was significant, $B = -.16$, $t(175) = -2.02$, $p = .04$; $R^2 = .04$. Participants with clear boundaries (+1 SD) were less hesitant to dine at the burger restaurant; that is, they showed riskier health behavior with a friend ($M = 3.11$) than with an acquaintance, $M = 2.15$; $B = -.48$, $t(175) = -2.34$, $p = .02$; partial $r = .17$, indicating that they felt less vulnerable to a COVID-19 infection when visiting an indoor restaurant with a friend rather than with an acquaintance. In contrast, for participants with blurred in-group/out-group boundaries ($-1 SD$), the friendship association did not affect their health risk behavior, $B = .11$, $t(175) = .52$, $p = .60$; Figure 3.

As Figure 4 also shows, participants with clear in-group/out-group boundaries distinguished more effectively between friends

Figure 3

Health Risk Behavior as a Function of Friendship Association and Clarity of In-Group/Out-Group Boundaries



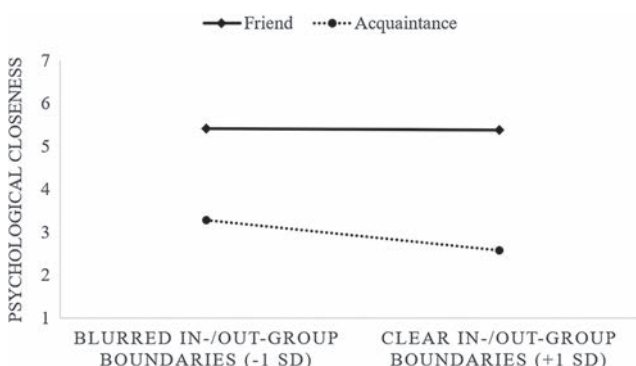
and acquaintances in terms of psychological closeness. To assess whether the effect of friendship association on health risk behavior, moderated by the clarity of in-/out-group boundaries, was mediated by psychological closeness, we conducted a moderated mediation analysis. The bootstrap analysis (5,000 resamples, Process Model 58; Hayes, 2018) confirmed that the influence of the Friendship association \times Clarity of group boundaries interaction on health risk behavior was mediated by psychological closeness for participants with clear in-group/out-group boundaries (point estimate: $-.43$, $SE = .19$, 95% CI $[-.81, -.06]$) but not for those with blurred boundaries (point estimate: $-.17$, $SE = .15$, 95% CI including zero $[-.45, .15]$). In line with our prior findings, the double moderation in Process Model 58 indicated that relationships between friendship association and psychological closeness, as well as between psychological closeness and health risk behavior, existed for participants with *at least* an average (mean) in-group/out-group boundary clarity level (point estimate: $-.29$, $SE = .14$, 95% CI $[-.55, -.001]$; more pronounced effects at higher levels).

Discussion

Study 4 affirmed our prediction that the relationship between a virus infection being associated with a friend and health risk behavior is more pronounced among people with clear in-group/

Figure 4

Psychological Closeness as a Function of Friendship Association and Clarity of In-Group/Out-Group Boundaries



out-group boundaries than among those with blurred boundaries. Yet it was difficult to draw a conclusion on whether changes in health risk behavior occurred in the acquaintance or friend condition as compared with the natural baseline because participants with clear versus blurred in-group/out-group boundaries (i.e., individual difference variable) represent different populations. That is, people with clear in-group/out-group boundaries could also have had innately greater risk perceptions than those with blurred boundaries, mimicking the pattern in the acquaintance condition as their baseline tendency. In that case, the Study 4 results would imply that being with a friend increases health risk behavior above an innate baseline tendency, in line with the friend-shield effect. But if the innate baseline perception of risk is lower for those with clear rather than blurred in-group/out-group boundaries, similar to the pattern in the friend condition, then the findings of Study 4 would contradict the predicted friend-shield effect. Thus, a baseline control was needed to determine whether the results of the friend condition or the acquaintance condition mimic the baseline pattern of results, as provided by Study 5.

Study 5

Because our research focused on risk perceptions involving third-party crowds, with Study 5, we formally measured perceived crowdedness of an indoor eating establishment, which could be a mechanism that underlies risk perceptions and behavior. We also adopted a different measure of in-group/out-group boundary clarity. Previous research showed that people with conservative political orientations have clearer in-group/out-group boundaries than do liberals (Castano et al., 2002; Janoff-Bulman, 2009; Jost et al., 2003; Krosch et al., 2013; Sparkman et al., 2019). Because the friend-shield effect we identified is moderated by boundary clarity, with stronger effects at higher levels of clarity, we expected a more pronounced friend-shield effect among persons with more conservative, rather than liberal, political orientations. We thus relied on political orientation as an indicator of the clarity of in-group/out-group boundaries. Along with the friend and acquaintance conditions, this study included an alone condition (no social associations), as a neutral control to test the direction of the effects. To test the generalizability of the friend-shield effect across different contexts, we asked participants to imagine a visit to their favorite coffee shop (Study 5) rather than to a burger restaurant (Study 4). We chose these venues since coffee shops and burger restaurants are commonly found and popular across different cities and towns in the United States. Moreover, these venues are fitting to examine COVID-19 risk perceptions because individuals must take off their masks to consume products while sharing the same indoor space with anonymous crowds.

Method

Participants and Design

This online experiment included 301 participants residing in the United States (55.8% men; $M_{age} = 31.8$ years, $SD = 11.02$; data collected in April 2020 on Prolific). The post hoc power analysis using G*Power 3.1 (effect size $f^2 = 0.10$; Faul et al., 2007) showed that this sample size yielded 99% power to detect the focal effect. Study 5 included a between-participants factor (friendship

association: friend vs. acquaintance vs. alone) and measured political orientation as a continuous moderator.

