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Prospect Theory in Times of a Pandemic: The Effects of Gain versus Loss Framing on Risky Choices and Emotional Responses during the 2020 Coronavirus Outbreak – Evidence from the US and the Netherlands

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ABSTRACT

During the 2020 coronavirus pandemic, governments across the globe relied heavily on the legacy media, not only to inform citizens about fast-paced developments in the midst of a crisis, but also to stimulate compliance with strict interventions. Prospect theory postulates that gain versus loss framing may affect preferences for different interventions. In a conceptual replication of Tversky and Kahneman's seminal prospect theory, findings from surveys in the US and the Netherlands (N = 1,121) demonstrate that gain frames of the coronavirus promote support for risk-aversive interventions, whereas loss frames result in relatively more support for risk-seeking alternatives. Loss frames elicit stronger negative emotions, such as frustration and powerlessness. The experience of powerlessness, in turn, mediates the effects of loss versus gain frames on support for stricter interventions. Together, these findings indicate that framing the pandemic in terms of gains may be most effective in promoting support for risk-aversive treatments of the pandemic.

During the outbreak of the new coronavirus in 2020, global media coverage mostly focused on the loss of lives and the uncontrolled spread of the virus. Such a negativity bias may have implications for risk-seeking behavior. In their seminal work on prospect theory, Kahneman and Tversky (1979) demonstrate that people's preferences for risk-seeking versus risk-aversive options can be

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influenced by exposing them to logically equivalent information framed in terms of gains versus losses. More specifically, people have a tendency to prefer risk-aversive options when they are confronted with gains, and prefer risky choices when logically equivalent information emphasizes losses. A large-scale 19-country replication of prospect theory and risky-choice framing found convincing support for prospect theory across contexts (Ruggeri et al., 2020). In this paper, we aim to replicate the findings in the setting of the global coronavirus outbreak in 2020. By asking people about their preferences for hypothetical interventions to prevent the spread of the virus within the time-frame of this actual crisis, we aim to test the effectiveness of gain versus loss framing in a setting where the equivalent information presented resonates strongly with reality.

The outbreak of the coronavirus in 2020 sparked heated debates on the global treatment of the issue, and the measures taken by different governments have been received with mixed support (Van Bavel et al., 2020). Many countries enforced strict rules and restrictions on public life: universities and schools were closed, people were ordered to avoid crowds and social interactions, and many countries enforced a lockdown on public life. In times of this global crisis, it is important to investigate the role of communication on people's support for different measures and policies: Are people more likely to support strict interventions when certain aspects of the pandemic's consequences are made more salient?

Literature on media dependency theory demonstrates that people rely more on media coverage in times of crisis (e.g., Boukes et al., 2019). People may thus be susceptible to the specific ways in which the coronavirus is framed by the media at times when the crisis surrounding the outbreak is novel and rapidly developing. Importantly, media dependency has been found to positively predict compliance with pro-social behavior (Ho et al., 2015). In this paper, we specifically focus on the role of equivalency framing in communicating policy alternatives in times of crisis.

The most well-known application of equivalency framing is prospect theory, or gain versus loss framing (e.g., Tversky & Kahneman, 1981). Prospect theory postulates that presenting the same information in a way that focuses on gains results in a stronger preference for risk-avoidance policies, whereas the emphasis on losses results in preferences for riskier policies. Tversky and Kahneman tested prospect theory by referring to a potentially lethal Asian disease. In the conceptual replication presented in this paper, we aim to assess whether the same effects of logically equivalent gain and loss-framed information on policy preferences can be identified when the threat is not hypothetical, but part of a global crisis situation. In addition, we explore the role of discrete emotions in promoting policy preferences and compare two highly distinct national settings in which the outbreak has had different ramifications for policy making: the

US and the Netherlands. Finally, we assess to what extent the effects of gain versus loss frames are different when the threat is perceived as more personally relevant: Are people more susceptible to framing effects when they feel likely to suffer consequences of the pandemic?

This paper aims to offer unique insights into the effects of gain versus loss framing in a natural experimental setting. In times of crisis, information is oftentimes conflicting, fast-paced, and surrounded by inconsistencies and confusion. Yet, the demand for information is high. In such a communicative setting, it is important to assess how the different presentation of the same information may result in different levels of compliance with interventions proposed by the authorities.

Equivalency framing and prospect theory

There are different approaches and conceptualizations of framing. For this reason, it is important to explicate how framing is conceptualized in this study (e.g., Cacciatore et al., 2016). Frames can be understood as patterns of interpretation that give meaning to issues and events. Frames emphasize some aspects of reality, whereas other aspects are made less salient (e.g., De Vreese, 2005; Entman, 1993; Gamson & Modigliani, 1989; Scheufele, 1999). On the most general level, we can distinguish equivalency and emphasis framing (e.g., De Vreese, 2005). Emphasis frames do not present equivalent information, but emphasize different aspects of reality by focusing on different problem definitions, causal interpretations, moral evaluations, and/or treatment recommendations (Entman, 1993). Equivalency frames, in contrast, organize or present events and situations differently, but rely on logically equivalent information (De Vreese, 2005; Druckman, 2001). This paper focuses on such equivalency frames: We aim to investigate how different emphasis on logically equivalent information on the spread of the 2020 coronavirus can affect people's policy preferences and emotional states.

