
Public Appeals and Collective Crisis Mitigation

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Abstract

Arrivals of crises often trigger public appeals by policy leaders, attempting to motivate crisis-mitigating behaviors. We run a controlled experiment among a general-population sample to investigate the impact of such appeals and of their tonality. Varying the language, an identical content of the appeal—a plea to contribute to mitigating a crisis—is formulated with either positive or negative wordings. Relative to the case with no appeal, both types of appeals successfully raise contributions, each by about 20 percent. A separate sample of policy-makers is presented with our design and asked to estimate the effect of the appeals. They correctly predict the effect of the positively worded appeal but fail to predict the effect of the negatively worded one.

1 Introduction

The prevention or mitigation of systemic crises—like climate change, pandemics or bank runs—often suffers from a collective action problem: humans have difficulties in working together or taking coordinated actions for the common benefit when costs are borne privately, creating an incentive to free ride. While government regulation or other types of formal agreements can incentivize or enforce collective action, creating incentives at a large scale can be difficult, especially when under time pressure—like during the onset of a crisis. Policymakers and other societal leaders therefore often resort to public appeals to motivate contributions to crisis mitigation. The question then arises how such

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appeals can be most effective in providing a sense of the situation' urgency (von Dawans et al., 2012, Filsinger and Freitag, 2021).

Our study asks whether the effectiveness of a public appeal changes with its *valence*, that is, whether the appeal has a positive or negative emotional impact. While the context and the meaning of crisis communication will be specific to a time and place, its valence is an important general attribute that can be studied when abstracting from a real-world crisis. To this end, we conduct a wide-sample experiment with a participant pool that is designed to be representative of the general US population (N=2,380). Following the psychological literature, we randomly vary the valence of the wording (positive versus negative) without affecting the statement. We measure whether public appeals can motivate individuals to engage in crisis mitigation and whether their effectiveness is related to the valence of the appeal. Our positive appeal emphasizes the collective benefits of collaboration and praises the contributions, while our negative appeal emphasizes the danger of the crisis and denounces freeriding.

Moreover, we ask whether policymakers are aware of the effectiveness of different types of public appeals. In an additional survey with a sample of experts (N=87)—members of German government departments—we summarize the wide-sample experiment and ask for predictions about the outcome. This allows an assessment of whether the conclusions from the experiment are already represented in the beliefs of those who implement policy communication.

We find that public appeals have a sizable and significant effect: they increase contributions by 20%, or by around 30% of a standard deviation. The effects of positive and negative appeals are of similar magnitude and statistically not different. We also study whether the effect of appeals varies by relevant characteristics of the recipients and find a very consistent pattern for all subgroups: public appeals significantly increase contributions but the valence does not have a significant effect. Finally, we show that policymakers underestimate the effectiveness of negative appeals. They expect that valence significantly matters, with a far weaker effect of negative appeals than positive appeals. These results have implications for the design of political communication strategies in times of crises: warnings and other negative wording may be surprisingly effective.

Much of the existing literature focuses on decentralized mechanisms for collective action, such as rewards and punishments (cf. for example Zelmer, 2003, for a metaanalysis). *Between-player* communication has also received a lot of attention, from early contributions such as Isaac and Walker (1988) to more recent ones such as Palfrey et al. (2017). We contribute to this literature by testing the effects of top-down *public* communication that advocates a prosocial behavior. While there is some field evidence for the effects of such public appeals, discussed

for example in Bénabou and Tirole (2011), the evidence from experimental economics is scarce.

In the psychological literature, the affect and tone of verbal statements have long been under scrutiny. Kashinsky and Wiener (1969) is an early example of a controlled experiment where, similar to our study, the content of all messages stays identical but only the tone varies. Leenaars et al. (1978), likewise, hold the informational content of the statements constant but vary the use of positive versus negative wording. Both studies find only small effects of the variation. There are, however, also studies that document differences between positive and negative communication, e.g., the higher effectiveness of positive messages in marketing, documented in Lee et al. (2018). Kronrod et al. (2022) examine circumstances where positive or negative wording may be relatively more successful, and give literature references for environments where each direction of positive/negative valence has been observed in successful communication. Our literature search has not yet recovered studies on the relative effectiveness of positive versus negative wording in crisis communication.