Materials and Procedure

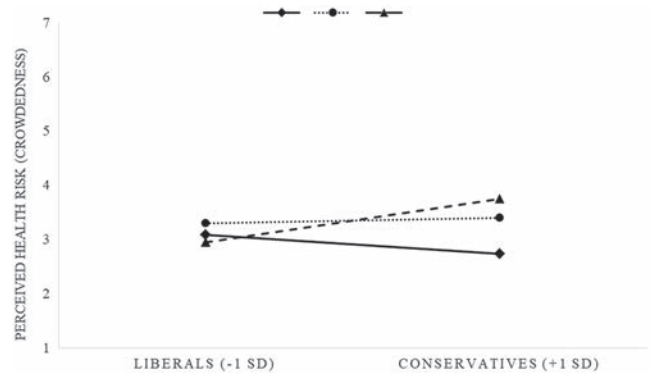
After providing informed consent and the name of their favorite coffee shop, participants were randomly assigned to one of three conditions. Similar to Study 4, the description outlined a city currently affected by COVID-19. Depending on the condition, they had to imagine that a friend or an acquaintance called and asked them to meet sometime that week at their favorite coffee shop; participants in the alone (control) condition were asked to imagine visiting their favorite coffee shop by themselves sometime that week. This neutral control enabled us to test the direction of the effects more explicitly. To measure the perceived risk of contracting the virus from unknown crowds of people in the coffee shop, we asked participants “How crowded do you expect the coffee shop to be?” (1 = *not at all crowded*; 7 = *extremely crowded*). Research shows that the risk of exposure to the COVID-19 virus increases exponentially with the number of people present in a shared space (Maggiacomo & Greshko, 2020). As measures of perceived health risk, we asked, “How likely is it for you to catch the virus while being at the coffee shop?” (1 = *extremely unlikely*; 7 = *extremely likely*) and “How high is the chance for you to become infected with the virus while having coffee at the coffee shop?” (1 = *zero*; 7 = *very high*; averaged indicator, $\alpha = .93$). To assess their health risk behavior, we asked participants to indicate, on 7-point scales, how hesitant they would be (reverse coded) and how likely they would be to visit the coffee shop ($\alpha = .84$). Finally, participants indicated their political orientation (1 = *extremely liberal*; 7 = *extremely conservative*; $M = 3.12$, $SD = 1.58$), which we used as a proxy for the clarity of their in-group/out-group boundaries (Janoff-Bulman, 2009).

Results

We predicted that the effect of friendship association on health risk behavior would be mediated by two measures of perceived health risk—expected crowdedness and then perceived risk of virus infection—and moderated by participants’ political orientation (Figure 1). If the friend-shield effect was moderated by the clarity of in-group/out-group boundaries, with stronger effects for stronger clarity, we expected a more pronounced friend-shield effect among persons with conservative rather than liberal political orientations. To test for this moderated multiple serial mediation, we first analyzed a series of three regression equations (Kim, 2013). The first regression analysis (Process Model 1; Hayes, 2018), with expected crowdedness as a function of friendship association (1 = *friend*, 2 = *acquaintance*, 3 = *alone*) and political orientation, indicated no main effects, $B = -.36$, $t(300) = -1.34$, NS; $B = -.32$, $t(300) = -1.89$, NS, respectively. Yet the predicted interaction between friendship association and political orientation was significant, $B = .19$, $t(300) = 2.42$, $p < .05$; $R^2 = .09$. Among conservatives (+1 SD), expected crowdedness was lower if they were going with a friend ($M = 2.73$) rather than an acquaintance, $M = 3.40$, $B = .67$, $t(300) = 1.97$, $p = .05$; partial $r = .11$, or alone, $M = 3.75$, $B = 1.02$, $t(300) = 3.02$, $p < .01$; partial $r = .17$. These findings provided further evidence that a psychologically close relationship drove the identified effects. For liberals (−1 SD), no effect arose between

Figure 5

Perceived Health Risk as a Function of Friendship Association and Political Orientation as an Indicator of Clarity of In-Group/Out-Group Boundaries



the friendship association and expected crowdedness ($t < 1$, NS; Figure 5).

According to the second regression, the path from higher expected crowdedness to higher perceived risk of virus infection was significant, $B = .28$, $SE = .05$, $t(300) = 5.80$, $p < .001$; $R^2 = .10$. The third regression also confirmed a significant path from a higher perceived risk of infection to less risky health behavior, $B = -.30$, $SE = .06$, $t(300) = -5.43$, $p < .001$; $R^2 = .09$.

We then tested for the moderated, serial, multiple mediation (Process Model 86 with two mediators and 5,000 resamples; Hayes, 2018), with friendship association as the independent variable, health risk behavior as the dependent variable, expected crowdedness and perceived risk of infection as mediators, and political orientation as the moderator. The results confirmed the predicted friend-shield effect for conservatives (point estimates friend vs. acquaintance: $-.07$, $SE = .04$, 95% CI $[-.15, -.003]$; friend vs. alone: $-.10$, $SE = .04$, 95% CI $[-.19, -.03]$). In line with our expectations, liberals did not reveal a friend-shield effect (point estimates friend vs. acquaintance: $-.02$, $SE = .04$, 95% CI $[-.10, .05]$; friend vs. alone: $.01$, $SE = .04$, 95% CI $[-.05, .09]$).

