The psychological impacts of nudge-based evacuation advisories

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Abstract

This study examined the psychological effects of disaster prevention nudges. The participants (total N=1,330) read a scenario describing approaching danger with either a loss-framed evacuation advisory or a non-framed control one and reported their intentions to evacuate, feelings of guilt, and perceived external pressure (Study 1) and rated extrinsic motivational regulation (Study 2). Moreover, in Study 3 the participants were presented with the same scenario and one of three evacuation advisories (loss-framed, gain-framed, and control advisories) and indicated their behavioral intentions, feeling of guilt, perceived external pressure, and extrinsic motivation as in Studies 1 and 2. Both frames increased the participants’ intentions to evacuate, feelings of guilt, and perceived external pressure. However, their effects on extrinsic motivation differed: the loss-framed advisory enhanced all three types of extrinsic motivation, whereas the gain-frame advisory increased only identified regulation. The implications for future work on nudges are discussed.

Key Words: nudge-based evacuation advisories, intention to evacuate, guilt, extrinsic motivation

Psychological effects of nudge-based evacuation advisories

Natural disasters are becoming more frequent and severe worldwide. This suggests the need for evacuation strategies for individuals’ survival. One challenge occurs from how individuals respond to disasters. Evacuation advisory is a low-cost evacuation method that encourages individuals to evacuate quickly to protect themselves. In Japan, the Ministry of the Environment (2019) proposed an evacuation advisory using a nudge, which refers to a choice architecture (i.e., how decisions are presented and framed) that alters individuals’ behaviors indirectly toward a desired direction without punishment or economic incentives (Thaler & Sunstein, 2008). Indeed, Ohtake, Sakata, & Matsuo (2020) showed that a loss-framed evacuation advisory was more effective than gain- and neutral-framed ones. However, because existing evidence has been restricted, the psychological and behavioral effects of framed evacuation advisories on individuals have not been fully examined. This study addresses the effects by focusing on how recipients of framed evacuation advisories feel and are motivated toward evacuation.

The effectiveness of a loss-framed evacuation advisory (Ohtake et al., 2020) may suggest that such an advisory is perceived to be a mandatory one, which leads to recipients feeling external pressure, accompanies negative feelings, and eventually enhances their intentions to evacuate. Indeed,
a loss-framed message is positively associated with increased feelings of guilt (Quick, Kam, Morgan, Montero Liberonona, & Smith, 2015).

Furthermore, the effectiveness of a loss-framed evacuation advisory may result from the influence of the frame on the quality of motivation. Although evacuation from disasters is thought to be often motivated extrinsically, self-determination theory (Ryan & Deci, 2000) suggests that extrinsic motivation varies in the extent to which it is autonomous. The least autonomous type of extrinsic motivation is external regulation, which occurs when behaviors are performed to satisfy an external demand or reward contingency. The second lowest autonomous extrinsic motivation is introjected regulation. When individuals behave with this relatively controlled regulation, its aim is to avoid feelings of guilt or anxiety or to attain ego enhancements. The most self-determined regulation within extrinsic motivation is identified regulation, which includes an action that is accepted or owned as a personally important value and goal. Because loss framing has obligatory nuances (Higgins, 1997), it may evoke extrinsic motivation, particularly a less autonomous one.

In this study, we hypothesized and examined that a loss-framed evacuation advisory would increase individuals’ behavioral intentions to evacuate and evoke more guilt and external pressures (Study 1) and enhance individuals’ extrinsic motivational regulation (Study 2) than a non-framed standard evacuation advisory. We also evaluated the effect of a loss-framed advisory by comparing it with that of a gain-framed evacuation advisory in Study 3.

Study 1

Method
We recruited 400 participants via an internet survey company. The participants were randomly assigned to either the loss-framed evacuation advisory condition (loss-framed condition) or the non-framed standard evacuation advisory condition (control condition). Thirty-five participants who answered the same choice for all question items were excluded in the following analysis. The data from the remaining 365 participants are thus reported here (n=186 in the loss-framed condition, n=179 in the control condition; 51.2% female, M age=45.82 years, SD age=13.84). This study was approved by the ethical review committee of the institution to which the second author belonged.