2 Empirical Strategy

We ran two studies, a representative large-sample experiment, which we describe in section 2.1, and a small-sample expert survey, which we describe in section 2.3. The other two subsections contain hypotheses and some details about the experimental procedures.

2.1 Experimental Study: Crisis Mitigation Game

The general setting that our participants face is a crisis mitigation game, which frames a one-shot linear public goods in terms of a crisis without changing the monetary incentives. In this setting, the public good is the mitigation of a crisis that destroys welfare. The linear public goods game is a standard setting in experimental economics to study behavior in a collective action problem. Participants maximize their individual payoff if they contribute nothing to crisis mitigation, while a group payoff is maximized if everyone contributes everything. Our game has the following characteristics.

- *Crisis framing.* We frame the public goods game in terms of loss for all players, which in the experimental instructions we call a crisis. Each participant has two accounts, a private account (called "current account" in the instructions) and a public account (called "future account"). The crisis is an exogenous event that destroys *the same share* of every participant's public account and this share can be reduced through individual contributions from the private account. Initially, the private account has a balance of 2 USD, while the public account contains 6 USD. In the end, every

participant receives the sum of what remains in both accounts. (More details about the payoff rules is given in the next paragraph.) The framing in terms of a crisis deviates from existing presentations of one-shot public goods games (see for instance Sonnemans et al., 1998) without changing the monetary incentives and while straightforwardly allowing for our variation in communication.

- *Large group size and small marginal per-capita return (MPCR).* We assign participants to groups of $N=100$, which is very large in comparison to groups sizes in the experimental literature. Every dollar contributed from an individual's private account increases the total group payoff by 1.2 USD, implying a comparatively low MPCR of 0.012, which is suitable for our purposes.²
- *Vocalized instructions and group leader.* All subjects received written instructions and in addition, via their electronic devices, the participants listen to a recording by a fictitious group leader, "James", who reads the experimental instructions out loud. We introduce the group leader into the experiment so that the person who makes the appeal has a factual authority, in the sense that he also transports the rules of the game and guides the interaction.

In a questionnaire at the end, each subject reports their belief about the average contribution of all subjects in their group of 100. Correct guesses were paid in addition \$0.50. Moreover, they provide information about relevant sociodemographic variables, such as gender, age, education and earnings.³

2.2 Treatments and Hypotheses

We randomize participants into one of three groups: a control group that receives no appeal and two groups to whom "James" reads a positive and a negative appeal, respectively. The wording of the appeals was analyzed with the Linguistic Inquiry and Word Count (LIWC, cf. Tausczik and Pennebaker, 2010) and designed to contain high share of positive (positive appeal) or negative (negative appeal) emotion words and none of the respective other category. The content of the appeals is constant between the positive and negative wording, and both statements are assertive in the sense of demanding concrete actions. See

² The debate in the literature on the effect of group size and MPCR that started with Isaac and Walker (1988), is The complete instructions, including the questionnaire, are in the Appendix.contribution see Weimann et al., 2019). We set our parameters in order to increase external validity by highlighting the societal aspect of the crisis.

³ The complete instructions, including the questionnaire, are available upon request.

Appendix A for the exact wording of the appeals and the share of positive and negative emotion words.

We pre-registered the following hypotheses.⁴

H1: Public appeals increase contributions to crisis mitigation.

Although participants know that the appeal is a mere recommendation and carries no economic consequences, we expect a positive effect. For public goods games, the effectiveness of free-form pre-play communication between players in raising contributions is well documented (see, e.g. Isaac and Walker 1988, Brosig et al., 2003; Bochet et al., 2006; Palfrey et al., 2017). Evidence on whether communication by an external party can effectively increase contributions to the public good is scarce. However, we know that pre-play communication by an external party—a leader—can positively influence play in coordination games, for example, by raising group contributions in a weak-link game (Brandts and Cooper, 2007) or helping players to choose the same action in a pure-matching coordination game (Heursen et al., 2020). Based on previous research, we, therefore, expect the leader’s communication to motivate contributions to crisis mitigation, even in the absence of sanctions or rewards.

H2: Either of the appeal's valence types (positive or negative) may increase contributions more than the other.

Our pre-registered predictions were agnostic on the directions of the valence comparison, consistent with the differential findings in the literature (see the Introduction).

