# Causal effects of self-blame and self-efficacy messages on climate change intentions and behaviors in the context of political party affiliation: A randomized controlled trial

## Bryson Shaub

*Personal Section*

I witnessed a sea of yellow-orange skies cast a haze over the nearby buildings. This was not *Blade Runner 2049*; this was yet another example of the cataclysmic impacts climate change can have on the planet we call home. The smoke from the wildfires in Canada had finally arrived in New York, sending my entire community into disarray. I felt my eyes burning as I walked out of the double doors of my school on what should have been a normal school day. Wearing two KN-95 masks, I turned my usual 10-minute walk home into a 5-minute run. I swiftly closed all of the windows in my house and turned on the air conditioner. I was watching the disastrous effects of climate change unfold first-hand, and so was everyone else. I immediately dialed my Dad's phone number, concerned that he would be significantly impacted because of his underlying condition. It was a difficult week to be a New Yorker.

Climate change continues to pose a significant threat to life on Earth. It seems that events such as the wildfires in Canada have become commonplace as individuals become more desensitized to the natural disasters we are witnessing. Growing up, my parents often tried to shield me from the realities of the outside world. However, each year I found myself scrolling through news headlines more often, wondering what I could learn about life outside of my gated community. The pressing nature of climate change stood out to me, and I soon found myself engrossed in how I could one day make a difference.

After being selected as a Freshman into my high school's Social Science Research Program, I found an avenue to make my dreams a reality. The highly selective 10-person program involved reading and analyzing research studies, submitting to historical competitions, and conducting empirical studies of our own. At the beginning of my Junior year, I expressed my

interest in the topic of climate change to my teacher and began searching for a mentor to guide me through my empirical study.

After sending several emails to university professors, I connected with Assistant Professor Mary McGrath from Northwestern University. I detailed my experience in the Social Science Research Program and my excitement to have the opportunity to work with a professor as passionate about climate change as I was. She responded promptly, and we began brainstorming ideas for possible topics within the realm of climate change. I was so thankful to have the privilege of conducting a study under her guidance.

As I scrolled through past studies, I wrote down thirty questions that warranted more research. A few of these were whether political party affiliation affects opinions on climate change, if hope regarding climate change impacts action against it, and whether humans feel responsible for climate change. Past studies suggested that emotions, namely hope and blame, can influence intentions and behaviors relating to climate change. However, research had yet to view these findings in relation to one's political party. This study intended to explore this narrow aspect of climate change research.

Under my mentor's guidance, I designed a novel survey for my study on Qualtrics and distributed it through Amazon's Mechanical Turk. Participants were sorted into three groups: self-blame, self-efficacy, and control. Each received a slightly different environmental statement in the survey. The survey also had questions about a participant's background, an optional letter to a Congressman, and statements measuring intentions to combat climate change. In my survey, I made it a point to include an option for participants to submit their letters to their representative on a website known as Democracy.io. I hoped these letters would spark a new outlook on climate change among the participants in my survey.

Participant responses were uploaded to a platform called RStudio, where a unique form of a t-test was used to evaluate if each "treatment" group affected a Republican or Democrat's pro-environmental intentions or behaviors. As I loaded up RStudio for the first time, I started to feel mathematics come alive like never before. Under my mentor's supervision, I learned how to code for variables, histograms, and data plots, conduct one-tailed t-tests, and determine several crucial values such as the mean, standard error, and 95% confidence intervals. Although analyzing my data was a challenging and extensive process, it significantly enhanced my understanding of mathematics and statistics.

The results of the t-tests suggested that feelings of self-efficacy (hope) significantly impacted a Republican's pro-environmental behaviors. Additionally, it seemed that Democrats generally had more positive intentions and behaviors. The results also suggested that intentions may not be an accurate reflection of behaviors in the context of climate change. More research should be conducted to determine other factors that prompt action.

As I reflect on my experience conducting this study, I hope to offer a few pieces of advice for any aspiring researcher in high school with a budding interest in science or mathematics. First and foremost, I would suggest choosing a topic you are passionate about. This will allow you to stay motivated throughout the process and thus design a well-crafted project. Also, focus on the real-world implications of the study. How can its results be utilized in the outside world? What are its impacts? Even after finishing my study, I still find myself brainstorming steps we can take in our communities and beyond to mitigate the impacts of climate change. If the yellow-orange skies across New York were any indication, time is of the essence; we cannot afford to wait any longer.

.

*Research Section*

# ABSTRACT

As carbon dioxide emission rates escalate because of human activity, climate change is becoming a topic of concern across the globe. Prior research suggests that emotions can play a significant role in influencing climate change perceptions and actions. Self-efficacy, an attribute closely related to hope, and self-blame have been tied to pro-environmental behavior, yet the role of these specific emotions in climate change intentions remains unsettled. An individual's party affiliation has also been linked to their opinions on climate change. However, few studies have examined whether Democrats or Republicans are more susceptible to statements invoking feelings of self-efficacy and self-blame. This study intended to establish causal relationships between emotions and pro-environmental intentions and behaviors in the context of an individual's political party affiliation, a niche aspect of climate change research that remained almost entirely unexplored. A novel survey was distributed through Amazon's Mechanical Turk to people across the United States. Each participant was given either a control statement, a self-blame treatment statement, or a self-efficacy treatment statement. The survey also consisted of standard demographic and sociopolitical questions, an optional letter to a Congressman, manipulation checks, and three items on a 7-point Likert scale measuring pro-environmental intentions. The responses from the 155 participants were transferred into RStudio, where Welch Two Sample T-Tests were used to test for significance between each treatment group and the control group regarding intentions and behaviors among Republicans and Democrats. There was a significant difference in pro-environmental behavior between Republicans in the self-efficacy treatment group and the control group. Environmental activists should consider reaching out to Republicans by inspiring hope to spark a significant shift in their environmental opinions and collectively limit the impacts of climate change.

# 1. Introduction

As the years pass by, climate change is becoming more and more severe across the globe. Carbon dioxide emissions are rising due to human activities such as deforestation, burning fossil fuels, agriculture, and cement production. The emission levels are at their highest since over 2 million years ago. The highly debated topic of climate change has recently received more attention from researchers, some of whom have been trying to determine the best methods of producing pro-environmental support. This study will compare the effects of self-efficacy (hope) and self-blame (guilt) on climate change behaviors and intentions. Understanding whether feelings of hope or guilt affect climate behavior is critical as it helps climate change activists and researchers determine which emotions to draw on in their outreach efforts.

# 2. Literature Review

## 2.1. Affect and Emotion as Drivers of Action against Climate Change

Past research suggests that human behavior is influenced by affect and emotions (Lerner et al., 2015; Brosch et al., 2013). Affect has been described as a positive or negative feeling towards an object or event that may influence judgments. Conversely, emotions are more intense reactions to specific events (Brosch et al., 2013). Findings also suggest that affect and emotions often can act as drivers of climate change perception and action. For example, a study titled "Predicting climate change risk perception and willingness to act" found that negative affect was the largest predictor of wanting to engage in climate mitigation through public transport or saving electricity (Xie et al., 2019). A similar study by Anne van Valengoed and Linda Steg in 2019 found that negative affect was one of the largest predictors of climate change behaviors (van Valkengoed & Steg, 2019). In addition, two other studies from 2013 and 2018 found that public support for climate change was predicted by affect and emotions, including worry, interest, and hope (Smith & Leiserowitz, 2013; Wang et al., 2018). A more recent research study, "Identifying the most important predictors of support for climate policy in the United States," determined that worry over global warming was the greatest predictor of climate policy support, followed by affect toward global warming (Goldberg et al., 2020). Similarly, according to a study conducted in the same year, worry about climate change was a direct predictor of climate policy support and an indirect predictor of personal energy-saving behaviors (Bouman et al., 2020). Since most of these research studies were correlational, it is unclear whether affect and emotions

were antecedents of climate change judgments and behaviors or consequences (Brosch, 2021). This study intends to determine if there is a causal relationship between these variables.

