The effectiveness of utilizing the framing effect to motivate climate change mitigation effects on an individual level

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Abstract

Climate change has become a concerning threat to our planet. This essay explores the potential of employing the framing effect as a strategic tool to inspire individual involvement in mitigating climate change. Framing, representing certain perceived reality through language, can significantly influence decision-making. This research examines how positive and negative ways of discussing climate change affect people. It uses experiments and surveys involving 300 participants to understand how individuals react to different ways of framing the issue. Following psychological theories by Tversky and Kahneman, the study looks at specific aspects of framing, like actions and outcomes, to see how people respond. The goal is to understand how these framing techniques influence people's engagement with climate change. The research assesses participants' responses, considering demographic factors like age, gender, and political affiliation. The study aims to elucidate whether framing can bridge the gap between climate change awareness and action through statistical analyses and correlation tests. Preliminary expectations suggest that positive framing might inspire proactive measures, while negative framing could invoke fear-driven actions. By understanding the nuances of framing effects, this research sheds light on individual decision-making and offers vital insights into climate change communication strategies. Acknowledging the complexities of human decision-making, this study underscores the need for continued exploration, emphasizing the potential of framing as a powerful tool in the fight against climate change.

Keywords: Climate change, Framing effects, Psychological insights, Questionnaire-based analyses.

1. Introduction

Climate change has evolved into a critical issue, posing a significant threat to the environment that sustains human life. The European Commission has stated that the decade from 2011 to 2020 witnessed the highest temperatures ever recorded, with the global average temperature exceeding pre-industrial levels by 1.1°C in 2019 (European Commission, n.d.). This rise of 0.2°C per decade is a consequence of human activities. If this trend persists, Earth could become unsuitable for human habitation. Effectively addressing climate change requires the participation of individuals. In this context, this paper is dedicated to exploring the potential of employing the framing effect as a means of resolution.

Framing refers to representing certain perceived realities in a more salient way in communicating text, which facilitates the definition of certain problems, causal explanations, ethical evaluation, and/or therapeutic recommendations for the item described[1]. In Tversky and Kahneman's "The Framing of Decisions and the Psychology of Choice," a problem that reveals the same situation is represented with different emphasis on the text [2]. Two treatment groups facing the same situation with different wording, making a choice that will "save" some people or making the same choice that brings corresponding deaths, end up with different choices. Such an experiment partially provides evidence for the significance of framing.

Given the concerning impacts of climate change, a research question has been formulated: To what extent can the strategic use of framing in communication enhance its effectiveness in encouraging individual involvement in mitigating climate change? To answer this, an experiment with a questionnaire incorporating framing has been designed.

In the forthcoming sections, this work will delve deeper into the context of the research question, elaborate on the methodology employed, discuss the anticipated outcomes, and critically assess the viability of the chosen approach.

2. Literature review

Past findings indicate that climate change has brought about significant societal challenges. However, individuals often overlook its importance due to cognitive biases and economic considerations. Recent studies have concentrated on the impact of framing in communication as a means of motivating action, and they have also offered psychological explanations for this framing phenomenon. Nevertheless, the efficacy of framing in this context is still awaiting determination.

Notably, governments worldwide have come to recognize

the pressing imperative of addressing the climate disaster. In December 2015, representatives of the United Nations Framework Convention on Climate Change (UNFCCC) convened in Paris. They achieved a significant milestone by signing the Paris Agreement, which focuses on mitigating greenhouse gas (GHG) emissions [3]. However, subsequent surveys reveal a troubling trend: climate change does not feature prominently as a key organizational concern for entities such as PwC. Shockingly, "37% of employees in commercial enterprises felt that the leadership of their companies do not even believe that climate change is real."

Therefore, despite the global and government attention on climate change, its impact seems to have eluded smaller organizations and individuals. The collaborative endeavors of both organizations and individuals are indispensable to effectively combat the challenges posed by climate change.

In addition to the rational economic perspective that often prioritizes personal utility, the failure to adequately address climate change issues can be attributed to the failure to view the problem through a moral lens instead of relying solely on economic reasoning to guide responses [4]. However, the potential for framing effects to stimulate moral consciousness is significant and should not be underestimated.