In addition to the effect of top-down communication, we wanted to study how the type of crisis, specifically its perceived severity, modifies the effectiveness of communication. To this end, we set up and pre-registered an orthogonal additional treatment. Unfortunately, due to weak manipulation of crisis severity perception, the results are inconclusive. Refer to Appendix C for Details.

2.3 Policymaker Prediction

After we conducted and analyzed the online experiment, we surveyed German government employees to see if practitioners of public communication could predict the effectiveness of public appeals. First, we asked them how effective negative and positive public appeals are in general when it comes to motivating

⁴ <https://osf.io/ubrve>.

individual contributions to crisis mitigation. To this end, we gave them a definition of what positive and negative communication means, corresponding closely to the definition used in this paper.

Second, we elicit the government experts' beliefs about the effectiveness of the two specific appeals in our experiment. Before asking them to provide an estimate for average contributions by communication treatment, we informed them not only about the details of our experiment, but also about average contributions in the control group. We did this to make their predictions of appeal effects more easily comparable.⁵

2.4 Data Collection

Experimental study on crisis mitigation. We conducted our online experiment on Prolific, targeting a sample of people living in the United States that is representative in terms of age, state, and a broad concept of race. In total, 2,380 individuals participated in the experiment.

Policymaker prediction survey. We sent our survey by e-mail to personally acquainted individuals working for German ministries on the federal or state (Bundesland) level, asking them to forward the survey to colleagues in their ministries. Within the survey, we used a screening question asking respondents if they were working for a federal or state ministry to filter out unintended accidental recipients. Sample collection was limited by a pre-specified time frame of 22 days in March 2023, which we included in the pre-registration of this survey.⁶

3 Results

3.1 Crisis Mitigation Experiment Results

Before we present the results of the effects of the appeals and the valence of the appeals on contributions to crisis mitigation, we provide evidence how contributions vary across relevant subgroups. This descriptive information is important to interpret the magnitude of the appeal effects and the heterogeneity results.

Contributions of different subgroups. To give an impression about the overall distribution of the contributions to crisis mitigation, Table 1 reports the contributions split by several demographic groups and other characteristics aggregated across all groups. As expected, we find that altruistic individuals provide the highest contributions. Moreover, individuals older than 45 and

⁵ The complete survey is available upon request.

⁶ <https://osf.io/dn8g4>

women contribute more. The same holds for individuals who are pro redistribution. In contrast, differences by income and education are less pronounced.

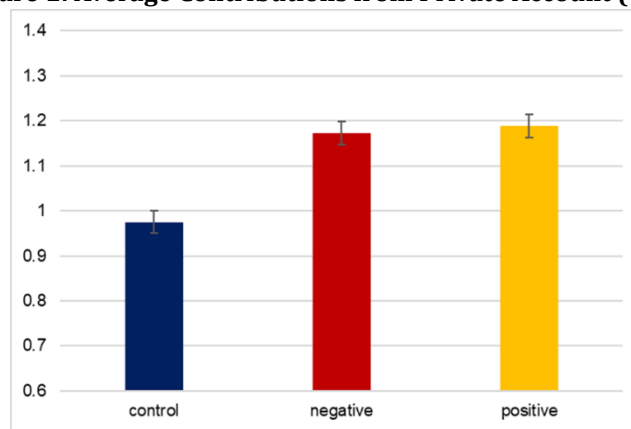
Table 1: Average Contribution by Subgroup

	Yes	No
<i>Demographics</i>		
Age over 45	1.21 (0.0206)	1.01 (0.0209)
Female	1.19 (0.0221)	1.03 (0.0217)
At least Bachelor's Degree	1.08 (0.0187)	1.15 (0.0202)
Income over 50k USD/month	1.09 (0.0198)	1.12 (0.0158)
<i>Preferences: Personal</i>		
Altruist	1.29 (0.0179)	0.96 (0.0142)
Risk Averse	1.03 (0.0142)	1.19 (0.0153)
<i>Preferences: Political</i>		
Left Leaning	1.12 (0.0134)	1.10 (0.0142)
Democrat	1.13 (0.0133)	1.09 (0.0127)
Pro Redistribution	1.17 (0.0121)	1.04 (0.0124)

Note: Numbers are \$ amount contributed out of an endowment of \$2. All demographic cutoffs chosen so that the sample split is as close as possible to 50/50. Likewise, preferences are binarized by classifying respondents at the median of some self-reported scale. (Refer to appendix for actual questions). For example, "altruist" means respondents state they would give more than the median (USD 10 out of USD 100) of a hypothetical lottery prize to charity.

