

Nudging pro-environmental cognitions: evidence from a web experiment on message framing, eco-friendly attitudes, and intention to donate

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Abstract: In the past decade, there are increasing interests in changing the public's cognitions and behaviors on environmental issues. Message framing can be an effective tool to influence environmental protection attitudes, intentions and behavior. However, past studies investigating the effectiveness of message framing in promoting environmental protection behavior have mostly examined this in offline contexts, and it is unknown whether online message framing could influence people's attitudes and intentions towards environmental protection. In the current study, we investigated whether the framing of online messages could shift people's attitude to support environmental protection organizations and increase intention to donate to eco-friendly causes. Two-hundred and one U.S. participants were recruited from Amazon Mechanical Turk to participate in an online study. The results indicated that positive, but not negative, message framing could promote individuals' attitudes concerning environmental protection and increase their intentions to donate to eco-friendly groups. The results of our study were consistent with prior research in offline contexts, and suggests that message framing could successfully influence people's attitudes in computer mediated communication. From a practical perspective, given that online message framing is a low-cost intervention strategy that can be applied at scale, our finds support that message framing has the potential to make a great contribution to our society and environment by shifting people's environmental attitudes.

1. Introduction

Environmental pollution is a serious challenge on Earth that we all need to combat (Briggs, 2003). Conservationists, governments, and environmental protection organizations have strived to improve the contaminated environments, and these efforts need everyone to get involved. Conservationists tried to promote the public's environmental awareness, and thus, reduce the possibility of pollution. How to change the public's behavior on environmental issues has become a significant question in the contemporary society.

Persuasive messages can be an effective tool to influence human behavior (Chang et al., 2015). Message framing is a type of communicative technique that aims to bring different persuasive effects towards the same information by using different words or tones in the expression (Smith & Petty, 1996). This technique has been frequently used in the fields involving communication and psychology, including news editing, psychological experiment, and informational nudge (Gallagher & Updegraff, 2011). Results from a meta-analytic study found that framing can have a positive impact on health-related behaviors, particularly for prevention behaviors (Gallagher & Updegraff, 2011).

Message framing can be effective in influencing environmental protection attitudes and behaviors. As man-made plastic items such as plastic bags and bottles are among the main contributors to environmental pollution (Eriksen et al., 2014), one way that could reduce the extent of environmental contamination is to lower the utilization of these man-made plastic items. In a scientific experiment (Nelson et al., 2021), researchers conducted an experiment to test whether using different informational nudges could reduce the utilization of plastic bags. The authors found that any intervention (message framing and/or not providing plastic bags as default) is more effective than none,

and any sign regardless of framing, coupled with asking customers if they want a bag, can be an effective and low-cost way to reduce plastic bag use. No significant difference in plastic bag refusal was observed between the positive and negative framing treatments. A sign may also serve as a reminder to the clerk to ask each customer if they need a bag.

Most of the research papers regarding pro-environmental behavior took place offline (Steg & Vlek, 2009; Ganzach & Karsahi, 1995; Nelson et al., 2021). It is unknown whether online message framing could influence people’s attitudes and intentions towards environment protection. To that end, we investigated whether message framing could shift people’s attitude and intention to support environmental protection NGOs in an online study. Two-hundred and one U.S. participants were recruited from Amazon Mechanical Turk to participate in an online study. This research is crucial for the pro-environmental organizations since conservationists can realize how the public could endow them and allow pro-environmental groups to make greater contributions to the Earth.

2. Methods

2.1 Participants and procedures

This study recruited 211 participants between Feb 8th and Feb 10th. We excluded 9 participants who did not pass the attention check question, and the current study includes the remaining 202 participants. On average, participants were 38 years old (SD = 10.40, range: 20-67 years old), most of them were female (67.6%).

In this experiment, participants (who would randomly divide into six groups) filled out a questionnaire survey with a cover story, which tells them that they are doing a market research for a t-shirt product. In the experiment, we tested and measured the changes of the outcome variables before and after the questionnaire survey. Each of the participants will answer a few questions before they received the message framing, including their nation, hometown, age, gender, whether they are willing to donate to the pro-environmental organization (willingness from 1 to 5), the frequency they buy T-shirts with a pro-environmental sign (frequency from 1 to 5), and lastly, the color they would like if they were to purchase an eco-friendly themed t-shirt.