The importance of framing effects has been proved by the vast attention being paid to by interdisciplinary scholars. They have also concluded that people respond differently to situational factors. The paper, the Framing of Decisions and the Psychology of Choice, introduced ideas of framing of acts, contingencies, and outcomes [2].

Beyond analyzing framing effects in a general context, social scientists have started looking into how strategic framing in communication specifically affects people's perceptions of climate change and the willingness of people to react to climate change problems.

Researchers started investigating how to employ framing to convey climate change mitigation plans. For instance, Whitmarsh investigated a sample of 589 residents in South England through a survey and discovered disparities in concerns, responsibilities, and perceived impacts of global climate change based on whether the terms "climate change" or "global warming" were used[5]. On the other hand, Villar and Krosnick conducted survey experiments in both the United States and England[6], revealing partisan distinctions in the United States regarding the terms: Democrats considered "global warming" to be of greater concern, while Republicans displayed greater openness to the term "climate change."

Framing is intricately connected to the psychological dimensions of cognitive biases. In a study conducted in 2016, Zaval and Cornwell delved into the realm of "constructed preferences and climate change," uncovering how individuals' choices regarding localized warming effects, attribute substitution, and personal experiences shape their decisions, which contribute to the resistance of climate change mitigation [7]. This insight suggests that framing can be skillfully manipulated in various manners, guiding participants through intricate psychological mechanisms to accentuate one option over another in their perceptions, providing us with insights into the research question.

Apart from this, many other experiments demonstrate the framing effects. However, a challenge persists: these works cannot sufficiently bolster the credibility of this established phenomenon to prompt the scientific community to recognize that framing techniques might serve as a viable approach for effectively conveying information to the public. This limitation arises from the scant number of experiments that only marginally address the core matter at hand.

The experiments researchers have finished so far are in no way enough to receive full credibility from the general public and science community. This is because most research on framing effects is focused on all possible real-life examples that could prove it, but the experiments that can be related to climate change are small amounts. Even those experiments focused on the climate part only pay attention to the superficial level of the issue; for example, people's perception of the naming of the issue and in-depth reviews of the climate change perception and framing effects are barely provided. Hence, the need arises for further experiments to gain deeper insights into this subject. To this end, the paper will make a valuable contribution to the realm of research dedicated to examining how strategic framing influences individuals' perceptions and engagement in matters related to climate change.

It is also important to note that the bias discussed above is mainly related to holding actions, and it is necessary to make this discussion comprehensive with further research on how the bias fosters actions in real life through strategic framing, which is explored by this paper. In this way, the research gap can be filled in, making the study of this field more credible and convincing.

3. Context

Generally, framing could be divided into two categories: positive and negative. Positive framing focuses on getting something, benefit, or gain. It's also more promotion-oriented, highlighting things such as progress and growth. Since positive framing focuses on gain and is crafted

with positive words, it tends to attract people to your solution. On the other hand, negative framing focuses on losing something, the fear of loss, or the fear of missing out (FOMO) [8]. It's also more prevention-oriented, highlighting things such as stopping problems before they occur. Negative framing focuses on loss and is crafted with negative words. People will think of the unhappy or even fearful situations they might face and will, therefore, be repulsed by your statement [8]. For instance, when considering accidents, positive framing emphasizes the number of people who can survive, while negative framing is associated with the number of deaths that will occur. Theoretically, if decision-makers are rational, both ways of expressing the situation should be equivalent. However, distinct framings evoke varied emotions and present information differently to individuals [2].

In a more mathematical and logical context, different "decision frames" can be linked to a specific choice for decision-makers, encompassing the framing of acts, outcomes, and contingencies. These three approaches can potentially lead individuals away from the conventional expected utility theory, prompting them to make logically more "irrational" decisions that are more in line with real life. Framing of acts suggests that many concurrent decisions in the real world are framed independently and that the preference order would often be reversed if the decisions were combined [2]. Framing of contingencies reveals that attitudes toward uncertainty are inconsistent with the axioms of rational choice [2]. Framing of outcomes is perceived as the different decisions made based on where the outcome is accounted for and whether it is positive or negative [2].

