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Emotional responses to prosocial messages increase willingness to self-isolate during the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic may be one of the greatest modern societal challenges that requires widespread collective action and cooperation. While a handful of actions can help reduce pathogen transmission, one critical behavior is to self-isolate. Public health messages often use persuasive language to change attitudes and behaviors, which can evoke a wide range of negative and positive emotional responses. In a U.S. representative sample (N = 955), we presented two messages that leveraged either threatening or prosocial persuasive language, and measured self-reported emotional reactions and willingness to self-isolate. Although emotional responses to the interventions were highly heterogeneous, personality traits known to be linked with distinct emotional experiences (extraversion and neuroticism) explained significant variance in the arousal response. While results show that both types of appeals increased willingness to self-isolate (Cohen's d = 0.41), compared to the threat message, the efficacy of the prosocial message was more dependent on the magnitude of the evoked emotional response on both arousal and valence dimensions. Together, these results imply that prosocial appeals have the potential to be associated with greater compliance if they evoke highly positive emotional responses.

1. Introduction

In the span of just a few months, COVID-19 has ripped through almost every country, infecting 30 million people, killing close to a million individuals as of September 17th, 2020 (John Hopkins University, 2020), and severely crippling dozens of economies. Without a vaccine in hand, it seems that the virus can only be slowed by extreme behavioral change and societal coordination (Arenas et al., 2020). Some countries, like South Korea, were quick to respond by instituting enforced quarantines and entreating citizens to practice social distancing (Beech, 2020; Fisher & Sang-Hun, 2020). Other countries, like the United States and the United Kingdom, were reluctant to impose widespread shelter-in-place measures (The Associated Press, 2020). In the United States, for example, individual states began gradually issuing social isolation practices to combat the spread of the virus through the months of March and April of 2020 (Mervosh, Lu, & Swales, 2020). In both cases, the countries hoped their citizens would readily comply with public health messages. Preliminary reports, however, show vast differences in people's willingness to practice measures that can reduce pathogen transmission (Lunn et al., 2020).

At present, public health advisors, such as the World Health Organization, argue that mitigating the spread of COVID-19 necessitates people swiftly adapt and change their usual habits to obey new social distancing measures (World Health Organization, 2020). Problematically, social distancing measures increase unemployment rates (Coibion, Gorodnichenko, & Weber, 2020), influence work productivity, and acutely affect mental wellbeing (Kawohl & Nordt, 2020). Thus, the actions needed to reduce the spread of COVID-19 are in direct opposition to functioning daily life. This poses a critical challenge for accomplishing extreme behavior change compliance, especially in such large populations.

Decades of research show that emotional engagement is a critical component of behavior change (Bagozzi & Pieters, 1998; Cooper & Nisbet, 2016; Hartley & Phelps, 2010; Nabi, 2007; Perugini & Bagozzi, 2001), which is why it is often employed in public health campaigns (Dillard and Nabi, 2006; Lang & Yegiyan, 2008; Nabi, 1999, 2002; Zeelenberg & Pieters, 2006). However, the relationship between emotion and behavior change is not straightforward (O'Keefe, 2012). For instance, tailoring messages to evoke a specific emotional response can backfire: When public service announcements about binge drinking evoke shame—rather than the intended guilt—vulnerable populations can increase their alcohol consumption (Duhachek, Agrawal, & Han, 2012). Fear is also notoriously fickle in creating successful behavior change (Hastings, Stead, & Webb, 2004; Leventhal, 1970; Petty &

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Cacioppo, 1996). Some research shows that only those most at risk for certain behaviors, such as drunk driving, are least responsive to messages with fearful language (Tay & Ozanne, 2002). While widespread and rapid adoption of preventative measures is unlikely to occur without messages that include emotional appeals (Myers, Nisbet, Maibach, & Leiserowitz, 2012), it is crucial that current public health officials and researchers understand the relationship between emotional engagement and different persuasive messages related to COVID-19.