2.2 Experimental manipulation

After finishing all of the previous questions, participants in six groups are going to experience a message frame. To ensure that the experiment can have the least bias and the greatest rigor, all of the volunteers in six different groups will undergo a message framing with a tone, which may be positive, negative, or simply no sign, depending on which groups are they in. The overall test would have 2 message frames, and the difference between the two message framing is our focus on the subject, and thus, indicating that this approach could work for not only plants but also animals. For the first message framing, we will emphasize the importance of donation to the forest. For the second message framing, we plan to concentrate on the importance of donation to marine life.

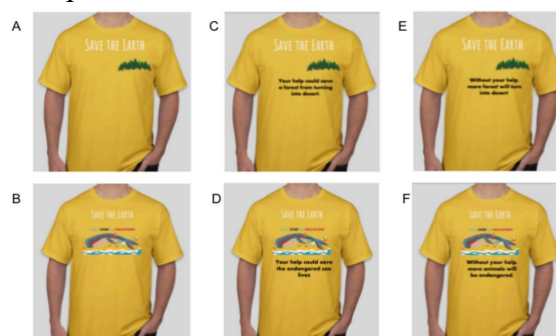


Figure 1. Experiment stimuli used in message framing. Participants were randomly assigned to view one of these six stimuli depending on which group they are in. A-B: no message control condition; C-D: positive framing condition; E-F: negative framing condition.

2.3 Measures

After all of the participants have undergone their message frame I mentioned above in the article, they will fill out another questionnaire survey since we want to see the changes in variables (intention and attitude) and make sure the completeness of our covering story. In this new questionnaire survey, participants will reply to the following questions: whether they are willing to donate to the pro-environmental organization (willingness from 1 to 5), the frequency they buy T-shirts with a pro-environmental sign (frequency from 1 to 5), do they like the T-shirt posted on the previous survey (scale from 1 to 5), and lastly, in what part do the T-shirt need to make some improvement.

2.4 Hypotheses and analyses

Based on prior literature on message framing effects on people's attitudes and intentions, we propose the following hypotheses:

H1a: Positive message framing could significantly increase people's attitude toward pro-environmental behaviors.

H1b: Negative message framing could significantly increase people's attitude toward pro-environmental behaviors.

H2a: Positive message framing could significantly increase people's intention concerning donating their money to eco-friendly groups.

H2b: Negative message framing could significantly increase people's intention concerning donating their money to eco-friendly groups.

We will conduct unpaired t-tests to test these hypotheses at significance level $p < 0.05$ to see whether the hypotheses above could be supported.

3. Results

First, we examined participants' levels of support for environmental protection and intention to donate before experimental manipulation. On average, participants' intentions toward environmental protection were around 3.72 (on a scale from 1 to 5), and their attitudes concerning pro-environmental behavior were approximately 3.73 (on a scale from 1 to 5). This data indicates that, in general, participants are willing to protect the environment and have a positive attitude toward eco-friendly behavior.

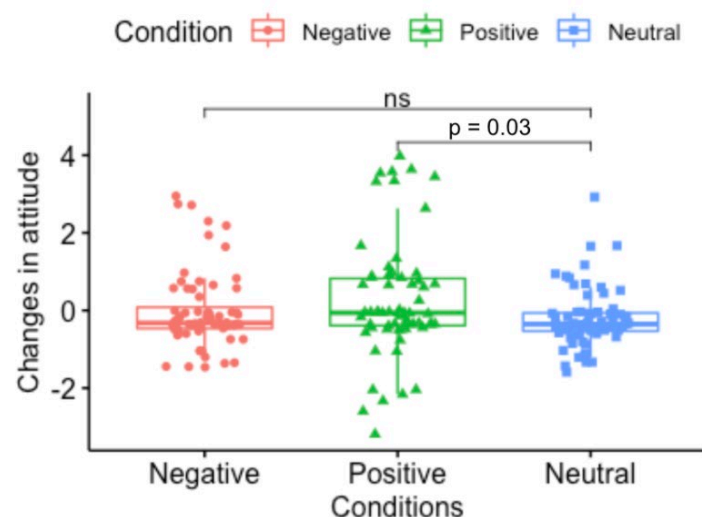


Figure 2. Changes in participants' attitude toward environmental protection. We used this data to test H1a and H1b, and the data was collected by comparing pro-environmental attitudes in two conditions: negative message framing vs neutral and positive message framing vs neutral.

Note: ns indicates non significance.

