Sign Evaluation and Compliance Under Mortality Salience: lessons from a pandemic

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INTRODUCTION

At the time of this writing we find ourselves in the midst of a pandemic. Daily news reports of fatalities from COVID-19 and ever-increasing death counts make mortality salient in the minds of the public. This unusual circumstance presents an opportunity to explore the influence of mortality salience on the processing and acceptance of messages conveyed by signs.

Signs play an important role in conveying information to the public (Calori 2007; Kellaris and Machleit 2016; Taylor et al. 2005). The importance of this role is magnified when the information concerns public health or safety, such as signs conveying health warnings or soliciting cooperation with mitigation strategies to combat health threats (Cian et al. 2015). Examples from the COVID-19 pandemic include handwashing signs, restricted shopping hours for vulnerable groups, maintaining physical distance, and wearing protective face masks in public to reduce contagion, among others. A significant communication challenge with such signage is that by calling attention to potentially fatal consequences, mortality salience can be triggered.

Mortality salience is mindfulness of the inevitability of one's own death (Greenberg et al. 1986). According to terror management theory, reminders of mortality evoke feelings of anxiety, which in turn activate defensive coping mechanisms (Spielberger 1966; Greenberg et al. 1986; Greenberg et al. 2003). These defense mechanisms include becoming more entrenched in a shared worldview, which sets standards concerning how one should behave, and self-esteem, which reflects one's assessment of how we live up to those standards (Ferraro et al. 2005). Additionally, people tend to respond to mortality salience by seeking the comfort of in-groups and close others (Mikulincer et al. 2003). Pyszczynski et al. (1997) explain this tendency to retreat to one's comfort zone

Abstract /

This article examines sign communication effectiveness in the context of COVID-19 pandemic-related signs that promote behavioral changes. A program of four experiments assessed the influence of mortality salience on responses to signs promoting frequent handwashing (Study 1), restricted shopping hours for vulnerable groups (Study 2), maintaining physical distance (Study 3), and mask wearing (Study 4). Findings support a conceptual model proposing a serial mediation process whereby mortality cues trigger a chain of events (feelings and thoughts) that ultimately shape evaluations of and intentions to comply with signs. Findings offer evidence-based guidelines for effective signage communication.

Keywords /

sign communication; mortality salience; sign evaluation; behavioral intentions

in the face of existential threat as identifying at a symbolic level with things that will outlast one's own existence.

The effects of mortality salience are broad and far-reaching, impacting decision-making in domains as disparate as financial allocation, to selecting chocolate cake over fruit salad (Kasser and Sheldon 2000; Arndt et al. 2004; Salisbury and Nenkov 2016; Ferraro et al. 2005). Mandel and Smeesters (2008) document a general tendency to over-eat when primed with thoughts of mortality—an effect they explain in terms of escape from self-awareness.

Germane to this research, Cai and Wyer (2015) show that people process information differently when they are conscious of their own mortality. Specifically, the relative effectiveness of appeals to help (in the wake of a natural disaster) differs according to the viewer's state of mind. Whereas "need-focused" appeals are more effective when people are not thinking about their own mortality, "bandwagon" appeals (i.e., join the many other people that are doing something) are more effective when mortality is salient. This is consistent with the basic premise of terror management theory, that mortality salience motivates people to reaffirm their cultural worldview (Greenberg et al. 1986). Presumably, the behavior of others exemplifies the predominant worldview to which mortality-conscious people are motivated to conform.

We propose another possibility. Feelings of anxiety triggered by thoughts of mortality may be experienced as a generalized "bad feeling." Negative affect attendant to uncomfortable thoughts has potential to influence the evaluation of information (Schwartz 2012). Signs that raise mortality salience may also induce changes in affective reactions to the sign, which may influence the evaluation of the information presented. Specifically, whereas positive affect should encourage positive evaluations, negative affect may color subsequent evaluations. Good feelings produce good evaluations, and this general principle should apply to positive affect toward a sign engendering favorable evaluations of itself.

Why are evaluations of a sign important if compliance is the communication goal? Simply put, people are motivated to maintain internal consistency. According to cognitive consistency theory, people tend to act in accordance with beliefs and intentions formulated on the basis of those beliefs (Abelson 1968). This means that positive evaluations should instill positive behavioral intentions. In the case of processing sign information, a "liked" sign opens the door to positive behavioral intentions with regard to the message of the sign.

In this study, we examine how sign information is processed under conditions of a looming threat to public health, with the ultimate goal of understanding how to design sign messages that encourage positive behaviors. Specifically, we address the following research questions: How does mortality salience influence viewers' responses to signs that advocate behavioral change? By

what process does this influence operate? Does positive evaluation of signs predict compliance with sign messages?