Despite the complexity of the relationship between emotion and behavior, some media outlets have been leveraging fear language in order to motivate people to stay home and socially distance. A recent article, for example, highlighted grim outcomes, staggering death tolls, and an inability for an overwhelmed health system to treat citizens (Pueyo, 2020). There is good reason to specifically focus on fear related to COVID-19 (Feldman & Hart, 2015; Moser, 2010; Nisbet, 2009): Evoking fear can potently effect attitudes and behaviors (Tannenbaum et al., 2015), likely because fear can enhance attention towards the message (Baron, 1994) and increase perceptions of threat (Leiserowitz, 2006). However, the relationship between fear and disease prevention behaviors is not straightforward (Hastings et al., 2004). A message that is perceived as too threating can cause people to engage in defensive avoidance, which leads them to disregard the message altogether (Janis & Feshbach, 1953). Indeed, across a host of behaviors, a message that evokes too much (Janis & Feshbach, 1953; Krisher, Darley, & Darley, 1973), too little (Boster & Mongeau, 1984; Witte & Allen, 2000), or in some cases, any amount of fear at all (O'Neill & Nicholson-Cole, 2009), can fail to produce any noticeable behavioral change. Thus, while the use of fearful language is widely adopted as a means for behavior change, the evidence to date illustrates that its efficacy is variable (O'Keefe, 2012).

On the other hand, appeals that use prosocial rather than threatening language can play a potent role in the efficacy of public health campaigns (Lewis, Watson, White, & Tay, 2007), serving as a distinct contrast to fear-based appeals. For example, describing prosocial actions that can lead to positive outcomes in the face of public health problems can produce positive emotions, such as hope or joy (Nabi et al., 2018; Ojala, 2012), which can increase reception to the message by reframing the issue as being more personally relevant (Monahan, 1995). Indeed, some recent research illustrates that prosocial public health messages that underscore behaviors linked to societal and communal benefits (e.g., help protect your fellow citizens)—rather than focusing on behaviors that only benefit the self (e.g., protect yourself)—may be an especially effective method (Kelly & Hornik, 2016; Li, Taylor, Atkins, Chapman, & Galvani, 2016) for communicating public health recommendations related to COVID-19 (Jordan, Yoeli, & Rand, 2020).

One additional difficulty in designing public health messages is the heterogeneity of emotional responses to interventions (Carey & Sarma, 2016). Although typically outside the scope of public health research, characterizing how stable personality traits interact with emotional experiences can provide inroads for understanding the link between emotions and a message's efficacy. For example, the biological theory of personality explores how extraversion and neuroticism are linked with the body's physiological response (Eysenck & Eysenck, 1991), and these traits generally correlate with positive and negative mood, respectively (Costa & McCrae, 1980; Rusting & Larsen, 1997). Whereas neurotic tendencies are linked to increased emotional arousal (Haas, Constable, & Canli, 2008; Kehoe, Toomey, Balsters, & Bokde, 2012), extraverts are less likely to be as reactive to arousing stimuli. When considered within the framework of public health messaging, this suggests that neuroticism, and not extroversion, may predict stronger arousal responses to emotionally evoking messages.

Presently, it is unknown whether messages using threating or prosocial language are equally effective in promoting changes in willingness to self-isolate regarding COVID-19. Research on public health campaigns typically examine specific emotions (Nabi et al., 2018; Ojala, 2012; Tannenbaum et al., 2015; Witte & Allen, 2000), but these approaches constrain a person's emotional experiences by limiting them to identifying with a set of discrete emotions pre-selected by the researcher. For example, asking how afraid one feels after reading a message imposes an emotional structure that the participant "ought" to feel afraid. Scaffolding the question in such a manner assumes that these emotional words are interpreted in similar ways across individuals, and may even influence how the very emotion is experienced (Kassam & Mendes, 2013). Here, we circumvent these issues by using a model of emotion that avoids specific emotion states and partitions emotional experiences into a two dimensional space: the affective dimensions of valence (pleasurableness) and arousal (alertness/activation; Russell & Barrett, 1999). Using this approach, we can characterize the heterogeneity in emotional responses to both threat and prosocial appeals related to COVID-19, and directly relate emotional engagement on the independent dimensions of valence and arousal to message efficacy. Given that past research suggests that the intensity of emotional engagement (i.e., arousal) increases learning, memory, and attention (Kensinger & Corkin, 2004; Reisberg & Heuer, 1992; Storbeck & Clore, 2008), we posited that increases in emotional responses would result in greater compliance. However, because of the inconsistent relationship between evoked fear and behavioral change in prior research, we were agnostic as to whether stronger valence and arousal reactions to the threat intervention, compared to the prosocial intervention, would result in more willingness to self-isolate regarding COVID-19.