## 2.2. Self-Efficacy and Hope

Self-efficacy, or a person's belief in their ability to take action, create multiple pathways, and attain their goals, has been discussed in current research on climate change (Yang et al., 2020). In the context of climate change, self-efficacy is extremely important, as researchers are constantly looking for ways to increase a person's motivation to act pro-environmentally. Ferudun Sezgin and Onur Erdogan's 2015 study suggests there is a positive relationship between self-efficacy and hope (Sezgin & Erdogan, 2015). A more current 2020 study conducted across universities in China came to a similar conclusion, with results suggesting that hope and creative self-efficacy (CSE) also have a positive relationship. Creative self-efficacy is defined as the understanding that a person holds the potential to induce creative outcomes and was quantified by utilizing a portion of the Short Scale of Creative Self, or SSCS (Haase et al., 2018; Yang et al., 2020). This study will consider self-efficacy and hope in the same context and treatment group, the terms being interchangeable because of their positive correlation and similar definition.

Recent research has also started to test whether hope is a significant factor in predicting pro-environmental behavior and how climate messages can induce feelings of hope. One recent study by Amy Chadwick in 2014 suggested that hope is often evoked through messages about the importance of climate protection (Chadwick, 2014). Additionally, there are different subtypes of hope which are driven by different appraisals. According to two past studies, constructive hope is the trust that climate change can be mitigated through action and has been positively connected to pro-environmental behavior (Marlon et al., 2019; Ojala, 2015). The first source of constructive hope is positive re-appraisal. This consists of describing environmental worries and thinking positively. The second source of constructive hope is trusting in technology and environmental organizations. The last is the trust that humans can make a difference in the battle against climate change (Ojala, 2012). This study will utilize the first and third sources of constructive hope. To determine if constructive hope was associated with pro-environmental behavior, Maria Ojala distributed two questionnaires for her 2012 study and found that those with high levels of constructive hope were more engaged with pro-environmental behaviors (Ojala, 2012). However, the design of the study did not allow for a causal relationship between

hope and environmental behavior, which is a question that this study intends to capitalize on. Also, a research study in North Carolina determined that hope seems to add motivation to act against climate change (Stevenson & Peterson, 2015).

Although researchers have found hope to be effective in promoting pro-environmental behavior, other studies have found hope to be less clear in promoting pro-environmental attitudes or intentions. For example, Matthew Hornsey and Kelly Fielding's study, "A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation," found that optimistic messages on reducing carbon emissions increased hope but reduced perceptions of risk and did not increase mitigation motivation (Hornsey & Fielding, 2016). In addition, a study by Hornsey and Fielding three years later found that high-threat messages lead to more efficacy than low-threat messages. To conduct their research, the researchers distributed two articles to their participants, one with an optimistic "glass half-full" message and the other with a "glass half-empty" message. The two researchers found that hope was higher among participants when distributed the optimistic message but intentions to combat climate change were lower (Hornsey & Fielding, 2019). This suggests that complacency does occur around hope-based emotions in certain situations. In addition, researchers should not assume that fear messages are not leading to engagement or that only positive messages should be used.

## 2.3. Self-Blame and Guilt

Similar to feelings of personal responsibility and guilt, self-blame has been closely observed in recent research on climate change. Research suggests that a relationship exists between responsibility and action against climate change. According to a 2020 study conducted in Europe relating to climate change concern and personal responsibility, assuming personal responsibility had a significant positive effect on most actions relating to climate change mitigation (Jakučionytė-Skodienė & Liobikienė, 2020). Another study conducted by Gennaro Punzo and Demetrio Panarello, among others, suggests that both indirect and direct values and felt responsibility are positively connected to pro-environmental behavior (Punzo et al., 2019). In addition, a 2014 study conducted in two research universities concerning the systematic processing of climate change information indicates that messages emphasizing individual responsibility may attract a wider audience and lead to more profound thoughts about the topic (Rickard et al., 2014). Similar emotions, such as guilt, have also been observed in an

environmental context. For instance, a research study from the same year concerning guilt and its connection to climate change found that guilt over human-caused environmental damages led to higher chances of signing environmental petitions (Rees et al., 2014).

Although most past research suggests there is a positive relationship between feelings of self-blame or responsibility and climate change action, the results from a separate study conducted by Anja Kalch and others suggest that its effect on intentions may be different. In contrast to their hypothesis, the researchers of this study found that an individual responsibility frame decreased the pro-environmental intentions of the participants. However, the researchers believe these results may have been affected by outside factors (Kalch et al., 2021).

## 2.4. Pro-Environmental Behavior versus Intentions

As climate change and ecological harm resulting from human activities become more prominent, environmental awareness and intentions have increased. However, the actions and behaviors of people across the globe may not necessarily change with the intentions. One 2021 study in China examined the gap between intentions and behaviors and concluded that people with greater pro-environmental intentions are more likely to participate in pro-environmental behavior (Wang & Mangmeechai, 2021). However, the study asked participants to report their environmental behavior on a survey instead of actually measuring their behavior. As a result, false reporting may have occurred from participants. The absence of an actual measurement for behavior is a gap in the research that this study intends to explore. Additionally, since this study will use an experiment-based survey, causal effects on intentions and actual behavior, as opposed to mere correlations, will be analyzed.

## 2.5. Political Party Affiliation

Past research suggests that a person's political party affiliation can significantly influence their likelihood of participating in pro-environmental activities. According to a recent longitudinal research study from 2020, more than 90% of registered Democrats believe climate change is a moderately significant worry for the United States. In addition, most Democrats also believe that the federal government is not doing enough to mitigate climate change. Lastly, conservative Republicans are more often doubtful of policies to reduce climate change (Kennedy & Johnson, 2020). These results suggest that Democrats are more inclined to take action against climate change than Republicans. However, research has not explored how feelings of self-efficacy or self-blame might affect Republicans and Democrats differently when it comes to

their pro-environmental intentions and behaviors. This study plans on specifically observing this uninhabited aspect of environmental research.

## 2.6. Other Drivers of Action against Climate Change

Several other factors can affect a person's willingness to act against climate change. For example, pro-environmental behavior can depend on if individuals think messages are relevant to goals of stopping climate change (Hahnel & Brosch, 2018). Also, when targeting audiences for climate change communication, the speaker or writer of a particular message can be just as important as the message itself. Communicating messages about climate change is easier when it is from a source or person that people can trust. Also, the messages that are communicated should be realistic. In other words, there should be no exaggerated scenarios, according to Hornsey and Fielding's 2019 research report (Hornsey & Fielding, 2019). Denise Baden's 2019 study suggests that solution-focused stories should be used because they can lead to pro-environmental intentions (Baden, 2019). Another study by Joshua Carlson, Hannah Kaul, and a few other researchers has also suggested that positive images of solutions were better than negative ones (Carlson et al., 2020). However, it should be noted that most of this recent research used surveys, not field experiments (Schneider et al., 2021). Lastly, personal stories relating to how climate change affects individuals may be a better method of inducing emotional engagement as they result in greater feelings of worry and compassion, thus causing a greater belief in global warming and higher risk perceptions (Gustafson et al., 2020).