We specifically look at gain versus loss framing – a particular application of equivalency framing (Druckman, 2001; Levin et al., 1998; Tversky & Kahneman, 1981). Gain versus loss framing theory holds that encoding framed information as positive or negative determines people's preferences for risky choices (e.g., Levin et al., 1998). Risky choice framing implies that alternative frames describing options with different risk levels affect people's preferences for risk-seeking versus risk-aversive options. Prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981) specifically postulates that framing issues in terms of gains motivates people to avoid risks and protect the status quo (risk-aversive). However, when people are framed with dooming losses, they have the motivation to take a risk in order to prevent the worst-case scenario. People's preferences for

risk-seeking options should be motivated by the emphasis on losses, whereas risk-aversive preferences should be influenced by framing issues in terms of gains.

Although prospect theory and the consequences of risky choice framing on risk-seeking have been tested in numerous studies on economic, environmental, and health issues, and replicated across different national settings (e.g., Ruggeri et al., 2020), to the best of our knowledge, there has been little to no evidence on prospect theory in the real-life setting of a global health crisis. Hence, it can be argued that gain versus loss framing has different effects when people are asked to "imagine" a crisis situation compared to when this crisis is actually occurring. Against this backdrop, we aim to replicate findings on prospect theory in the midst of the global outbreak of the coronavirus in 2020. In line with the premises of prospect theory, we hypothesize that: Framing the coronavirus in terms of gains promotes support for risk-aversive treatments (H1a), whereas framing the coronavirus in terms of losses promotes relatively more support for risk-seeking treatments (H1b).

The effect of gain versus lost framing on policy preferences

In line with Tversky and Kahneman's (1981) findings, and replications of prospect theory (see, e.g., Ruggeri et al., 2020), it can be expected that framing the corona outbreak in terms of gains may motivate people to prefer risk-aversive or preventative policies, whereas the emphasis on losses should result in the preference for risk-seeking options. Beyond giving people the option to indicate their preference among two alternative programs, we aim to assess the extent to which exposure to either a gain- or loss-framed scenario affects people's support for strict interventions to fight the pandemic. Here, it should be noted that we deviate from the classical approach to prospect theory. Specifically, in the second part of this study, we assess how the emphasis on negative aspects of hypothetical treatments' consequences (losses in terms of casualties) versus positive aspects (the amount of people that can be saved) makes people more or less likely to support strict interventions used to combat the new coronavirus.

In the field of health communication, gain and loss framing studies mostly shifted from a focus on risk as uncertainty to risk as severity (e.g., Rothman & Salovey, 1997). In this setting, gain and loss frames typically describe the undesirable or desirable consequences of certain behaviors, such as applying sunscreen to prevent cancer. Preventative behaviors (i.e., using sunscreen or exercising) are seen as involving low risk because their consequences – mostly framed as not getting ill – are desirable. Detection behaviors, in contrast, are seen as risky as their consequences are negative and undesirable (i.e., finding out that a person is ill).

Although it has been argued that gain frames should promote relatively more support for prevention behaviors than loss frames (Rothman & Salovey, 1997), numerous meta-analyses demonstrate that prospect theory is not consistently replicated in the health context (O'Keefe & Jensen, 2007; O'Keefe & Nan, 2012). Arguably, this may be the consequence of a different operationalization of the independent and dependent variable (Harrington & Kerr, 2017), theoretical flaws (O'Keefe & Jensen, 2007; Van 'T Riet et al., 2016) or a too strong deviation from the underpinnings of prospect theory (O'Keefe & Jensen, 2007). Hence, deviating from risky-choice framing, many studies in health communication frame risk as the severity of outcomes and look at preferences for prevention or detection behaviors. As yet another critique, engagement in detection (prevention) behaviors does not take the relative uncertainty of engaging versus not-engaging in preventative behavior into account (Van 'T Riet et al., 2016).

In this study, we aim to stay closer to the classical operationalization of risky choice framing. However, it should be acknowledged that the second dependent variable, preference for strict interventions to combat the coronavirus, does not automatically involve low risk. Although it could be argued that stricter interventions are more risk-aversive in terms of casualties, at the time of data collection, all treatments were surrounded with high uncertainty. In addition, risk-aversive treatments for the health domain could imply risk-seeking consequences for the economy. However, we suggest that when consequences are framed in terms of casualties, stricter interventions that promote distancing to avoid contamination involve lower risk than not supporting these interventions. Hence, at the time of data collection, most information emphasized the risk of not taking action (and uncertainty with regard to casualties), whereas complying with interventions was seen as involving low risk.

Some studies found that gain frames are more effective under conditions in which the elimination of risk is the desired outcome (e.g., Dijkstra et al., 2011) – which corresponds to the strict preventions to fight the pandemic proposed by governments throughout the globe (Van Bavel et al., 2020). It is, however, unclear how the effects of gain versus loss frames translate to the setting of the 2020 pandemic. At the first stage of the outbreak, all outcomes were uncertain and stakes were high. Yet, there seemed to be consensus that the strict interventions announced were effective in preventing the virus from spreading. Indeed, statistics supported declining numbers of casualties when strict interventions were in place. Preferences for preventative measures to slow down the virus may be regarded as the most certain and risk-aversive treatment in times of crisis. Against this backdrop, we propose the following hypothesis: Gain frames are more effective in triggering support for stricter interventions to stop the spread of the coronavirus than loss frames (H2).