Although this program of experimentation is largely exploratory, we hypothesize on the basis theory and previous findings that mortality salience will ultimately influence behavioral intentions to comply with sign messages via a serial mediation process as depicted in the conceptual model shown in Figure 1 (below). Specifically, the level of mortality salience (MS) evoked by a sign should influence viewers' anxiety levels, with higher (vs. lower) MS producing greater states of anxiety. Anxiety levels should influence affective reactions to the sign, which in turn should influence evaluations of the sign. Finally, these evaluations should influence behavioral intentions to comply with the advocacy of the sign, with more positive evaluations leading to greater compliance.
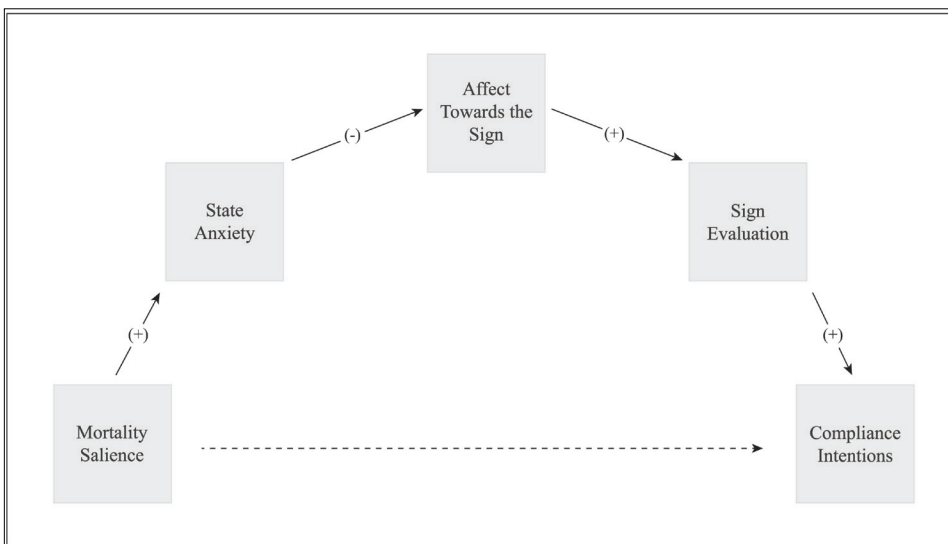

Figure 1 / Conceptual Model

STUDY 1

Our initial exploration of sign communication effectiveness under mortality salience exposed participants to variants of a sign designed to promote handwashing as a COVID-19 abatement strategy.

Method

Participants ($N = 113$) were recruited from an online panel in exchange for monetary compensation. Their ages ranged from 18 to 73 years with an average age of 31.5 (median=29) and the majority were female (56%), with 4% electing to not disclose their gender identity. Stimulus materials were simulated handwashing signs created by a graphic artist. Variants of the sign represented low / high mortality salience (MS), crossed with the presence or absence of an in-group appeal in a 2 x 2 between-subjects experimental design (See Appendix 1). After obtaining informed consent, participants were asked to view a sign and then answer questions about the sign and about themselves.

Measures

The dependent variable was behavioral intent to comply with the advocacy of the sign ("Compliance"), represented by a seven-point agreement scale (1=strongly disagree, 7=strongly agree) preceded by the statement "I am likely to comply with the sign's message."

The first mediator variable, state anxiety, was captured by a seven-item, four-point agreement scale patterned after an instrument by Marteau and Bekker (1992). Participants were asked to respond to the prompt: "There are many ways people can react to messages on signs. We are interested in the extent to which (if at all) the sign you viewed made you feel…" with the words: "worried, tense, nervous, apprehensive, ill-at-ease, upset, and anxious" and rate each from 1-4 (1=not at all, 2=perhaps somewhat, 3=moderately so, 4=very much so). These were combined into a summed and averaged composite scale (α = .941).

The second mediator, affective reaction to the sign ("affect") was measured via a three-item, seven-point agreement scale adapted from Madden et al. (1988). Participants responded to the prompt: "Viewing this sign made me feel…" with "good / bad, happy / sad, positive / negative." This seven-point semantic differential scale was reversed, with larger values representing more positive affect. These too were combined into a composite scale (α = .918).

The third mediator, evaluation of the sign ("SignEval"), was represented by a five-item, seven-point agreement scale (1=strongly disagree, 7=strongly agree). For this variable, participants responded to the statement "The following questions concern your evaluation of the sign you just saw…" with: "The sign communicated its message effectively," "The intent of the message was clear," "The message was easy to understand," "Given its purpose, this was a good sign," and "Given the purpose of the sign, the message was well worded." These also were combined into a summed and averaged composite scale (α = .881).

The questionnaire also included manipulation and reality checks. To verify the integrity of our experimental manipulations, mortality salience was assessed by five, seven-point agreement items: "The message on the sign made me think of human mortality," "Viewed in the context of a pandemic, the sign reminded me that fatalities can occur if people do not wash their hands frequently," "The sign implied that viruses can be deadly," "The sign called to mind that my loved ones won't live forever," and "The sign made me think of my own mortality". These were summed and averaged to form a composite scale (α = .864). The in-group appeals treatment was assessed via three, seven-point agreement items ("I thought of family and friends when I saw the sign," "The sign made me think of my loved ones," "The sign called to mind those who are closest to me"), which were combined into a composite scale (α = .947).

'Reality checks' are items included to verify participants' attentiveness, mindfulness, and cooperation with the experimental task, e.g., "I did not take this study seriously or strive to provide thoughtful answers" (1=strongly disagree, 7 = strongly agree). These allow for the exclusion of aberrant responses from statistical analyses. The questions concluded with standard demographic items (e.g., gender, age) to facilitate sample description.

