Together we can slow the spread of COVID-19: The interactive effects of priming collectivism and mortality salience on virus-related health behaviour intentions

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Behaviours recommended for reducing transmission of COVID-19 – social distancing, wearing masks, and now, vaccination – are aimed at not only reducing one's own risk, but risk to others. We posited that a collectivist mindset, versus individualistic, would facilitate intentions to engage in behaviours aimed at curtailing the spread of the virus when the awareness of mortality is activated. This hypothesis was informed by the terror management health model and tested in two studies. In each study, collective 'we' (vs. the individual 'I') was primed, in conjunction with mortality salience compared to a control condition. The results were generally consistent, with Study 1 showing that when collectivism, but not individualism, was primed, individuals responded to a COVID-19-based mortality reminder with a significant increase in health intentions, including social distancing and mask wearing. In Study 2, when mortality was salient, priming individualism led to reduced vaccination intention compared to collectivism. We discuss limitations to the research and conclude with the recommendation that COVID-19-based communications highlight the dangers of the virus in conjunction with a focus on the collective 'we' to best encourage optimal virus mitigation behaviour.

COVID-19, the disease caused by the virus SARS-CoV-2, has claimed hundreds of thousands of lives worldwide. Terror management theory (TMT; Greenberg, Pyszczynski, & Solomon, 1986) posits that the human awareness of imminent mortality poses an existential threat, provoking psychological defences to buffer against the potential for terror instigated by that awareness. In the time of a pandemic, news coverage, social media posts, and everyday conversations centre around the unprecedented nature of COVID-19 and its rising death toll, activating mortality awareness and fatalistic attitudes on a day-to-day basis (Jimenez et al., 2020). The terror management health model (TMHM; Goldenberg & Arndt, 2008) extends TMT to the realm of health behaviours, allowing for examination of the influence of mortality awareness on a litany of health-based behaviours and intentions.

With the widespread and grave implications of a pandemic virus, considerations from the TMHM have been further extended to explain behaviour in the pandemic (Courtney, Goldenberg, & Boyd, 2020). The TMHM for pandemics parallels the TMHM and outlines two routes of responses to a deadly pandemic. As a proximal response to conscious death

thoughts activated by the pandemic, people are expected engage in efforts to reduce perceived health risk with both adaptive health behaviours (e.g., washing one's hands) and with denial (e.g., downplaying the severity of the virus). However, when pandemic-related mortality concerns are salient, but not conscious, the model specifies a more distal (and less intuitive) system of defences against the awareness of pandemic-related mortality. As extant research demonstrates (see Arndt & Goldenberg, 2017), when death thoughts are activated outside of consciousness, decisions are guided not by health concerns, but the distal motivational goals of bolstering self-esteem by clinging to personally relevant cultural values.

In the context of a health pandemic, where one's behavioural decisions – to socially distance, wear a mask, and even get vaccinated – affect not just one's own heath, but also the health of others, an important consideration is the extent to which individuals draw personal value from being part of a collective. There is some evidence that the regions of the world that were most successful at containing the pandemic (e.g., countries of the Asian-Pacific rim, see Lowy Institute, 2021; Van Beusekom, 2020) also tend to rank high in collectivism (Hofstede, 2011; Hofstede, Hofstede, & Minkov, 2010); in contrast, the United States, a highly individualistic country (Hofstede, 2011; Hofstede et al., 2010), ranked 94th out of 98 countries on pandemic responsiveness (Lowy Institute, 2021). This observation is supported by the positive correlation between individualism and COVID-19 fatality rates in Western countries and a negative correlation between collectivism and fatality rates in countries higher in collectivism (Liu, 2021). This observation and empirical support, in conjunction with experimental findings that Asian Americans react to reminders of mortality with an increased focus on other people, while European Americans react with a focus on themselves (Ma-Kellams & Blascovich, 2011), suggests that a collectivist mindset in conjunction with salient mortality concerns may facilitate more adaptive health-based responses in a pandemic.

Notably, individualism and collectivism are not just facets of different cultures, but such values are malleable depending on the salience of the singular 'I' versus the collective 'we' (see Oyserman & Lee, 2008). Extending the TMHM to the pandemic, we predict that, to the extent that individuals are focussed on the collective, they should be especially likely to respond to accessible mortality concerns with an increased willingness to engage in behaviours aimed at curtailing the virus's spread.

Terror management health model for pandemics

TMT builds upon the works of Becker (1973) to posit that individuals are motivated to reduce the psychological threat associated with the awareness of mortality and that much of human behaviour can be understood through the lens of death denial. The TMHM applies TMT and its dual-process approach (Pyszczynski, Solomon, & Greenberg, 1999) to health behaviours, outlining a system of psychological defences against the awareness of mortality which depends on the extent to which the awareness of mortality is consciously accessible (see Arndt & Goldenberg, 2017). First, when thoughts about death are consciously activated, people are motivated to engage in *proximal* defences to mitigate the perceived death-related health risk. In the context of the TMHM for pandemics (Courtney et al., 2020), this means that the threat of death associated with the virus should instigate immediate intentions to wash one's hands, engage in social distancing, or don personal protective equipment (all of which are behaviours highlighted to be effective in combating the spread of the virus, CDC, 2020a). Additionally, and problematically, proximal defences may also take the form of denial or avoidance of the health threat as

another way of reducing the perceived threat (Arndt, Routledge, & Goldenberg, 2006), possibly explaining reactions like President Donald Trump's downplaying of the severity of the virus (Summers, 2020).

Critically, the TMHM offers different predictions under conditions when mortality concerns are activated outside of conscious awareness. The model specifies that death thoughts will recede from consciousness when perceived risk is reduced through proximal defence activation, insofar as death is no longer perceived as an immediate threat (e.g., Arndt et al., 2006; Arndt, Schimel, & Goldenberg, 2003). Additionally, continuous exposure to reminders of death in the form of updated death tolls or images of mobile morgues on daily news cycles may lead to a level of desensitization and more subliminal (Arndt, Greenberg, Pyszczynski, & Solomon, 1997) activation of mortality awareness at a non-conscious level as people attempt to move through life as normal. In these situations, when thoughts of death are activated, but not conscious, *distal* defences are initiated.

Distal defences do not rely on engagement in actual health behaviours to mitigate risk, but instead hinge on variables that impact the manner in which individuals derive a sense of meaning from their respective environments. When individuals derive self-esteem from smoking cigarettes (Hansen, Winzeler, & Topolinski, 2010) or from attaining beauty standards associated with tanning behaviours (Cox et al., 2009), distal defences can drive paradoxical intentions to engage in those unhealthy behaviours to a greater extent. Conversely, non-conscious mortality awareness can also motivate healthy behaviours like smoking cessation and increased exercise when identity-relevant variables are introduced into the paradigm (e.g., thinking of a prototypically unhealthy smoker, or instilling fitness-based self-esteem contingencies; Morris, Goldenberg, Arndt, & McCabe, 2019). These studies reveal that when mortality concerns are activated outside of conscious awareness, motivations distal to health play a critical role in determining health behaviour.