Discussion

Study 5 replicated the findings of the previous four studies, providing further evidence of the hypothesized friend-shield effect. It also offered a useful reference for testing whether perceived risk decreases or increases in relation to a friend versus an acquaintance, in that it included a baseline condition (i.e., going to the restaurant alone). The pattern in the acquaintance condition was similar to the baseline, whereas the friend condition reduced risk perceptions for people with clear in-group/out-group boundaries. Therefore, the movement occurred in the friend condition, such that people with clear in-group/out-group boundaries perceived less risk when contemplating a visit to a coffee shop with a friend than with an acquaintance or alone. In other words, they demonstrated stronger friend-shield effects than do people with blurred boundaries. In line with prior research that indicates that conservative political orientations tend to evoke greater threat sensitivity (Jost et al., 2003; Pedersen et al., 2018), our results showed that conservatives perceive greater risk in the baseline condition than liberals. This sensitivity significantly decreases when COVID-19 is associated

with friendship, though. By using political orientation as a measure of boundary clarity, we offer an actionable conceptualization of in-group/out-group boundary clarity that could guide policymakers' efforts to address COVID-19 or future pandemics, while balancing public health against economic interests.

General Discussion

In support of a friend-shield effect, we found that people anticipated reduced COVID-19 infection risk from a crowd of generalized others if they associated COVID-19 with friendship—whether friends were the source of a virus infection, were present in the same public indoor space as third-party crowds, or were merely salient in their minds. In addition to arising regardless of the point in time when the COVID-19 association with friendship was established, and in line with investigations of intuitive risk judgments (Loewenstein et al., 2001; Slovic et al., 2004), we found that the friend-shield effect manifested due to a sense of safety bestowed by psychologically close relationships (Collins & Feeney, 2004; Spencer, 2007), even if the actual risk involved crowds beyond a social circle. Building on research that indicates that people anticipated less health risk arising from in-group compared with out-group members (Cruwys et al., 2020), we showed how friendship can trigger reduced virus infection risk perceptions when third parties are involved and revealed that this effect was most prominent among people with clear in-group/out-group boundaries. The findings thus shed new light on how social cues influence individual health risk perceptions and behaviors.

By confirming the friend-shield effect in a field study and four experiments, this article also identified an irrational, potentially dangerous bias. Limiting interactions to friends and family offered a good protective measure that reduced the physical transmission of COVID-19 (Block et al., 2020). But it may also have created some unintended issues, because it facilitated the association between COVID-19 and friendship, thereby reducing health risk perceptions and increasing risky health behaviors. Feelings of safety linked to family and friends may be rational in other risk contexts, such as financial risk, because close social networks can provide “cushions” that protect risk takers in case of failure (Hsee & Weber, 1999). But such a perceived safety shield in an infectious disease context is irrational, as well as dangerous. No matter how loving and intimate, friends and family cannot protect someone from contracting the virus through exposure to anonymous crowds in virus-prone environments, such as indoor restaurants.

Accordingly, the findings of this research suggest the need for a holistic response to the pandemic, with mitigation efforts that address both physical transmission of the virus and the effects on psychological risk perceptions. Awareness campaigns that describe how virus risk perceptions might be improperly reduced when COVID-19 is associated with friendship could help people recognize and proactively counteract this risk perception bias. Then they may be more likely to behave in ways that promote, rather than undermine, the efficacy of COVID-19 public health interventions to ensure societal well-being.

Furthermore, the two measures of in-group/out-group boundary clarity that we employed facilitate the implementation of our findings for public policy. If they were to use political orientation as a concrete measure of in-group/out-group boundary clarity, health officials and public policymakers could create different health

campaigns for politically conservative and liberal citizens. Information about political orientation is more widely available than information on individual differences in in-group/out-group boundary clarity; many organizations provide readily available data about the neighborhoods, states, television channels, and stores that liberals or conservatives tend to favor. Thus, our conceptualizations of in-group/out-group boundary clarity are actionable: The friend-shield effect is especially strong for people with conservative political orientations. In turn, the friend-shield effect and the clarity of in-group/out-group boundaries might help explain liberal/conservative divides in COVID-19-related health behavior (Imhoff & Lamberty, 2020). Conservatives, with their clear in-group/out-group boundaries (Castano et al., 2002; Janoff-Bulman, 2009; Jost et al., 2003; Krosch et al., 2013; Sparkman et al., 2019), may resist COVID-19 precautions and protections more than liberals in part because of a stronger friend-shield effect.

This article extends timely scientific research on COVID-19 by offering the first empirical test of the role of social relationships and in-group/out-group boundaries for determining COVID-19-related risk perceptions and behavior. By providing causal evidence in support of our theoretical framework, which sheds light on the antecedents of COVID-19 risk perceptions, we extend research on pandemic control measures. Moreover, social distancing measures involve both social and health domains, and, in this sense, our studies provide a unique contribution to risk perception research. That is, existing studies note that the effect of close relationship cues on risk judgments vary with the domain, because various decision problems require different resolution strategies (Rettinger & Hastie, 2001). In financial domains, for example, people tend to take greater risks when primed with close instead of more distant relationships (Mandel, 2003), because they anticipate tangible support (Hsee & Weber, 1999). In social domains, though, they are generally averse to risks due to anticipated embarrassment, disapproval, or rejection (Dahl et al., 2001; Mandel, 2003). The current research reveals a friend-shield perception bias in the health risk realm, even when COVID-19 is only tangentially associated with friendship and the actual risk stems from unknown crowds.

Finally, by demonstrating that the friend-shield effect exists irrespective of the time at which the friendship association is established, our findings contribute by extending research on the integrated nature of the psychological processes involved in the recollection of the past and the imagination of the future (Klein et al., 2002; Mullally & Maguire, 2014; Schacter & Addis, 2007).