Results
Manipulation checks

Low / high mortality salience groups differ statistically on the MS manipulation check measure ($Mean_{low}$=3.97, $Mean_{high}$=5.37; t = -5.53, df=111, $p < .001$, two-tailed). Additionally, low/high in-group treatment groups differ statistically on the in-group manipulation check measure ($Mean_{low}$=3.70, $Mean_{high}$=5.04; t = -3.68, df=111, $p < .001$, two-tailed). However, we note that the two manipulation check measures are correlated ($r = .48$, $p < .001$), which led us to investigate the impact of the mortality salience treatment on the in-group manipulation check measure. Evidence suggests that although MS and in-group appeals were manipulated orthogonally, it appears that mortality salience "overpowered" the in-group manipulation, with high MS making people mindful of their loved ones (i.e., in-group). Further analyses were performed both with and without the in-group treatment variable.

Moderation analysis

Whereas we expected the interplay between mortality salience and in-group appeals to influence compliance intentions indirectly by triggering anxiety, we ran an initial analysis via PROCESS macro model 1 to examine the interactive effect of the treatments on anxiety (Hayes 2018). Results indicate a strong, direct effect of MS on anxiety ($p = .0037$), but the interaction was not statistically significant ($p = .0788$, CI: -.0502, .9081). Moreover, MS had a significant, positive effect on anxiety under both low ($p = .0037$) and high ($p < .0001$) in-group conditions. Hence, further analyses omitted the in-group treatment variable.

Serial mediation analysis

To test the implicit hypotheses suggested by our conceptual model (Figure 1), we conducted a serial mediation analysis using PROCESS macro model 6 (Hayes 2018), whereby the 95% confidence intervals (CIs) used to generate each indirect effect were performed using 5,000 bootstrap samples. Consistent with our conceptual model, anxiety (M1), affect (M2) and sign evaluation (M3) mediate the effect of mortality salience (IV) on sign compliance (DV) (-.1198, CI: -.2624, -.0414). There was no evidence that MS influenced compliance intentions directly, independent of its effect on anxiety and ensuing events in the causal chain (.1872, CI: -.2154, .5899). This analytic technique permits the efficient assessment of direct and indirect effects, and showed a fully mediated path whereby MS determines anxiety levels (.7517, $p < .0001$), anxiety contributes negatively to affect toward the sign (-1.0167, $p < .0001$), affect shapes evaluations of the sign (.3576, $p < .0001$), and evaluations exert a positive influence on compliance intentions (.4384, $p < .0001$).

Discussion

Findings provide initial evidence in support of the conceptual model. It appears that mortality salience exerts an indirect influence on intentions to comply with the advocacy of signs by triggering emotions that influence cognitive evaluations of those signs. Provisionally, we speculate that evaluations of signs are the primary driver of compliance intentions, and that lowering (vs. raising) mortality salience in sign messages should engender favorable downstream effects. To gather corroborative evidence, we conducted a conceptual replication of Study 1.

STUDY 2

Study 2 is a conceptual replication of Study 1, using different stimuli to see if results from the context of encouraging positive behavior (washing hands) hold when the message is about restricting a behavior, which in this instance was limited business hours. Participants ($N = 112$, 60.6% female, median age = 28) were exposed to signs asking for voluntary compliance with store hours restricted for vulnerable population use only. The experimental design and method were similar to those of Study 1, although different stimulus materials were used (see Appendix 2). The measures were identical with the exception of the Sign Evaluation and Compliance scales, which used a 100-point sliding scale in Study 2 to capture more subtle variability in responses.

Results

Manipulation checks show that treatment group means differ in the expected directions but did not differ statistically on the corresponding manipulation check measures for either MS ($p = .855$) or in-group ($p = .312$). Consequently, we performed subsequent analyses using measured MS as the independent variable (IV) rather than treatment group membership.

Serial mediation analysis

As in Study 1, we conducted a serial mediation analysis using PROCESS macro model 6 (Hayes 2018). Consistent with our conceptual model and results obtained in Study 1, anxiety (M1), affect (M2) and sign evaluation (M3) mediate the effect of measured mortality salience (IV) on sign compliance (DV) (-.0535, CI: -.1582, -.0004). There was no evidence that MS influenced compliance intentions directly, independent of its effect on anxiety and ensuing events in the causal chain (.3109, CI: -.9582, 1.5801). Again, results showed a fully mediated path whereby MS determines anxiety levels (.1006, $p = .0075$), anxiety contributes negatively to affect toward the sign (-.5661, $p = .026$), affect shapes evaluations of the sign (2.8480, $p = .013$), and evaluations exert a positive influence on compliance intentions (.3296, $p < .0001$).

Discussion

Study 2 provides further evidence in support of the conceptual model. It appears that MS exerts a significant and indirect influence on sign compliance through the emotions and evaluations that arise from a causal chain trigger by MS. Moreover, evidence suggests that the model holds even when the context shifts from a positive frame (do wash hands) to a negative, restrictive frame (don't shop during certain hours).

Regarding the failure of the MS manipulation, we note two things. The signs used in Study 2 contained more information than those used in Study 1. We speculate post hoc that the higher informational density may dilute the impact of mortality salience cues, lowering the high group mean and raising the low group mean. Gravitation to the mean might also reflect people's pre-existing beliefs about COVID-19; if some in the high MS conditions believe that COVID-19 is not a threat, or some in the low MS condition believe COVID-19 is an existential threat, that would result in the means gravitating to the center of the distribution.