4. Methodology

4.1 Two designs

An experiment and a questionnaire, designed with the knowledge mentioned in Context, are being employed to test the framing effect. The questionnaire is more mathematically oriented and involves numerous probability-based questions. It assesses how rationality is influenced by various decision-making environments, such as whether the problem is presented in a two-stage manner or through a narrative-first approach. Thus, the questionnaire uses the framework of framing of acts, contingencies, and outcomes. On the other hand, the experiment primarily concentrates on how human preferences are altered when exposed to different perspectives – viewing situations negatively or positively – within the context of framing. Therefore, the experiment uses the idea of negative and positive framing.

4.2 Methodology for decision-making experiment design

4.2.1 Sample Selection

Three hundred participants will be randomly recruited online. Each participant will receive a financial incentive of $10 for participating in the experiment.

4.2.2 Procedure

Participants will be randomly divided into Group A and Group B. Group A will receive the negative framing treatment, while Group B will receive the positive framing treatment.

Once participants are assigned to the two groups, they will read a page explaining a new policy that comprises two initiatives. Except for the policy title and the definition provided to explain the title, the material on the policy introduction page stays the same for different groups of participants.

First, they will be given some background information. They will learn that activities such as driving cars and using electricity contribute to burning fossil fuels, which releases significant amounts of carbon dioxide into the atmosphere, exacerbating global warming. They will also be informed that the waste generated by their daily activities needs to be either incinerated or landfilled, further increasing their carbon footprint.

After familiarizing themselves with the background information, participants will be asked to provide financial contributions to the two initiatives. The first initiative will be presented as either "Fossil Fuel Emission Treatment" or "Green Investment."

In the "Fossil Fuel Emission Treatment" scenario, participants will read: "The objective of the fossil fuel emission treatment initiative, which can be either mandatory or voluntary in terms of contribution, is to ensure that people themselves undertake the actual societal costs of people's daily activities and energy used."

In the "Green Investment" scenario, participants will encounter the following: "The goal of the green investment initiative, which can be either mandatory or voluntary in terms of contribution, is to reduce reliance on fossil fuels and mitigate people's contribution to global warming."

The second initiative will be presented as "Waste Reduction" or "Resource Optimization." In the "Waste Reduction" description, participants will read: "The aim of the waste reduction initiative, which can be either mandatory or voluntary in terms of contribution, is to ensure that we cover the expenses associated with managing the waste generated by daily activities."

In contrast, the "Resource Optimization" statement

will read: “The objective of the resource optimization initiative, which can be either mandatory or voluntary in terms of contribution, is to enhance the efficient use of scarce resources and minimize their impact on global warming.”

Participants in Group A will see the initiative in terms of fossil fuel emission treatment and waste reduction. In contrast, participants in Group B will encounter the initiative titles regarding green investment and resource optimization.

After reviewing all the provided information, participants will indicate their potential monetary contributions and rate from 0 to 5 (0 meaning “definitely not” and 5 meaning “definitely”) their agreement on making contributions to fossil fuel emission treatment / green investment mandatory for the respective initiatives.

Following their responses, participants must complete a survey related to economic and demographic information, including gender, age, income level, and political affiliation.

4.3 Methodology for the Questionnaire

Randomly recruited participants online. Participants could only answer one of the problems from a problem set. The questionnaire consisted of problems with the application of framing of acts, contingencies, and outcomes. Each category’s sample set of problems is listed below, with reasons for constructing problems. The real questionnaire would have ten problem sets for each category.

4.3.1 A sample problem set of Framing of acts

Problem 1: Imagine that you are deciding whether to invest in a significant climate change mitigation project. Which option do you prefer?

A. With project A, there is certainty that the global temperature will be reduced by 0.1°C.

B. With project B, there is a 25% chance that the global temperature will be reduced by 0.5°C and a 75% chance that there will be no reduction.

Problem 2: Imagine a scenario where a massive oil spill occurs, and two strategies for emergency response are available, each with potential consequences.