Effect of public appeals (H1). Public appeals have a sizable effect on contributions to crisis mitigation: they increase by about 20%. Participants in the control group contributed \$0.98 on average, while participants that received an appeal contributed \$1.18 on average. This difference is significant at all conventional levels and large at nearly 30% of a standard deviation. In terms of magnitude the effect of the appeals is comparable to the effect of altruism and larger than the difference between other demographic subgroups considered in Table 1.

Figure 1: Average Contributions from Private Account (USD)



Note: Error bars appear around treatment-specific means.

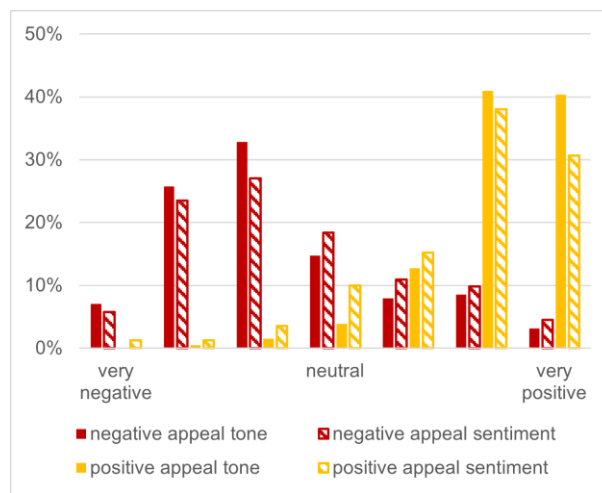
Effect of appeal tonality (H2). We find no evidence that average contributions are lower after a negatively worded appeal compared to a positively worded one (H2). This evidence is consistent with positive and negative appeals being equally effective in increasing contributions to crisis mitigation. We discuss possible interpretations of this finding below.⁷

Appeal perception. After the experiment, we asked participants in the communication treatments to rate i) the tonality of the appeal that they heard and ii) what sentiment the appeal evoked in them. The majority of respondents rated tonality and sentiment in a way that corresponds to the expected effect of each appeal, with the modal tonality and sentiment ratings at “slightly negative” for the

⁷ Belief differences account for two thirds of the treatment differences: regressions of public goods contributions on the treatment yield treatment coefficients of about 0.2 in the case of bivariate regressions, versus about 0.07 in regressions where beliefs are included as right-hand-side variable. See table B.1 in the Appendix.

negative appeal and “positive” for the positive one (see Figure 2) and all average ratings significantly different from the neutral option ($p < 0.001$). That is, the manipulation was successful in shifting tonality and sentiment in the intended direction– albeit more effectively so for the positive appeal. When comparing the tonality and sentiment ratings between the two types of appeals, we can conclude that their distributions differ significantly (Wilcoxon-Mann-Whitney test $p < 0.001$).

Figure 2: Perceived Tone and Evoked Sentiment of Appeals (Percent of Participants in Condition)



Positive Appeal: N=795, Negative Appeal: N=793

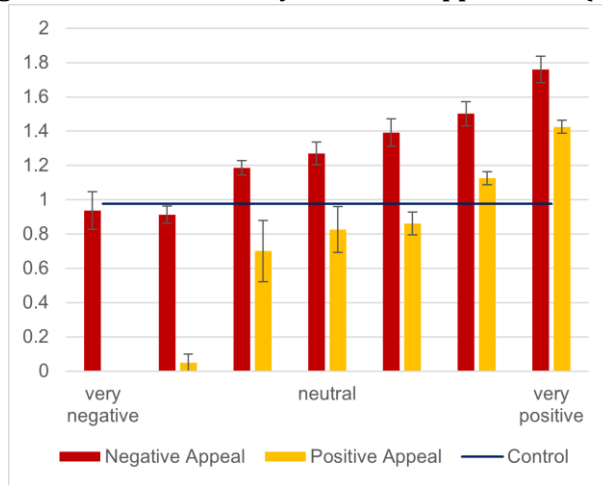
An assumption that is implicit in our design is that appeals also work *through* their perception, and that both negative and positive perception of an appeal can motivate contributions. However, further investigation points to a different conclusion. When we compare contributions conditional on appeal perception, we find that a more positive appeal perception is associated with higher contributions. This association holds regardless of which appeal the participants heard and is illustrated in Figure 3 for perceived tonality.⁸

The implication is that perception of tonality and evoked sentiment of an appeal may not be causal for the effect of an appeal. This could point to a number of possible explanations that invite further investigation. Potential explanations

⁸ Comparing contributions conditional on evoked emotion yields a very similar picture.

include a taste for authoritative guidance, a modification of beliefs or of preferences, and an influence on self-image.