In the context of the TMHM for pandemics, there is evidence that people's behavioural decisions are influenced by efforts to affirm themselves, their esteem, and their values, to the benefit or detriment of physical well-being. As the pandemic has progressed, there is evidence that the more people were worried about the virus, the more they displayed support for their ideological values (Su & Shen, 2020), indicating naturally occurring activation of distal defences in response to the pandemic. Increases in ideological striving may translate into behaviours that prolong the pandemic, especially when individuals cling to ideologies based in personal freedoms and meritocracy, and thus respond to the pandemic with protests against adaptive pandemic mitigation efforts like social distancing and mask wearing (see Pyszczynski, Lockett, Greenberg, & Solomon, 2020). Alternately, clinging to some ideological beliefs and values could facilitate an adaptive response to the pandemic, to the extent that certain virus mitigation behaviours themselves become associated with a sense of value. For example, the social media trend #MaskUp returns videos and photographs of laypersons and celebrities alike donning face masks as a means of celebrating and encouraging the behaviour. Indeed, the degree to which media encourages awareness and makes health behaviours visible, and therefore imbued with value, has the theoretical potential to serve as a crucial means through which actual health behaviours can be promoted (Korda & Itani, 2013). In this light, it is not surprising that so many people are taking and posting post-vaccination selfies (Kelly, 2021). Thus, it is critical to identify and subsequently highlight the cultural values contributing to exhibition of adaptive health behaviours in response to the pandemic.

Collectivism as an adaptive distal defence to the pandemic

In the current research, we consider a pathway to facilitating adaptive distal defences to the pandemic. Because the behaviours critical to curb the spread of the pandemic protect not just one's own health, but the health of others, we posit that orienting individuals to the value of the collective, rather than the individual, should facilitate virus mitigation behaviours. Indeed, as we highlighted, there is some evidence that regions of the world that tend to be higher in collectivism seem to have fared better in terms of their responsiveness over the course of the pandemic. Based on the numbers of confirmed cases, deaths, and positive COVID-19 tests (both aggregate and per capita), along with the number of tests per thousand people, the Asian-Pacific region of the world has been considered most successful in pandemic mitigation, due in large part to successful public health systems, early border closing, and compliance in the general populous (Lowy Institute, 2021; Roser, Ritchie, Ortiz-Ospina, & Hasell, 2020). Supporting this, research from Liu (2021) found a distinct positive correlation between collectivism and successful virus mitigation in terms of significantly lower COVID-19 infection and fatality rates. On the other hand, Western nations with paradoxically higher human development indices and higher individualism exhibited general failures in handling COVID-19. We argue that the interplay of collectivist culture and successful pandemic responsiveness is not a coincidence: instead, the mortality awareness instigated by the pandemic exacerbated a collectivist response, with tangible results for successful pandemic mitigation.

Prior terror management research offers support for a role of collectivism versus individualism in orienting how individuals respond under conditions when mortality is salient. For individuals from more collectivist-based cultures, relational self-esteem and interdependence serve to attenuate death-related anxiety, while individuals from more individualist-based cultures instead rely on individual esteem to buffer against mortality concerns (Du et al., 2013). For those from a more collectivist culture, reminders of death lead to increases in collectivist esteem, especially when the existential threat was aimed at the many rather than the individual; conversely, those from more individualist cultures respond to reminders of death with increases in individual esteem (Kashima, Halloran, Yuki, & Kashima, 2004). A similar pattern was observed between Asian Americans and European Americans, where mortality salience led Asian Americans to express more concern for and positive attitudes towards other people, even when those other people were dissimilar; European Americans, on the other hand, reacted negatively towards others and aimed to bolster themselves (Ma-Kellams & Blascovich, 2011).

Critically, however, ideological values are malleable, and therefore, it is possible to alter the trajectory of distal defences by targeting specific values in conjunction with mortality priming. For example, under conditions where mortality is salient, compared to when it is not, priming the value of tolerance leads individuals to exhibit more tolerant attitudes (Vail, Courtney, & Arndt, 2019), priming pacifism makes individuals more pacifistic (Jonas et al., 2008, Study 2), and priming prosocial norms and the importance of helping makes individuals exhibit more prosocial attitudes and helpfulness (Jonas et al., 2008, Studies 1 and 4). Given that it is experimentally possible to prime collectivism (for review, see Oyserman & Lee, 2008), we argue that, even in a country that values individual liberties, instilling a notion of collectivist identity has the potential to sway attitudes related to a more collectivist-based outcome. It follows that encouraging a collectivism-based mindset in a time where mortality is highly salient, and where individual health behaviours impact a great number of people, may offer an effective route for influencing individual health behaviours relevant to the spread of the virus.

To an extent, a focus on the well-being of the collective has already been stressed in pandemic-related communications, like the CDC's public service announcement touting the slogan 'Together We Can Slow the Spread' (CDC, 2020b). However, this slogan lacks what we posit is a critical focus on the awareness of death in encouraging health. The TMHM for pandemics specifies that, in order to achieve optimal results, messages related to the pandemic should prime collectivism in conjunction with an association with the awareness of pandemic-related mortality so as to encourage adaptive health behaviours as a result of distal defence activation. In two studies, we hypothesize that, in the context of COVID-19, intentions to engage in adaptive pandemic health behaviours should manifest not solely from reminders of death or the collective, but as a result of an interplay between the two constructs.

STUDY 1

The aim of Study 1 was to test whether mortality reminders differentially affect health behaviour intentions related to slowing the spread of the virus depending on whether a collectivist or individualistic orientation is activated. To this end, we used a mortality prime explicitly related to COVID-19 paired with a validated means of priming collectivism and individualism and measured intentions to engage in CDC-recommended health behaviours (e.g., washing one's hands for 20 s, putting distance between one's self and others), in real time during the first peak of the pandemic in the United States. We hypothesized that a COVID-19 mortality prompt (compared to a non-mortality related control prompt) would increase intentions to engage in these health behaviours when collectivism is primed, but not in the context of individualism priming.