C. With strategy A, the oil spill event will still result in a confirmed loss of approximately 3000 marine lives.

D. With strategy B, there is a 75% chance of an oil spill causing a loss of around 4000 marine lives and a 25% chance of no loss.

In Problem 1, for choice B, the calculation yields 25% × 0.5°C + 75% × 0°C = 0.125°C, which surpasses the 0.1°C of choice A. From the expected value perspective, choice B appears more advantageous than choice A. However, considering that Problem 1 involves risk aversion, individuals tend to opt for a certain outcome over a risky one, even if the expected value is equivalent or higher [2]. Respondents who are risk averse would tend to prefer choice A, contrary to what mathematical and rational reasoning might suggest in favor of choice B.

In Problem 2, for choice D, 75% × 4000 = 3750, greater than the 3000 marine lives lost in choice C. In terms of expected value, choice C has a lower expected value in terms of marine life loss. However, Problem 2 involves risk-taking, making a risky option more appealing than a riskless option with equal or lower expected loss [2].

These two sample problems constitute a problem set that examines people’s reactions to risk. To increase acceptability, if risk aversion and risk seeking have distorted the mathematical value while describing the impacts of a project, a certain outcome should be stressed for beneficial outcomes. In contrast, a probabilistic statement should be utilized for adverse ones.

4.3.2 A sample problem set of Framing of contingencies

Problem 1: Consider the following scenario. If you are asked to donate to renewable energy projects. During the research stage, there is a 50% chance of the research stagnating because of the rejection of original methodologies and a 50% chance that the research succeeds, progressing to the marketing stage. If the marketing stage is reached, you have a choice between (you need to indicate the choice before the research stage starts):

A. Use marketing plan 1 to ensure a reduction of approximately 80 E.J. of fossil fuels burned.

B. Use marketing plan 2 to have an 80% chance to reduce approximately 120 EJ of fossil fuels burned

Problem 2: Which marketing plans do you prefer if they are used to promote a newly developed renewable energy?

C. Use the market plan 1 to have a 50% chance to reduce approximately 80 E.J. of fossil fuels burned.

D. Use the market plan 2 to have a 40% chance to reduce approximately 120 EJ of fossil fuels burned

When considering probability, choice A represents a 50% chance × 100% = a 50% chance of reducing approximately 80 E.J. of fossil fuels burned. In comparison, choice B represents a 50% chance × 80% = a 40% chance of reducing approximately 120 EJ of fossil fuels burned. Mathematically, choices A and B equate to C and D, respectively. However, the pseudocertainty effect suggests that individuals tend to perceive choice A as more certain and, therefore, are inclined to prefer it over choice C [2]. If this effect were to be demonstrated in this context, future efforts to promote climate change mitigation could divide an issue into consecutive phrases and highlight certainty in the latter phrase. This approach

would enhance people's sense of security and empower them to feel greater control over the issue.

4.3.3 A sample problem set of Framing of outcomes

Problem 1. Every year, you generate approximately 1642 pounds of rubbish. Those who are unable to recycle contribute to rising landfills and incineration. Would you donate $200 annually to prevent waste from piling up on the planet?
A. Yes
B. No
Each year, a person generates approximately 1642 pounds of rubbish. Those who are unable to recycle contribute to rising landfills and incineration. Would you donate $200 annually to prevent waste from piling up on the planet?
A. Yes
B. No
*1642 pounds of rubbish reference to the source https://www.dumpsters.com/blog/us-trash-production
The only difference between these two questions is whether "you" or "a person" is used in narration. The concept of psychological account could explain how the difference works [2]. When the sentence is addressed as "you," the external cost of 1642 pounds of rubbish produced is entered into respondents' psychological accounts, making them negative. To balance their accounts, people would be more willing to donate $200 to cancel out the external effect: making the balance of accounts less negative or becoming zero. If the logic of psychological accounts truly works, the approaches in narration could be carefully selected to push people to account for their daily behaviors rather than adopting minimal accounts.

5. Analysis

5.1 Primary data managing

Measure the time that the participants have spent completing the tasks. Calculate the mean of the time that they have spent. Delete the data for people who took time with three standard deviations less than the mean value.