Figure 3: Contributions by Perceived Appeal Tone (USD)



Standard Error Bars. Positive Appeal: N=793, Negative Appeal: N=795, Control: N=792

Treatment Heterogeneity. Table 2 shows treatment effects for the same subgroups that we presented before. We can draw two broad conclusions from the table. First, despite the different levels of contributions (Table 1) the evidence from the heterogeneity analysis is consistent with appeals working rather homogeneously across subgroups that are classified according to demographic characteristics or preferences. Although the point estimates differ between groups, these differences are not significant relative to the average effects, at conventional levels (see p-values at the last two columns).⁹ Second, the finding that negative and positive appeals are similarly effective, too, is robust across different subgroups (see p-value in Column 5).

⁹ Only for one group we find a significant difference to the average effect: altruistic individuals who hear the negative appeal.

Table 2: Treatment Effect by Subgroup

Subgroup	Effect Size		Tests (p-values)				
	<i>Negative Appeal</i>	<i>Positive Appeal</i>	<i>Control Mean</i>	<i>Sample Size</i>	<i>Negative = Positive</i>	<i>Neg. Appeal (subgroup) = Neg. Appeal (full sample)</i>	<i>Pos. Appeal (subgroup) = Pos. Appeal (full sample)</i>
Full Sample	0.197 (0.036)	0.214 (0.036)	0.975	2380	0.635		
Age over 45	0.196 (0.05)	0.23 (0.05)	1.072	1193	0.497	0.994	0.740
Female	0.14 (0.048)	0.197 (0.048)	1.076	1209	0.233	0.238	0.735
High Education	0.15 (0.05)	0.198 (0.051)	0.967	1251	0.349	0.355	0.760
High Income	0.262 (0.059)	0.224 (0.06)	0.930	924	0.523	0.271	0.859
Altruist	0.292 (0.047)	0.281 (0.047)	1.099	1099	0.815	0.041	0.154
Risk Averse	0.114 (0.051)	0.197 (0.051)	0.932	1164	0.112	0.106	0.740
Left Leaning	0.181 (0.049)	0.157 (0.048)	1.009	1249	0.630	0.746	0.242
Democrat	0.125 (0.051)	0.172 (0.05)	1.036	1138	0.365	0.162	0.404
Pro Redistribution	0.228 (0.047)	0.168 (0.048)	1.039	1295	0.207	0.501	0.343

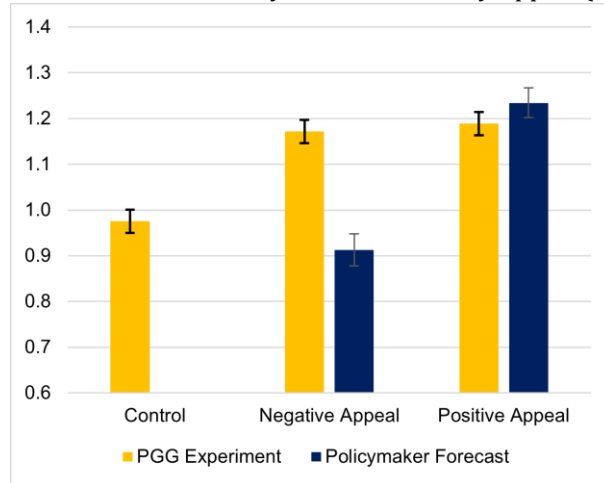
Note: Treatment effects by subgroup. Test columns show p-values of linear F-tests for the hypotheses that i. negative and positive effect sizes are equal, the ii. negative appeal effect size is as strong in the subgroup as that in the overall sample (i.e. 0.197), iii. positive appeal effect size is as strong in the subgroup as that in the overall sample (i.e. 0.214).