Limitations and Suggestions for Further Research

We outline five points that deserve further research and comprise interesting extensions of the present work. First, the sample sizes are low for studies with complex analyses such as moderated mediation with continuous variables. Despite the sample size limitation, we note that the post hoc power analyses revealed an average value of 93% across the five studies, which is in line with recommendations (Cohen, 1988; Ellis, 2010).

While Study 1 confirmed that the mere association of friendship with COVID-19 drives the friend-shield effect, the effects in Studies 4 and 5 also might have been partly driven by rational inferences that a friend is objectively less dangerous. People generally have better information about their friends than about acquaintances, in terms of how cautious or lackadaisical they are about COVID-19 prevention

and whether they have been infected or recently come in close contact with those who are. Yet, the amount of information one has about close friends would likely be similar for people with clear versus blurred in-group/out-group boundaries. Thus, the moderating role of in-group/out-group boundary clarity in Studies 4 and 5 suggests that the friend-shield effect is not solely driven by rational inference regarding friends being less dangerous. With that said, additional studies that specify that a friend or acquaintance is surely virus free and then measure the perceived infection risk of anonymous crowds would provide cleaner evidence to disentangle the rational versus associative drivers of the friend-shield effect.

In Studies 2 and 3, participants allocated less money to health protection and perceived a lower likelihood of reinfection when they had been previously infected by a friend rather than an acquaintance. These studies did not include the amount of time participants spent with the friend or acquaintance at the time they got infected, so perhaps they spent less time with the acquaintance than with the friend, leading to a rational conclusion that the virus is more contagious in the former case. We call for further research that controls for the amount of time spent with the person responsible for the infection to address this possibility.

Furthermore, as we demonstrated, the friend-shield effect can be explained by feelings of safety associated with friendship, which spills over to virus risk contexts when anonymous crowds are involved. However, since people with clearer in-group/out-group boundaries and conservative orientations have strong in-group protection motivation (Janoff-Bulman, 2009; Jost et al., 2003), their stronger desire to protect their friend from harm may motivate them to identify reduced risk from eating at indoor venues. Additional research could separate out these possible effects.

Finally, additional research may examine the robustness of the friend-shield effect over time and determine if it grows stronger or weaker as the COVID-19 pandemic continues or as new viruses emerge.

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(Appendices follow)

Appendix

Experiment Stimuli, Measures, Debriefing, and Correlations

Study 1

Friend Condition

Please think of a close friend that you have. You are very close with this person.

After thinking of a close friend that you have, please write down the name of your close friend and describe the relationship that you have with this close friend in detail using five sentences.

The name of my close friend is: _____

The relationship that I have with my close friend, I would describe as follows:

(please write 5 sentences) _____

Acquaintance Condition

Please think of a distant acquaintance that you have. You are not at all close with this person.

After thinking of a distant acquaintance that you have, please write down the name of your distant acquaintance and describe the relationship that you have with this distant acquaintance in detail using five sentences.

The name of the distant acquaintance is: _____

The relationship that I have with my distant acquaintance, I would describe as follows:

(please write 5 sentences) _____

All Conditions

*We are currently in a worldwide COVID-19 pandemic. COVID-19 is a disease caused by a new coronavirus called SARS-CoV-2, causing viral pneumonia, fever, dry cough, and a loss of taste or smell, among other symptoms. The World Health Organization (WHO) warns that people of all ages can get seriously ill or die from COVID-19. **Research has further shown that eating sugary foods, and more generally eating unhealthy snack items, increases your risk of experiencing more severe COVID-19 infection symptoms.** On the other hand, the regular use of hand sanitizer, face masks, and disinfecting wipes reduces your chance of getting COVID-19.*

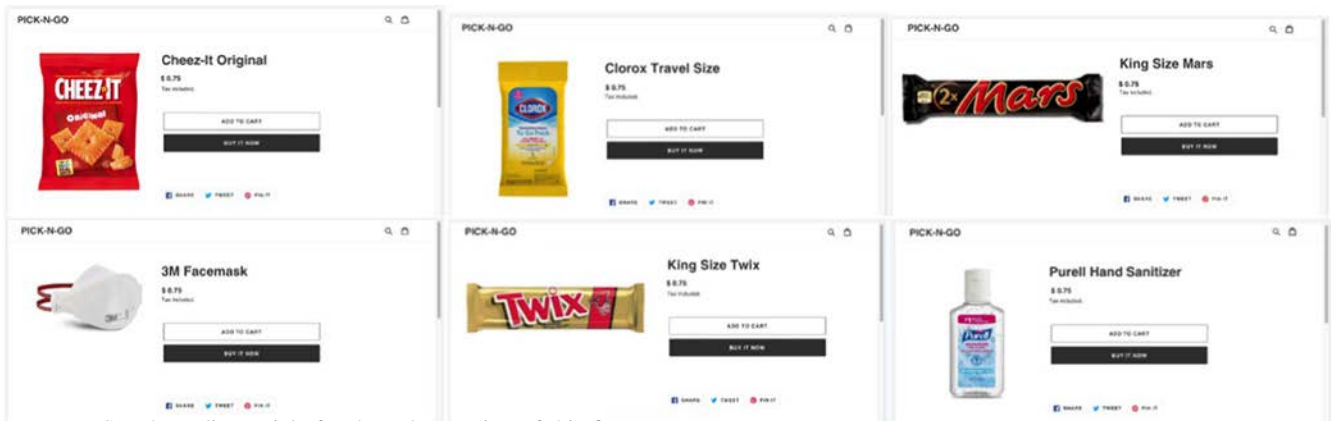
SPECIAL OFFER

In collaboration with WEB SHOP PICK-N-GO

You can use the money that you are earning by filling out this survey, to buy one product at web shop PICK-N-GO. Please take a look at the products that are offered for sale at web shop PICK-N-GO and indicate whether you want to take advantage of this offer by indicating which product (if any) you want to buy.

