The climate battle in America

War metaphors alarm Republicans but Democrats more likely to act

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Metaphorical frames are commonly used in public discourse in the United States of America to communicate about climate change and promote climate action. Previous work found climate metaphors to resonate more so with Democrats than with Republicans. Democrats are also more likely to increase their support for climate action. The present study investigated if tailoring climate metaphors to conservatives' affective domain and personality traits may trigger metaphor realisation. It experimentally tested, for the first time, if a WAR frame for climate change which better fits with conservatives' worldview, can induce fear and anger, and if these emotions alongside personality trait aggressiveness predict increasing support for climate action in both liberal ($n = 63$) and conservative ($n = 63$) respondents. The findings showed that the WAR frame induced fear in both groups, especially among Republicans, but not anger, and that it directly impacted climate attitudes, primarily among Democrats. Trait aggressiveness predicted lower support for climate action at baseline but did not predict attitudinal changes. These novel findings show conservatives are not climate apathetic and encourage further research into how the fear triggered by climate metaphors can be channelled into attitudinal changes in climate inactive populations.

Keywords: metaphor, metaphorical framing, climate change, trait aggressiveness, fear

1. Introduction

Metaphorical framing has been extensively used in the United States of America (USA) to explain climate science, to discuss the anthropogenic climate change

https://doi.org/10.1075/msw.24015.gae | Published online: 14 April 2025
Metaphor and the Social World 15:1 (2025), pp. 77–106. ISSN 2210-4070 | E-ISSN 2210-4097

debate, and to urge people to proactively take steps to mitigate the effects of climate change. This approach is commonly adopted in environmental communication because when soundly processed, metaphors systematically influence our reasoning and understanding of the target domain (Brugman et al., 2017, 2019; Gibbs, 2013).

Metaphorical constructions have different cognitive, linguistic and pragmatic layers to them which are not fully independent (Johansson Falck, 2018; Lakoff, 1993). The realisation of individual metaphors is determined by many factors with either long-lasting and/or momentary effects, which include bodily states, cognitive states (e.g. beliefs and emotions), linguistic and pragmatic competence, social conditions/contexts, motivations, online processing, and the neural underpinnings (Gibbs, 2013). Figure 1 illustrates the complexity of metaphor realisation and the cognitive phenomena that ensue.

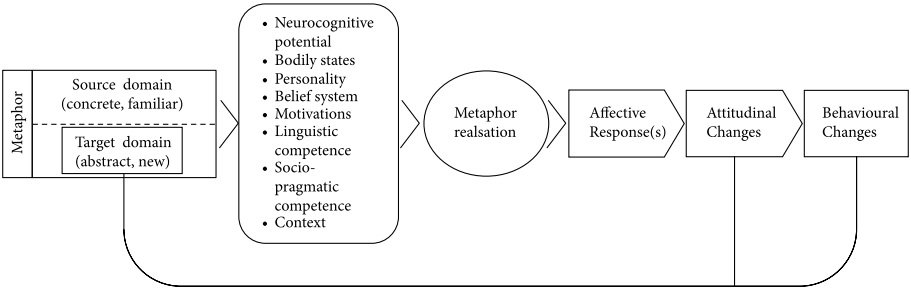

Figure 1. Metaphorical processing. The different factors that contribute to the successful realisation of metaphors are presented below, followed by the cognitive and behavioural responses that may result from metaphor realisation. The relationship between the target domain and cognitive and behavioural responses is also represented in the diagram

Accordingly, when designed to meet the cognitive and social demands of the audience, metaphors have the potential to persuade us to change our attitudes and adopt different behaviours towards the target domain. If the metaphor "There's no question Mother Earth is venting" (Okonski & Ferreira, 2019, p. 127) resonates with the audience, it might trigger subjects to experience feelings of guilt and regret for not looking after the planet, conceptualised as a mother, and instigate them to adopt new attitudes and behaviours that appease her. For this reason, metaphors are often weaponised in political and societal discourse, including the climate change debate between liberals and conservatives in the USA. A summary of commonly used metaphorical frames of climate change is provided in Table 1.