The effects of gain versus loss framing on emotions

In the midst of a pandemic, people's responses may be informed by negative emotions, such as fear and anxiety (e.g., Mobbs et al., 2015; Van Bavel et al., 2020). Applied to the effects of gain and loss frames in the context of a severe global crisis surrounded by threats and insecurity, people's support for different policies and treatments of the crisis may be informed by the emotional evaluation of the crisis situation. We specifically rely on emotional framing effects literature (e.g., Druckman & McDermott, 2008; Gross & D'Ambrosio, 2004), which uses appraisal theory to understand how different frames elicit different emotional states by triggering different cognitive evaluations of events. Here, we also deviate from classical prospect theory approaches by assessing how framing the pandemic in terms of gains (people that recover) versus losses (people that do not survive) can affect the emotional states of receivers.

Emotional framing literature suggests that gain and loss frames may present equivalent information, but arguably present alternative lines of reasoning that strongly diverge in valance. Hence, they may promote different appraisals that may correspond to different emotional states (Druckman & McDermott, 2008). Gain focuses on hope, positive outcomes, improvement, and the potential alleviation of the crisis. Loss, in contrast, emphasizes a negative future situation in which the crisis will intensify. Appraisal theory postulates that the experience of emotional states – such as hope, fear, or anger – can be seen as the outcome of people's cognitive evaluations of events or phenomena (e.g., Gross & D'Ambrosio, 2004; Lazarus, 1991). Events or phenomena, such as the outbreak of the coronavirus, elicit discrete emotions that are in line with an individual's evaluation of that event or phenomenon (e.g., Gross & D'Ambrosio, 2004). In other words, specific events, issues, or situations by themselves do not trigger emotions, but the specific interpretation or framing of these issues and situation elicit emotional responses.

In appraisal theory, discrete emotions are associated with specific appraisal patterns, which can be understood as the subjective interpretation or evaluation that corresponds with specific emotional states such as anger or fear (Lerner & Keltner, 2001; Nabi, 2003). Fear has, for example, been associated with uncertainty and uncontrollability, whereas anger corresponds to more controllability, certainty, and the reliance on existing evaluations (e.g., Lerner & Keltner, 2001). Roseman (1991) offers a more elaborate overview of the different appraisal patterns that can be associated with a wide range of positive and negative discrete emotions. In an uncertain situation (such as the outbreak of the coronavirus), the presence of punishment and absence of reward may cause frustration or fear. Yet, the absence of punishment and the presence of a reward can cause hope. When

outcomes are more certain, dooming losses (the absence of rewards or punishment) may cause anger.

Applied to gain versus loss frames of the coronavirus, we specifically focus on six discrete emotional responses that correspond with the different patterns of interpretation caused by logically equivalent frames. Building on Roseman's (1991) framework, we believe that gain frames should cause more hope than loss frames. Specifically, in uncertain times of crisis, gain frames highlight the potential absence of punishment, and the presence of rewards (people will be saved). Loss frames, in turn, should cause the experience of negative emotional states: anger, fear, frustration, and powerlessness. Hence, these emotions correspond with the negative prospect of punishment/losses and the (un)certainty that many people cannot be saved and will die. Together, we formulate the following hypotheses on the emotional responses caused by gain versus loss framing of the corona crisis: Gain frames should elicit more hope than loss frames (H3a); Loss frames should elicit more anger (H3b); frustration (H3c); fear (H3d), pity (H3e) and powerlessness (H3f) than gain frames.

It has been argued that people rely on their emotional state to assess risks and motivate behavior (Loewenstein et al., 2001; Van Bavel et al., 2020). Specifically, applied to the outbreak of the coronavirus, Van Bavel et al. (2020) argue that negative emotions may promote the approach of more negative information, and promote behaviors that are both desirable in the context of the spread of the virus (i.e., social distancing, washing hands) and less desirable for society (i.e., hoarding). They argue that the media have disproportionally focused on negative aspects of the pandemic (people who die) and less on a positive outlook (people who recover), and that these negative frames are more effective in promoting action and negative emotions than positive framing (also see Peters et al., 2006).

Emotions have been regarded as important mediators of framing effects (Lecheler et al., 2013). Exposure to news frames is argued to cause emotional responses, which motivate behaviors and attitudes subsequently (Lecheler et al., 2013). Especially when looking at support for stricter policy measures in response to gain versus loss framing of the coronavirus, it can be argued that people's emotions drive their support for strong preventative measures (Van Bavel et al., 2020). In line with the premises of appraisal theory, emotions are experienced because people evaluate situations and events cognitively (e.g., Roseman, 1991). These emotional states, in turn, may motivate support for policy preferences.

Extrapolated to the framing of the 2020 corona crisis, we expect that loss frames have an effect on preferences for policy preferences via discrete emotional responses that correspond to uncertainty and a lack of control. More specifically, the appraisal patterns associated with fear, powerlessness, and pity in particular relate to a lack of control as well as less reliance on

existing attitudes and motivated search for novel information (Roseman, 1991). We therefore postulate the following hypotheses on the mediating role of emotions in promoting policy support in response to loss versus gain frames: Loss frames promote support for stricter interventions to combat the coronavirus via the activation of the negative emotions fear (H4a), pity (H4b), and powerlessness (H4c).