This offer is only valid right now

*Note. Below images are resized for the article publication as thumbnails to respect copyright.



Note. See the online article for the color version of this figure.

I would like to buy the following product for 0.75 USD (no shipping costs):

Please select the product of your choice (if any)



Cheez-It Original



Clorox Travel Size



King Size Mars



3M Facemask



King Size Twix



Purell Hand Sanitizer

Note. See the online article for the color version of this figure.

Please click on the box below to confirm your purchase (or no purchase if you chose not to buy anything). PURCHASE (\$0.75)/NO PURCHASE

Before going to the last part of the questionnaire, please answer the following questions about the person you wrote about.

This person is clean. (1) *Totally Disagree*, (7) *Totally Agree*

Do you live in the same building as this person? Yes/No

Have you been diagnosed with COVID-19 at some point?

Yes/No, but there has been serious suspicion that I am/was infected with COVID-19/No

If you already are vaccinated please answer "Already vaccinated" (coded as 0 if not vaccinated, coded as 1 if vaccinated)

What is your gender? Male/Female/Other

What is your age? (only write a number below) _____

In which country do you currently reside? _____

Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes. Less than \$10,000/\$10,000 to \$19,999/\$20,000 to \$29,999/\$30,000 to \$39,999/\$40,000 to \$49,999/\$50,000 to \$59,999/\$60,000

to \$69,999/\$70,000 to \$79,999/\$80,000 to \$89,999/\$90,000 to \$99,999/\$100,000 to \$149,999/\$150,000 or more

Please write your Prolific ID below (24 alphanumeric characters): _____

Please note: This survey is purely for scientific purposes. In this case, it was not really possible to purchase any products. Hence, every respondent, irrespective of whether you indicated you wanted to buy something or not, will not receive any product but will be paid in full for participation in this study.

Please click the next button to record all your responses. Thank you *very much* for your time!

Debriefing After the Study Completion

Dear Participant,

Thank you for your participation in our study on COVID-19 and risk perception. In this study, we investigated whether individual choices regarding risky behaviors related to COVID-19 could change depending upon who is on your mind while reading COVID-19 news. Thus, we first asked different participant groups to think of a close friend or an acquaintance. Then, we provided a news article on COVID-19. We would like to clarify the following statement in this article: "Research has further shown that eating sugary foods—and, more generally, eating unhealthy snack items—increases your risk of experiencing more severe COVID-19 infection symptoms."

Unhealthy eating habits can indeed increase various health issues (such as obesity, diabetes, heart conditions, etc.). According to the World Health Organization and the Centers for Disease Control and Prevention, people with underlying health conditions are at increased risk for more severe COVID-19 infection symptoms. Individuals tend to increase sugary food intake when faced with stressful situations, such as the COVID-19 pandemic, and high sugar intake can increase inflammation.

Therefore, we want to clarify that eating sugary foods—and, more generally, eating unhealthy snack items—CAN increase your risk of experiencing more severe COVID-19 infection symptoms. The statement in the news article provided during our study was more direct and definitive due to the need to be brief and focused on our research manipulation. However, if you'd like more information on the guidelines regarding sugary food intake or on recommendations from health officials, please refer to the links at the end of this message.

We sincerely hope that everyone is staying safe and healthy!

Thank you again for your participation in our study.

With warm wishes and gratitude,

Researchers

<https://www.health.harvard.edu/staying-healthy/all-about-inflammation>

<https://www.healthline.com/health-news/eating-excess-sugar-is-worse-for-you-during-covid-19-6-ways-to-cut-it>

<https://www.goodhousekeeping.com/health/a35166456/how-to-treat-covid-19-symptoms-at-home/>

<https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/publications-and-technical-guidance/food-and-nutrition-tips-during-self-quarantine>

<https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html>

Study 2

All Condition

This survey consists of several parts.

Below, we first inquire how close you feel to different categories of people in your life.

How close do you generally feel to a friend? (1) *Not at all close*, (7) *Very close*

How close do you generally feel to an acquaintance? (1) *Not at all close*, (7) *Very close*

How close do you generally feel to a stranger? (1) *Not at all close*, (7) *Very close*

As you are probably aware, there has been an international coronavirus outbreak. The new coronavirus (COVID-19) could cause lung infection and other troublesome health issues. Currently, there is no proper vaccine nor medication to treat the virus infection.

The current survey aims to examine perceptions and experiences regarding the virus infection. Please carefully read each question and answer as honestly as possible. Thank you for your cooperation.

Friend Condition

a close friend

Please imagine below as good as possible, before continuing to the questions on the following page.

Please imagine for a moment that you got infected with COVID-19 by a close friend

Acquaintance Condition

an acquaintance

Please imagine below as good as possible, before continuing to the questions on the following page.

Please imagine for a moment that you got infected with COVID-19 by an acquaintance

Stranger Condition

a stranger

Please imagine below as good as possible, before continuing to the questions on the following page.

Please imagine for a moment that you got infected with COVID-19 by a stranger

All Conditions

During the first 2 months after your city reopens (when the lockdown in your area has ended), how much are you planning to spend on hand sanitizer and health protection in general? Indicate the amount in U.S. dollars \$ _____

You will now continue with the last part of the questionnaire.

Please continue by answering some questions about your mood, personal thoughts, characteristics, and habits.