The participants were presented with an imaginary scenario depicting a situation in which they are staying at home in heavy rain and then received an evacuation advisory depending on the assigned condition: “If you do not evacuate, you endanger the lives of others (Ohtake et al., 2020, p. 74)” in the loss-framed condition; “Protect yourself from disasters by developing an ability to make a good decision about and take action against approaching danger (Ohtake et al., 2020, p. 74)” in the control condition. The scenario and advisories were identical to those used by Ohtake et al. (2020).

The participants then rated their behavioral intentions to evacuate to a shelter on a scale of 1 (not at all) to 7 (very much). They also completed an evacuation-related guilt scale (7-point scale, 1=not at all, 7=very much), which consisted of seven items we developed by adopting those of Ohnishi (2008), by rating the extent to which they would experience guilt for their non-evacuation behaviors and its consequences (see Online Supplementary Information for the details). The reliability was high (ω=.94). Finally, they rated their perceived external pressure when reading the advisory by using a two-item scale consisting of adjective pairs (pressured-unpressured and forced-unforced) on a 7-point scale (1=unpressured/unforced, 7=pressured/forced). The participants’ ratings for the two items were strongly correlated (r=.58, p<.001).

2) We did not include integrated regulation, which is the most autonomous form of extrinsic motivation (Ryan & Deci, 2000). The considerable amount of research has examined self-perceptions of the reasons for behavior by excluding integrated regulation from the four regulatory styles of external motivation in the Ryan and Deci’s original model to present better psychometric properties in some domains of social behavior (see Ryan & Connell, 1989 for achievement and prosocial behavior; Losier, Perreault, Koestner, & Vallerand, 2001 for political behavior). Moreover, a meta-analysis (Okada, 2010) suggested the difficulty of discriminating integrated regulation from identified regulation. Given these previous findings, we measured the three types of regulatory styles that are probably most appropriate in examining the association between framed evacuation advisory and extrinsic motivation.
Results and Discussion

Table 1 shows the descriptive statistics obtained in Studies 1–3. As predicted, compared with participants in the control condition, those in the loss-framed condition rated their behavioral intentions to evacuate to be higher ($t(363)=3.39, p=.001, d=0.36$), their feelings of guilty to be greater ($t(363)=2.10, p=.036, d=0.22$), and their perceived external pressure to be higher ($t(363)=7.83, p<.001, d=0.82$). These results suggest the psychological effect of the loss-framed message, implying the negative consequence of an individual’s failure to evacuate to others’ lives.

Study 2

Method

Participants comprised 400 Japanese recruited via an internet survey company. They were randomly assigned to either of the loss-framed or control conditions. Data of 35 participants who answered the same choice for all items were excluded from the following analysis. The data of the 365 remaining participants are reported here ($n=183$ in the loss-framed condition, $n=182$ in the control condition; 52.1% female, $M_{age}=44.68$ years, $SD_{age}=12.78$).

The procedure was similar to that used in Study 1, except that instead of participants’ feelings of guilt and perceived external pressure, the reason for evacuation was assessed to measure the motivational quality. Based on the self-determination theory (Ryan & Deci, 2000), we created six items of extrinsic motivation by using a five-point Likert scale (see Online Supplementary Information for the details). We calculated the average rating of two items measuring each type of extrinsic motivational regulation.

Results and Discussion

As in Study 1, compared with participants in the control condition, those in the loss-framed condition rated their behavioral intentions to evacuate to be higher ($t(363)=3.79, p<.001, d=0.40$). In addition, they showed higher in identified regulation ($t(363)=2.35, p=.019, d=0.25$), whereas the two conditions did not differ in either external regulation ($t(363)=1.15, p=.251, d=0.12$) or introjected regulation ($t(363)=1.77, p=.077, d=0.19$). The results on motivational quality partly supported our prediction.