2. Methods

2.1. Participants

On March 24th, 2020, we began recruitment through the online site Prolific to collect a representative United States sample (based on sex, age, and ethnicity; Prolific Team, 2019) of $N = 1000$. Because effect sizes of persuasion on behavior are highly variable, our study used a conservative estimate of the smallest effect size of interest (Lakens, 2017). Using a lower equivalence bound of $d = -0.10$ and upper bound of $d = 0.10$, our study was well powered (87%) to detect effect sizes with a greater absolute magnitude than 0.1 with an alpha of 0.05. Participants received monetary compensation and provided informed consent in a manner approved by Brown University's Institutional Review Board. The experiment was conducted within a week of the COVID-19 infection reports in the United States reaching 10,000 (John Hopkins University, 2020). We only recruited U.S. participants to ensure that national messages and questionnaires specific to the United States would be relevant. For example, on March 13th, the White House released a proclamation declaring a national state of emergency related to the COVID-19 outbreak (The White House, 2020) and on March 16th, social distancing guidelines were issued in the United States (The White House & Centers for Disease Control and Prevention, 2020). Using the preregistered exclusion criterion that aimed to ensure high quality data, we excluded 45 individuals' data using a conservative measure of noncompliance based on instructions for an emotion classification task (see *Measuring Emotional Experiences* for a description of the task). This resulted in a final sample of 955 participants recruited between March 24th and March 26th, 2020 (506 females; age $M = 44.8$, $SD = 15.9$). Participants reported being 73.0% White, 13.4% Black, 4.4% East Asian, 3.9% Hispanic / Latinx, 2.1% South Asian, 1.6% Mixed Race, 0.4% Native American, 0.3% Middle Eastern, and 0.9% Other.

2.2. General procedure

Here we detail every measure that participants responded to, however, only the intervention measures, personality measures (BFI-2-S; Soto & John, 2017) and a questionnaire on COVID-19 preventative behaviors (e.g., "I stayed at home", which provided a baseline for

COVID-19 self-isolation behavior), were analyzed for this experiment (all detailed below). All other measures were collected for another experiment, whose hypotheses and methods were preregistered on OSF (https://osf.io/y2uj6). All participants completed a series of tasks and questionnaires in the following order: an emotion classification task, a variety of self-report questionnaires with a randomly presented order including the emotion regulation questionnaire (Gross & John, 2003), interpersonal regulation questionnaire (Williams, Morelli, Ong, & Zaki, 2018), extraversion and neuroticism subscales of the Big Five Inventory-2-S (Soto & John, 2017), intolerance of uncertainty (Carleton, Norton, & Asmundson, 2007), and clinical measures of depression (Radloff, 1977), anxiety (Spitzer, Kroenke, Williams, & Lowe, 2006), and alexithymia (Bagby, Parker, & Taylor, 1994), a questionnaire that assessed their knowledge of COVID-19, a fear intervention, questionnaires that assessed behavioral responses towards COVID-19, fear of COVID-19, media consumption of COVID-19, motives related to COVID-19 behaviors, social support related to COVID-19, information about work related to COVID-19, an altruism intervention, and demographics.

2.3. Interventions

In a within-subject design, participants were given two prompts we created in the following order: The threat intervention followed by the prosocial intervention. The threat intervention was inspired by a recent Medium article (Pueyo, 2020) that tapped into fear of COVID-19: *"The coronavirus is coming for you. When it does, your healthcare system will be overwhelmed. Your fellow citizens will be turned away at the hospital doors. Exhausted healthcare workers will break down. Millions will die. The only way to prevent this crisis is social distancing today."* This generated threat message contains two traditional components of threat appeals that emphasize: 1) the severity of the issue through negative consequences, and 2) the likelihood these consequences will occur to the reader (Dillard et al., 2016).

After reading this prompt, participants were asked three questions: (a) How does this statement make you feel? (responses recorded using a granular emotion measure, see details below); (b) On a scale from 0 (not at all) to 100 (completely), how willing are you to self-isolate?; (c) On a scale from 0 (no change) to 100 (a lot of change), how much does the previous statement change your willingness to self-isolate? In the second prompt (which was temporally spaced by multiple questionnaires in between), participants were given a prosocial intervention that was designed to be as similar as possible in structure to the threat prompt, but which emphasized prosocial actions: *"Help save our most vulnerable. Together, we can stop the coronavirus. Everyone's actions count, every single person can help to slow the crisis. We have the tools to solve this problem. Together, by self-isolating we can save millions of lives."* This prosocial message focused on internal efficacy (how the individual can take successful action to mitigate the spread of COVID-19) and response efficacy (emphasizing the effectiveness of the group working together; Hart & Feldman, 2014). After this prompt, participants were again asked the three questions denoted above.