5.2 Analyzation of the experiment

5.2.1 General Analysis

Calculate the basic components of statistics, including the mean, median, mode, variance, standard deviation, and upper and lower quantiles.
Use a box of whiskers to represent the distribution of data and also show the comparisons between different groups who received different titles for initiatives related to mitigating climate change.
Make comparisons between the box of whiskers diagrams for different groups. (As this paper wanted to find out whether positive or negative framing is more beneficial in assisting people to make decisions under the topic of environment, the comparison is quite necessary)
Hold a statistical test to determine if the mean and standard deviation difference between group A's and group B's responses are statistically significant enough. In other words, the statistical significance needs to be determined (whether it is statistical significance at 1%, 5%, or 10%). Whenever the p-value is larger than 0.1, the null hypothesis could be rejected, and it could be concluded that negative framing is more effective or less effective (it needs to be determined from the calculated value) than positive framing.

5.2.2 Detailed demographics analysis

A more in-depth analysis can be conducted using the economic and demographic information collected from the survey. Gender, age, income level, political affiliation, and education level could influence individuals' decision-making regarding the amount they are willing to donate and their acceptance of mandatory donations. For example, participants who are older than 65 years old will be separated from other participants for analysis. The framing effect will be analyzed with separated age groups. Graphs, such as Figures 1 and 2, will be made for comparison, as shown below.

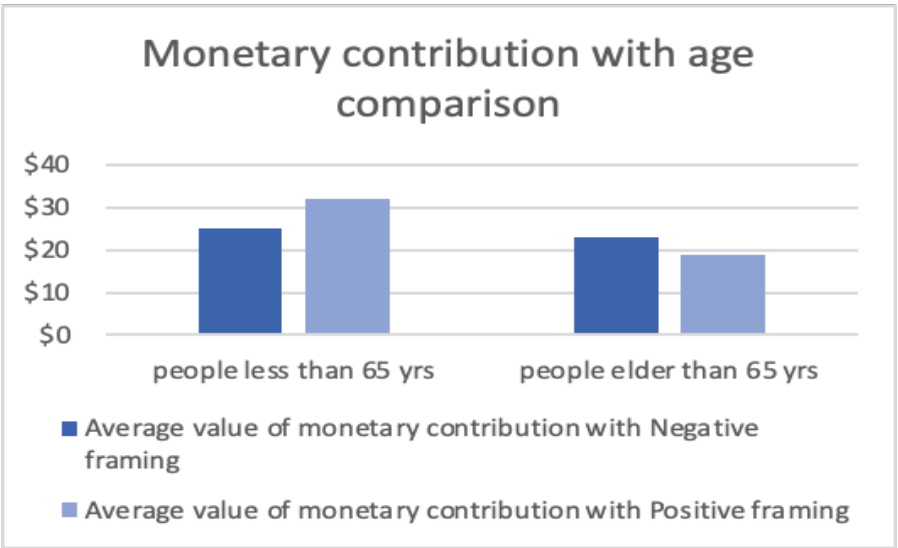

Figure 1. Monetary contribution with age comparison.