The role of perceived relevance of the coronavirus threat

It may be argued that the effects of gain and loss frames are conditional on the perceived susceptibility to the threat of the coronavirus. Messages emphasizing threats may be more influential when they resonate with people's perception of losing out because of the coronavirus, and messages emphasizing gains may be more persuasive when people actually have hope that the threat can be averted. In line with this, as argued by Mahoney et al. (2011), there may be individual differences that predict the susceptibility to the effects of gain versus loss frames.

In the context of the highly salient global issue of the coronavirus at the time of data collection, we in particular focus on individual-level differences in the perceived vulnerability to the consequences of the virus. It may be argued that when people care more about an issue and its potential implications for them personally, attitudes are more easily accessible than when an issue is less relevant (Krosnick, 1989). In line with this, people have the tendency to accumulate more information on issues they care about most compared to less personally relevant issues (e.g., Krosnick, 1989). Applied to framing effects, the role of issue importance can be interpreted in different ways. Lecheler et al. (2009) find that low-importance issues yield stronger framing effect than high-importance issues. They explain this effect as a consequence of the more accessible and fixed attitudes people have for issues they care most about. These perceptions are thus more resistant to framing effects compared to issues that are lower on people's personal agendas – and for which people did not yet develop strong opinions.For the specific case of the coronavirus, we expect a reverse effect of perceived vulnerability. The pandemic is an issue high on the media and political agenda all across the globe, and citizens across the globe are constantly exposed to information on the developments on the "corona crisis." As predicted by media dependency theory, media coverage has a stronger effect on people in new situations that people have less knowledge about (Ball-Rokeach & DeFleur, 1976). As the coronavirus was novel and uncertain at the time of data collection, and as new developments related to the crisis followed each other at an extremely fast pace, it is not likely that people had already formed strong opinions on the coronavirus. Hence, people's evaluations, behaviors, and opinions in times of an

emerging crisis are likely to be strongly dependent on the information they receive from the media (Boukes et al., 2019).

In this setting, it can be argued that the more people perceive they are personally susceptible to the virus, the more likely they depend on new information to form attitudes and behaviors to avert the threat. In other words, we expect gain and loss frames to have the strongest effects on policy preferences among people who perceive that they are vulnerable to the threats of the coronavirus framed in the message. Likewise, emotional states are more likely to be triggered as a consequence of framing when people perceive they are more vulnerable to the threat. Hence, when they feel that they are susceptible to the consequences of the virus, their emotional states are more likely to be affected by gain and loss frames that emphasize the potential number of casualties or survivors. When people feel more vulnerable, the issue of the coronavirus becomes more personally relevant, which should make emotional appraisals more easily accessible (Krosnick, 1989). Against this backdrop, we formulate the following hypotheses: Loss frames have a stronger effect on policy preferences among participants that feel susceptible to threats associated with the coronavirus (H5a). Likewise, we effect that emotions in response to gain and loss frames are more pronounced among participants that perceive to be vulnerable to the threat (H5b).

Case description

In this paper, we assess the effects of gain versus loss framing of the coronavirus in two different national settings: the United States and the Netherlands. These two cases were selected to investigate whether framing effects differ in strength across settings facing different consequences of the coronavirus outbreak, different policy actions to avert the crisis, and different distances to the epicenter of the outbreak (Europe was in the epicenter at the time of data collection, and the United States banned all travel from Europe as they were not facing severe consequences of the virus at that stage). We do not specifically focus on national-level differences, but rather ask to what extent gain and loss frames have similar effects across settings that differ in the national-level salience of the crisis.

Method

To test our hypotheses, we rely on a survey study with a between-subjects experiment component among a diverse sample of participants in the United States and the Netherlands. We exposed people to either a gain-framed message about the coronavirus outbreak or a loss-framed message about the outbreak.

Sample

Participants were recruited from mixed-resources panels of Dynata (N = 1,121). All surveys were computer-assisted; in the United States and the Netherlands, participants entered the digital survey via an online invitation with a link to the study. As developments surrounding the virus moved at an extremely fast pace during data collection (March 16, 2020), we made sure that all valid completed responses were collected within 24 hours. The sample includes 50.9% female participants (49.9% male, 0.2% other). 20.1% was lower educated, 42.7% finished a moderate level of education, and 37.2% was higher educated. The average age was 42.46 (SD = 13.82). In the US, the sample included 38.5% Democrats and 35.3% Republicans (26.2% Independent). These proportions were reflected in the ideological self-placement of Dutch participants. Although this national setting does not allow us to categorize people into bi-partisan preferences, we see that 36.6% is more left-wing oriented, and 38.2% right-wing oriented (25.2% undecided/in between).

Independent variables

We followed the classical prospect framing approach (e.g., Tversky & Kahneman, 1979) and randomly exposed participants to a gain-framed versus a loss-framed message and asked their preference for equivalent risk-seeking and risk-aversive programs. The classical "Asian disease" message was adapted to fit the context of the outbreak of the coronavirus pandemic. We did not mislead participants, and clearly noted that we would like to present them with a hypothetical example of different ways to deal with the crisis.