2.4. Measuring emotional experiences

After reading both the threat and prosocial appeals, participants reported their affective experiences using the *dynamic Affective Representation Mapping* (dARM) tool (a measure we have used in our work; (Heffner, Son, & FeldmanHall, under revision)), which was adapted from the affect grid used in past research (Russell, Weiss, & Mendelsohn, 1989). This measure allows participants to rate their affective experiences on a subjective map where the horizontal axis characterizes an unpleasant-pleasant dimension (i.e., valence), and the vertical axis characterizes a low-high activation dimension (i.e., arousal). The dARM has a sampling resolution of 500 × 500 pixels, enabling us to measure fine-grained self-reports of both the valence and arousal dimensions without forcing discrete emotional labels on their experiences. To ensure participants were able to effectively use the dARM to rate their emotional experiences after appeals ("How does this statement make you feel?"), participants completed an emotion classification task at the beginning of the experiment. The emotional classification task asked participants to rate 20 canonical emotion words (e.g., angry, sad, happy) using the dARM measurement. Critically, participants were told where to rate a specific feeling, neutral, in the instructions as an attention check: "*The center of the square represents a neutral, average, everyday feeling. It is neither positive nor negative*". Our preregistered exclusion criterion was to remove participants who failed to rate neutral within a 100 × 100 pixel square around the center (N = 45/1000).

2.5. Analysis

We used linear mixed-effects regressions to predict participants' self-reported 1) willingness to self-isolate, and 2) change in willingness to self-isolate after reading the interventions. Predictor variables were participant's emotional ratings on the dARM, separated by the arousal and valence dimensions, as well as the type of intervention (threat/prosocial). Separate regressions were run for predicting willingness to self-isolate (labeled "willingness") and change in willingness (labeled "change"). For the personality analyses, we used separate linear mixed-effects regressions to predict participants' arousal and valence ratings as a function of the personality trait and intervention type. All regressions were run using the nlme package in R (Pinheiro et al., 2020).

3. Results

To examine the effectiveness of the fear and prosocial interventions, we first examined current reported self-isolation behavior. We found that, on average, people reported staying at home 87.3% of the time because of COVID-19 ("I stayed home" ranging from 0 – not at all to 100 – all the time). Although people's initial willingness was heavily skewed (skewness = −2.80) such that most people were already reporting engaging in self-isolationist measures, we can still examine whether the two interventions encouraged people to engage even more in self-isolation.

3.1. Prosocial and threat interventions are equally effective in increasing willingness to self-isolate

To create a measure of each intervention's effectiveness, we subtracted reports of current self-isolation from reported willingness to self-isolate after reading the threat and prosocial interventions (both scales ranged from 0 to 100). Comparing intervention' scores to 0 (i.e., no effect of intervention) revealed that both the threat intervention (M = 6.44, SD = 15.41; $t(954)$ = 12.92, p < .001; Cohen's d = 0.42) and prosocial intervention (M = 6.50, SD = 15.71; $t(954)$ = 12.79, p < .001; Cohen's d = 0.41) increased willingness to self-isolate, confirming the efficacy of both interventions. Importantly, these results remain the same when we use an aggregate measure of all preventative COVID-19 behaviors, rather than a single item assessing willingness to stay home (threat Cohen's d = 0.31, prosocial Cohen's d = 0.30). We then examined whether the threat or prosocial intervention produced differences in people's reported willingness to self-isolate (termed "willingness"; Fig. 1A), as well as their reported change in self-isolation behavior after reading the intervention (termed "change"). Although participants reported high levels of willingness to self-isolate after reading both the threat intervention (M = 93.75, SD = 12.96) and the prosocial intervention (M = 93.81, SD = 13.43), a paired sample t-test showed the two interventions did not produce significantly different reports of willingness ($t(954)$ = 0.25, p = .81) or changes in self-isolation ($t(954)$ = 0.17, p = .87). The correlation between willingness and change was significant for both the prosocial ($r(953)$ = −0.07,