Study 3

Method

We recruited 600 Japanese participants (51.3% female, $M_{age}=46.26$ years, $SD_{age}=13.58$) through an internet survey company. They were randomly assigned to one of the three conditions: loss-framed condition ($n=200$), gain-framed condition ($n=200$) and control condition ($n=200$). The scenario and the evacuation advisories were identical to those used in Studies 1 and 2. In the gain-framed condition, the evacuation advisory was identical to that used by Ohtake et al. (2020), that is, “If you evacuate, you save the lives of others (Ohtake et al., 2020, p. 74).”

As in Study 2, the participants were asked to indicate their behavioral intentions, feelings of guilt ($\omega=.95$), perceived external pressure ($r=.74, p<.001$), and the three types of motivational regulation ($\omega=.66–.85$). These scales were identical to those used in Studies 1 and 2. A confirmatory factor analysis on the items of motivational regulation found that the three-factor model fit well (GFI=.98, CFI=.98, RMSEA=.08).

Table 1 Mean ratings in Studies 1–3

<table>
<thead>
<tr>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Loss</td>
<td>Control</td>
</tr>
<tr>
<td>Behavioral intention</td>
<td>4.41 (1.30)</td>
<td>3.94 (1.38)</td>
</tr>
<tr>
<td>Guilty</td>
<td>4.19 (1.26)</td>
<td>3.91 (1.30)</td>
</tr>
<tr>
<td>External pressure</td>
<td>4.51 (1.04)</td>
<td>3.59 (1.18)</td>
</tr>
<tr>
<td>External regulation</td>
<td>2.66 (0.80)</td>
<td>2.55 (0.87)</td>
</tr>
<tr>
<td>Introjected regulation</td>
<td>2.67 (0.88)</td>
<td>2.51 (0.92)</td>
</tr>
<tr>
<td>Identified regulation</td>
<td>3.60 (0.92)</td>
<td>3.36 (1.02)</td>
</tr>
</tbody>
</table>

Note. Standard deviations are given in parentheses.

3) We reported correlations among dependent variables in Studies 1–3 in Table S2.
Results and Discussion
An ANOVA on the mean rating of behavioral intention with one between-subjects variable (condition: loss-framed, gain-framed, control) showed a significant main effect of condition ($F(2, 597)=8.21$, $p<.001$, $\eta^2=.03$). The participants reported significantly higher behavioral intention in the two framed conditions than in the control condition (loss-control: $t(597)=3.45$, $p=.001$, $d=0.34$, gain-control: $t(597)=3.57$, $p=.001$, $d=0.36$). The rating in the loss-framed condition did not significantly differ from that in the gain-frame condition ($t(597)=0.12$, $p=.908$, $d=0.01$).

We also performed ANOVAs on the meaning ratings of the feelings of guilt and perceived external pressure respectively and found a significant main effect of the condition (guilt: $F(2, 597)=6.71$, $p<.001$, $\eta^2=.02$; pressure: $F(2, 597)=16.64$, $p<.001$, $\eta^2=.05$). The participants reported significantly greater feelings of guilt in the loss- and gain-framed conditions than in the control condition (loss-control: $t(597)=3.57$, $p=.001$, $d=0.36$; gain-control: $t(597)=2.49$, $p=.026$, $d=0.25$), although no significant difference was found between the two framed conditions ($t(597)=1.08$, $p=.281$, $d=0.11$, n.s.). In addition, the participants reported significantly higher perceived external pressure in the loss-framed condition than in the control condition ($t(597)=5.75$, $p<.001$, $d=0.57$). The mean rating of perceived external pressure in the gain-framed condition was in between those in the two other conditions (gain-loss: $t(597)=2.42$, $p=.016$, $d=0.24$; gain-control: $t(597)=3.32$, $p=.002$, $d=0.33$).