As developments surrounding the coronavirus developed in a rapid pace at the time of data collection, we did not use actual numbers or statistics on the crisis, but presented participants with a hypothetical situation in which different treatment programs could be selected. Tversky and Kahneman used a smaller survival rate (i.e., 1/3 are saved). This is, however, not a credible scenario for the fatality rate of the new coronavirus. For this reason, a more realistic number of 35% was chosen. Although this was still a high number, it was close to some early estimates that circulated at the time of data collection (which were later corrected to lower numbers). Hence, it would not be realistic to tell participants that more people will die from than survive the virus. There were some other differences between the original stimuli and our scenarios: We talked about deaths of contaminated (and not all) people, emphasized that the situation was hypothetical (for ethical reasons), and used the less certain term "can" instead of "will." These changes were made to make the stimuli reflect news coverage and actual (official) information on the new coronavirus more closely. Among

other things, there was no treatment available at the time of data collection, so the term "can" was more suitable (even though the case was presented as hypothetical). The scenarios were judged as very credible by the participants (see below). It should be noted that, to some extent, all potential outcomes formulated in response to the pandemic were inherently uncertain in real life: At the time of data collection, expert knowledge on treatments was scarce, and it was not certain that the strict interventions proposed by governments would be 100% effective.

The wording of the gain-frame condition was as follows: "Recently, there have been a number of concerns about the treatment and spread of the coronavirus in the US/the Netherlands – and there are many different opinions and perspectives on how we should deal with it. What if, hypothetically speaking, there are two potential strategies to deal with the outbreak: Program A and program B. Program A has the consequence that 65% of all contaminated people can be saved. Program B has a 65% likelihood to save all contaminated people, and a 35% likelihood to save none of the contaminated people."

The loss-frame condition used equivalent statistics, but presented the treatments in terms of losses: "Recently, there have been a number of concerns about the treatment and spread of the coronavirus in the US/the Netherlands – and there are many different opinions and perspectives on how we should deal with it. What if, hypothetically speaking, there are two potential strategies to deal with the outbreak: Program A and program B. Program A has the consequence that 35% of all contaminated people will die. Program B has a 65% likelihood that none of the contaminated people will die, and a 35% likelihood that all of the contaminated people will die."

The conditions had equal group sizes: there were 276 participants in the U.S. loss frame, 277 in the U.S. gain frame, 279 in the Dutch loss frame, and 278 in the Dutch gain frame.

Measures

Right after exposure to the gain or loss frame, but in a separate screen that separated the treatments (stimuli) from risky-choice preferences (dependent variable), participants were asked to indicate their preference for program A or B ("Which program has your preference?"). A more elaborate battery of specific policy preferences was asked after this question, in which we specifically asked people to indicate they support and compliance for stricter measures that could be taken by the government to fight the outbreak of the coronavirus. The following three items, all measured on 7-point disagree-agree scales, were used: "It is important to lock down our country to prevent the spread of the virus further," "We need to take even more extreme measures to fight the coronavirus," and "I am afraid

that we don't do enough to prevent the virus from spreading." (M = 4.78, SD = 1.44, Cronbach's α = .79). These measures can be seen as indicators of people's support for more disruptive and strict interventions to prevent negative consequences of the outbreak. To measure the discrete emotions people experienced related to the coronavirus, we formulated the following question, which was asked after the stimulus and before measuring people's support for stricter governmental interventions: "And can you now indicate what emotions you experience when thinking about the impact of the coronavirus?" The following emotional states were asked with single-item measures on 7-point scales (1 = I do not feel this emotion at all, 7 = I experience this emotion very much): anger (M = 3.89, SD = 1.87), fear (M = 4.28, SD = 1.75), pity (M = 4.27, SD = 1.73), hope (M = 4.57, SD = 1.62), frustration (M = 4.61, SD = 1.73), and powerlessness (M = 4.89, SD = 1.70).

Perceived vulnerability was measured by asking people to indicate their agreement (7-point disagree-agree scales) with two statements about their perceived vulnerability/susceptibility to negative consequences of the coronavirus: "I am worried about the impact of the coronavirus on my health" and "I am worried about the impact of the coronavirus on my economic situation" (M = 5.52, SD = 1.37, Cronbach's α = .786).

Manipulation checks

After exposure to the stimuli, we asked participants to rate the credibility of the different gain and loss-framed messages, as well as to remember the statistics they were exposed to, and which program entailed which consequences. Both the gain and loss frame were perceived as relatively credible examples of information on the coronavirus outbreak (Gain: M = 4.87, SD = 1.51; Loss, M = 5.01, SD = 1.48). In addition, loss frames were significantly more likely to be perceived as emphasizing deaths and losing lives (86.6%) compared to gain frames (29.6%), which were more likely to be seen as focusing on saving lives (89.5%) than the loss frames (34.7%).

Results

The effect of gain and loss framing on policy preferences

We first of all hypothesized that loss framing would promote support for risk-seeking programs, and that gain frames promote support for risk-aversive programs (H1). Our data supports this expectation in both countries (see Table 1). Overall, people exposed to gain frames were more likely to endorse the risk-aversive Program A (83.2%) than risk-seeking Program B (16.8%). People exposed to loss frames were more likely to endorse risk-

Table 1. Effects of gain and loss framing on risk-seeking and risk-aversive policy preferences.