3.2 Policymaker Prediction Results

From an ex-ante perspective, it is not clear if positive or negative appeals are more efficient. Consistent with H2 we do not find significant differences between the treatments with a positive versus negative appeal. Policy makers decide about the communication and need to design the wording and the valence of an appeal. Therefore, it is important to understand how policy makers think about the role of valence and to relate this to the findings of the experiment.

German government officials we surveyed believe, on average, that only positive appeals have an effect to increase individual contributions to crisis mitigation.¹⁰ Specifically, they expected only a positive effect for the positive appeal, whose size they predicted with surprising accuracy. By contrast, experts on average expected the negative appeal to have no effect or even somewhat decrease contributions. Figure 4 illustrates these findings.

Figure 4: Contributions and Policymaker Forecast by Appeal (USD)



Standard error bars. Policymakers (N=87) each predicted averages for both treatments.

4 Conclusion

Our study offers two sets of conclusions, one for scholars who research public communication, and for policymakers who professionally engage in it.

From a perspective of behavioral economics and communication, it is interesting to observe that appeals are effective in mitigating a collective action problem. Interestingly, we find no evidence that the emotional impact of public appeal changes its effectiveness. Although our positively and negatively worded appeals were perceived as such and although their effects on contributions were of similar magnitude, there was no association between intended appeal perception and contributions. Rather, the appeals were uniformly perceived as

¹⁰ The questionnaire asked “Can positive/negative appeals motivate prosocial behavior that reduces the risk of a collective damage?” with answers ranging from “strongly decrease motivation (1)” to “strongly increase motivation (7)”. The average response was 5.3 for a positive appeal and 4.11 (=no influence) for the negative one. The difference is significant at all conventional levels.

more positive when contributions were higher. This suggests that appeal perception and contributions are co-determined by a different mechanism through which the appeal work.

From a perspective of policymakers, it is useful to see evidence suggesting that appeals have a material effect on behavior, in a large and representative sample of individuals living in the United States. To the extent that our sample of German policymakers is representative of policymakers elsewhere, it seems that the effectiveness of negative appeals is generally underestimated. While we find no evidence of one type of appeal being more effective than the other, they may differ on other dimensions, such as ability to create attention. Recent evidence (Robertson et al., 2023) suggests that negative wording increase news consumption rates. To the extent that attention is important for public communication practitioners, a conclusion may therefore be to also incorporate negative wording into their appeals, for example in the form of warnings and admonitions.

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Appendices

A Appeals

Positive Appeal: Be generous and contribute to the common good! The more you contribute the more everyone will profit. Help your group succeed and benefit everyone! If everyone in your group works together, you can make matters better.

LIWC: Positive tone words = 22.22%, Negative tone words = 0.00%

Negative Appeal: Don't be selfish. Reduce collective damage! The less you contribute to making the crisis less severe, the more everyone will lose. You will let your group down if you don't minimize the harm to everyone! If your group fails to join forces, then matters will remain bad.

LIWC: Positive tone words = 0.00%, Negative tone words = 12.24%

B Tables

B.1 Effects of Appeals on Contributions, Controlling for Beliefs

VARIABLES	(1) contribution
positive appeal	0.072*** (0.025)
negative appeal	0.061** (0.026)
Belief	1.010*** (0.021)
Constant	0.048* (0.026)
Observations	2,380
R-squared	0.514
Standard errors	*** p<0.01, **

C Communication and Crisis Severity

The types of systemic crises we consider differ in many aspects. One way that we hypothesized to influence the effectiveness of communication is perceived severity. Intuitively, a crisis which is very urgent, such as a pandemic, feels more severe and may therefore warrant a different kind of appeal to foster collective mitigation than one whose consequences still feel distant such as climate change. In the following, we describe our precise hypotheses, treatments, and results.

C.1 Treatments and Hypotheses

In an orthogonal sample split, we randomize participants into one of two groups, varying the perceived severity of the crisis. In one condition the crisis destroys 50% of the public account if no participant contributes to crisis mitigation (we call this scenario "low impact"). In the other condition it destroys 90% of the public account if no-one contributes ("high impact"). However, between the groups, the total amount by which contributions can reduce the crisis damage is held constant at 40 percentage points.¹¹ That is, also the public good multiplier is the same at 1.2, implying that the marginal individual and social gains of an additional dollar invested remain the same.