Second, we hypothesized that message framing could change people's attitude (H1a and H1b),

which was measured by subtracting pre-attitude from post-attitude. After controlling for demographic variables including gender, race, and age, positively framed messages significantly increased participants' attitude toward pro-environmental behavior (Two sample t test, $t(95.7) = 1.7, p = 0.03$; Figure 2). The negative message frame did not significantly change people's attitude compared to the control condition (Two sample t test, $t(125.8) = 1.7, p = 0.25$; Figure 2). These results indicated that positive message framing was successful at increasing people's attitude concerning pro-environmental behavior. On the other hand, negatively framed messages are unable to increase individuals' attitude toward eco-friendly behavior.

Third, we used the data collected from the survey to test if message framing could change people's intention to donate. we hypothesized that message framing could change people's intention (H2a and H2b), which was measured by subtracting pre-intention from post-intention. After controlling for demographic variables including gender, race, and age, positively framed messages significantly increased participants' intention to donate their money to eco-friendly groups (Two sample t test, $t(95.7) = 1.7, p = 0.03$; Figure 2). The negative message frame did not significantly change people's intention compared to the control condition (Two sample t test, $t(125.8) = 1.7, p = 0.25$; Figure 2). These results indicated that positive message framing was successful at increasing people's intention regarding donating their money to support pro-environmental organizations. On the other hand, negatively framed messages are unable to increase individuals' intention to donate.

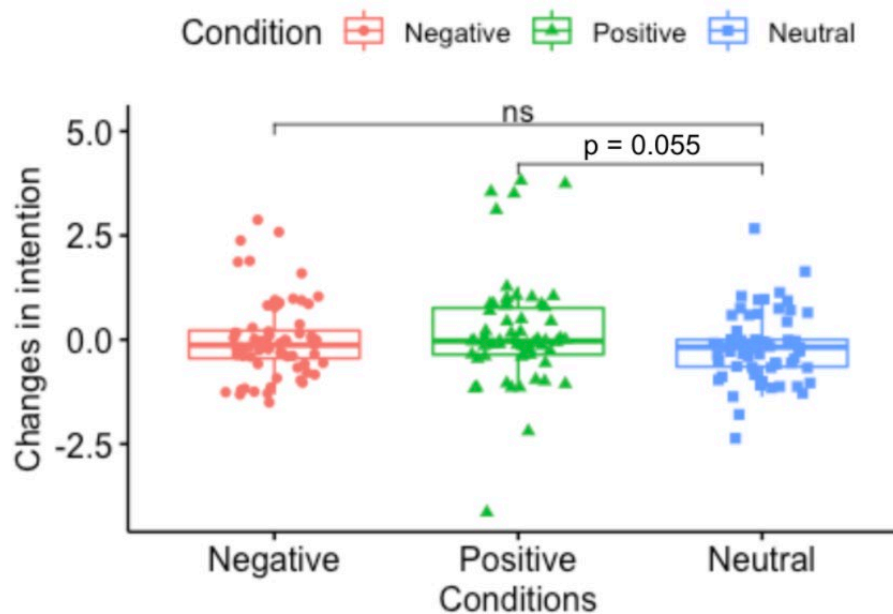


Figure 3. Changes in participants' intention to donate across three different conditions. We used this data to test H2a and H2b, and the data was collected by comparing intention to donate in two conditions: negative message framing vs neutral and positive message framing vs neutral.

Note:ns indicates non significance.

4. Discussion

In the current study, we conducted an online experiment in which participants in different message priming groups reported their environment-related attitudes and donations. This study produced two main findings: first, positive, but no negative priming significantly increased participants' pro-environmental attitudes; second, positive, but not negative priming marginally increased participants' intention to donate to environmental protection organizations. The findings of the current paper shed light on the impact of message framing on human intention, attitude, and their potential behavior toward environmental issues. Since the hypothesis that positive message framing could positively change individuals' attitudes concerning environmental protection and have the tendency to alter people's intention on donating their money to support eco-friendly groups has been proved by the data

we collected, we now are able to extend and utilize our result into the online environment. Through including positive message framing to the public in a pro-environmental scenario, such as a product or a public good with positive message frames related to environmental protection, a bulletin, online supermarket, internet software, or even foods, eco-friendly groups could encourage more individuals to concern about the polluted environment (change in attitude) and stimulate their targeted audiences to offer pro-environmental groups more monetary support (change in intention). Therefore, Eco-friendly groups could explore much more potential financial assistance and develop a well long-term relationship with people who are willing to promote the environment owing to the effect of positive message framing.