## 3. Hypotheses

(1.1) The *self-blame* treatment will significantly affect pro-environmental *intentions* relative to the control among *Republicans*.

(1.2) The *self-efficacy* treatment will significantly affect pro-environmental *intentions* relative to the control among *Republicans*.

(2.1) The *self-blame* treatment will significantly affect pro-environmental *intentions* relative to the control among *Democrats*.

(2.2) The *self-efficacy* treatment will significantly affect pro-environmental *intentions* relative to the control among *Democrats*.

(3.1) The *self-blame* treatment will significantly affect pro-environmental *behavior* relative to the control among *Republicans*.

(3.2) The *self-efficacy* treatment will significantly affect pro-environmental *behavior* relative to the control among *Republicans*.

(4.1) The *self-blame* treatment will significantly affect pro-environmental *behavior* relative to the control among *Democrats*.

(4.2) The *self-efficacy* treatment will significantly affect pro-environmental *behavior* relative to the control among *Democrats*.

## 4. Methodology

### 4.1. Sample

The participants for this study were recruited from Amazon's Mechanical Turk, an online portal in which requesters, or specific individuals and businesses, may submit jobs. Each participant was 18 or older and lived in the United States of America. They received $1.00 for their participation in the study. The participants accessed a link on Mechanical Turk that directed them to the study's survey on Qualtrics, a management software that allows users to create surveys using various question types. By using a survey link and giving each participant a unique completion code, each survey response in Qualtrics was linked to the participant on Mechanical Turk.

### 4.2. Stimulus and Procedure

After agreeing to the terms of consent, participants were randomly assigned to either one of the treatment groups (self-efficacy or self-blame) or the control group. These groups were assigned so that the participant distribution among the groups would be equal or almost equal. The participants were then distributed the survey. Northwestern University's Institutional Review Board approved this survey.

The first section of the survey asked about a participant's demographic information, specifically their age, gender, race/ethnicity, and educational background. Following this, participants were asked about their political ideology, ranging from extremely liberal to extremely conservative. They were then asked about their political party affiliation. If they answered either "independent" or "other," the participants received a follow-up question that asked if they identified closer with Democrats or Republicans.

The second section of the survey asked the participants to read a couple of sentences concerning rising carbon dioxide emissions and the causes of climate change. However, depending on the participant's group, there was a slightly altered statement in bold lettering intended to invoke either feelings of self-efficacy, self-blame, or a neutral emotional response. The specific wording for the self-efficacy treatment group was "humans have been making stronger and stronger efforts to reduce global climate change." The self-blame treatment group was altered to say that "humans are directly responsible for causing global climate change." Lastly, the control group simply said, "global climate change" in bold lettering.

### 4.3. Measures

In order to measure the participants' pro-environmental behavior, they were then given an optional question asking them to draft a letter to their members of Congress about the issue at hand. At the end of the survey, participants who chose to write a letter received back the letter they had written and were asked to visit democracy.io so they could submit this letter.

The next set of questions in the survey used a seven-point Likert scale (1 = "Strongly disagree," 4 = "Neither agree nor disagree," 7 = "Strongly agree") to assess whether the manipulation of the groups was successful and the pro-environmental intentions of the participant. Another question about the participant's "worry" over climate change was added. The three statements assessing the participant's pro-environmental intentions were adapted from a study relating to the antecedents of green behavioral intent, and a study conducted this past year (Mancha & Yoder, 2015; Kalch et al., 2021). The statements asked about the participants'

inclination to mitigate climate change ("I will try to reduce my carbon footprint in the coming months," "I intend to engage in environmentally friendly behavior in the coming months," "I plan to stop wasting natural resources in the coming months.")

## 4.4. Data Collection

The survey received 155 responses through Amazon's Mechanical Turk. Every participant agreed to the terms and conditions of the informed consent. Approximately 68% of individuals who completed the survey were between the ages of 25 and 44. Additionally, approximately 61% of participants identified as male, and 39% identified as female. In terms of racial or ethnic identity, approximately 78% of participants identified as White or Caucasian, 8% as Asian or Pacific Islander, 5% Multi-Racial, 5% as Black/African American, 3% as Hispanic, and 2% as American Indian/Native American or Alaska Native. For the participant's level of education, it should be noted that around 52% of participants received a Bachelor's Degree. Lastly, 57% of participants identified themselves as even slightly liberal, 27% as at least slightly conservative, and 16% as middle of the road.

After the survey responses were transferred into RStudio, participants were sorted into three political parties: Democrats, Republicans, and Independent/Other. Those participants who identified as Independent or Other in the initial question of the survey were placed into the Democratic and Republican groups depending on their answer to the follow-up question they received. If participants did not lean toward one of the two primary parties, they were classified as Independent/Other. For this study, only the responses of Democrats and Republicans (including Democratic and Republican "leaners") were analyzed. 67% of participants were classified as Democrats, while 26% were classified as Republicans.

## 4.5 Testing of Hypotheses

For each of the three Likert scale questions relating to pro-environmental intentions, the responses in the 7-point scale were categorized into three different categories: negative (-1), neutral (0), and positive (1). If a participant chose 4 on the scale, which was labeled "Neither agree nor disagree," they were categorized as having a neutral response. Those who answered with a number less than 4 (closer to "Strongly disagree") were considered to have negative intentions. If the participant selected a number greater than 4 (closer to "Strongly agree"), they were categorized as having positive intentions. Histograms were then created for both Democratic and Republican intentions across all three items ("carbon footprint,"

"environmentally friendly behavior," and "natural resources") and each treatment and control group.

Next, an intentions tri-index was created to ascertain a participant's mean, or average, intentions to combat climate change. Each participant's score for each item, -1, 0, or 1, was added up and divided by three. A set of histograms for both the Democrats and Republicans were then created, once again separated by treatment group.

In order to test for significance between each treatment group and the control group, each participant's mean intentions were put into two categories based on whether the participants had positive intentions across all three items. Then, participants were once again divided into their treatment groups. Welch Two Sample T-Tests were used to test for significance because it accounts for unequal proportions in each population. This was vital, considering that there was a slight difference in the number of participants in each treatment or control group among Republicans and Democrats. A significance threshold of $p \leq 0.05$ was established. The mean, standard error, and 95% confidence intervals were also calculated for each treatment group. This data was also represented with a plot, with a dashed line indicating the control group mean and points clarifying the means of the treatment groups. The 95% confidence interval for the self-blame and self-efficacy groups was represented with a solid horizontal line.

Environmental behavior was measured by participants' willingness to write a letter to their Congressman. Participants who chose not to answer this question on the survey were placed into the neutral (0) category. The responses of participants who answered the optional prompt were divided into either an anti-climate letter (-1), no letter (0), and a pro-climate letter (1) or were not included because their answer was unclear (N/A). An example of a pro-climate letter was a response that said, "Save our future. Do something about climate change." On the other hand, a negative letter written by a participant stated, "Climate change is not happening in the way that it has been described." Two responses were declared invalid (N/A) since they failed to address the prompt or clarify their argument. The data was then represented with histograms and plots similar to those crafted for environmental intentions. Again, Welch Two Sample T-Tests were conducted by comparing participants exhibiting pro-environmental behavior to those who did not. The mean, standard error, and confidence intervals were estimated, and the p-values between each treatment group and the control group were calculated.