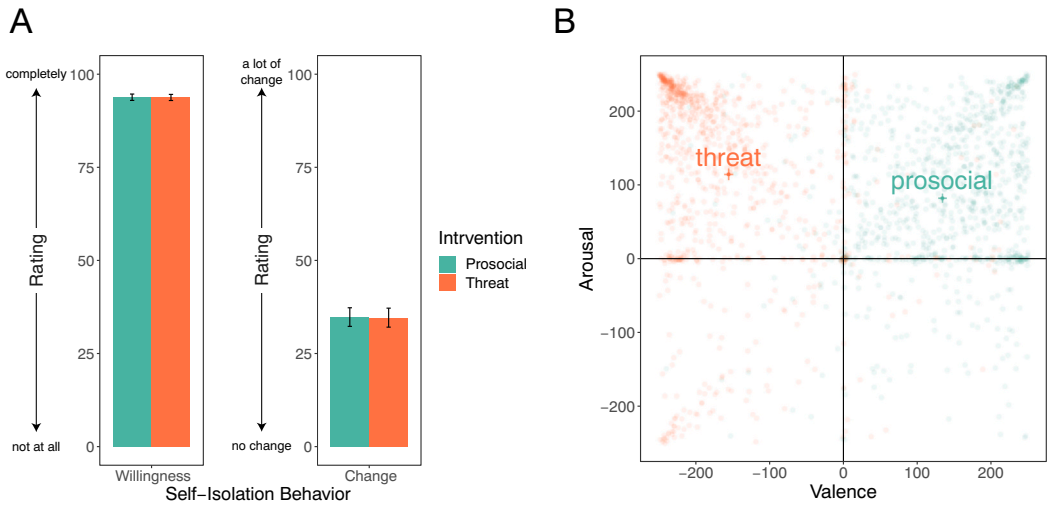

Fig. 1. Intervention results. **A)** Self-isolation behavior after reading each intervention. Participants reported how willing they were to self-isolate from 0 (not at all) to 100 (completely) and how the intervention changed their willingness to self-isolate from 0 (no change) to 100 (a lot of change). Participants report similar levels of willingness and change in self-isolation to the prosocial and threat interventions. **B)**. Emotional experiences after interventions. Participants reported how each intervention made them feel on the dynamic Affective Representation Mapping (dARM) measure, which simultaneously captures experienced valence and arousal at a granular level. Raw data has been plotted as transparent dots and the group averages are plotted below the intervention labels. All error bars are 95% confidence intervals (CIs).

$p = .04$) and threat interventions ($r(953) = -0.07$, p = .04). Together, these results illustrate that both prosocial and threat interventions nudged willingness to self-isolate in comparable ways to help mitigate the spread of the virus.

3.2. Threat interventions evoke stronger valence and arousal responses compared to prosocial interventions

While the interventions were similarly effective (Fig. 1A), examining the emotional reactions to both interventions revealed they were associated with distinct emotional experiences. The average emotional response to the threat intervention was very unpleasant and highly arousing while the average emotional response to the prosocial intervention was fairly pleasant and moderately arousing (Fig. 1B). The emotional responses to the threat intervention were heavily clustered in the upper-left corner of the dARM, indicating more homogeneity in emotional responses compared to the prosocial intervention responses. Formal tests comparing experienced arousal and valence between the two interventions revealed that the threat intervention was experienced as significantly more arousing ($M = 115.46$, $SD = 126.60$) than the prosocial intervention ($M = 81.88$, $SD = 99.37$; paired sample $t(954) = 7.90$, $p < .001$; Cohen's $d = 0.26$). Moreover, while the threat intervention was unsurprisingly significantly more negatively valenced ($M = -158.67$, $SD = 94.28$) than the prosocial intervention ($M = 134.60$, $SD = 90.95$; $t(954) = -68.50$, $p < .001$; Cohen's $d = 2.22$), it was critically experienced as more unpleasant than the prosocial intervention was experienced as pleasant (absolute value of valence, $t(954) = 7.56$, $p < .001$; Cohen's $d = 0.24$). This suggests that participants had a stronger emotional reaction on both dimensions to the threat intervention than the prosocial intervention.