	Gain framed messages			Loss framed messages		
Framing coronavirus	US	NL	Total	US	NL	Total
Risk-aversive preference (A)	$80.9\%_a$	$85.6\%_a$	$83.2\%_a$	$47.8\%_a$	$41.9\%_a$	$44.9\%_a$
Risk-seeking preference (B)	$19.1\%_b$	$14.4\%_b$	$16.8\%_b$	$52.2\%_b$	$58.1\%_b$	$55.1\%_b$

Cell entries reflect percentages of participants that prefer program A or B within gain and loss framed conditions. Proportions with differing subscripts indicate significant differences ($p > 0.001$).

seeking Program B (55.1%) than Program A (44.9%). It should be noted that the differences in proportions are stronger for gain-framed than loss-framed messages. The findings are similar in the two different countries, although the effects are stronger in the Netherlands. We thus find support for H1a: framing the coronavirus in terms of saving lives (gains) enhances more support for a risk-aversive program. H1b is also supported; when emphasizing the potential losses of an intervention, people demonstrate a stronger preference for a risk-seeking treatment that has a good chance of saving all people at the risk of saving none. The results stay the same if we control for political orientation: Preferences for risk-aversive or risk-seeking treatments in response to gain and loss frames are similar across partisan or ideological cleavages across countries.

But what if we look at the effects of gain versus loss framing on preferences for strict (preventative) measures (goal-framing effects)? In Table 2, the effects of gain and loss framing on support for the specific (strict) policy measures that have been taken at the time of the coronavirus are summarized. We see that there is no significant effect of gain versus loss framing on support for stricter governmental interventions (b = .13, SE = .07, p = .065). Although the effect is in the expected direction – and close to significance – gain frames do not significantly yield more support

Table 2. Effects of gain and loss framing on preference for stricter interventions.

	Model I (n = 1,110)			Model II (n = 1,110)			Model III (n = 1,110)		
	b	SE	β	b	SE	β	b	SE	β
(Constant)	2.04	.16		1.97	.17		1.91	.23	
Country (Netherlands)	−.20	.10	−.07**	−.20	.08	−.07**	−.08	.11	−.03
Relevance of the threat	.52	.03	.50***	.52	.03	.50***	.52	.04	.50***
Gain framing (reference: loss)				.13	.07	.04†	.23	.32	.08
Gain framing × country (NL)							−.24	.15	−.07
Gain framing × relevance							.01	.06	.01
Adjusted R^2	.249			.251			.251		
F	185.11***			124.56***			75.27***		
F for change in R^2				2.83†			1.26		

†$p < 0.10$, $p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Two-tailed tests. Unstandardized (b) and standardized (β) regression weights. Analyses are checked for multicollinearity.

for preventative measures to fight the coronavirus than loss frames – which does not support H2.

The effects of gain and loss frames on discrete emotions

We hypothesized that exposure to a gain frame would elicit hope (H3a) whereas loss frames correspond to negative discrete emotions (H3b-f). The results are depicted in Table 3. First of all, the results indicate that exposure to a gain versus loss frame does not elicit different levels of hope (b = .11, SE = .10, p = .233), which does not support H3a. We do see a non-significant negative effect of gain versus loss frames on anger (b = .11, SE = .10, p = .069), which offers limited support for the direction of effects formalized under H3b. However, participants exposed to a loss framed message of the coronavirus experienced more frustration than participants exposed to a gain frame (b = .22, SE = .10, p = .027) – which supports H3c. However, as can be seen in Table 3, gain versus loss frames do not elicit different levels of fear (H3d) or pity (H3e). However, the results do offer support for H3f: loss frames result in higher levels of powerlessness than gain frames (b = .21, SE = .10, p = .042).

Taken together, we find only very limited support for the expectation that gain versus loss frames activate different emotional responses. Although gain frames do not promote more positive emotions than loss frames, we do see that the negative loss frame elicit more frustration, and powerlessness than gain frames. But to what extent do these emotional responses mediate the effects of gain versus loss framing on support for stricter governmental interventions?

We estimated mediation models using the R-package mediation (Hicks & Tingley, 2011), with robust standard errors and 1,000 simulations and Quasi-Bayesian Confidence Intervals. For fear, the ADE (Average Direct Effect) and ACME (Average Causal Mediation Effect) are not significant – indicating that fear does not mediate the effects of gain versus loss framing on support for stricter measures, which does not support H4a. The same results were found for pity (H4b). The results do indicate that the mediation model for powerlessness yield a significant ADE (b = 0.18, 95% CI [0.03, 0.34], p = .016) and ACME (b = −0.07, 95% CI [−0.13, 0.00], p = .038). We thus find support for a partial mediation effect of powerlessness: loss compared to gain frames yield higher levels of powerlessness, which, in turn, promote support for stricter interventions. This supports H4c.

In sum, when we do not take emotions into account, gain frames are more effective in promoting support for stricter interventions than loss frames. However, when we include the role of powerlessness, we see that loss compared to gain frames indirectly promote support for preventative

Table 3. Effects of gain and loss frames on discrete emotions.