Additionally, we note that the signs in Study 2 asked for cooperation to reduce a mortality threat to groups that are out-groups for the majority of participants. For example, restricted hours designed to protect senior citizens may have seemed less personally relevant and therefore did not trigger MS among the comparatively young participants (range = 18 to 61 years, median = 28 years). In fact, age is positively correlated with evaluations of signs across conditions ($r = .332$, $p < .001$, two-tailed), suggesting that older participants were generally more favorably disposed to the idea of restricted shopping hours to benefit special population segments, regardless of their MS level.

Nevertheless, measured MS provided a strong test of the model, providing convergent evidence that behaved consistent with theory, exactly as the model predicted. We are concerned, however, that the looming presence of the pandemic threat and the informational density of the signs used in Study 2 overwhelmed the treatment effect of our manipulation. This concern motivated a third study, in which the prior studies are extended by examining a mechanism that intensifies message reception.

STUDY 3

Study 3 is a conceptual replication and extension of the two previously described studies, but incorporates different stimuli and an additional experimental manipulation. Participants ($N = 268$, 55% female, median age = 34.5) were exposed to signs promoting the practice of social distancing. Variants of these signs represented low / high mortality salience, crossed with the presence or absence of an in-group appeal, and an additional factor: verbal information that did or did not rhyme, in a 2 x 2 x 2 between-subject experimental design (see Appendix 3). Measures were identical to those in Study 2.

Results

Manipulation checks verified the integrity of the mortality salience treatment. Low / high MS groups differ statistically on the MS manipulation check measure ($Mean_{low}=4.58$, $Mean_{high}=5.08$; $t = -2.98$, df=266, $p < .003$, two-tailed). The low / high in-group manipulation did not produce statistical differences on the post-test manipulation check. As in Study 1, the MS and in-group manipulation check measures were positively correlated ($r = .564$, $p < .001$, two-tailed), which we construe as evidence that MS overwhelmed any potential impact of the in-group treatment. The in-group treatment was excluded from further analyses.

*Serial mediation analysis -
conceptual replication of studies 1 and 2*

As in Studies 1 and 2, we conducted a serial mediation analysis using PROCESS macro model 6, whereby the 95% confidence intervals used to ascertain each indirect effect were generated using 5,000 bootstrap samples (Hayes 2018). There was no evidence that MS influenced compliance intentions directly, independent of its effect on anxiety and ensuing events in the causal chain (-.1032, CI: -3.1386, 2.9322). Results partially replicated prior results, in that MS determines anxiety levels (.3036, $p = .0002$) and anxiety contributes negatively to affect toward the sign (-.4123, $p = .0018$). However, affect did not have a statistical effect on evaluations of the sign (.9085, $p =$ n.s.). Evaluations did exert a positive influence on compliance intentions (.7603, $p < .0001$). To summarize, the indirect effect of MS on compliance via the full mediational path (-.0865, CI: -.2574, .0114) broke down between

affect and evaluation. Our explorations to understand this inconsistency led us to consider the role rhyming messages might play in making messages more salient.

Serial mediation analysis on rhyming text sub-sample

We conducted an additional serial mediation analysis using PROCESS macro model 6 on data from the subset of participants exposed to rhyming versions of the sign message (Hayes 2018). Consistent with our conceptual model and results obtained in Study 1, anxiety (M1), affect (M2) and sign evaluation (M3) mediate the effect of measured mortality salience (IV) on sign compliance (DV) (-.2192, CI: -.6361, -.0119). There was no evidence that MS influenced compliance intentions directly, independent of its effect on anxiety and ensuing events in the causal chain (-1.5955, CI: -6.7581, 3.5670). Again, consistent with our conceptual model, results showed a fully mediated path whereby MS determines anxiety levels (.3642, p = .002), anxiety contributes negatively to affect toward the sign (-.4905, p = .0033), affect has a positive effect on evaluations of the sign (1.5472, p = .0689), and evaluations exert a positive influence on compliance intentions (.7931, p < .0001).

A closer examination of the "rhyming effect" shows a significant, positive association between affect and evaluations among participants exposed a sign featuring a rhymed version of the message (r = .223, p < .008, two-tailed), but not among those exposed to non-rhyming versions (r = .005, n.s.).

Discussion

Findings provide additional corroborative evidence in support of the conceptual model and demonstrate a potentially important technique for amplifying sign messages. Rhymed messages appear to be more effective in traveling the path from feelings (affect) to thoughts (evaluations) to intended actions (compliance). We speculate that this is the result of being more salient in the minds of receivers and thus more accessible in memory as evaluations are formed (Feldman and Lynch 1988). The ease with which a sign message is retrieved during evaluation may also confer a beneficial fluency effect, whereby the feeling of ease is construed as positive information in and of itself (Schwarz 2012).

STUDY 4

Study 4 is a replication and extension of all the previously described studies, utilizing different stimuli and a new experimental manipulation. Participants (N = 201, 58% female, median age = 34.0) were exposed to signs regarding wearing a face mask in a store. Variants of these signs represented low/high mortality salience, crossed with framing the store face mask policy as a request (please wear a face mask) as opposed to a demand (must wear a face mask), in a 2 x 2 between-subject experimental design with a control group (see Appendix 4). Measures of anxiety, affect, sign evaluations, and behavioral intent, with respect to compliance, were identical to those used in the previous studies.