# 5. Results

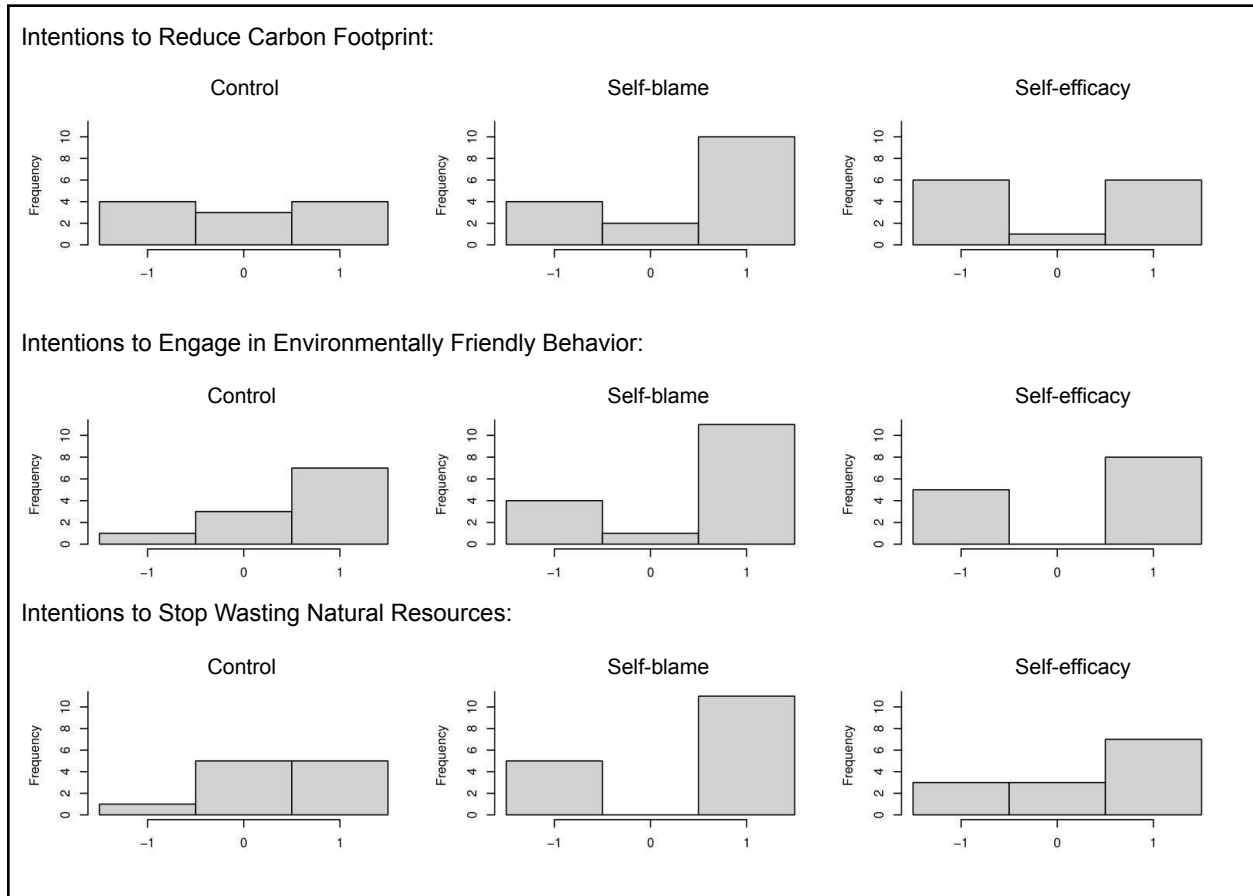## *5.1. Republican Pro-Environmental Intentions Items*



*Figure 1.* Intentions of Republicans to act pro-environmentally in the coming months. Each row represents one of the three items indicating their intentions. The x-values clarify whether the overall intentions were negative (-1), neutral (0), or positive (1), while the y-values indicate the frequency of Republican participants.

The histograms reveal specific trends in each treatment group among Republicans (Figure 1). For instance, the self-blame treatment group has many more positive responses than the control group. Additionally, the self-blame and self-efficacy treatment groups seem to push participants out of the neutral and into the negative for intentions. Since this pattern emerged across all three intention items, a tri-index was created, taking the average of the responses for each treatment group's three items of intent.

## 5.2. Republican Pro-Environmental Intentions Tri-Index
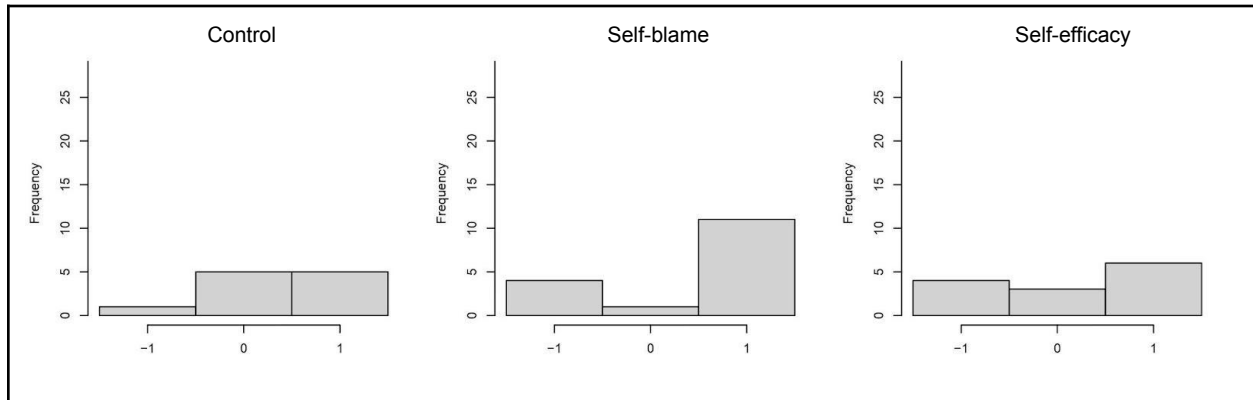


*Figure 2*. Intentions of Republicans to act pro-environmentally in the coming months. The three different types of intentions were consolidated into an intentions tri-index.
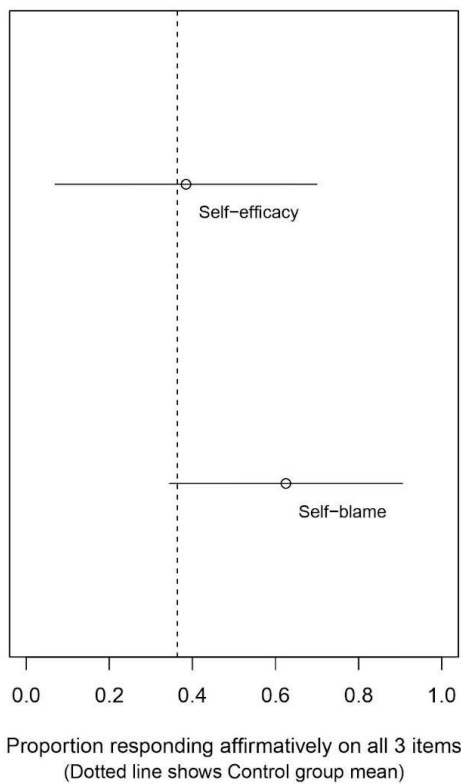


Proportion responding affirmatively on all 3 items
(Dotted line shows Control group mean)

*Figure 3*. Plot indicating the mean proportion of Republican respondents with positive intentions for each treatment group. The horizontal lines indicate the estimated 95% confidence interval. The vertical dotted line represents the control group mean, and the open circles represent the means for each treatment group.