Generally speaking, do you consider yourself a risk-taker? (1) *Not at all*, (7) *Very much*

Generally speaking, how much risk do you feel comfortable taking in health-related situations? (1) *Not at all*, (7) *Very much*

Generally speaking, how much risk do you feel comfortable taking in social situations? (1) *Not at all*, (7) *Very much*

I ceaselessly strive to become a better person every day. (1) *Not at all*, (7) *Very much*

My major goal in life right now is to avoid becoming a failure. (1) *Not at all*, (7) *Very much*

How positive do you feel right now? (1) *Not at all*, (7) *Very much*

How negative do you feel right now? (1) *Not at all*, (7) *Very much*

Have you been diagnosed with COVID-19 virus infection at some point during the last half a year? Yes/No, but there has been serious suspicion that I am/was infected with COVID-19/No

What is your gender? Male/Female/Other

What is your age? (only write a number below) _____

In which country do you currently reside? _____

Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes. Less than \$10,000/\$10,000 to \$19,999/\$20,000 to \$29,999/\$30,000 to \$39,999/\$40,000 to \$49,999/\$50,000 to \$59,999/\$60,000 to \$69,999/\$70,000 to \$79,999/\$80,000 to \$89,999/\$90,000 to \$99,999/\$100,000 to \$149,999/\$150,000 or more

Please write your Prolific ID below (24 alphanumeric characters): _____

Please click the next button to record all your responses. Thank you *very much* for your time!

Study 3

All Conditions

As you are probably aware, there has been an international coronavirus outbreak. The new coronavirus (COVID-19) could cause lung infection and other troublesome health issues. Currently, there is no proper vaccine nor medication to treat the virus infection.

The current survey aims to examine perceptions and experiences regarding the virus infection. Please carefully read each question and answer as honestly as possible. Thank you for your cooperation.

Have you been diagnosed with COVID-19 virus infection at some point during the last half a year? Yes/No, but there has been serious suspicion that I am/was infected with COVID-19/No

Do you know from whom you got the virus infection? Yes/No, but I am pretty sure who it might be/No, I have no idea

For Participants Who Knew or Was Pretty Sure Who Gave Them the COVID-19 Infection

The person from whom I got the COVID-19 virus infection was a: Friend/Family member/Acquaintance/Stranger

Please indicate your agreement about the person from whom you got the COVID-19 virus infection.

I like this person a lot. (1) *Totally Disagree*, (7) *Totally Agree*

What do you think is the likelihood of getting the virus again? (1) *Not at all likely*, (7) *Very likely*

Please continue by answering some questions about your mood, personal thoughts, characteristics, and habits.

Generally speaking, do you consider yourself a risk-taker? (1) *Not at all*, (7) *Very much*

Generally speaking, how much risk do you feel comfortable taking in health-related situations? (1) *Not at all*, (7) *Very much*

Generally speaking, how much risk do you feel comfortable taking in social situations? (1) *Not at all*, (7) *Very much*

I ceaselessly strive to become a better person every day. (1) *Not at all*, (7) *Very much*

My major goal in life right now is to avoid becoming a failure. (1) *Not at all*, (7) *Very much*

How positive do you feel right now? (1) *Not at all*, (7) *Very much*

How negative do you feel right now? (1) *Not at all*, (7) *Very much*

What is your gender? Male/Female/Other

What is your age? (only write a number below) _____

In which country do you currently reside? _____

Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes. Less than \$10,000/\$10,000 to \$19,999/\$20,000 to \$29,999/\$30,000 to \$39,999/\$40,000 to \$49,999/\$50,000 to \$59,999/\$60,000 to \$69,999/\$70,000 to \$79,999/\$80,000 to \$89,999/\$90,000 to \$99,999/\$100,000 to \$149,999/\$150,000 or more

Choose one or more races that you consider yourself to be: White/Black or African American/American Indian or Alaska Native/Hispanic or Latin American/Asian/Native Hawaiian or Pacific Islander/Other _____

Please write your Prolific ID below (24 alphanumeric characters): _____

Please click the next button to record all your responses. Thank you *very much* for your time!

Study 4

All Conditions

This study consists of several sets of questions about different settings presented via script. Now you will start the first set of questions. Please read the following scenario carefully.

As you are probably aware, there has been an international coronavirus outbreak. The new coronavirus could cause lung infection, causing much troublesome health issues. Currently, there is no proper vaccine nor medication to treat the virus infection.

For this reason, an increasing number of individuals are becoming more cautious and selective in visiting some stores. Consequently, consumers' visits to some businesses are becoming significantly reduced, begetting inevitable economic impact.

The current survey aims to assess consumers' likelihood of visiting different types of stores. This information will be useful in predicting which businesses would likely be more affected by the current virus outbreak and help businesses to be prepared for what is to come. Please carefully read each question and answer as honestly as possible. Thank you for your cooperation.

Imagine that all burger restaurants are open in your city this week.

Also, imagine that all citizens are allowed to sit in at burger restaurants this week.

Friend Condition

In your city, what is the name of your favorite burger restaurant?

Write ONLY the name of the burger restaurant below: _____

Imagine that your close friend, whom you know and get along really well with, called you to meet sometime this week at your favorite burger restaurant _pipe_text_restaurant_name_ (for sit-in, not take-out)

How close does this person feel to you? (1) *Not at all close*, (7) *Very close*

If your close friend called to meet you at the burger restaurant _pipe_text_restaurant_name_, how hesitant would you be to go? (1) *No hesitation at all*, (7) *Extremely hesitant*

Acquaintance Condition

Sometimes we interact with people whom we have never met in person but have interacted a couple of times online. There are organized online gatherings, such as a Meetup group, where people gather to share a particular interest or hobby.