The following measures were also included: shopping intentions ("I am likely to shop at this store on this trip," and "I am likely to shop at this store in the future," both 100 point sliding agreement scales); and reasons for compliance ("To reduce the threat to my own health," "To gain admission to the store to accomplish my shopping," "To protect the health of fellow shoppers," "To be a good citizen," seven-point importance scales, 1=not at all important, 7=extremely important).

We also included items to measure beliefs about the level of threat posed by COVID-19, including "Most people need to take the COVID-19 coronavirus more seriously*," "The government is over-reacting because the chance of getting the COVID-19 virus is low*," "I see too many people not taking adequate precautions to protect the community from the virus*," "My chance of getting the COVID-19 virus is low, so I'm not going to live in fear of this*," "In general, COVID-19 is not a grave threat to my existence," "Even if I get infected with COVID-19, it's not going to kill me," "The threat of COVID-19 to the lives of my family and friends is relatively small*," "Taking minor precautions reduces the threat of COVID-19 to near zero," "Early in the pandemic, COVID-19 seemed to be a bigger threat, but over the course of the pandemic my beliefs about COVID-19 have changed.*" Each item was followed by a seven-point agreement scale (1=strongly disagree, 7=strongly agree). We formed a summed and averaged composite scale of six items (*) that loaded highly on

a single factor (α = .896). Low / high perceived threat groups were formed via median split.

Additionally, we measured the following COVID-19-related behaviors: "I wash my hands longer and more frequently than I did at this time last year," "I own a face mask," and "Typically, I don't wear a face mask when I go out in public," each followed by a seven-point agreement scale (1=strongly disagree, 7=strongly agree).

Results

Manipulation checks verified the integrity of the mortality salience treatment. Low/high mortality salience groups differ statistically on the MS manipulation check measure ($Mean_{low}$=2.72, $Mean_{high}$=4.19; t = -8.4, df=162, $p < .001$ two-tailed). Mortality salience was higher in all treatment conditions as compared with the control group (mean = 1.82), suggesting that MS was relatively lower, but not absent, in the low (vs. high) MS condition. Mortality salience did not differ between the framing treatment groups ($mean_{request}$ = 3.43; $mean_{demand}$ = 3.51, n.s.).

Serial mediation analysis - conceptual replication

As in prior studies, we conducted a serial mediation analysis using PROCESS macro model 6, whereby the 95% confidence intervals (CIs) used to generate each indirect effect were performed using 5,000 bootstrap samples (Hayes 2018). Consistent with our conceptual model and results obtained in the prior studies, anxiety (M1), affect (M2) and sign evaluation (M3) mediate the effect of mortality salience (IV) on sign compliance (DV) (-.3380, CI: -.8978, -.0353). There was no evidence that MS influenced compliance intentions directly, independent of its effect on anxiety and ensuing events in the causal chain (3.2009, CI: -3.6957, 10.0975). Again, results showed a fully mediated path whereby MS determines anxiety levels (.3186, p = .0002), anxiety contributes negatively to affect toward the sign (-.8768, $p < .0001$), affect shapes evaluations of the sign (4.9083, $p < .0001$), and evaluations exert a positive influence on compliance intentions (.2465, $p < .0412$).

Message framing as a request vs. requirement

Interestingly, framing neither affected feelings about the sign nor its evaluation, but rather had a direct effect on intentions to comply. Moreover, those intentions appear to drive present and future shopping intentions (an extension of our conceptual model to consider downstream consequences of sign compliance intentions). A serial mediation model using PROCESS macro model 6 shows framing influences compliance intentions such that compliance intentions are lower (86.7%) when mask wearing is framed as a request, and higher (94.0%) when framed as a requirement (7.2643, p = .0339) (Hayes 2018). Compliance intentions contribute positively to the intentions to shop on the present trip (.7597, $p < .0001$), which contribute positively to intentions to shop at the same store in the future (.8434, $p < .0001$). There is no evidence of a direct effect of framing on future shopping intentions (2.1852, CI: -1.3899, 5.7603), but rather an indirect effect mediated via sign compliance and immediate shopping intentions (4.6545, CI: .6116, 9.2320).

The role of beliefs about COVID-19

Individuals differ widely with respect to beliefs about the level of perceived threat the COVID-19 pandemic presents. Participants in our sample ranged from 1.17 to 6.83 on the seven-point COVID-19 threat scale (mean = 5.17, median = 5.50), essentially representing a wide range of beliefs, from "COVID-19 is a hoax" denial to grave concern about the seriousness of the threat. (As a side note, we observed that the strongest predictor of beliefs about the magnitude of the COVID-19 threat is level of education, with more education associated with higher perceived threat, r = .185, p = .018 two-tailed.) What role might such beliefs play vis-à-vis reactions to sign communication?

Beliefs about COVID-19 threat levels are positively associated with feelings about the sign (r = .412, $p < .001$), evaluations of the sign (r = .218, $p < .005$), compliance (r = .407, $p < .001$), and shopping intentions (r_{now} = .451, $p < .001$; r_{future} = .424, $p < .001$). COVID-19 beliefs are not statistically associated with anxiety levels (r = .11, n.s.), nor does exposure to mortality cues have any effect on such beliefs (r = .023, n.s.). That is, those who take the threat more seriously do not feel more worried; rather, they are simply more likely to engage in threat reduction behaviors such as increased hand washing (r = .418, $p < .001$), owning a face mask (r = .427, $p < .001$), and using a mask in public (as indicated

by disagreement with the statement "typically I don't wear a face mask when I go out in public" ($r = -.587$, $p < .001$). Moreover, COVID-19 beliefs appear to operate via serial mediation in a path similar to the framing reported above, with beliefs influencing compliance with downstream effects on shopping intentions.