The three items indicating environmental intent among Republicans were consolidated into an intentions tri-index, as seen with the histograms above (Figure 2). The pattern in the first figure was even more pronounced in the tri-index figure. Again, the self-blame treatment seems more positive than the control group, and both treatments show some indication of pushing people out of the neutral into the positive or negative.

The mean of the intentions on the tri-index for Republican participants in the self-blame group was approximately 0.63, while the mean for the control group was 0.36, as seen in the plot (Figure 3). To test whether the apparent difference between the self-blame treatment and the control group was significant, one-tailed Welch Two Sample T-Tests were conducted based on the percentage of respondents with positive intent for all three items, and 95% confidence intervals were estimated. The p-value was not significant as it was slightly greater than 0.05 (p = 0.1). Therefore, Hypothesis 1.1 was not supported. The mean of the

intentions for participants in the self-efficacy group was 0.38, which was much closer than the self-blame treatment to the control group's mean, as seen in Figures 2 and 3. The p-value when comparing the self-efficacy treatment with the control group was also not significant ($p = 0.46$), refuting Hypothesis 1.2. Although there were no significant findings regarding pro-environmental intentions among Republicans, the self-blame treatment had a much greater effect on a participant than the self-efficacy treatment.

### 5.3. Democrat Pro-Environmental Intentions Items
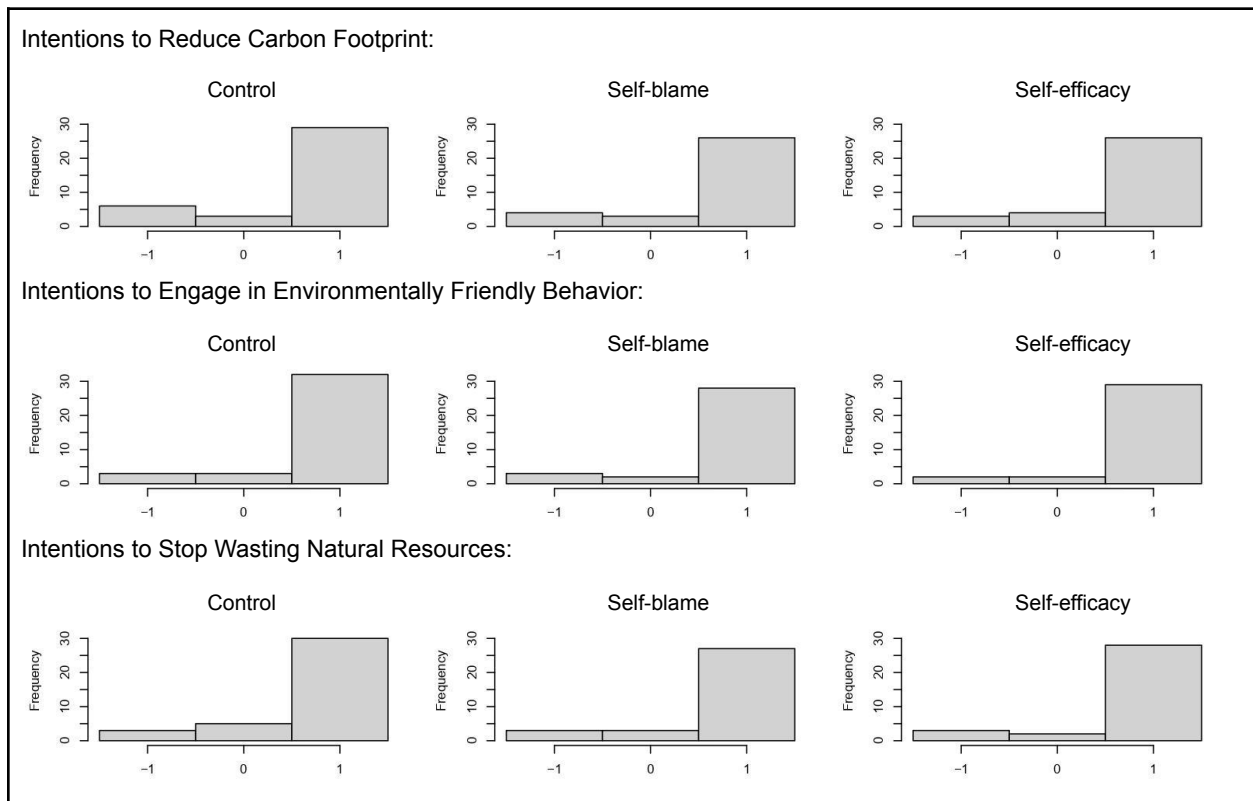


*Figure 4.* Intentions of Democrats to act pro-environmentally in the coming months. Each row represents one of the three items indicating their intentions.

There were only minute differences between the intentions of Democrats in the control group versus each treatment group (Figure 4). Additionally, there was more consistency across the items of intent for Democrats than for Republican respondents. For example, most Democrats exhibited affirmative intent in every treatment group to take action against climate change. Since answers were almost identical for each treatment group across all three items, the responses were combined into a tri-index for Democrats.

### 5.4. Democrat Pro-Environmental Intentions Tri-Index
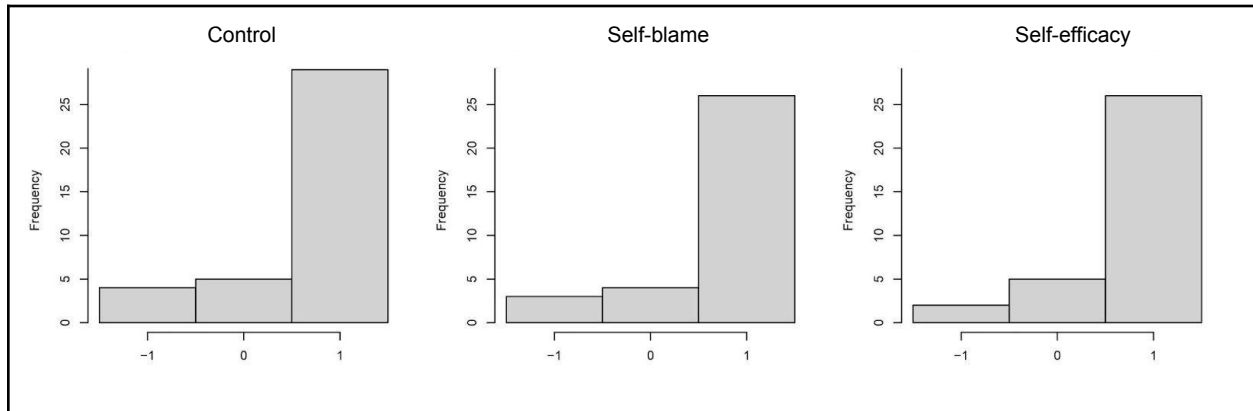


*Figure 5*. Intentions of Democrats to act pro-environmentally in the coming months. The three different items of intentions were consolidated into an intentions tri-index.
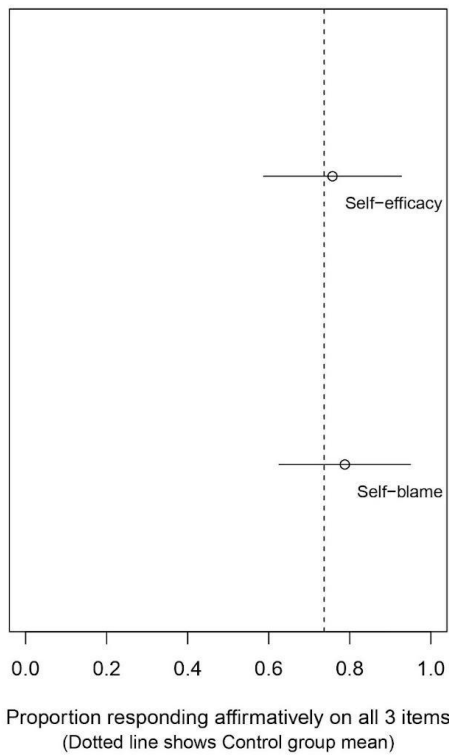


*Figure 6*. Plot indicating the mean proportion of Democratic respondents with positive intentions for each treatment group.