The results from the current study are consistent with findings from prior literature on message framing. The author from the prior research conducted an experiment offline in which researchers tried to use interventions to promote the public's environmental concern toward the utilization of plastic bags. Their data indicated that any intervention (message framing and/or not providing plastic bags as default) is more effective than none, and any sign regardless of framing, coupled with asking customers if they want a bag can be an effective and low-cost way to reduce plastic bag use. No significant difference in plastic bag refusal was observed between the positive and negative framing treatments (Nelson et al., 2021). This finding is, to some extent, similar to the result in our research that positive message framing could promote people's attitude regarding pro-environmental behavior and intention to offer eco-friendly groups monetary support. The parallel result has been found in another experiment conducted online, in which researchers investigated whether "nudging" could be an effective tool in dealing with environmental issues and promoting social preferences by using a visual priming technique from a cartoon regarding the lifecycle of a smartphone (Bimonte et al., 2019). As expected, the author came up with a quite similar conclusion to us, demonstrating that message framing could increase people's attitude concerning pro-environmental behavior and have a positive impact on encouraging the public's willingness to pay for the goods that have been labeled as "green". These authorized conclusions that are consistent with the results in this paper have further proved the authenticity of our findings.

From an extensive perspective regarding environmental issues, positive message frames are not simply an effective tool for helping eco-friendly groups receive more financial support. To be more specific, by taking the advantage of a strong positive message framing, conservationists could change people's final behavior while individuals are facing some issues that would negatively affect the environment, and which is not limited to only one area (such as donating money to environmental groups), but across multiple industries and fields on Earth. For instance, environmental organizers can put a notice on the wall of the parking lot, saying: "Every time you decide to go green (by riding a bicycle instead of driving a car), you can create a blue sky and clean air for your family." By imbuing this kind of positive message frame, car-users would theoretically reduce their frequency of using their cars, and therefore, reduce the extent of pollution on our environment. In another scenario, if we intend to lower the utilization of plastic bags in supermarkets, employees can design a delicate note and print it on their coupons, writing: "If you are willing to reduce the use of plastic bags, an additional ocean will be purified by your small actions. Extend your helping hand now!" Ultimately, the public will make a great contribution to our society and environment and eco-friendly organizations will be able to maximize their potential to promote our polluted environment (change in public's behavior).

References

- [1] Briggs, D. (2003). Environmental pollution and the global burden of disease. *British Medical Bulletin*, 68(1), 1–24. <https://doi.org/10.1093/bmb/ldg019>
- [2] Bimonte, S., Bosco, L., & Stabile, A. (2019). Nudging pro-environmental behavior: Evidence from a web experiment on priming and WTP. *Journal of Environmental Planning and Management*, 63(4), 651–668. <https://doi.org/10.1080/09640568.2019.1603364>
- [3] Chang, Y.-T., Yu, H., & Lu, H.-P. (2015). Persuasive messages, popularity cohesion, and message diffusion in social media marketing. *Journal of Business Research*, 68(4), 777–782.

<https://doi.org/10.1016/j.jbusres.2014.11.027>

[4] Eriksen, M., Lebreton, L. C., Carson, H. S., Thiel, M., Moore, C. J., Borerro, J. C., Galgani, F., Ryan, P. G., & Reisser, J. (2014). Plastic pollution in the world's oceans: More than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea. *PLoS ONE*, 9(12). <https://doi.org/10.1371/journal.pone.0111913>

[5] Gallagher, K. M., & Updegraff, J. A. (2011). Health message framing effects on attitudes, intentions, and behavior: A meta-analytic review. *Annals of Behavioral Medicine*, 43(1), 101–116. <https://doi.org/10.1007/s12160-011-9308-7>

[6] Ganzach, Y., & Karsahi, N. (1995). Message framing and buying behavior: A field experiment. *Journal of Business Research*, 32(1), 11–17. [https://doi.org/10.1016/0148-2963\(93\)00038-3](https://doi.org/10.1016/0148-2963(93)00038-3)

[7] Nelson, KM, Bauer, MK, & Partelow, S. (2021). Informational nudges to encourage pro-environmental behavior: Examining differences in message framing and human interaction. *Frontiers in Communication*, 5. <https://doi.org/10.3389/fcomm.2020.610186>

[8] Smith, S. M., & Petty, R. E. (1996). Message framing and persuasion: A message processing analysis. *Personality and Social Psychology Bulletin*, 22(3), 257–268. <https://doi.org/10.1177/0146167296223004>

[9] Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309–317. <https://doi.org/10.1016/j.jenvp.2008.10.004>