Motivations for compliance

Although our conceptual model proposes that compliance intentions are driven by sign evaluations, we measured and assessed additional antecedents of compliance, including self-oriented and others-oriented motives. "To protect the health of other shoppers" appears to be an important motive for compliance with the face mask sign ($r = .561$, $p < .001$), as is "To be a good citizen" ($r = .499$, $p < .001$). "To reduce the threat to my own health" is also a significant reason for compliance ($r = .371$, $p < .001$), albeit smaller in magnitude. "To gain admission to the store to accomplish my shopping" appears to influence compliance contingently, depending upon beliefs about the magnitude of the threat posed by COVID-19. To examine this contingency, we ran an analysis via PROCESS macro model 1 (Hayes 2018). Results indicate direct effects of both the "gain admission" motive (14.2035, $p = .0009$) and beliefs about the level of threat posed by COVID-19 (20.8641, $p < .0001$) on compliance intentions, and a significant interactive effect (-2.5568, $p = .0014$, CI: -4.1117, -1.0019). There is a positive effect of this motive on compliance among individuals that believe the threat of COVID-19 is low (3.9762, $p = .0052$, CI: 1.2031, 6.7494), and a non-significant, negative effect among individuals that believe the threat of COVID-19 is high (-2.4158, $p = .1153$).

Discussion

Evidence from this study provides further support for our conceptual model in yet another context - that of a store face mask policy. Verbal and visual cues that raise mortality salience above control group levels appear to raise anxiety, which are generalized as negative affect attributed to the sign. Affect colors evaluations of the sign, which drive compliance intentions with the advocacy of the sign message. Extending the conceptual model to consider downstream consequences of compliance intentions, it appears that such intentions influence present and future shopping intentions.

Regarding framing a desired behavior as a request vs. a demand, it appears that a polite request does not take the sting out of mortality cues. Nor does it engender positive feelings that one might expect under general circumstances. Politesse should engender liking. However, we note that study participants did not have an opportunity to compare request/demand messages side-by-side in our between-subjects design. Hence the "demand" condition did not suffer from contrast with the polite request. Whereas the purpose of the sign's message was to reduce a public health threat, compliance intentions were relatively high across framing conditions, but compliance intentions were more positive when the store policy was presented as a requirement. We attribute this to heuristic reasoning triggered by context: a brief exposure that does not permit much critical evaluation, and a threatening situation. Under such circumstance, the mindless tendency is simply to "obey authority" as a self-preservation reflex (Cialdini 2001).

Not surprisingly, given that the signs in this study conveyed a message about a COVID-19 prevention measure, beliefs about the level of threat posed by COVID-19 are positively associated with feelings toward the sign, ensuing evaluations, and intentions to comply and shop. To generalize in the abstract, sign messages that are congruent with shoppers' previously formed beliefs should be received more positively. This suggests a strategy for improving sign communication effectiveness among target audiences with known beliefs.

Regarding motives for compliance that are extraneous to our model, both self-oriented and others-oriented motives appear to offer reasons for compliance. As a caveat, we note that direct questions about motivations are subject to social desirability bias, wherein people offer responses that are socially expected or make them look good in the eyes of others. Nevertheless, statistical evidence suggests that there may be reasons in addition to cognitive evaluations of a sign driving compliance with the sign's message. Moreover, beliefs about COVID-19 appear to be an important contingency underlying the operation of self-oriented, utilitarian

goals such as gaining admission to a store to accomplish a shopping task. To generalize in the abstract, if people do not believe the underlying basis of a sign message, they may nevertheless be coaxed into compliance through a different route.

GENERAL DISCUSSION

When human health is threatened, compliance with mitigation strategies is a tremendously important outcome of sign communication. It may seem hyperbolic to claim that "signs save lives," yet in the case of COVID-19 prevention signs, this may literally be true. Signs can play a vital role in encouraging behavioral changes. The present research demonstrates a process by which this occurs.

Starting with the end goal, compliance with the call for judicious hand washing, observing restricted store hours for the protection of vulnerable populations, social distancing, and wearing a face mask while shopping, our model and evidence suggest that how a sign is evaluated is a significant driver of behavioral intentions. When a sign is judged as communicating effectively, conveying the intended message clearly, is well-worded and easy to understand, and judged to be a "good" sign, such positive evaluations of the sign itself enhance the veridicality of the message and pave the way for compliance via cognitive consistency. If one likes a sign and judges it to be "good," rejecting its advocacy would be illogical and internally inconsistent; "good" signs should motivate compliance.

What influences the evaluation of signs? Much of the past research on this topic has focused on design features of signs that contribute to aesthetics and ease of processing (Kellaris and Machleit 2016). This research, however, looks at signs under unusual circumstances created by the COVID-19 pandemic. The importance of pleasing design features diminishes under a looming existential threat when viewers process information under the stress of mortality salience. The state of anxiety attendant to mortality salience has potential to induce negative feelings, which can color evaluations unfavorably and actually lower compliance with the very behaviors that can reduce the threat.