Method

Participants and procedure

We report all measures, manipulations, and exclusions in this study. Ethical approval from the Institutional Review Board was attained prior to study administration. A priori power analyses for a small-to-medium effect size suggested a sample size of 225. A total of 239 responses were collected from undergraduate psychology students at a university in the southern United States, recruited through a voluntary research participant pool, in exchange for course credit. Participants were first provided with an informed consent and told that they were taking part in a study involving personality and health behaviours. Thirteen participants failed a face-valid manipulation check embedded within the demographics portion, four participants failed an attention check (e.g., 'For this item, please select "Extremely"'), and two neglected to complete the dependent variable. The final sample consisted of 220 participants ($M_{age} = 21.64$, $SD_{age} = 5.76$[3]), where 150 identified as women, 68 as men, 1 as other, and 1 choosing to not identify. Of the participants, 45.9% identified as White, 6.8% as Black, 15% as Asian, 4.5% as Middle Eastern/Arab, 18.2% as Hispanic/Latinx, 7.7% as Biracial/Mixed Race, 1.4% as Other, and 0.5% choosing to not identify. All materials were administered online and are detailed below in order of presentation.

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[3] *The ages of participants ranged from 18 to 55, and as a result, was non-normally distributed with skewness of 3.36 (SE = 1.61) and kurtosis of 12.92 (SE = .32). Given that the sample was composed of undergraduate students, and 81.1% of the sample ranged in age from 18 to 22 (the typical age of undergraduate students), we do not discuss age further in this study.*

Pronoun manipulation.   Priming a sense of either individualism or collectivism was accomplished using a pronoun identification task originally developed by Brewer and Gardner (1996) and refined by Gardner, Gabriel, and Lee (1999; for review, see Oyserman & Lee, 2008). The task involves reading a short paragraph in which participants are asked to find pronouns, where those being primed with individualism find *I*, *me*, and *my*, while those being primed with collectivism find *we*, *us*, and *ours*. Rather than circling the pronouns, as would be the case in standard paper-pencil delivery of this prime, the online survey platform enabled participants to click on the pronouns as they read the paragraph. Each level of this prime had 19 potential pronouns for participants to find. To account for participant engagement with the prime, and observing that the number of words found was significantly correlated with the dependent variable ($r = .20, p = .003$), we used the number of pronouns participants found as a covariate in analyses.

Mortality salience (MS) manipulation.   Following the pronoun task, participants were presented with a manipulation of mortality salience. Rather than the traditional mortality salience manipulation utilized in TMT research (see Burke, Martens, & Faucher, 2010), this version was specific to COVID-19. The manipulation of mortality salience, originally utilized by Fairlamb and Courtney (2021), presented participants with a short paragraph detailing the number of deaths (as of the time of study administration) caused by the spread of the coronavirus, reading: 'The COVID-19 (also known as coronavirus) outbreak is a worldwide pandemic that has caused more than 300,000 deaths so far. This, of course, does not count for indirect deaths caused by the virus because of the strain to medical services. Many who die have underlying health conditions or are older, but there are numerous documented cases of healthy, and young, individuals dying from the virus'. In this prime, the threat of death related to COVID-19 is made explicit, ensuring that COVID-19 aroused conscious thoughts of death. This paradigm was used in order to mirror a standard TMT-based experimental paradigm (e.g., Burke et al., 2010), in which an explicit reminder of mortality is followed by a delay to activate distal defensiveness.

   To ensure engagement with the prime, participants were asked on the next page to indicate the number of deaths presented on the previous page, and how likely they thought it was that they would contract the virus themselves in the next few months on a 5-point Likert-type rating scale ranging from 'not at all likely' to 'extremely likely'. In the control condition, participants were presented with a parallel paragraph about the percentage of people who experience dental pain and a question pertaining to the likelihood of experiencing dental pain.

Delay.   To allow thoughts about death to recede from focal attention (Pyszczynski et al., 1999), participants were presented with the 20-item Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS (even as a short form) is commonly used as a delay and distraction task in TMT research (Burke et al., 2010).[4]

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[4] *As is the case with TMT studies, we did not expect differences in affect as a result of mortality priming (see Burke, Martens, & Faucher, 2010). Indeed, there were no differences in either positive affect (= .92), t(220) = .12, p = .91, or negative affect (= .90), t(220) = 1.43, p = .15. Additionally, and in line with Lambert et al. (2014), we tested for potential differences in the negative affect fear subscale (afraid, scared, nervous, jittery). We found no differences in fear arousal between the COVID-19 and dental pain primes, t(220) = −1.30, p = .20.*

Within this section, participants were also presented with an embedded attention check (i.e., 'Please select "Extremely"').

Health behaviour intentions.   Health behaviours associated with preventing the spread of the coronavirus were derived from recommendations from the CDC (e.g., washing your hands for 20 s, putting distance between yourself and others). Nineteen COVID-19 virus mitigation behaviours ($\alpha = .92$) were presented, and participants were asked to indicate on a 5-point Likert-type rating scale how willing they were to do the behaviours listed, ranging from 'not at all' to 'entirely'. For example, participants were asked how willing they would be to voluntarily wear a mask in public, comply with Stay-at-Home orders, and frequently disinfect surfaces. Items were averaged to create a composite health behaviour intention score such that higher scores indicate more willingness to engage in virus-related health behaviours. See Table 1 for items, correlations, means, and standard deviations.

Political ideology.   Following health intentions, participants were presented with items pertaining to their political ideology. Participants were asked to characterize their political ideology on an 8-point Likert scale from 'extremely liberal' to 'extremely conservative'. Based on the above-detailed political divisiveness of some COVID-19-related health behaviours like mask wearing, along with the item's significant correlation to the dependent variable ($r = -.13, p = .05$), we opted to use this single item for political ideology as a covariate for subsequent analyses.[5]

Demographics.   At the end of the study, participants were asked to provide some demographic information and to identify the health issue presented at the beginning of the study (either COVID-19 or dental pain) as a face-valid attention check for engagement with the manipulation.