For each of the three types of motivational regulation, we performed an ANOVA and found a significant main effect of condition (external regulation: $F(2, 597)=3.78$, $p=.023$, $\eta^2=.01$; introjected regulation: $F(2, 597)=3.90$, $p=.021$, $\eta^2=.02$; identified regulation: $F(2, 597)=4.51$, $p=.011$, $\eta^2=.02$). As expected, the mean ratings of the three types of motivational regulation were significantly higher in the loss-framed condition than in the control condition (external regulation: $t(597)=2.68$, $p=.023$, $d=0.27$; introjected regulation: $t(597)=2.78$, $p=.017$, $d=0.28$; identified regulation: $t(597)=2.56$, $p=.021$, $d=0.26$). By contrast, only identified regulation was higher in the gain-framed condition than in the control condition (external regulation: $t(597)=1.87$, $p=.063$, $d=0.19$; introjected regulation: $t(597)=1.23$, $p=.220$, $d=0.12$; identified regulation: $t(597)=2.64$, $p=.026$, $d=0.26$). The difference between the two frame conditions was not significant in either of the three types of motivation (external regulation: $t(597)=0.82$, $p=.415$, $d=0.08$; introjected regulation: $t(597)=1.56$, $p=.120$, $d=0.16$; identified regulation: $t(597)=0.08$, $p=.936$, $d=0.01$).

Consistent with the findings of Studies 1 and 2, the loss-framed evacuation advisory increased individuals’ behavioral intention, feelings of guilt, perceived external pressure, and identified regulation.4) As we report in detail in the Supplementary Information, using a mini meta-analytic approach suggested by Goh, Hall, & Rosenthal (2016), we found that participants in the loss-framed condition were greater than those in the control condition in their behavioral intentions in Studies 1–3, feelings of guilt and perceived external pressure across Studies 1 and 3 and introjected and identified regulatory styles across Studies 2 and 3. By contrast, although the effect of the gain-framed evacuation advisory appeared in the same way as that of loss framing, it was relatively limited.5)
General Discussion

In this research, we found that a loss-framed evacuation advisory promoted individuals' behavioral intentions to evacuate, evoked guilt and external pressures, and increased their extrinsic motivational regulation. We also investigated the effect of a gain-framed evacuation advisory and demonstrated that it appeared on individuals' behavioral intentions to evacuate, feelings of guilt, and external pressures in the same way as a loss-framed one did. By contrast, a gain-framed evacuation advisory increased identified regulation only, whereas overall, a loss-framed one augmented individuals' extrinsic regulation, particularly introjected regulation with awareness of others, such as feeling ashamed.

Both the loss- and gain-framed evacuation advisories were effective for enhancing individuals' intentions of evacuation. However, the difference in perceived external pressures between the two framings suggests a potential moderating role of frame on the underlying mechanism of individuals' evacuating behaviors. Effective advisories intended to nudge individuals into evacuative behaviors are crucial because appropriately evacuative behaviors can help save individuals' lives from disasters. Indeed, empirical evidence on nudges from behavioral economics has been successfully applied to policy (e.g., Ministry of the Environment, 2018). Although research on behavioral economics has focused on nudges as choice architectures and environments (Thaler & Sunstein, 2008), because nudges affect psychological processes underlying individuals' behaviors, social psychological research examining the psychological effect of nudges is also necessary for policymakers. We believe that the understanding of how effective a nudge is as an important policy toolkit will be enhanced by examining the effect on individuals' motivation and emotion. Although this research has some limitations, including that the situation used disregarded the presence of those (e.g., socially vulnerable people) who decide not to evacuate for a specific reason, our finding will be a small step in the direction.

References


Ministry of the Environment (2019). Material 2 Disaster mitigation and prevention (Evacuation behavior research):

6) For an exploratory purpose, we conducted mediation analyses regarding whether the framing effect on behavioral intention might be accounted for by the feelings of guilt, external pressures, and extrinsic regulation that differ across condition. Please see Figure S1 for the details.

7) The effect of evacuation advisory might be attributed not only to the framing but also to the content. For example, whereas advisory in the loss-framed condition clearly referred to evacuation behaviors, one in the control condition was somewhat vague in terms of how to evacuate. The direct advisory message used in the framed condition might foster an individual's intention to evacuate, the feelings of guilt, perceived pressure, and regulatory styles (particularly, identified regulation). Although we adopted the advisory messages developed by Ohtake et al. (2020), it is necessary to develop a new set of advisories controlled in the clarity of how to evacuate, and examine the framing effect of advisory on psychological processes in future work.