The three intentions items were again consolidated into a tri-index, as indicated by the histograms (Figure 5). In all three treatment groups, most participants had affirmative intentions, followed by neutral intentions, and lastly, negative intentions. Although it seemed unlikely that there was any significance between the intentions of each treatment group, statistical t-tests were still run.

The mean of the intentions on the tri-index for Democrats in the control group was approximately 0.74, and the average intentions in the self-blame group was 0.79 (Figure 6). Following this, one-tailed Welch Two Sample T-tests were conducted, and 95% confidence intervals were estimated. The calculated p-value between these two groups was not significant ($p = 0.3$). As a result, Hypothesis 2.1 was not supported. The average of the tri-index intentions for Democrats in the self-efficacy treatment was approximately 0.76, slightly closer to the control group mean than the self-blame treatment. The p-value calculated between the self-efficacy treatment and the

control group was not significant (p = 0.42). Therefore, Hypothesis 2.2 was not supported. Although there were no significant findings, the self-blame treatment group had a greater positive impact on overall environmental intentions than the self-efficacy group, as with the Republicans.

## 5.5. *Frequency of Letter Writing among Republicans*
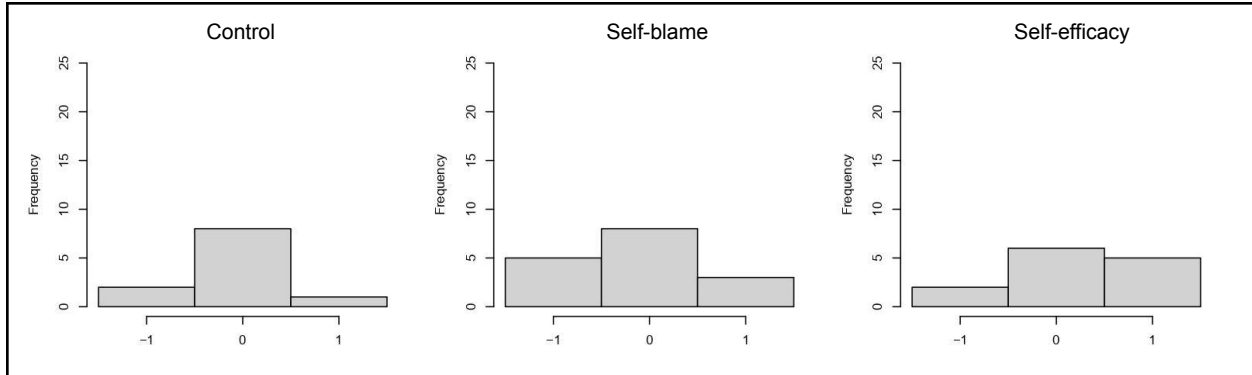


*Figure 7*. Environmental behavior among Republicans, measured by whether the participant wrote a letter to Congress.
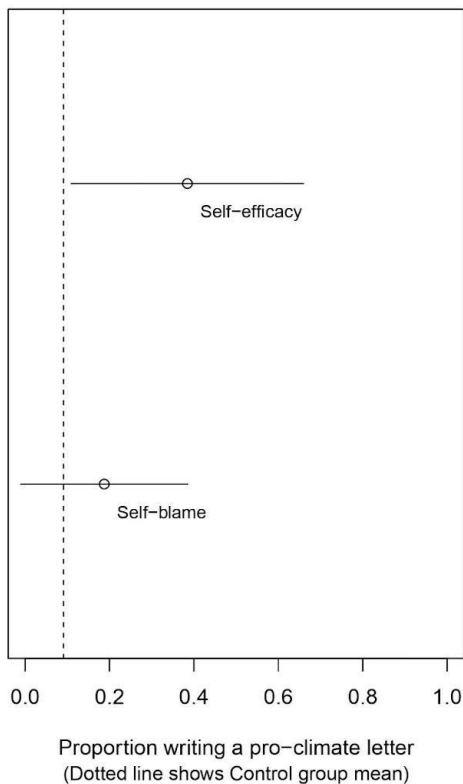


*Figure 8*. Plot indicating the mean proportion of Republican respondents writing a pro-climate letter.

After the behavior of each participant was classified as either pro-climate, anti-climate, or no letter, the responses were sorted by treatment group among Republicans (Figure 7). The no letter response was the most frequent in each treatment group and the control group. Also, the self-efficacy treatment had the most considerable portion of positive responses, the self-blame treatment had the greatest percentage of negative responses, and the control group had the largest number of neutral responses.

The mean of the behavior in the control group was 0.09, while the average in the self-blame group was 0.19 (Figure 8). Welch Two Sample T-tests were utilized again to determine whether self-efficacy or self-blame significantly shaped a Republican's environmental behavior. There was no significance between these two values (p = 0.24), refuting

Hypothesis 3.1. The mean of the behavior for Republicans in the self-efficacy group was 0.38. Hypothesis 3.2 was supported, as there was significance between the self-efficacy and control groups, as the p-value was less than 0.05 ($p = 0.047$). This crucial finding suggests that feelings of hope or self-efficacy may be the key to promoting activism among Republicans.

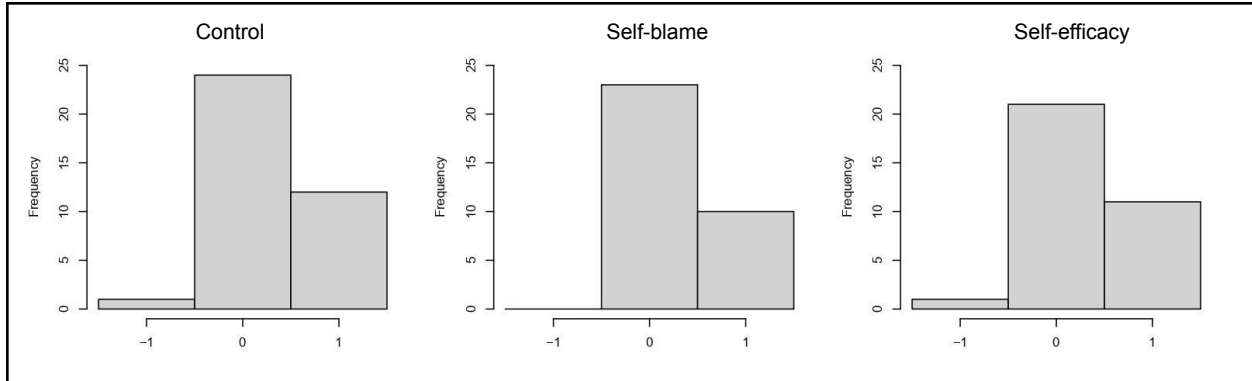## 5.6. *Frequency of Letter Writing among Democrats*



*Figure 9*. Environmental behavior among Democrats, measured by whether the participant wrote a letter to Congress.
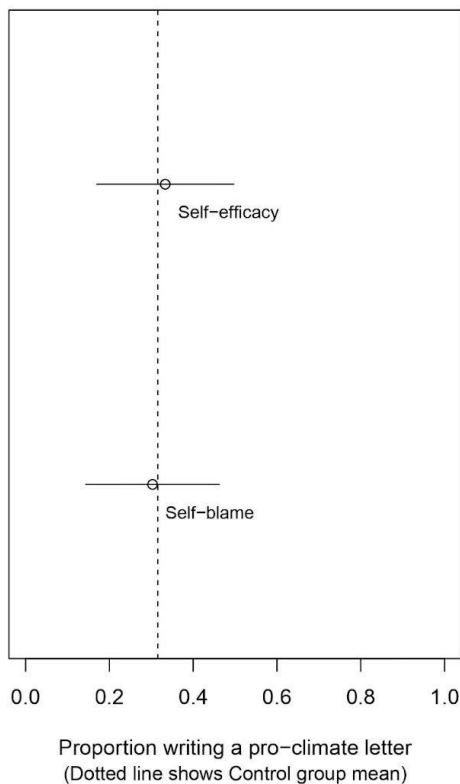


*Figure 10*. Plot indicating the mean proportion of Democratic respondents writing a pro-climate letter.