Results

A 2 (Pronouns: Collectivism vs. Individualism) × 2 (MS: COVID-19 Mortality vs. Dental Pain) between-subjects factorial ANCOVA was conducted to analyse effects on health behaviour intentions when controlling for date of data collection, number of pronouns identified in the word-search task (to control for engagement), and political ideology (see Table 2 for all adjusted means and standard errors).[6] Neither main effects for MS ($p = .23$) nor pronouns ($p = .89$) reached significance. Date of data collection was not a significant covariate ($p = .39$), but both number of pronouns identified in the word-search task ($p = .01$) and political ideology ($p = .05$) were. The interaction did not reach

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[5] *For exploratory purposes, participants were also presented with a list of 11 issues compiled from a Gallup poll where voters were asked to rank the issues they deemed most important in the 2020 election (Hrynowski, 2020). For each issue, participants were asked to characterize their specific political ideology for that issue on an eight-point scale (see Kroh, 2007) from "extremely left" to "extremely right" ($\alpha = .95$). The composite measure was correlated with the single item ($r = .76$, $p < .001$), but unlike the single item, the full spectrum of items was not a significant covariate ($p = .07$). For this reason, we retained the single item characterization of political ideology in the analyses for Study 1. We also opted to use the single item measure of political ideology as a preregistered covariate in Study 2.*

[6] *This analysis was replicated without any covariates, and the interaction did not reach significance ($p = .13$).*

Table 1. Correlations for CDC-recommended health behaviour intentions (N = 220)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Washing your hands for 20 s	–																		
Using hand sanitizer when in public	.54**	–																	
Avoiding touching your face	.46**	.46**	–																
Avoiding close contact with others	.40**	.36 **	.55**	–															
Putting distance (at least 6 feet) between yourself and others	.41**	.23**	.38**	.72**	–														
Staying home if you feel ill	.41**	.26**	.23**	.26**	.33**	–													
Covering your mouth when coughing	.36**	.34**	.20**	.20**	.29**	.44**	–												
Sneezing into the inside of your elbow	.47**	.46**	.25**	.25**	.18**	.26**	.43**	–											
Using tissues	.49**	.46**	.42**	.34**	.27**	.38**	.47**	.53**	–										
Immediately washing your hands after coughing or sneezing	.53**	.46**	.46**	.51**	.45**	.39**	.39**	.33**	.60**	–									
Wearing a mask if you feel sick	.44**	.46**	.32**	.40**	.36**	.47**	.21**	.31**	.47**	.52**	–								
Frequently disinfecting surfaces	.52**	.49**	.45**	.42**	.38**	.23**	.27**	.43**	.46**	.34**	.52**	–							
Staying inside	.19**	.11	.31**	.60**	.51**	.18**	.09	.05	.12	.33**	.30**	.34**	–						
Avoiding close physical contact with others	.35**	.20**	.39**	.72**	.65**	.29**	.19**	.05	.26**	.40**	.36**	.41**	.70**	–					
Avoiding all people outside your immediate household	.35**	.25**	.38**	.62**	.58**	.24**	.09	.15*	.24**	.41**	.30**	.42**	.68**	.68**	–				
Only leaving your home for absolute necessities	.25**	.13	.35**	.54**	.50**	.24**	.07	.06	.21**	.31**	.25**	.41**	.68**	.67**	.82**	–			
Complying with 'Stay-at-Home' directives from the government	.28**	.22**	.36**	.53**	.51**	.30**	.22**	.11	.30**	.31**	.41**	.44**	.64**	.63**	.67**	.77**	–		
Not going out to socialize	.20**	.069	.32**	.58**	.55**	.12	.12	.01	.14*	.29**	.22**	.33**	.64**	.73**	.74**	.77**	.68**	–	
Voluntarily wearing a mask if you go out in pubic	.32**	.37**	.31**	.40**	.35**	.25**	.17**	.22**	.35**	.30**	.57**	.41**	.43**	.44**	.41**	.44**	.53**	.42**	–
Mean	4.63	4.73	4.28	4.22	4.41	4.81	4.91	4.83	4.71	4.45	4.71	4.36	4.20	4.22	3.61	3.72	4.21	3.99	4.55
SD	0.718	0.674	1.06	1.07	0.908	0.538	0.340	0.525	0.723	0.983	0.784	0.978	1.07	1.03	1.34	1.32	1.14	1.19	0.963

Note. * Indicates $p < .05$, ** indicates $p < .001$.

Table 2. Adjusted means and standard errors of reported health intentions, controlling for political ideology and prime engagement

	COVID-19 priming			Dental pain priming		
	M	*SE*	*N*	*M*	*SE*	*N*
Collectivism	4.55	0.07	60	4.32	0.09	47
Individualism	4.34	0.08	55	4.38	0.08	58
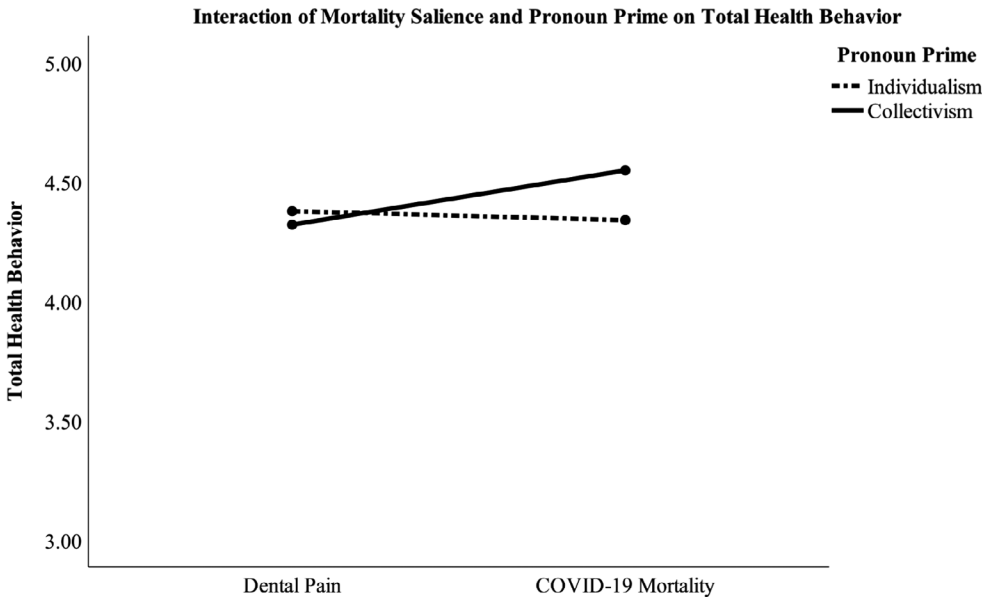
Figure 1. Study 1 Interaction of mortality salience and pronoun prime on total health behaviour.

significance, $F(1, 213) = 2.77$, $p = .09$, $\eta_p^2 = .01$, but the pattern of results was as expected and thus we probed for significant pairwise comparisons (see Figure 1). COVID-19 mortality priming led to higher reported health behaviour intentions than the dental pain prime when collectivism was primed, $F(1, 213) = 3.98$, $p = .05$, $\eta_p^2 = .018$, but did not have effects on health behaviours when individualism was primed, $F(1, 213) = .114$, $p = .74$, $\eta_p^2 = .001$. Looked at alternatively, within the COVID-19 mortality condition, priming collectivism led to marginally higher health behaviour intentions compared to priming individualism, $F(1, 213) = 3.60$, $p = .06$, $\eta_p^2 = .017$, whereas when dental pain was primed, there was no difference as a function of collectivism versus individualism, $F(1, 213) = 0.24$, $p = .63$, $\eta_p^2 = .001$.