The MOTHER EARTH frame is perhaps the most widely used frame, permeating political speech and social media (Okonski et al., in preparation-b). It metaphor-

Table 1. Metaphorical frames of climate change. A list of metaphorical frames of climate change commonly used in public discourse in the US is presented alongside a description of the frame

Metaphorical frame	Frame description	Reference
Disaster preparedness	Frame that urges individuals to act as insurance against potential devasting consequences.	Raimi et al., 2017
Race against climate change	Frame that encourages thinking about climate change as an adversary to triumph over.	Flusberg et al., 2017
Mother Earth	Cross-sociolinguistic organic frame that appeals to subjects' sense of familial care for the planet.	Okonski et al., in preparation-a
Corporations are drug addicts	Frame that pits citizens against corporations that rely on non-renewable energy, calling for collective action and regulations.	Okonski et al., in preparation-b
Green Tea Party	Frame that emphasises consumers' freedom of choice with regards to energy supply.	
Science is not settled	Frame that plays to anti-climate beliefs by emphasising not all climate scientists believe climate change to be anthropogenic.	

ically establishes a relationship between the planet (a female caregiver) and, for example, severe weather and pollution (the consequence of angering and frustrating the former) by using Mother as the source domain, a familiar concept, and the climate as the target domain, a complex concept. Examples include the metaphors "There's no question Mother Earth is venting", "Why Is Mother Earth on Life Support?" and "The Earth is our mother and it's time for us to take care of her" (Flusberg & Thibodeau, 2023; Okonski et al., in preparation-b; Okonski & Ferreira, 2019).

In another less widely used metaphorical frame, CORPORATIONS ARE DRUG ADDICTS, corporations are conceptualised as drug addicts, the source domain, and their reliance on fossil fuels and other polluting energy as drugs, the target domain (Okonski et al., in preparation-b). This frame contrasts with the previous one in that it shifts the blame for climate inaction away from the general population and on to private companies. Examples can be found in the media and political speeches about climate change, like metaphors "Fossil-fuel addicts need help to quit just like smokers." and "addiction to foreign oil" (Bush, 2006; Kitching, 2021; Okonski et al., in preparation-b).

Okonski and colleagues (in preparation-b) tested these frames, as well as the GREEN TEA PARTY, the SCIENCE IS NOT SETTLED and other frames, in a large,

politically diverse sample from the USA. Participants completed the study online and were assigned to one of the metaphorical conditions. They read the article about climate change, which employed one of the frames, and completed a socio-demographic questionnaire and a questionnaire that measured their support for individual climate action and policy. Participants also indicated whether or not the article was biased and if they enjoyed reading it. The study found that both liberal and conservative participants enjoyed reading the articles and thought positively of the frames, but only liberals increased their support for climate action, e.g. reducing meat consumption or purchasing hybrid vehicles. So, despite metaphorical framing being a commonly used rhetorical device, it seems to predominantly resonate with liberals, who are climate proactive, as conservatives are less likely to engage in climate change mitigating behaviours (Kahan et al., 2012; Okonski et al., in preparation-b).

There are several reasons why conservatives might largely be predisposed to climate inaction, compromising the effectiveness of the frames (DeNicola & Subramaniam, 2014; Funk & Kennedy, 2020). Conservative republicans are significantly more sceptical than liberal democrats towards the reality of climate change, though the majority do not deny it and, instead, question its origin (Druckman & McGrath, 2019; Maibach et al., 2013; Van Boven et al., 2018). The data are conflicting with some studies suggesting over two thirds think climate change is anthropogenic and others the opposite, and with some attributing the belief to low science literacy and others not (Funk & Kennedy, 2020; Kahan et al., 2012; Van Boven et al., 2018). Findings converge on the conclusion that, unlike liberals, approximately two thirds of conservatives do not perceive climate change to be a major threat or believe it is an emergency that needs urgent addressing (Kennedy, 2020; Kennedy & Johnson, 2020). Conservatives' climate inaction may be further bolstered by partisanship (DeNicola & Subramaniam, 2014; Kahan et al., 2012). Political parties in the USA commonly use their electoral bases' confirmation bias to push their agenda, and political affiliation predicts policy support (Cohen, 2003; Druckman & McGrath, 2019; Van Boven et al., 2018). That suggests that political affiliation is an important marker of moral and social identity affecting the climate beliefs and attitudes of conservative republicans.