The good news, however, is that the reverse is also true. Messages featuring low levels of mortality salience may abate anxiety, allowing more positive affect to blossom, with beneficial consequences on sign evaluation. The challenge, of course, is how can one craft a message that takes the sting out of mortality salience when the implicit message is "you/others could die if you don't adopt these behaviors"? Rhyming a message might abate the negative connotation associated with this idea; however, our findings show that is simply not true. Rhymed and non-rhyming versions of the social distancing signs are evaluated similarly (89 vs. 88, $p = .437$) and produce identical compliance intentions ($p = .788$). The role of rhyming is more subtle: rhymed messages appear to facilitate the transfer of affect to evaluations, without inflating positive affect ($p = .365$). Framing messages as requests vs. demands can also shape desirable outcomes,

depending upon circumstances. The natural tendency is to craft a "polite" message, but we found people respond more favorably to a direct demand; "do this" or "you must" seems off-putting at first glance, yet may be a more effective framing when dealing with a threatening situation.

Implications for practice

Findings from four studies offer evidence-based guidelines for effective communication under exceptional circumstances, which may extend beyond the present pandemic to other threatening situations, including natural disasters, national emergencies, or warning signs. The primary lesson in this work is that people process information differently when mortality salience, anxiety, and negative feelings intervene. Ironically, the very information that can help reduce a threat may be disregarded, poorly evaluated, or not complied with depending upon how it is presented. Directly highlighting a threat, for example, may be counter-productive. This is roughly analogous to the failure of fear appeals when the level of fear is too high (Leventhal 1971). Mortality salience is not a fear appeal, but rather a psychological mindset of heightened awareness of one's mortality, an uncomfortable and often anxiety-producing thought. Indeed, recent news reports demonstrate that some are so strongly motivated to avoid the uncomfortable truth—their mortality— that they harness denial as a coping mechanism (Wolf 2020).

To communicate effectively under conditions that raise mortality salience, sign creators must consider the viewer's state of mind, how messages are likely to be processed, and strive to convey a message in a way that sparks positive evaluations of the sign. Our evidence suggests that positive sign evaluations are requisite— an essential antecedent— to compliance with a sign's message. It is a large leap from exposure to a message to compliance with that message. This research begins to unravel what happens in between and suggests that shaping feelings and thoughts to engender positive evaluations of signs is the surest route to gain compliance.

How then can creators of signs in the public and private sectors influence behavioral intentions of citizens / consumers? The present work reminds us that responses are sensitive to how a message is framed, for example as "do this" (Studies 1, 3) or "don't do that" (Study 2), or as a request vs. a demand (Study 4). Desired outcomes can also be influenced at any stage of our process model. The anxiety component can be shaped by avoiding mortality cues and by using anxiety reduction messages, which may be as simple as "take a deep breath." The affective component can be influenced directly by use of visual cues that foster positive affect, such as use of vivid colors or foreground/background combinations that promote fluency (Kellaris and Machleit 2016). The evaluation component can be addressed directly by pre-testing alternative sign messages and designs, and by suggesting evaluative criteria. For example, a sign that includes the question "Is the message clear?" suggests that clarity should be the criterion for judging the sign rather than, say, attractiveness. Further, it seems unlikely that signs can influence behavioral change directly (e.g., shop here! or buy this!). Understanding the sequence of events that precedes and determines behavioral change gives sign communicators numerous strategies to foster desired results.

Implications for research

There are some features of our research that may limit the general applicability of the findings, including the particulars of our online samples, stimuli, and the viewing context. Our evidence comes from simulation experiments, in which a small number of participants were asked to imagine seeing a sign prominently displayed in a public space. This was an exercise in imagination, of course, because what participants saw was an image of a sign displayed on their computer screen, not a sign they happened upon in a public space, among numerous distractions, where passive, voluntary exposure to the sign might happen. For this reason, we recommend field studies or additional lab studies that use an incidental exposure protocol.

The present research also identifies a mediational path— a sequence of mental events— by which mortality salience exerted an indirect influence on compliance intentions. Whereas our model shows a general case, there are likely contingencies— conditions within which these processes work. Identification of such

boundary conditions (moderator variables) would be an important next step in refining our conceptual model. Might individuals differ with respect to their proneness to mortality salience? As we think about people in our circle of acquaintances, we can probably identify individuals who might react differently to mortality salience sparked by a sign. The present research begins to paint a picture of how mortality salience works in sign communication. It remains to discover when, where, and with whom it works - all exciting possibilities for the advancement of sign communication research.

CONCLUSION

Use of mortality cues seems natural, perhaps unavoidable, in communication designed to address the threat of a pandemic, or other threatening, emergency situations. The present findings, however, suggest that raising mortality salience does not serve the cause of compliance with sign messages. Rather than triggering compliance as a coping mechanism for dealing with the threat of COVID-19, raising mortality salience appears to give rise to negative feelings that color evaluations and subsequent compliance.