Discussion

The aim of the current study was to investigate the extent to which priming COVID-19 mortality concerns would impact COVID-19-related health behaviour intentions depending on whether collectivism or individualism is salient. Though our hypothesis was not

fully supported given the marginal interaction, our simple effects analyses did suggest some degree of positive health intention outcome attributable to the combination of collectivism and COVID-19 mortality priming. We found that, under conditions where collectivism was primed, individuals responded to mortality reminders with higher reported intentions to engage in health behaviours helpful for mitigating the spread of the virus. This was not the case when individualism was primed. Priming collectivism also marginally increased health intentions relative to individualism in the condition where COVID-19 mortality was primed. Though we need to interpret the results with caution, in light of the marginal findings, the results are generally suggestive that exposure to information pertaining to COVID-19 (and its resulting death toll) could impact daily behaviours depending on the salience of cultural factors or values in conjunction with that information. Namely, instilling the notion of a collective 'we' had an impact on the way existential threats motivated health-related intentions in the context of the pandemic.

Notably, there were limitations with this study. For one, we primed COVID-19-related death which, while offering a more naturalistic approach, limits us from pinpointing the awareness of mortality as the driving factor for the activation of distal defences. That is, we are unable to make conclusions about whether it was the awareness of death itself impacting these increases in health behaviour intentions, or if it was the salience of the virus irrespective of mortality. In other words, people might have wanted to wash their hands after thinking about COVID-19 without necessarily thinking about whether COVID-19 would kill them. Alternately, some individuals invest in COVID-19 conspiracy theories (e.g., Stecula & Pickup, 2021) and therefore may be sceptical of the connection between the virus and death, thereby undermining the effects of the COVID-19-related death prime. Additionally, and as we note in the outset, news about COVID-19 so often focuses on death that even explicit mention of fatalities at the hands of the disease may not have sufficiently evoked mortality concerns due to desensitization. Such issues would certainly contribute to our marginal findings.

Another consideration, which may be initially considered a limitation, is our use of an undergraduate student sample. However, this may not present as much of a limitation as other undergraduate convenience samples, given that young people contributed greatly to COVID-19 outbreaks due to a lack of prioritization of vaccine rollout and engagement in potentially unsafe behaviours (Lovelace, 2021). Thus, the use of undergraduates in this case may be a strength more than a limitation, in that it enabled us to test predictions from the TMHM for pandemics among a population who might be generally less likely to adhere to health recommendations.

Another limitation, which may have contributed to the marginal effects, is that the health behaviour intentions measure was non-normally distributed (skewness of -1.13, $SE = .16$) and thus may reflect a ceiling effect. Given the time period during which the data were collected, the manifestation of a ceiling effect is probably not surprising due to high levels of required compliance with health behaviours (e.g., required face mask mandates, closure of non-essential businesses, and Stay-at-Home orders). In light of the skewness issue, we did attempt data transformations, but no transformations contributed to a significant improvement in skewness. Thus, though we interpret our marginal findings with caution, the observed pattern of results informed Study 2.

To reconcile these limitations, we opted to make multiple changes in our second study. First, we utilized a traditional mortality salience manipulation used in most TMT studies (see Burke et al., 2010) to isolate the awareness of death as the mechanism motivating changes in behaviour intentions in conjunction with pronoun priming and to bypass potential resistance to associating COVID with death (e.g., desensitization and

conspiracy theories). Second, we measured vaccine intentions, which we suspected would be less susceptible to a ceiling effect due to a significant amount of scepticism surrounding the vaccine (e.g., Tyson, Johnson, & Funk, 2020). We also used a more rapid data collection strategy through an online survey platform. Although the date of data collection was not a significant covariate in Study 1, we wanted to avoid the potential for noise associated with changing attitudes once the vaccine began its rollout.

Study 2

On Monday, 9 November 2020, Pfizer and BioNTech became the first pharmaceutical company to announce that they had been able to produce a candidate COVID-19 vaccination with 90% effectiveness in a crucial phase of clinical testing (Pfizer Incorporated, 2020). Data collection for Study 2 took place on a single day (12 November 2020). As with the other virus mitigation measures, the efficacy of the vaccine requires a majority of people to actually get vaccinated in order for the vaccine to have a sufficient impact on slowing and eventually stopping the pandemic (Aubrey, 2020). Thus, individuals might be more likely to respond adaptively when considering the importance of the vaccine for other people, rather than for themselves, when deciding whether or not to get vaccinated. In extension of Study 1, we hypothesized that the awareness of death would influence intentions to get vaccinated in the context of collectivism, but not an individualism, priming.

Method

Participants and procedure

Study 2 was preregistered on the Open Science Framework (https://osf.io/9zxs6/?view_only=d67cca392ed94386a239a45a4b278a2f). We report all measures, manipulations, and exclusions in this study. Ethical approval from the Institutional Review Board was attained prior to study administration. A priori power analyses for a small-to-medium effect size suggested a sample size of 225. A total of 225 responses were collected from Prolific, an online survey platform, in exchange for $1.00. Participants were eligible to participate if they resided in the United States and had high approval ratings from the survey site (>95% approval). Participants were first provided with an informed consent and told that they were taking part in a study involving personality and health behaviours. No participants were excluded; all participants completed all materials and correctly answered all attention checks for a total sample of 225 ($M_{age} = 30.74, SD_{age} = 11.42$). Of the participants, 119 identified as women, 96 as men, one as transman, one as transwoman, five as non-binary, and three as other, two as agender, and one as gender flexible. In addition, 64.9% identified as White, 7.1% as Black, .4% as American Indian or Alaska Native, 13.8% as Asian, 10.2% as Hispanic/Latinx, 2.7% as Biracial/Mixed Race, and .9% as Other. All materials were administered online and detailed below in order of presentation.

Pronoun task.   The same pronoun identification task used in Study 1 was used again in Study 2. In line with Study 1 and with our preregistration plan, we used the number of pronouns found as a covariate in our analyses.

Mortality salience manipulation. Rather than remind participants of mortality in the context of a COVID-19 prompt, the current study instead utilized a well-validated means of priming mortality (see Burke et al., 2010). This manipulation employs two open-ended questions in which participants are asked to 'Briefly describe the emotions that the thought of your own death arouses in you' and to 'Jot down, as specifically as you can, what you think happens to you as you physically die and once you are physically dead'. The control condition asked parallel questions about experiencing dental pain.