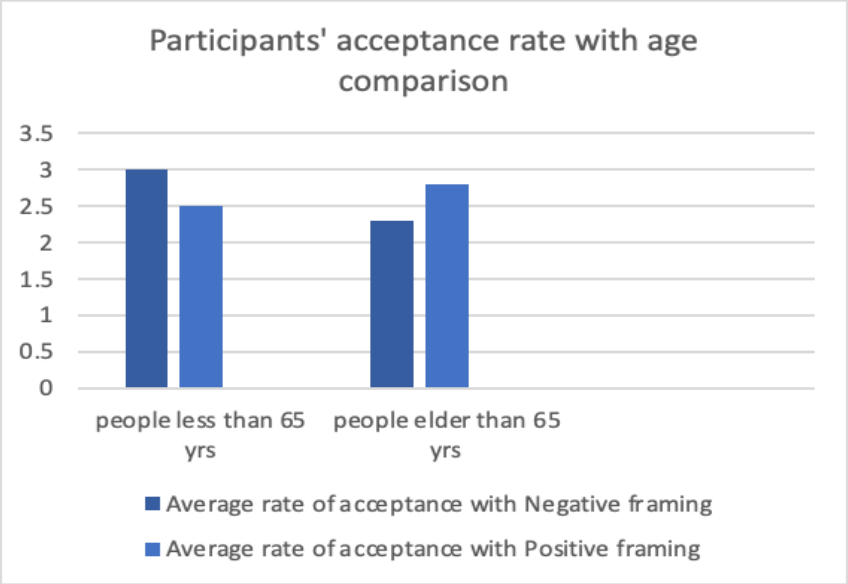

Figure 2. Participants' acceptance rate with age comparison.

5.2.3 Correlation Analysis with real world Implication

An additional step of analysis that could complement this study is conducting a correlation test to identify the relationship between monetary contributions and acceptance ratings. In this context, the acceptance rating can be interpreted as a reflection of one's belief in the importance of addressing climate change mitigation. On the other hand, monetary contributions represent a tangible action taken towards mitigating climate change. If the inclination and action align closely, their combined effect will likely be amplified. Otherwise, real action does not realize aspirations, or actions lack sustainability due to a lack of underlying belief.

5.2.4 Expected result for the experiment

As stated earlier, positive framing has the potential to elicit feelings of happiness and inspire individuals to take proactive measures to improve situations. On the other hand, negative framing may evoke feelings of fear, compelling people to take action to prevent adverse outcomes. It remains unclear whether the motivating force of joy outweighs that of fear. Individuals may react differently. Prevention-oriented individuals are more persuaded by the negative framing, while promotion-oriented individuals are more influenced by the positive framing [9]. Experiments must be conducted to ascertain the comparative effectiveness of negative and positive framing.

5.3 Analyzation of the Questionnaire

5.3.1 Visualization

Make bar graphs for each question based on responses by the participants as they have already chosen in the questionnaire phase.

5.3.2 Comparison

Compare the probabilities of population preferences among different answer choices. Within a problem set, choices have or have not been interfered with by the framing effect. For instance, in scenarios involving the framing of contingencies, selections made through a two-staged approach represent choices aligned with the framing of contingencies strategy. Meanwhile, one of these two options signifies choices influenced by both the framing of contingencies and the pseudocertainty effect. Credits are assigned based on the prevalence of selections, with higher credits assigned to choices with a greater proportion of participants opting for them and vice versa. Accumulated credits are assigned to choices in different presenting ways. For instance, if there are ten problem sets involving the framing of contingencies, credits for choices framed by both the concept of contingencies and the pseudocertainty effect are summed up. The choice with the highest credit score indicates the optimal presentation approach (whether to frame it or not, whether to enhance certainty or not, etc) to enhance its attractiveness. This approach enables us to determine the most effective means of presenting information within the three categories, allowing us to make informed decisions about presentation methods.

5.3.3 Expected result for the questionnaire

Choices crafted using framing acts, contingencies, and outcomes are more likely to be selected according to the principles outlined in "The Framing of Decisions and the Psychology of Choice" [2]. However, human decision-making processes are complex, so actual results may deviate from what theories expect.

6. Conclusion

The significance of climate change has been clearly stated in previous sections. Without intervention, its impact would be tremendous. The application of framing aims to increase individual participation in climate change mitigation. Based on expected results, framing should influence individual decisions concerning the issue, making it possible to change their reaction in reality, slowing down the rate of climate change. Different targeted populations could react differently to framing, divided by age, gender, income, political affiliation, and education level. The effectiveness of framing could fluctuate depending on these factors. This work's approach ensures precision and accuracy of the expected results by investigating and comparing the decisions made by different treatment groups so that the effectiveness of framing effects can be identified. However, it is worth noting that the psychological process involved in making decisions could differ in specific situations and individuals. Additionally, changes in wording might have unexpected effects that are hard to control, suggesting potential avenues for further exploration.

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All authors contributed equally to this work and should be considered co-first authors.

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