3.3. Extraversion and neuroticism explain emotional responses to prosocial and threat interventions, respectively

Given the heterogeneity of emotional responses to the two interventions (Fig. 1B), we next examined whether personality traits known to predict positive and negative moods—extraversion and neuroticism, respectively (Costa & McCrae, 1980; Rusting & Larsen, 1997)—explain the observed emotional variance. We found that neuroticism interacted with intervention type to predict increasing arousal (interaction $\beta = -0.10 \pm 0.03$, $p < .001$) but not valence (interaction $\beta = -0.02 \pm 0.02$, $p = .52$), and this was uniquely carried by the threat intervention ($\beta = 0.07 \pm 0.02$, $p = .004$; prosocial intervention: $\beta = -0.03 \pm 0.02$, $p = .19$). There was also an observed main effect of neuroticism predicting negative valence for both intervention types (threat $\beta = -0.05 \pm 0.02$, $p = .006$; prosocial $\beta = -0.06 \pm 0.02$, p < .001), suggesting that individuals higher in neuroticism generally experienced more negative emotions to the interventions. Although less predictive, extraversion also interacted with intervention type to predict increasing arousal in the opposite direction as neuroticism (interaction $\beta = 0.06 \pm 0.03$, $p = .02$), and this was uniquely driven by the prosocial intervention ($\beta = 0.05 \pm 0.02$, $p = .04$) and not the threat intervention ($\beta = -0.01 \pm 0.02$, $p = .56$). Finally, we observed that greater extraversion predicted increasingly positive valence for the prosocial intervention ($\beta = 0.06 \pm 0.02$, $p = .001$) but not the threat intervention ($\beta = 0.02 \pm 0.02$, $p = .31$). However, because of a nonsignificant interaction between extraversion and intervention type predicting valence (interaction $\beta = 0.04 \pm 0.02$, $p = .10$), these simple effects should be interpreted with caution.

3.4. The efficacy of prosocial—but not threat—interventions depend on degree of emotional engagement

Examining how these emotional responses influenced willingness to self-isolate revealed that the strength of experienced arousal and valence was more associated with willingness to self-isolate for the prosocial intervention compared to the threat intervention (arousal: interaction $\beta = 0.07 \pm 0.03$, $p = .023$; valence: interaction $\beta = 0.16 \pm 0.05$, p < .001; Fig. 2). Indeed, the fact that the simple effects of the threat intervention (dark red and dark purple lines in Fig. 2) were not significant suggests that the efficacy of the threat intervention does not rely on the strength of the emotional response, whereas the prosocial intervention does. A similar behavioral pattern was found for changes in self-isolation (Fig. 3), where the effect of valence on behavior change was significantly higher for the prosocial intervention than the threat intervention (interaction $\beta = 0.24 \pm 0.06$, p < .001). However, unlike before, the relationship between arousal and change was similar across both interventions (interaction $\beta = 0.02 \pm 0.04$, $p = .644$), suggesting that increases in