Despite that, one metaphorical frame – the WAR frame – has been found to increase people's risk perception, sense of urgency in taking climate action and willingness to change their behaviour in three large samples, balanced for political affiliation (Flusberg et al., 2017). That suggests the WAR frame may communicate the threat more effectively to conservative samples in the USA than other frames, but the affective responses to the threat that could confirm metaphor realisation, namely fear and anger, were not measured or related to framing effects and political affiliation. Additionally, the study did not control for other individual char-

acteristics, including personality or cognitive traits, that might have elucidated the results vis a vis metaphor realisation. Collecting baseline and post-metaphor reading scores for these variables, as well as climate attitudes, would have been important to track within-subject attitudinal and affective changes, and ascertain if these were indeed predicted by the metaphorical frame, and generalised to the wider political group (Reijnierse et al., 2015; Steen et al., 2014). The generalisability and efficacy of the WAR frame of climate change in enhancing conservatives' consideration of the climate crisis is, therefore, unknown.

Conservatives' seeming susceptibility to the WAR frame indicates that it recruits cognitive resources and taps into beliefs and personality traits that other metaphorical frames of climate change do not. WAR metaphors are violent metaphors, which conventionally include items like "fight", "battle" and "combat". They pit the audience against the target domain, creating a sense of threat, making them a useful rhetorical device to successfully persuade people to support interpersonal aggression against the outgroup, vote tribally and back partisan policies (Gubler & Kalmoe, 2015; Kalmoe, 2013, 2014, 2019; Kalmoe et al., 2018). In the WAR frame of climate change used by Flusberg and colleagues (2017), climate change, the target domain, is treated like a war enemy, the source domain. The frame grants readers an active role by appealing to their sense of patriotism and triggering them to want to defend the homeland from climate change. It includes metaphors like "The entire country should be recruited to fight this deadly battle" and "This is a war we can't afford to lose.". In the USA socio-political context, WAR metaphors have been predominantly used in conservative politics to communicate about drugs (Thibodeau & Boroditsky, 2011), to describe the Asian-American economic conflict, and to turn voters against political opponents as in the case of President Trump and Secretary Clinton (Trump, 2016).

This interaction between violent metaphors and partisanship may be directly attributable to personality trait aggressiveness, in particular physical aggressiveness (Gubler & Kalmoe, 2015; Kalmoe, 2014, 2019; Kalmoe et al., 2018), which is a defining characteristic of the American Republican population, and conservatives more generally (Gubler & Kalmoe, 2015; Kalmoe, 2013, 2014, 2019; Kalmoe et al., 2018). This interaction has also been shown to predict policy attitudes and civic-political behaviours, for example support for state violence and violence against politicians (Kalmoe, 2013, 2014, 2019).

The mediating emotions elicited by violent metaphors – fear and anger – might therefore be channelled into attitudinal changes, and even behavioural changes, by personality trait aggressiveness (Flusberg et al., 2017; Kalmoe et al., 2018; O'Neill & Nicholson-Cole, 2009). According to cognitive-appraisal theory (Lerner & Tiedens, 2006), individuals who experience fear when prompted to re-evaluate their attitudes show anger towards those they perceive to be outsiders.

Fear has indeed been found to be a highly reliable motivator of attitudinal changes, including among individuals with right-wing, populist or undefined political identity membership (Boeynaems et al., 2021; Reser & Bradley, 2017; Wirz, 2018), and so has anger (Kalmoe, 2013; Wirz, 2018). The complex interaction between personality trait aggressiveness and this fear-anger dynamic might therefore explain why WAR frames of climate change resonate with conservative populations unlike other frames. However, as the only study that employed the climate WAR frame (Flusberg et al., 2017) did not measure trait aggressiveness or any of these emotional responses, that remains to be determined.