The environmental behaviors of Democratic participants were also sorted into histograms, as seen above, based on whether they chose to write a letter to Congress (Figure 9). Similar to behavior among Republicans, most Democrats in the control, self-blame, and self-efficacy groups demonstrated neutral behavior. In the self-blame treatment, not a single participant expressed negative behavior regarding the environment.

The mean behavior calculated for Democrats in the control group was approximately 0.32, while the mean for participants in the self-blame treatment was 0.30 (Figure 10). Welch Two Sample T-tests were used to determine the connection between the treatment groups and pro-environmental action. Hypothesis 4.1 was not supported as there was no significance between the behavior of Democrats in

these two groups (p = 0.55). The average behavior for Democrats receiving the self-efficacy treatment was approximately 0.33. There was no significance between the self-efficacy treatment group and the control group, as the p-value was greater than 0.05 (p = 0.44). Therefore, Hypothesis 4.2 was also not supported. Based on these results, there was scarcely any difference between environmental behaviors depending on the treatment group among Democrats.

## 6. Discussion

The findings of this study suggest that, in most cases, simply inspiring feelings of hope or blame may not be enough to completely alter a person's beliefs on the environment and climate change. Contrary to the initial hypotheses, there was no significant effect of either treatment on a Republican or Democrat's environmental intentions. However, in hindsight, these results seem to be fitting, considering that past research on the effects of emotions on environmental intentions had a varied array of findings. Most previous empirical studies observed the impacts of self-efficacy and self-blame on pro-environmental behavior instead, as the actual behavior of a participant is arguably more important than simply their intentions.

A crucial pattern that emerged from data collection and the statistical analysis was that both the self-efficacy and self-blame treatments have a greater effect on both the intentions and behavior of Republicans than Democrats. In other words, the treatment groups had vastly different effects on populations depending on an individual's party identification. Although it may seem disheartening that each treatment had no apparent effect on a Democrat's environmental intentions and behaviors, Republicans are arguably the more important political party in the context of climate change. This is because the Democratic Party has generally been more active in promoting pro-environmental action and tackling climate change than the Republican Party (Kennedy & Johnson, 2020). The results from this study support this notion, as Democrats had higher pro-environmental intentions and behavior than Republicans overall, despite Democratic opinions not being shaped by the treatment groups.

Another important finding of the study was that there was significance between the behavior of Republicans in the self-efficacy treatment group relative to the control group. Although this result was expected, it is still crucial in understanding where action against climate change fits in the ever-changing political landscape. Since statements of self-efficacy or hope resonate with Republicans, environmental activists should consider presenting their research in a

hopeful manner instead of holding individuals accountable for the consequences of climate change. This also bodes well for activists in the future, as positive emotions can work as both antecedents and consequences of pro-environmental action. In other words, positive emotions may cause a never-ending cycle of environmental productivity from individuals, unlike negative emotions (Schneider et al., 2021).

Interestingly enough, the self-blame treatment had the greatest effect on pro-environmental intentions for Republicans, not the self-efficacy treatment. This suggests that Republicans may feel obligated to answer positively for each intention item because they feel directly responsible for the effects of climate change or hold their party accountable. However, since Republicans in the self-blame treatment group did not have significantly higher pro-environmental behaviors, it can be inferred that the feelings of responsibility are not enough for Republicans to devote the time and effort to writing a letter to their Congressman. It is surprising that Republicans in the self-blame treatment did not exhibit higher pro-environmental behavior, as past research concluded that individuals intending to act pro-environmentally tend to demonstrate pro-environmental behavior more often (Wang & Mangmeechai, 2021). There is no clear explanation for why this trend did not appear within this study. Although it may be tempting to devise strategies to target Republicans through personal responsibility or placing the blame on them, this study suggests that activists should steer away from this as it may only increase their intentions to act pro-environmentally and not their behavior.

## 7. Limitations and Future Research

The current study has some notable limitations. For one, each treatment group may not have had the exact desired effect on a participant. In other words, some participants may have interpreted the altered statements for each treatment group in a way that was not intended. Future researchers should avoid this limitation by testing each treatment statement before distributing an actual survey. In addition, there was a narrow racial or ethnic identity among participants. Over 75% of participants identified as White or Caucasian, meaning the study's results may only represent a particular portion of Americans. Also, only 26% of participants identified as Republicans. Since Republicans were divided into three groups for the purposes of this study, there was a narrow sample that could be tested and compared. Hence, the environmental attitudes and behaviors of Republicans in this study may not be indicative of Republicans across the

United States of America. Future researchers should aim to keep the number of Republicans and Democrats equal if it is an essential aspect of their study.

Another limitation was that it was impossible to tell whether a participant submitted their optional letter to democracy.io. Additionally, the letters written to Congress were categorized as anti-climate and pro-climate through the perspective of only a single researcher. Other researchers may have considered certain vague responses anti-climate instead of pro-climate, or vice versa. Future researchers should be sure to consult other researchers to ensure the results' accuracy. Lastly, Amazon's Mechanical Turk participants may have purposefully completed the survey quickly to receive payment for their participation. However, a set of specific criteria was established on the site to ensure that most participants were carefully and thoughtfully filling out the survey.

This study was novel in that it explored the impacts of multiple emotions on climate change intentions and behaviors through causal relationships instead of merely correlations. Also, it utilized a new method of measuring pro-environmental behavior and created an environmental intentions tri-index that future researchers can adapt for their use. Although this study examined self-efficacy and self-blame specifically, researchers should continue exploring the effects of other emotions, such as fear, while still utilizing a similar system for measuring pro-environmental intentions and behavior. Environmental researchers could also expand upon this study by increasing the number of participants, widening the demographic to a more diverse population, and conducting the research in regions outside of the United States. This would result in more accurate results that are telling of current opinions on climate change across the world. Research should also continue to analyze the role of certain facets of self-efficacy or hope and how they tie into action against climate change. In a time when climate change threatens to devastate our world and life as we know it, inspiring hope is compulsory as soon we will reach the point of no return.