Delay. As in Study 1, the 20-item PANAS (Watson et al., 1988) was used to allow thoughts of death to recede from focal attention.[7] Within this section, participants were also presented with an embedded attention check (i.e., 'Please select "Extremely"').

Vaccination intentions. To introduce this section, participants were presented with an image illustrating medical vials labelled 'COVID-19 vaccine' with the caption: 'Pharmaceutical companies in the United States project that a COVID-19 vaccine will be available by the end of 2020. The Centers for Disease Control and Prevention state that a combination of getting vaccinated and following the CDC's recommendations to protect yourself and others will offer the best protection against COVID-19. Getting vaccinated has the potential to reduce severity of symptoms and help keep others from getting sick'. Then, on 5-point Likert-style scales, participants were asked to describe their attitudes towards getting a COVID-19 vaccine (ranging from 'extremely negative' to 'extremely positive'); how willing they would be to get a COVID-19 vaccine (ranging from 'extremely unwilling' to 'extremely willing'); how serious their intentions are to get a COVID-19 vaccine (ranging from 'not at all serious' to 'extremely serious'); and how safe they think a COVID-19 vaccine would be (ranging from 'not at all safe' to 'extremely safe').[8] A mean composite score of these four items was computed to serve as an overall index of vaccination intentions ($\alpha = .95$). See Table 3 for correlations, means, and standard deviations.[9]

Demographics. At the end of the study, participants were asked basic demographic questions, asked to characterize their political ideology with the single 8-point item (ranging from 'extremely liberal' to 'extremely conservative', again serving as a covariate due to its correlation with the dependent variable, $r = -.32$, $p < .001$), and asked to identify the writing prompt they saw at the beginning of the study (either death or dental pain) to serve as a face-valid manipulation check.

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[7] *Again, as is the case with most TMT research, we did not anticipate an effect of MS on affect. This was the case for positive affect (= .90), t(218) = −.56 p = .57, and negative affect (= .92), t(217) = −.06, p = .96. We further probed for differences in the fear subscale. There were no differences in fear arousal between the death and dental pain primes, t(223) = −.79, p = .43.*

[8] *In our preregistration plan, we initially anticipated that perceived vaccine safety would serve as a covariate for potential unwillingness to get vaccinated. However, upon examination of the dependent variable, perceived safety was highly correlated with the mean composite of other three items (r = .84, p < .001) and improved scale reliability when added to the other three items (from = .94 to = .95). Because of this, we opted to include it as a fourth item on the overall intentions scale rather than as a covariate for a three-item measure.*

[9] *As anticipated, vaccination intentions were not as skewed as the dependent measure in Study 1 (skewness of −.84, SE = .16, within the generally recommended skewness range of −1 to +1; Hair et al., 2017). All analyses were performed on untransformed data.*

Table 3. Correlations for vaccination intentions ($N = 225$)

Variables	1	2	3	4
How would you describe your attitude towards getting a COVID-19 vaccine?	–			
How willing would you be to get a COVID-19 vaccine yourself?	.899**	–		
How serious are your intentions to get a COVID-19 vaccine?	.832**	.867**	–	
How safe do you think a COVID-19 vaccine would be?	.817**	.801**	.778**	–
Mean	3.96	3.94	3.71	3.30
SD	1.20	1.298	1.401	1.100

Note. * Indicates $p < .05$, ** indicates $p < .001$.

Results

A 2 (Pronouns: collectivism vs. individualism) × 2 (MS: death vs. dental pain) between-subjects ANCOVA was performed on the vaccination intentions outcome while controlling for political ideology and number of pronouns identified in the word-search task (to control for engagement) as covariates, as was proposed in our preregistration plan (see Table 4 for all adjusted means and standard errors).[10] Political ideology was a significant covariate ($p < .001$), but number of identified pronouns this time was not ($p = .07$). Again, no main effects of MS ($p = .35$) or pronoun ($p = .33$) priming emerged, but in this study the interaction was significant, $F(1, 219) = 4.49$, $p = .04$, $\eta_p^2 = .02$ (see Figure 2). Simple effects of MS, interestingly, revealed that priming collectivism did not lead to significant differences in vaccination intentions between death or dental pain priming, $F(1, 219) = 0.73$, $p = .39$, $\eta_p^2 = .003$, but that priming individualism did, $F(1, 219) = 4.59$, $p = .03$, $\eta_p^2 = .02$, such that those primed with death reported lower intentions to get vaccinated. In addition, within the death condition, priming collectivism was associated with greater vaccination intentions relative to when individualism was primed, $F(1, 219) = 4.78$, $p = .03$, $\eta_p^2 = .021$, whereas when dental pain was primed,

Table 4. Unadjusted and adjusted means and standard errors of reported vaccination intentions, controlling for political ideology and prime engagement

	COVID-19 priming			Dental pain priming		
	M	SE	N	M	SE	N
Adjusted means and standard errors of vaccine intentions						
Collectivism	3.91	0.15	61	3.66	0.16	53
Individualism	3.34	0.16	52	3.82	0.15	59
Controlling for political ideology and prime engagement						
Collectivism	3.88	0.14	61	3.70	0.15	53
Individualism	3.42	0.15	52	3.87	0.14	59

[10] *This analysis was repeated without any covariates, and results were unchanged, where there were no main effects of MS (p = .33) or pronoun (p = .35) priming, but the anticipated interaction remained significant, F(1, 221) = 6.84, p = .01, $\eta_p^2 = .03$.*

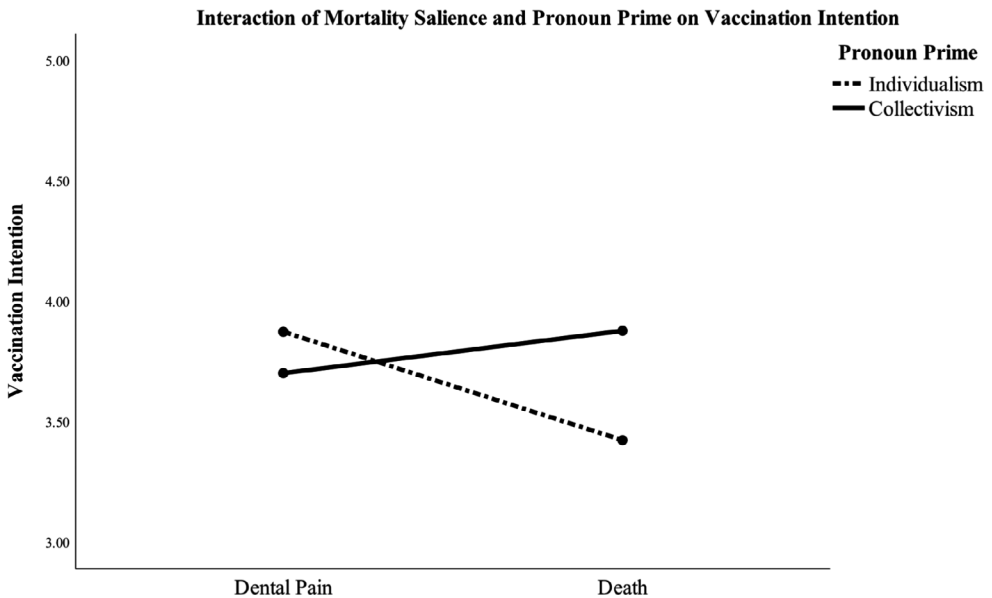**Interaction of Mortality Salience and Pronoun Prime on Vaccination Intention**