Findings suggest that the communication effectiveness of signs may be enhanced by the use of rhyming messages (Study 3), which have a positive effect on affective evaluations and may be more memorable, and by framing desired behaviors as a demand (Study 4). Whereas requests may be perceived as polite, demands carry the weight of authority, which may trigger automatic compliance in the face of a perceived threat (Cialdini 2001).
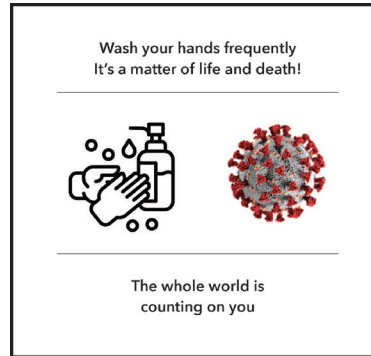
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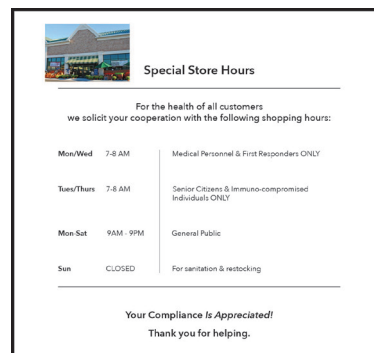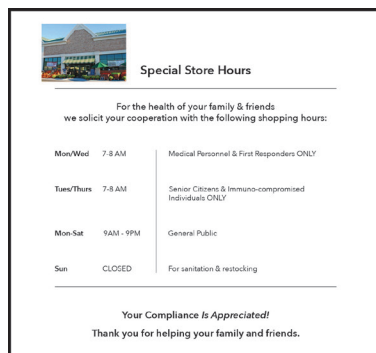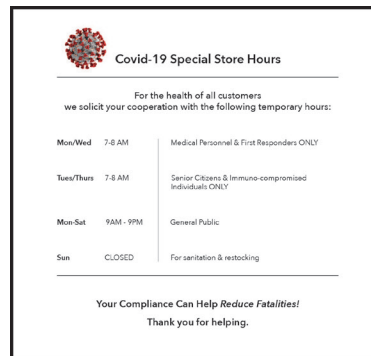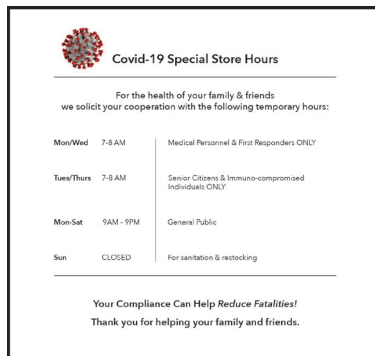
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APPENDICES

Appendix 1 / Signs Used in Study 1

Wash your hands frequently
It's a matter of life and death!

Your family and friends are
counting on you

Wash your hands frequently
It's a matter of life and death!

The whole world is
counting on you

Wash your hands frequently

Your family and friends are
counting on you

Wash your hands frequently

The whole world is
counting on you

Appendix 2 / Signs Used in Study 2

Covid-19 Special Store Hours

For the health of your family & friends
we solicit your cooperation with the following temporary hours:

Mon/Wed	7-8 AM	Medical Personnel & First Responders ONLY
Tues/Thurs	7-8 AM	Senior Citizens & Immuno-compromised Individuals ONLY
Mon-Sat	9AM - 9PM	General Public
Sun	CLOSED	For sanitation & restocking

Your Compliance Can Help *Reduce Fatalities!*
Thank you for helping your family and friends.

Covid-19 Special Store Hours

For the health of all customers
we solicit your cooperation with the following temporary hours:

Mon/Wed	7-8 AM	Medical Personnel & First Responders ONLY
Tues/Thurs	7-8 AM	Senior Citizens & Immuno-compromised Individuals ONLY
Mon-Sat	9AM - 9PM	General Public
Sun	CLOSED	For sanitation & restocking

Your Compliance Can Help *Reduce Fatalities!*
Thank you for helping.

Special Store Hours

For the health of your family & friends
we solicit your cooperation with the following shopping hours:

Mon/Wed	7-8 AM	Medical Personnel & First Responders ONLY
Tues/Thurs	7-8 AM	Senior Citizens & Immuno-compromised Individuals ONLY
Mon-Sat	9AM - 9PM	General Public
Sun	CLOSED	For sanitation & restocking

Your Compliance *Is Appreciated!*
Thank you for helping your family and friends.

Special Store Hours

For the health of all customers
we solicit your cooperation with the following shopping hours:

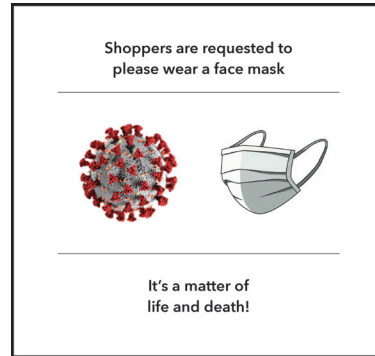| Mon/Wed | 7-8 AM | Medical Personnel & First Responders ONLY |
Tues/Thurs	7-8 AM	Senior Citizens & Immuno-compromised Individuals ONLY
Mon-Sat	9AM - 9PM	General Public
Sun	CLOSED	For sanitation & restocking

Your Compliance *Is Appreciated!*
Thank you for helping.

APPENDICES

Appendix 3 / Signs Used in Study 3

APPENDICES

Appendix 4 / Signs Used in Study 4

Shoppers <u>must</u> wear a face mask
to enter store

It's a matter of
life and death!

Shoppers are requested to
please wear a face mask

It's a matter of
life and death!

Shoppers <u>must</u> wear a face mask
to enter store

We appreciate
your business!

Shoppers are requested to
please wear a face mask

We appreciate
your business!

Control Condition

We accept cash and all major
credit/debit cards

We appreciate
your business!