We pre-registered the following hypotheses.

H3: Higher perceived crisis severity may increase or decrease average contributions to crisis mitigation.

We did not have a directed hypothesis about the effect of perceived crisis severity itself.

H4: The positive appeal increases contributions more in the low-severity crisis, while the negative appeal increases contributions more in the high-severity crisis.

This hypothesis is consistent with Construal Level Theory (cf. Trope and Liberman, 2010) and with Dual-System Theory (e.g. Evans, 2003). Under both theories, the less "distant" and more severe second version of the crisis (the one with 90% impact) is likely to invite a representation of lower abstraction and more System-1-immediacy. We hypothesize that this implies a more selfish instinctive reaction and the negative wording may resonate better with this selfish pre-inclination.

¹¹ Therefore, the smallest damage that the crisis can do to the public account is 10% (low impact) and 50% (high impact). Effectively, the only economic difference between the two conditions is a minimum guaranteed transfer to participants worth $(1 - \text{DefaultCrisisDamage}) \times \text{PublicAccountDefaultValue}$, which amounts to \$3 (low impact) and \$0.6 (high impact). The default value of the public account is \$6.

C.2 Results

Severity (H3). There is no evidence that our crisis severity treatment changed the average willingness to contribute to crisis mitigation.

Interaction of severity and tonality (H4). Descriptively, the data seem to support our interaction hypothesis (cf. Table C1). The point estimate of the effect of the positive appeal on contributions is higher when the crisis severity is low, while that of the negative appeal is higher when crisis severity is high. However, the difference between the two differences is not significantly greater than zero ($p=0.16$ for a one-tailed F-test).¹²

Table C1: Average Contributions by Treatment Cell (USD)

Appeal\Impact	Low Impact	High Impact	Difference
Control	0.991 (0.035)	0.959 (0.036)	-0.033 (0.051)
Negative Appeal	1.157 (0.036)	1.186 (0.036)	0.029 (0.051)
Positive Appeal	1.211 (0.037)	1.167 (0.036)	-0.044 (0.051)

Standard errors in parentheses.

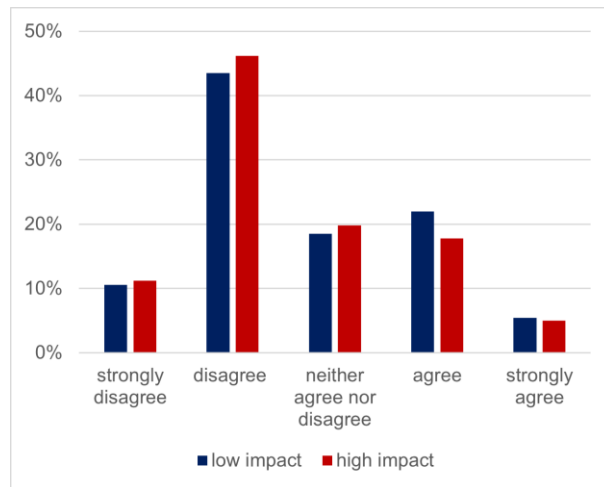
Manipulation of crisis perception. After the experiment, we asked participants to what extent they agreed with the statements that the crisis felt "threatening" to them and that it felt "distant" to them. We expected that the high impact treatment would be perceived as more threatening and as less distant than the low impact treatment. However, evidence for a successful manipulation is weaker in this case.

Although for both perceived crisis threat and distance, the distributions are different according to a Wilcoxon rank-sum test (Wilcoxon, 1945) at a 5% significance level and in the expected direction but the difference is small (see Figure C2 for perceived distance). Weak manipulation of crisis perception has likely contributed to the statistical insignificance of i) the perceived distance of the

¹² The interaction coefficients remain of similar size if belief reports are included as a control variable.

crisis on contributions and ii) the interaction effect of appeal type and crisis distance.¹³

Figure C2: Agreement with Statement "The Crisis Feels Distant to me" (Percent of Participants in Condition)



Low Impact Condition: N=1193, High Impact Condition: N=1185

¹³ A study by von Dawans et al. (2012) reports a related phenomenon: enduring social stress (by having to perform a public speech task) leads to more pro-social behaviors in controlled experiments. The effect appears in a trust game and a sharing game, but not in a punishment game.