Figure 2. Study 2 Interaction of mortality salience and pronoun prime on vaccination intentions.

there was no difference as a function of collectivism and individualism priming, $F(1, 220) = 0.68$, $p = .41$, $\eta_p^2 = .003$.

Discussion

Broadly, these results provide support for the notion that mortality reminders differentially affect health behaviour intentions relevant to virus prevention through vaccine intentions depending on whether one is orientated towards collectivism or individualism. The pattern of results for Study 2 diverged from Study 1 in finding a negative impact of mortality reminders in the individualism condition, rather than a positive impact in the collectivism condition. The difference between the studies may be explained by the potential risks associated with the assessed health behaviours. While there are no risks associated with wearing a mask and social distancing (Study 1), at the time of data collection, and still currently, many Americans have concerns about the safety of the COVID-19 vaccine (Stobbe & Fingerhut, 2021), and so it is perhaps not surprising that, in the context of an individualistic orientation, mortality salience decreased intentions for vaccination. We did find that when mortality was salient, collectivism is clearly beneficial as compared to individualism. To the extent that the pandemic causes mortality awareness, communications that promote collectivism are likely to go far in promoting health intentions: in this case, related to a willingness to get vaccinated, particularly as a vaccine becomes generally available.

Study 2 also provides more direct evidence that the results can be explained by mortality salience, and not concerns about the virus irrespective of death. Thus, the findings add to a growing body of support for the TMHM, and specifically to the TMHM for pandemics. Activating concerns about mortality can influence health behaviour related to the pandemic, and this can be adaptive or maladaptive depending on the ideological or cultural mindset.

General discussion

In two studies, we found evidence that mortality reminders differentially affect health behaviour intentions related to slowing the spread of the virus depending on whether a collectivist or individualistic orientation is activated. In Study 1, although the interaction was not significant, we found that when the collective 'we' had been primed, higher transmission-mitigating health intentions were reported under conditions where COVID-19-related mortality was salient compared to a control; an effect not observed when the individual 'I' was primed. In Study 2, we found that priming mortality salience using a well-validated TMT manipulation led not only to increases in reported vaccination intentions when collectivism compared to individualism was primed, but that when individualism was primed, mortality salience decreased intentions for vaccination. Given the connection between the virus and death, one can assume that mortality concerns may indeed be activated in the context of communications about the pandemic. These results suggest that this can be capitalized on and presented in conjunction with messages highlighting the value of collectivism.

Implications

When the coronavirus pandemic took hold in early 2020, terror management theorists recognized a vital opportunity: the unique ability to study the effects of salient mortality concerns on everyday people in an unprecedented context (e.g., Pyszczynski et al., 2020). Indeed, TMT provides a solid theoretical lens through which to better understand the impact of the pandemic on what used to be understood about life, and the ever-changing landscape as a result of a pervasive existential threat. Researchers have examined effects on the workforce (and existential repercussions of job loss, e.g., Blustein & Guarino, 2020), increases in rejection of dissimilar others (Golec de Zavala, Bierwiaczonek, Baran, Keenan, & Hase, 2020), heightened ideological defensiveness (Su & Shen, 2020), the adoption of pandemic-related health behaviours as a newly engrained part of culture (e.g., social distancing, Fairlamb & Courtney, 2021), and long-term implications for mental health (Saltzman, Hansel, & Bordnick, 2020). Generally, the TMT-based studies conducted thus far highlight a consistent narrative: the existential threat of COVID-19 provokes individuals to strengthen their commitment to cultural ideologies. Critically, this presents an issue when ideological values collide with behaviours necessary for curtailing a pandemic, which brings the TMHM to the forefront of theoretical applicability in terms of marrying cultural values with adaptive health behaviours.

Our studies employ the TMHM to apply the value of collectivism versus individualism to health behaviours, whereby manipulating the salience of these constructs had a distinct impact on individuals' intentions to engage in virus-mitigating behaviours under conditions where mortality was made salient. As mentioned, the TMHM posits that, when mortality is not conscious but still salient, health-based decisions hinge not on actual health, but on ideology. In America, individualism reigns supreme (e.g., Hofstede, 2011; Hofstede et al., 2010), implying that protecting one's own beliefs takes precedence over the beliefs (and health) of others, especially when the awareness of mortality grips the fringes of consciousness. Indeed, Study 2 shows that individualism had a negative impact on the extent to which participants indicated intentions to get vaccinated against COVID-19 when death was accessible, while collectivism and mortality salience were shown to have a positive impact on health intentions in both studies.

This pattern of results may serve to explain differential pandemic-related outcomes in countries with varying levels of individualist or collectivist identity (e.g., Hofstede, 2011; Hofstede et al., 2010; Liu, 2021; Lowy Institute, 2021). Importantly, our studies indicate that using a well-validated means of priming the notions of individualism and collectivism (see Oyserman & Lee, 2008) successfully interacted with mortality awareness to bolster adaptive health behaviour intentions, supporting the efficacy of the TMHM for encouraging the behaviours necessary to reach the conclusion of this pandemic. The TMHM for pandemics, and now evidence from two studies, lends support for the efficacy of communications in which a deadly virus is the focal point (i.e., where mortality is made salient) would likely be at their most effective if focus is also placed on 'we', serving as a means through which meaning and esteem from engaging in critical health behaviours might be drawn. More concretely, and mirroring examples given by Courtney et al. (2020), such communications should explicitly highlight collective pronouns in conjunction with a focus on death – along the lines of 'Together, We Can Slow the Deadly Spread of COVID-19'.

Limitations

These studies, however, are not without limitations. A major limitation is the failure to include a control condition in the context of the collectivism/individualism manipulation. Because of this, we can only interpret our results in terms of the effects of the mortality reminder in a collectivism condition relative to an individualism condition and are unable to draw any comparisons to a default condition where neither is experimentally primed. Because the study was conducted with participants from the United States, we assumed the default (no prime) reaction may be more in line with the 'I' condition, but this may not be the case. Even in a country high in individualism, there remains an expected degree of heterogeneity in cultural values (Vandello & Cohen, 1999).