Imagine that a person whom you have never met before in person but interacted a couple of times online via a Meetup group (organized online group of people who share a particular interest or hobby) called you to meet sometime this week at your favorite burger restaurant _pipe_text_restaurant_name_. Although you have only met this person a couple of times online, you get along with this person. (for sit-in, not take-out)

How close does this person feel to you? (1) *Not at all close* (7) *Very close*

If an acquaintance called to meet you at the burger restaurant _pipe_text_restaurant_name_, how hesitant would you be to go? (1) *No hesitation at all* (7) *Extremely hesitant*

All Conditions

You will now continue with the last part of the questionnaire. Please continue by answering some questions about your mood, personal thoughts, characteristics, and habits.

Sometimes, people in one's life can be categorized into "in-group" and "out-group" depending on how much one identifies as being a member of the same group or not.

That is, an in-group is a social group to which a person psychologically identifies as being a member. By contrast, an out-group is a social group with which an individual does not identify.

Thus, if you feel that someone would be in the same group as the one where you belong, then you would categorize that person as your in-group. In contrast, if you feel that someone would be in a different group as the one where you belong, then you would categorize that person as your out-group.

In your life, who would you categorize as your "in-group"? Please write as many people as you'd like. _____ essay text box

In your life, who would you categorize as your "out-group"? Please write as many people as you'd like. _____ essay text box

How easy or difficult was it to categorize people in your life into in-group and out-group? (1) *Very Easy* (7) *Very Difficult*

What is your gender? Male/Female/Other

What is your age? (only write a number below) _____

In which country do you currently reside? _____

Have you actually suffered with COVID-19 this year?

Yes, I suffered with COVID-19 symptoms, and I was officially diagnosed with COVID-19/Yes, I suffered with COVID-19 symptoms, although I was never officially diagnosed/No, I did not experience any COVID-19 symptoms

Please write your Prolific ID below (24 alphanumeric characters): _____

Please click the next button to record all your responses. Thank you *very much* for your time!

Study 5

All Conditions

This study consists of several sets of questions about different settings presented via script. Now you will start the first set of questions. Please read the following scenario carefully.

As you are probably aware, there has been an international coronavirus outbreak. The new coronavirus could cause lung infection, causing much troublesome health issues. Currently, there is no proper vaccine nor medication to treat the virus infection.

For this reason, an increasing number of individuals are becoming more cautious and selective in visiting some stores. Consequently, consumers' visits to some businesses are becoming significantly reduced, begetting inevitable economic impact.

The current survey aims to assess consumers' likelihood of visiting different types of stores. This information will be useful in predicting which businesses would likely be more affected by the current virus outbreak and help businesses to be prepared for what is to come. Please carefully read each question and answer as honestly as possible. Thank you for your cooperation.

Imagine that all coffee shops are open in your city this week.

Also, imagine that all citizens are allowed to sit in at coffee shops this week.

Friend Condition

In your city, what is the name of your favorite coffee shop?

Write ONLY the name of the coffee shop below: _____

Imagine that your close friend, whom you know really well, called you to meet sometime this week at a coffee shop *_piped_text_shop_name_* (for sit-in, not take-out)

If you were to go to your favorite coffee shop *_piped_text_shop_name_* with your close friend, how crowded do you expect the coffee shop to be? (1) *Not crowded at all*, (7) *Extremely crowded*

If your close friend called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how likely is it for you to catch the virus during the meeting?

(1) *Extremely unlikely*, (7) *Extremely likely*

How high is the chance for you to become infected with the virus while having coffee with your close friend at the coffee shop? (1) *Zero*, (7) *Very high*

If your close friend called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how hesitant would you be to go? (1) *No hesitation at all*, (7) *Extremely hesitant*

If your close friend called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how likely would you be to go? (1) *Extremely unlikely*, (7) *Extremely likely*

Acquaintance Condition

In your city, what is the name of your favorite coffee shop?

Write ONLY the name of the coffee shop below: _____

Imagine that an acquaintance, whom you barely know, called you to meet sometime this week at your favorite coffee shop *_piped_text_shop_name_* (for sit-in, not take-out)

If you were to go to your favorite coffee shop *_piped_text_shop_name_* with an acquaintance, how crowded do you expect the coffee shop to be? (1) *Not crowded at all*, (7) *Extremely crowded*

If an acquaintance called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how likely is it for you to catch the virus during the meeting? (1) *Extremely unlikely*, (7) *Extremely likely*

How high is the chance for you to become infected with the virus while having coffee with an acquaintance at the coffee shop? (1) *Zero*, (7) *Very high*

If an acquaintance called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how hesitant would you be to go? (1) *No hesitation at all*, (7) *Extremely hesitant*

If an acquaintance called to meet you at your favorite coffee shop *_piped_text_shop_name_*, how likely would you be to go? (1) *Extremely unlikely*, (7) *Extremely likely*

All Conditions

You will now continue with the last part of the questionnaire.

Please continue by answering some questions about your mood, personal thoughts, characteristics, and habits.

What is your gender? Male/Female/Other

What is your age? (only write a number below) _____

In which country do you currently reside? _____

Here is a 7-point scale on which the political views that people might hold are arranged from extremely liberal (left) to extremely conservative (right). Where would you place yourself on this scale? (1) *Extremely Liberal*, (7) *Extremely Conservative*

Please write your Prolific ID below (24 alphanumeric characters): _____

Please click the next button to record all your responses. Thank you *very much* for your time!