# References

Baden, D. (2019). Solution-focused stories are more effective than catastrophic stories in motivating proenvironmental intentions. *Ecopsychology*, *11*(4), 254–263. https://doi.org/10.1089/eco.2019.0023

Bouman, T., Verschoor, M., Albers, C., Böhm, G., Fisher, S., Poortinga, W., Whitmarsh, L., & Steg, L. (2020). When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Global Environmental Change*, *62*, 102061. https://doi.org/10.1016/j.gloenvcha.2020.102061

Brosch, T. (2021). Affect and emotions as drivers of climate change perception and action: A Review. *Current Opinion in Behavioral Sciences*, *42*, 15–21. https://doi.org/10.1016/j.cobeha.2021.02.001

Brosch, T., Scherer, K., Grandjean, D., & Sander, D. (2013). The impact of emotion on perception, attention, memory, and decision-making. *Swiss Medical Weekly*. https://doi.org/10.4414/smw.2013.13786

Carlson, J., Kaull, H., Steinhauer, M., Zigarac, A., & Cammarata, J. (2020). Paying attention to climate change: Positive images of climate change solutions capture attention. *Journal of Environmental Psychology*, *71*, 101477. https://doi.org/10.1016/j.jenvp.2020.101477

Chadwick, A. (2014). Toward a theory of persuasive hope: Effects of cognitive appraisals, Hope Appeals, and hope in the context of climate change. *Health Communication*, *30*(6), 598–611. https://doi.org/10.1080/10410236.2014.916777

Goldberg, M., Gustafson, A., Ballew, M., Rosenthal, S., & Leiserowitz, A. (2020). Identifying the most important predictors of support for climate policy in the United States. *Behavioural Public Policy*, *5*(4), 480–502. https://doi.org/10.1017/bpp.2020.39

Gustafson, A., Ballew, M., Goldberg, M., Cutler, M., Rosenthal, S., & Leiserowitz, A. (2020). Personal stories can shift climate change beliefs and risk perceptions: The mediating role of emotion. *Communication Reports*, *33*(3), 121–135. https://doi.org/10.1080/08934215.2020.1799049

Haase, J., Hoff, E., Hanel, P., & Innes-Ker, Å. (2018). A meta-analysis of the relation between creative self-efficacy and different creativity measurements. *Creativity Research Journal*, *30*(1), 1–16. https://doi.org/10.1080/10400419.2018.1411436

Hahnel, U., & Brosch, T. (2018). Environmental trait affect. *Journal of Environmental Psychology*, *59*, 94–106. https://doi.org/10.1016/j.jenvp.2018.08.015

Hornsey, M., & Fielding, K. (2016). A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation. *Global Environmental Change*, *39*, 26–34. https://doi.org/10.1016/j.gloenvcha.2016.04.003

Hornsey, M., & Fielding, K. (2019). Understanding (and reducing) inaction on climate change. *Social Issues and Policy Review*, *14*(1), 3–35. https://doi.org/10.1111/sipr.12058

Jakučionytė-Skodienė, M., & Liobikienė, G. (2021). Climate change concern, personal responsibility and actions related to climate change mitigation in EU countries: Cross-cultural analysis. *Journal of Cleaner Production*, *281*, 125189. https://doi.org/10.1016/j.jclepro.2020.125189

Kalch, A., Bilandzic, H., Sappler, A., & Stellinger, S. (2021). Am I responsible? the joint effect of individual responsibility attributions and descriptive normative climate messages on climate mitigation intentions. *Journal of Environmental Psychology*, *78*, 101711. https://doi.org/10.1016/j.jenvp.2021.101711

Kennedy, B., & Johnson, C. (2020). *More Americans see climate change as a priority, but Democrats are much more concerned than Republicans*. Pew Research Center. https://www.pewresearch.org/fact-tank/2020/02/28/more-americans-see-climate-change-as-a-priority-but-democrats-are-much-more-concerned-than-republicans/.

Lerner, J., Li, Y., Valdesolo, P., & Kassam, K. (2015). Emotion and decision making. *Annual Review of Psychology*, *66*(1), 799–823. https://doi.org/10.1146/annurev-psych-010213-115043

Mancha, R., & Yoder, C. (2015). Cultural antecedents of green behavioral intent: An environmental theory of planned behavior. *Journal of Environmental Psychology*, *43*, 145–154. https://doi.org/10.1016/j.jenvp.2015.06.005

Marlon, J., Bloodhart, B., Ballew, M., Rolfe-Redding, J., Roser-Renouf, C., Leiserowitz, A., & Maibach, E. (2019). How hope and doubt affect climate change mobilization. *Frontiers in Communication*, *4*. https://doi.org/10.3389/fcomm.2019.00020

Ojala, M. (2012). Hope and climate change: The importance of hope for environmental engagement among young people. *Environmental Education Research*, *18*(5), 625–642. https://doi.org/10.1080/13504622.2011.637157

Ojala, M. (2015). Hope in the face of climate change: Associations with environmental engagement and student perceptions of teachers' emotion communication style and future orientation. *The Journal of Environmental Education*, *46*(3), 133–148. https://doi.org/10.1080/00958964.2015.1021662

Punzo, G., Panarello, D., Pagliuca, M., Castellano, R., & Aprile, M. (2019). Assessing the role of perceived values and felt responsibility on pro-environmental behaviours: A comparison across four EU countries. *Environmental Science & Policy*, *101*, 311–322. https://doi.org/10.1016/j.envsci.2019.09.006

Rees, J., Klug, S., & Bamberg, S. (2014). Guilty conscience: Motivating pro-environmental behavior by inducing negative moral emotions. *Climatic Change*, *130*(3), 439–452. https://doi.org/10.1007/s10584-014-1278-x

Rickard, L., Yang, J., Seo, M., & Harrison, T. (2014). The "I" in climate: The role of individual responsibility in systematic processing of climate change information. *Global Environmental Change*, *26*, 39–52. https://doi.org/10.1016/j.gloenvcha.2014.03.010

Schneider, C., Zaval, L., & Markowitz, E. (2021). Positive emotions and climate change. *Current Opinion in Behavioral Sciences*, *42*, 114–120. https://doi.org/10.1016/j.cobeha.2021.04.009

Sezgin, F., & Erdogan, O. (2015). Academic optimism, hope and zest for work as predictors of teacher self-efficacy and perceived success. *Educational Sciences: Theory and Practice*, *15*(1), 7–19. https://doi.org/10.12738/estp.2015.1.2338

Smith, N., & Leiserowitz, A. (2013). The role of emotion in global warming policy support and opposition. *Risk Analysis*, *34*(5), 937–948. https://doi.org/10.1111/risa.12140

Stevenson, K., & Peterson, N. (2015). Motivating action through Fostering Climate Change Hope and concern and avoiding despair among adolescents. *Sustainability*, *8*(1), 6. https://doi.org/10.3390/su8010006

van Valkengoed, A., & Steg, L. (2019). Meta-analyses of factors motivating climate change adaptation behaviour. *Nature Climate Change*, *9*(2), 158–163. https://doi.org/10.1038/s41558-018-0371-y

Wang, H., & Mangmeechai, A. (2021). Understanding the gap between environmental intention and pro-environmental behavior towards the waste sorting and management policy of China. *International Journal of Environmental Research and Public Health*, *18*(2), 757. https://doi.org/10.3390/ijerph18020757

Wang, S., Leviston, Z., Hurlstone, M., Lawrence, C., & Walker, I. (2018). Emotions predict policy support: Why it matters how people feel about climate change. *Global Environmental Change*, *50*, 25–40. https://doi.org/10.1016/j.gloenvcha.2018.03.002

Xie, B., Brewer, M., Hayes, B., McDonald, R., & Newell, B. (2019). Predicting climate change risk perception and willingness to act. *Journal of Environmental Psychology*, *65*, 101331. https://doi.org/10.1016/j.jenvp.2019.101331

Yang, Y., Xu, X., Liu, W., & Pang, W. (2020). Hope and creative self-efficacy as sequential mediators in the relationship between family socioeconomic status and creativity. *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.00438