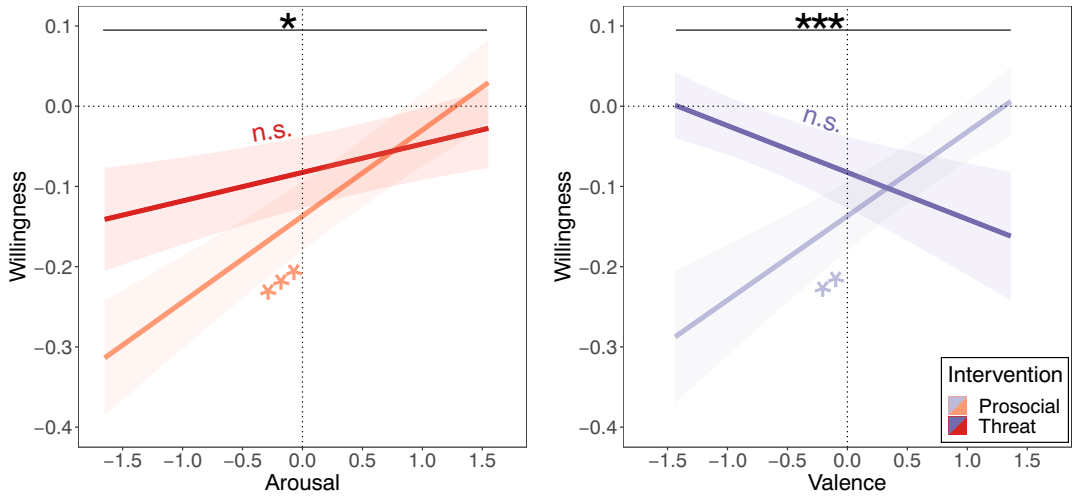

Fig. 2. Emotional experience predicts reported willingness to self-isolate after prosocial intervention. Willingness to self-isolate is plotted for arousal and valence after reading the prosocial and threat interventions. 'Willingness' has been normalized (standardized and mean-centered) while arousal and valence have been standardized without being mean-centered (as the 0 point on the scale reflects a neutral feeling). Lines represent regression fits and shaded areas reflect ± 1 standard errors (SEs).

arousal for both interventions lead to more intention to change behavior.

4. Discussion

The effectiveness of public health messages is crucial for successfully combating large public health crises such as the COVID-19 pandemic. Problematically, the behaviors associated with preventing the spread of the virus are difficult to adhere to, as they include vigilant hand washing, donning facial masks, and most disruptively, practicing extreme social distancing measures. This makes it challenging for public health officials to create messages that are effective in motivating behavior change. Here, we explore how emotion shapes the efficacy of two different persuasive appeals, one that highlights threat and one that emphasizes prosociality. Unlike previous research that has found prosocial frames to be more effective than threat frames (Shen, 2011), we find that both threat and prosocial messages were equally effective in stimulating willingness to engage in disease prevention health behaviors. However, while threat messages created a stronger emotional reaction (which were more negative and arousing) than the prosocial message, the efficacy of the threat intervention depended less on the strength of the emotional response compared to the prosocial intervention. In contrast, the prosocial message was more effective at boosting willingness to self-isolate if it produced a strong, positive, and arousing emotional response.

These findings reveal that although threat and prosocial interventions were similarly successful in changing people's self-isolation intentions, they do not operate from the same emotional mechanisms. While successful prosocial messages depend on strong, positive emotional engagement, effective threat messages leveraging fear-mongering language are less reliant on the strength of emotional reactions. Given the lack of observable relationship between emotion and reported willingness to self-isolate in response to fear-mongering language, other mechanisms such as a negativity bias (Rozin & Royzman, 2001), or selective attention to negative information (Carretié, Mercado, Tapia, & Hinojosa, 2001), may subserve the efficacy of fear messaging. Moreover, because stronger negative emotional responses did not yield influence on willingness to self-isolate, designing a message with more

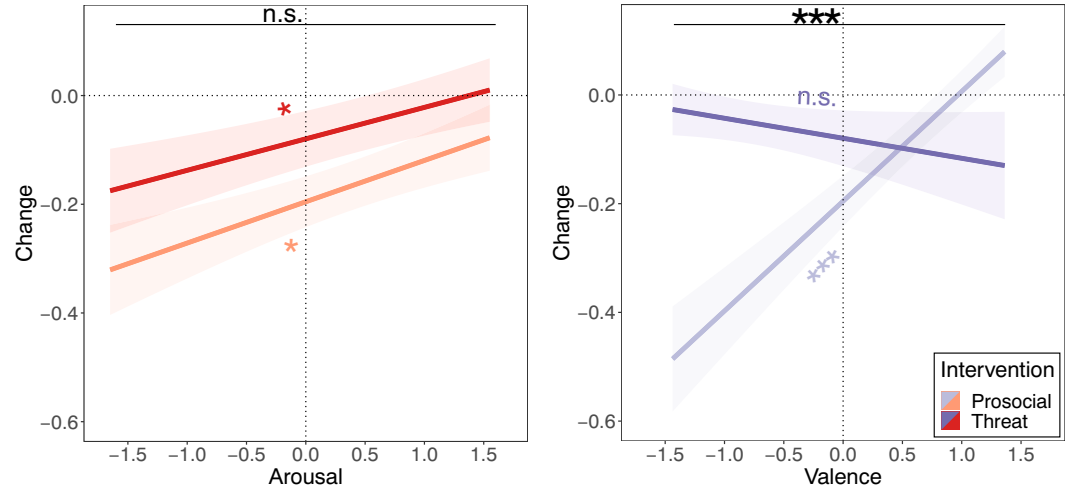

Fig. 3. Emotional experience predicts reported changes in self-isolation after prosocial intervention. Change in reported self-isolation is plotted for arousal and valence after reading the prosocial and threat interventions. Change has been normalized (standardized and mean-centered) while arousal and valence have been standardized without being mean-centered (as the 0 point on the scale reflects a neutral feeling). Lines represent regression fits and shaded areas reflect ± 1 standard errors (SEs).