Zero-Order Correlations

Study 1

Variable	<i>n</i>	1	2	3	4	5	6	7	8	9	10	11
1. Gender	495	—										
2. Age	495	.09*	—									
3. Country	495	.05	-.04	—								
4. Income	495	-.01	-.02	-.06	—							
5. Friendship association	495	.07	-.02	.05	.06	—						
6. Health risk behavior I	311	-.08	-.14*	.03	-.03	.07	—					
7. Health risk behavior II	495	-.06	-.11*	.02	-.03	.07	1.00**	—				
8. Physical proximity	495	.06	-.04	.01	-.08	.22**	-.05	-.05	—			
9. Perceived cleanliness	495	.11*	.10*	.02	.04	.41**	-.034	-.03	.04	—		
10. COVID-19 infection history	495	-.04	-.01	.02	-.01	-.09*	.07	.05	.01	-.08	—	
11. COVID-19 vaccination history	495	.04	.03	.01	.14**	.07	-.02	.01	-.01	.02	.04	—

Note. COVID-19 = coronavirus disease.

* Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

Study 2

Variable	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Gender	262	—																
2. Age	262	.01	—															
3. Country	262	.07	-.06	—														
4. Income	262	-.11	.01	-.02	—													
5. Friendship association	262	.02	-.10	-.01	.02	—												
6. Health risk behavior I	262	-.07	.01	-.02	-.02	-.15*	—											
7. Health risk behavior II	262	.03	.06	.03	.06	-.14*	.38**	—										
8. Closeness friend	262	.02	-.11	.09	.01	.05	-.05	-.04	—									
9. Closeness acquaintance	262	-.18**	-.03	.06	-.04	-.02	.07	.03	.49**	—								
10. Closeness stranger	262	-.11	.02	.04	-.06	.09	.11	-.04	.24**	.65**	—							
11. Trait risk-taking I	262	-.32**	-.08	.02	.10	.02	.06	-.02	.10	.14*	.14*	—						
12. Trait risk-taking II	262	-.27**	-.04	-.09	-.05	.11	-.01	-.08	.09	.06	.10	.46**	—					
13. Trait risk-taking III	262	-.18**	-.20**	-.09	.08	.03	-.02	-.06	.22**	.12	.07	.58**	.53**	—				
14. Promotion focus	262	-.03	-.03	-.09	.02	.08	.11	.11	.29**	.24**	.17**	.05	.01	.14*	—			
15. Prevention focus	262	-.06	-.33**	-.05	-.02	.07	.16**	.09	.05	.07	.07	-.01	.02	.04	.18**	—		
16. Positive mood	262	-.20**	.01	-.06	.02	.06	.14*	.03	.22**	.31**	.25**	.25**	.17**	.23**	.39**	-.08	—	
17. Negative mood	262	.11	-.04	.05	-.05	-.05	-.11	-.03	-.13*	-.19**	-.16**	-.15*	-.05	-.12*	-.31**	.15*	-.82**	—

* Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

Study 3

Variable	n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender	109	—														
2. Age	109	.01	—													
3. Income	109	.06	.02	—												
4. Race	65	.13	-.03	.03	—											
5. Infection source	109	.09	-.18	.02	-.06	—										
6. Psychological closeness	109	.08	-.13	.16	-.12	.49**	—									
7. Health risk behavior	109	.04	.01	-.18	-.03	-.25**	-.28**	—								
8. Trait risk-taking I	109	-.23*	-.10	.04	-.15	.20*	.03	.15	—							
9. Trait risk-taking II	109	-.18	-.07	.20*	-.03	.21*	.03	-.09	.51**	—						
10. Trait risk-taking III	109	-.14	-.12	.01	.03	.13	-.03	.02	.56**	.42**	—					
11. Promotion focus	109	.07	-.01	.03	.22	.06	.04	.05	.09	-.05	.12	—				
12. Prevention focus	109	-.12	-.30**	-.15	-.19	.04	-.126	.06	.26**	.07	.12	-.07	—			
13. Negative mood	109	.01	-.09	-.19*	-.14	.16	-.03	.17	-.03	.11	.03	-.21*	.35**	—		
14. Positive mood	109	-.03	.05	.17	.22	.01	.05	-.11	.21*	.13	.17	.25**	-.33**	-.80**	—	
15. COVID-19 infection history	109	.02	-.03	.01	.10	.03	.05	-.12	-.01	-.00	.01	-.13	-.08	-.05	.05	—

Note. COVID-19 = coronavirus disease. * Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

Study 4

Variable	<i>n</i>	1	2	3	4	5	6	7
1. Gender	176	—						
2. Age	176	-.04	—					
3. Friendship association	176	.18*	-.02	—				
4. Psychological closeness	176	-.18*	.04	-.68**	—			
5. Health risk behavior (reverse coded)	176	-.12	.07	-.09	.19*	—		
6. In-group/out-group boundary clarity (reverse coded)	176	-.03	-.01	-.08	-.05	-.07	—	
7. COVID-19 infection history	176	.10	.05	-.02	-.08	-.08	.02	—

Note. COVID-19 = coronavirus disease.

* Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

Study 5

Variable	<i>n</i>	1	2	3	4	5	6	7	8	9
1. Gender	301	—								
2. Age	301	.04	—							
3. Friendship association	301	.03	-.06	—						
4. Crowdedness	301	.10	-.05	.11	—					
5. Perceived health risk 1	301	.17**	-.04	.03	.31**	—				
6. Perceived health risk 2	301	.13*	.01	-.03	.31**	.87**	—			
7. Health risk behavior 1 (hesitance, reverse coded)	301	-.17**	-.03	.03	.07	-.34**	-.36**	—		
8. Health risk behavior 2 (likelihood)	301	-.18**	-.06	-.02	.13*	-.19**	-.20**	.72**	—	
9. Political orientation	301	-.26**	.15*	-.03	.05	-.10	-.04	.19**	.21**	—

* Correlation is significant at the .05 level (2-tailed). ** Correlation is significant at the .01 level (2-tailed).

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