Such a consideration also corresponds with social identity theory (e.g., Taijfel & Turner, 1986), and the possibility that priming an individualistic or collectivistic orientation may have triggered social identities relevant to, but not necessarily equivalent to, these orientations. This explanation is especially applicable to those embodying a more conservative set of ideological principles. In the United States, some traditionally conservative political issues are tied to individualism (e.g., gun ownership, Celinska, 2007), and modern conservativism is, at least in part, grounded in prioritization of individual liberties (Barber & Pope, 2019). Further, evidence suggests that conservatives are more likely to reject the severity of COVID-19 and invest in connected conspiracy theories (Stecula & Pickup, 2021) and report diminished adherence to COVID-19 safety recommendations (Kerr, Panagopoulos, & van der Linden, 2021). Additionally, and importantly to Study 2, conservatives exhibit more concern about COVID-19 vaccines (Hornsey, Finlayson, Chatwood, & Begeny, 2020). This could help to explain why the individualism prime undermined vaccination intentions when death was salient. Though we do control for political ideology, our 'I' prime could have made salient components of a social identity rooted in conservative ideologies tied to both rejection of COVID-19 guidelines (especially vaccination) and prioritization of individual freedom pre-existing in some American people. Future research should more explicitly test relationships between cultural orientation, social identities, political ideologies, and health behaviours, especially in a potentially longitudinal context throughout the pandemic.

In a similar vein, Dimoff, Dao, Mitchell, and Olson (2021) critique the TMHM for pandemics in noting that a perceived reduction in freedoms due to placement of

guidelines and restrictions to mitigate the spread of the virus could produce psychological reactance. Though the TMHM for pandemics (Courtney et al., 2020) does not explicitly account for psychological reactance, a systematic review of the TMHM literature (Courtney, 2021) now integrates the TMHM and research on fear appeals to explain that death awareness can produce the expected terror management-based defences and might also motivate defensive reactions in the context of health behaviours, including but not limited to psychological reactance. Indeed, it could be that those primed with individualism in Study 2 exhibited more psychological reactance, especially if social identities grounded in individual freedoms were made salient and led to rejection of vaccination. Future research could use framing techniques in the vein of studies by Bessarabova and Massey (2020), where vaccinations are explained as combinations of personal choices versus demands, as a way to undermine psychological reactance in response to health recommendations that may be perceived as limiting freedom, especially under the duress of death awareness, and especially in a longitudinal or sustained capacity.

Another limitation comes into play when considering that participants may have already been exposed to widespread public health communications highlighting collectivist values (e.g., 'Together We Can', CDC, 2020b). Consequently, the default mindset may have varied amongst individuals and as a function of time. Thus, we cannot draw conclusions about whether the collectivism prime increased the efficacy of the mortality salience manipulation, or whether the individualism prime decreased it compared to a no-prime condition, but only that when collectivism was primed it there was a relatively better outcome in response to mortality salience than when individualism was primed.

The self-report nature of the dependent variables is also a limitation of these studies. Individuals may have reported intentions to stay home and social distance, while going out to eat at a restaurant the following day. The variables of interest may have also been subject to demand characteristics, which may have played a role in the ceiling effect observed in Study 1. Some pandemic-based health behaviours have indeed become an accepted part of culture; for example, transgressors against social distancing guidelines are perceived as worthy of punishment (Fairlamb & Courtney, 2021). Individuals may have reported higher intentions under the duress of mortality awareness due to a desire to be accepted, or not punished, especially considering the extent to which those health behaviours were governmentally mandated at the time of data collection. To reconcile the issue of self-report, behavioural measures like actual vaccination follow-up would serve as a more valid means of evaluating the interactive effects of mortality and collectivist awareness.

We also recognize that our effect sizes are rather small, an issue coming up with other, more recent TMT-based studies (e.g., Schindler, Reinhardt, & Reinhard, 2020). Though our effect generally replicates across two studies, further replication may be necessary to lend additional support to these findings and reconcile this issue. Notably, our findings do not hinge specifically on effects of MS alone. Rather, and importantly to the overarching collection of TMT literature, we argue that the awareness of death serves to exacerbate health intentions informed by culture in terms of interactivity. Indeed, MS effects (i.e., main effects) have not manifested in our or other TMT replication attempts (e.g., Many Labs 4, Klein et al., 2019), but those main effects are not our primary focus. Critically, we do not make hypotheses exclusively about the impact of mortality salience alone, but rather an interaction with other salient values, which is supported by our lack of main effects of MS in both of our studies. In those terms, and in contest to the findings of Klein et al. (2019) in Many Labs 4 (see also Chatard, Hirschberger, & Pyszczynski, 2020), the

more distal effects of death awareness must take into consideration the salience of cultural values. Regardless, the TMT literature would continue to benefit from replication attempts so long as such attempts keep theoretical framework at the forefront of hypotheses.

Finally, our studies are limited by ecological validity. Though well-validated, the pronoun-finding manipulation used to prime individualism or collectivism is not an activity generally encountered in the context of pandemic-related communications. However, we do note the potential for actual pandemic-based communications to include a focus on both death and specific individual versus collective pronouns: the 'I' versus the 'we'. Future studies should seek to find this interaction using differential real-world public health messages in a more naturalistic context. Additionally, future studies should focus on the feasibility of sustained collective-based health communications, especially for communicable diseases.

Conclusion

The coronavirus pandemic has not yet reached its conclusion, and communications that highlight the danger of the virus can and should still be utilized to convey the dire circumstances, especially if those communications make an appeal to the greater good. Courtney et al. (2020) place special focus on the slogan brandished at the end of an informational commercial broadcast by the CDC: 'Together, we can slow the spread' (2020b) and argue that the inclusion of an existential threat with such a statement is crucial for encouraging adaptive health responses. Now, in two empirical studies, we provide initial support for the efficacy of this approach in the context of COVID-19 and potentially in the context of the world's next pandemic crisis.

Conflicts of interest

All authors declare no conflict of interest.

Author contribution

Jamie L. Goldenberg (Conceptualization; Supervision; Writing – original draft; Writing – review & editing) Roxanne N Felig (Data curation; Writing – review & editing) Emily P. Courtney (Conceptualization; Formal analysis; Methodology; Writing – original draft; Writing – review & editing).

Data availability statement

The data that support the findings of this study are openly available in the Open Science Framework at https://osf.io/9zxs6/?view_only=d67cca392ed94386a239a45a4b278a2f.

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