graphic and emotionally evocative language would likely not improve the success of a fear-mongering appeal, but it may increase the efficacy of prosocial messages. Since self-isolation and monetary hardship related to economic downturns can result in increases in depression and anxiety (Brooks et al., 2020), changing behavior without resorting to fear-mongering tactics would be important for public health officials to consider when designing public service announcements. Indeed, it is possible that messages associated with positive emotions may help buffer against any unnecessary increases in clinical mood disorders. Simply put, in a situation which may already exacerbate anxiety and depression, messages that promote behavioral change while simultaneously appealing to positive emotions are needed now more than ever.

However, the observed heterogeneity of emotional responses to these messages suggests a lingering challenge in fine-tuning the emotional language of either a threatening or prosocial message. Although exploratory in nature, we found evidence that two commonly measured personality traits, extraversion and neuroticism (Hamann & Canli, 2004) explain some of the emotional variance. Dovetailing with past research illustrating a link between positive and negative affect and extraversion and neuroticism, respectively (Canli, Sivers, Whitfield, Gotlib, & Gabrieli, 2002), our results reveal that neuroticism uniquely mapped onto arousal for the threatening intervention while extraversion uniquely mapped onto arousal for the prosocial intervention. Furthermore, neuroticism and extraversion generally predicted negative and positive valence across the intervention types. Overall, this suggests that individuals high on neuroticism will respond more strongly to threat-based messages while extraverts will engage more with the prosocial ones. Although a clear limitation is that we did not examine the full spectrum of personality traits, these findings may help policy makers consider the type of public health message given the demographics of a specific population.

It is worth noting, however, that participants in our studies were simply asked to report their willingness to change their behaviors. Research on message interventions illustrates that reported behavior change does not always coincide with actual behavior changes in the real world (Gibbons, Gerrard, Ouellette, & Burzette, 1998). Although previous work has demonstrated that perceived message efficacy is a relatively good measure of actual effectiveness (Dillard, Shen, & Vail, 2007; Dillard, Weber, & Vail, 2007), it will be important to confirm that these results generalize to actual COVID-19 related behaviors, where readers are being bombarded with many different messages and likely exhibit divided attention when consuming news or reading public health messages. Furthermore, it is also critical to highlight that, while the rapid transmission of COVID-19 is unfolding on a global scale, our sample was limited, by design, to the United States. As there are known cultural differences in how emotion is conceptually represented (Jackson et al., 2019) and expressed (Gendron, Roberson, van der Vyver, & Barrett, 2014), caution should be taken when interpreting the widespread applicability of these results since findings may not translate cross-culturally. One additional limitation of the current design is that participants were given the threat message first, followed by the prosocial appeal. While future work should consider counterbalancing the messages, in general, fixed-order effects typically present minimal to no changes in results (Sauer, Auspurg, & Hinz, 2020).

As of the beginning of September 2020, the United States had still not achieved widespread compliance with social isolationist measures (Canipe, 2020; Fitzpatrick & DeSalvo, 2020), despite repeated calls for citizens to shelter in place from specific States. To help speed the global goal of “flattening the curve” (Qualls et al., 2017), governments and public health officials need to find the most effective messaging for stimulating behavioral compliance. While threat appeals to mobilize society during this time might be tempting to motivate behavioral compliance, we found that prosocial calls to action not only created more positive emotions, but they also elicited just as much willingness to self-isolate compared to deploying threatening language. Although these are preliminary results, it suggests that when collaborative efforts are needed to fight a global pandemic, interventions that appeal to prosocial sentiments might have more to gain than those that appeal to threats.

Data and code availability

Behavioral data and analysis script of the reported experiment are available at: https://github.com/jpheffne/covid_intervention.

CRediT authorship contribution statement

J.H., M.L.V. and O.F.H. designed the study. J.H. collected and analyzed the data. J.H., M.L.V. and O.F.H. wrote the manuscript.

Declaration of competing interest

The authors declare no competing or conflict of interests.

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