	Fear		Anger		Pity		Hope		Frustration		Powerlessness	
Model I	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*	*β*	*b (SE)*	*β*
(Constant)	4.34 (.07)		3.99 (.08)		4.29 (.07)		4.52 (.07)		4.72 (.07)		5.00 (.07)	
Gain framing	−.12 (.11)	−.04	−.21 (.11)†	−.06	−.05 (.10)	−.01	.11 (.10)	.03	−.23 (.10)*	−.06	−.21 (.10)*	−.06
Adjusted R^2	.000		.002		.000		.000		.003		.003	
F	1.36		3.34†		.19		1.20		4.88*		4.16*	
Model II												
(Constant)	1.48 (.21)		2.88 (.24)		2.08 (.22)		3.00 (.21)		2.66 (.21)		1.96 (.20)	
Gain framing	−.11 (.10)	−.03	−.20 (.11) †	−.05	−.03 (.10)	−.01	.12 (.10)	.04	−.22 (.10)*	−.07	−.19 (.09)*	−.06
Country	−.19 (.10)†	−.05	−.65 (.11)***	−.17	.42 (.10)***	.12	.01 (.10)	.01	−.53 (.10)***	−.15	.20 (.09)*	.06
Perceived vulnerability	.53 (.04)***	.42	.26 (.04)***	.19	.36 (.04)***	.29	.27 (.04)***	.23	.42 (.04)***	.33	.53 (.03)***	.43
Adjusted R^2	.177		.068		.093		.052		.138		.188	
F	80.52***		27.97***		39.08***		21.37***		60.28***		86.78***	
Model III												
(Constant)	1.00 (.29)		2.64 (.34)		1.78 (.31)		2.89 (.29)		2.42 (.30)		1.32 (.28)	
Gain framing	.82 (.41)*	.23	.26 (.47)	.07	.55 (.43)	.16	.33 (.41)		.25 (.41)	.07	1.03 (.39)**	.30
Country	−.09 (.14)	−.03	−.60 (.15)***	−.16	.64 (.14)***	.19	.11 (.13)	.03	−.46 (.14)	−.13	.27 (.13)*	.08
Perceived vulnerability	.61 (.05)***	.48	.30 (.06)***	.22	.40 (.05)***	.32	.29 (.05)***	.24	.46 (.05)	.36	.64 (.05)***	.52
Gain framing × country (NL)	−.19 (.19)	−.05	−.10 (.22)	0.02	−.44 (.20)*	−.11	−.21 (.19)	−.06	−.13 (.19)	−.03	−.13 (.18)	−.03
Gain framing × vulnerability	−.15 (.07)*	−.25	−.07 (.08)	−.12	−.07 (.07)	−.11	−.02 (.07)	−.04	−.07 (.07)	−.12	−.21 (.07)**	−.36
Adjusted R^2	.180		.067		.096		.052		.138		.194	
F	49.58***		16.98***		24.69***		13.07***		36.44***		54.50***	

†$p < 0.10$, *$p < 0.05$; **$p < 0.01$; ***$p < 0.00$.
Two-tailed tests. Unstandardized (*b*) and standardized (β) regression weights. Analyses are checked for multicollinearity.

measures via the activation of powerlessness. These effects are similar across the different national settings. Overall, it should be stressed that we only find very limited support for the effects of gain versus loss framing on support for preventative measures.

The role of perceived relevance on the effects of gain versus loss frames

The results of Table 2 summarize the effects of gain versus loss frames for participants at different levels of perceived vulnerability. First of all, it can be seen that the more people perceive themselves to be vulnerable to the threat, the more likely they are to support stricter preventative measures (b = .52, SE = .03, p < .001) (Table 2, Model I). We also see that support for such measures is stronger in the US compared to the Netherlands. However, we do not find support for H5a: there is no significant interaction effect of perceived vulnerability and exposure to gain versus loss framing on policy support (b = .01, SE = .06, p = .970) (Table 2, Model III). In other words, individual-level differences in the perceived relevance of the threat posed by the coronavirus does not correspond to different effects of gain versus loss frames.

We do, however, see that perceived vulnerability significantly moderates the effects of gain versus loss frames on fear (b = .15, SE = .07, p = .031) and powerlessness (b = .21, SE = .07, p = .002) (Table 3, Model III). This means that the more people think they are vulnerable to the threat, the stronger the effects of loss versus gain frames on fear and powerlessness. Participants that acknowledge the coronavirus as a stronger threat are thus more likely to experience fear and powerlessness in response to loss versus gain frames. This only provides limited support for H5b: Perceived vulnerability moderates the effects of fear and powerlessness, but not for the other discrete emotions.

Discussion

This paper presents the findings of a conceptual replication of Tversky and Kahneman's (1979) prospect theory in the setting of a crucial stage of the coronavirus outbreak in two different settings: the US and the Netherlands. We specifically look at the effects of loss and gain frames on (1) preferences for risk-seeking versus risk-aversive interventions; (2) stricter interventions to fight the virus, and (3) discrete emotions. The main findings provide convincing support for prospect theory in the midst of a real crisis. Specifically, gain frames promote convincing support for risk-aversive treatments, whereas loss frames make people more supportive of risk-seeking alternatives. However, deviating from the

classical prospect theory approach and looking at the single-option dependent variable tapping support for stricter governmental interventions to combat the pandemic, our findings show that exposure to gain frames does not significantly yield more support for strict interventions than loss frames.

The findings of this study indicate that risk-seeking or risk-aversion, classically regarded as outcomes of prospect theory or gain and loss framing literature (Ruggeri et al., 2020; Tversky & Kahneman, 1981), are affected in a different way than preferences for desired versus undesired outcomes targeted in health communication. Our findings do replicate prospect theory in times of a pandemic, but we do not find consistent support for the effects of gain versus loss framing on support for specific policies that aim to prevent negative outcomes.

An important practical implication of these findings is that if governments want to motivate risk-aversion, they should rely on gain frames instead of loss frames (i.e., focusing on the amount of lives that can be saved if citizens incorporate the advice to integrate preventative behaviors in their daily routines). Yet, daily media coverage may impede this goal – as most legacy and alternative media coverage about the coronavirus contains a strong negativity bias that focuses on losses (Van Bavel et al., 2020). Even though preferences for interventions may not directly be affected, risk-aversion may be an important outcome in times of a pandemic. As people are highly dependent on the media in times of uncertainty (e.g., Boukes et al., 2019), small differences in the presentation of equivalent information on the consequences of the virus for survivors/deaths may have an impact on support for treatments that avert or seek risks.

As postulated in the appraisal theory of emotions, emotional responses may play a role in framing effects, and the way that people feel in response to frames may affect their subsequent cognitions and behaviors (e.g., Powell et al., 2015). Crisis communication, and information about pandemics in particular, may yield strong negative emotions (Van Bavel et al., 2020), which may be instrumental in promoting desired behaviors as well as less constructive actions (i.e., hoarding). Our findings illustrate that loss frames promote more negative emotions (fear and powerlessness) than gain frames. However, the emotional states elicited by these frames only motivated support for stricter interventions for powerlessness. This means that loss frames can promote compliance with strict governmental measures, but only when they elicit feelings of powerlessness among receivers. These feelings are reconciled by supporting strict interventions that may mitigate the threat. In line with appraisal theory (Lerner & Keltner, 2001; Nabi, 2003), the emphasis on negative consequences in the loss frame corresponded to higher levels of experienced fear and powerlessness. Yet, we find no significant effects of gain frames on emotional states.

In the different national settings of the US and the Netherlands, which were at different stages of the pandemic's curve as well as governmental schemes at times of data collection, gain frames that emphasize the number of lives that can be saved are more effective in promoting support for risk-aversive treatments. Overall, compliance with risk-aversive interventions may be most successful when governmental communication emphasizes the gains that can be achieved when performing pro-social behavior, while at the same time emphasize efficacy beliefs (i.e., performing this behavior can successfully secure the gains promoted).

Despite offering important insights of the implications of prospect theory for compliance in the midst of an actual pandemic, this study has a number of limitations. First of all, the experimental set-up did not include different factors that may have an impact on the effectiveness of gain and loss frames. For example, we only focused on gains and losses in terms of survivors and victims, whereas the actual debates surrounding the pandemic also involves more indirect losses for the economy and the disruption of social life (i.e., loneliness, job insecurity). Related, there is another issue regarding ecological validity. In real life, all potential treatments to impede the spread of the coronavirus may be uncertain. Hence, all proposed interventions – such as total social isolation – are not always feasible or effective. The issues presented to participants, including binary treatment options, may not reflect the complexity of real-life interventions. Follow-up studies may take the differential consequences and actual interventions of the crisis situation into account more explicitly. Second, as coronavirus-related information changed every hour during data collection, we refrained from using real numbers in the gain and loss scenarios – even though we emphasized that this was a potential scenario of the outbreak, it may be important for future research to relativize these findings with the actual number of victims, which may only be established in the aftermath of the outbreak. Related, although the experimental set-up aimed for internal validity whilst optimizing realism of the information offered, our findings are still collected in an artificial online experiment in which people make decisions about scenarios that they would normally not encounter in this way. In addition, the scenarios deviated from classical prospect theory to make them more realistic and fitting with media coverage at the time of data collection. It could be argued that these choices make the replication less clean – also considering that single words can make a difference in framing effect studies (Heritage et al., 2007).

Yet, the findings do replicate prospect theory and show that adjusting scenarios to the new threat still yield the same pattern of risk-seeking /aversive choices. Future research may assess the impact of making changes in the original formulation more carefully, but the findings and perceived credibility of scenarios indicate that the deviations are not

problematic. Finally, it may be argued that the second part of the experiment deviated substantially from prospect theory and risky-choice framing approaches. Beyond assessing choices, we aimed to explore to what extent gain and loss frames affect preferences for (stricter) interventions. However, this assessment was made after people indicated their choices, which could influence the assessment of the second dependent variable.

Despite these limitations, we do believe that these findings have important implications for understanding the effectiveness of using gain versus loss frames when aiming to promote support for preventative measures when stakes are high: During the 2020 outbreak of the coronavirus, governments and citizens throughout the globe relied heavily on the authorities' and media's information, not only to inform them about what was going on, but also to guide behaviors that would prevent negative outcomes. The findings of this study replicate prospect theory in the context of an actual health crisis. Emphasizing the potential gains of a treatment makes people more risk-aversive, whereas an emphasis on losses promotes more support for risk-seeking treatments. Practically, authorities communicating about the crisis may adapt their framing based on the desired outcomes: If they aim to make people risk-aversive, framing the pandemic in terms of gains may be the best strategy.

Notes on contributor

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