Indeed, to our knowledge, no study on climate metaphors has measured the cognitive predictors personality trait aggressiveness and negative affective responses to the threat of climate change (fear and anger) and related these to political affiliation. Our study experimentally explored this gap in metaphorical framing research, for the first time, and sought to clarify if conservative populations in the USA do not realise climate metaphors, or if they realise the metaphors but do not register attitudinal changes due to extraneous factors. The study tested three hypotheses:

H1 = The WAR frame of climate change is more likely to induce negative emotions – fear and anger – than non-metaphorical framings.

If the WAR frame is effective in communicating the threat of climate change, it should elicit one or more of the relevant emotions, fear and anger, not only in the overall participant population, but also in the conservative sample. Additionally, if this metaphorical framing, and not the issue of climate change, is responsible for these affective responses, we should not observe the same responses after exposure to a non-metaphorical counterpart.

H2 = The WAR frame of climate change is more effective than non-metaphorical framings in persuading individuals across the political spectrum to develop positive attitudes towards climate action, including liberals, who are climate proactive, and conservatives, who are not.

When metaphors are realised and elicit the intended affective responses, they should subsequently trigger attitudinal changes towards the target domain. Flusberg and colleagues' study showed that, overall, the WAR frame prompted some attitudinal changes, for example it increased participant's risk perception. However, it was not established if the attitudinal changes were driven by the liberal subset of the samples, or also registered in the conservative subset. If the frame resonates with conservative samples leading to more positive climate attitudes, they should also resonate with liberal samples due to their climate proactivity, which would indicate this frame has the potential to communicate climate science

to individuals across the political spectrum. The second hypothesis tests the efficacy of the framing in inducing overall support for climate action, but also in the different political affiliation subsets of the population.

H3 = The WAR frame of climate change is more effective than non-metaphorical frames in persuading high-trait aggressiveness individuals to support climate action.

To understand the generalisability of the WAR frame and its efficacy in triggering attitudinal changes, it is necessary to understand how it interacts with personality trait aggressiveness. As discussed, high trait aggression is a defining trait of conservative individuals, and it guides their support for violent action and policy (Gubler & Kalmoe, 2015; Kalmoe, 2013, 2014, 2019; Kalmoe et al., 2018). If this personality trait is a predictor of WAR metaphor realisation, either by interacting with or facilitating the negative emotional responses (fear and anger), it may explain why the WAR frame resonates with conservatives unlike other frames.

2. Methods

2.1 Participants

A sample of 145 individuals were recruited through Prolific (2021), who received monetary compensation for their participation. This sample size is larger than the 119 size that would provide a statistical power of 0.95 to identify a medium effect size ($f^2 = 0.15$), calculated with G*Power software (Faul et al., 2007; Liu, 2013). The sample was pre-selected on Prolific based on four criteria: nationality, political ideology, political affiliation and no history of mental illness. The criterion of nationality (USA) was used to ensure that the socio-political identity of participants was situated in the American context. The second and third criteria – political ideology (liberal versus conservative) and affiliation (Democrat versus Republican) – were applied to maximise the ideological preference of the participants and so exclude any variation introduced by independents and moderates. The last criterion (mental health) excluded participants with diagnosed or self-reported mental illness, for example anxiety disorders and depression, to protect vulnerable subjects from potential feelings of distress triggered by the stimuli, and to control for inflated fear and trait aggressiveness scores, which would affect the reliability of the data. The subjects volunteered this information to Prolific themselves and were not asked for any clinical information during the study. Subjects were provided with both a project summary and a detailed participant informa-

tion sheet on the platform before being taken to the study and provided informed consent prior to starting the study.

Data from 19 subjects were excluded from analysis: 11 due to incomplete participation (timed-out or abandoned study); 4 due to attempted duplicate participation (equating to two actual subjects); and 4 due to political ideology-affiliation inconsistencies (captured with the Demographic Questionnaire (DQ)). Consequently, the final sample was composed by 126 subjects, aged 18–85 years ($M = 35.63$ years), of whom 50.4% were female, 50% were conservative Republicans and 50% were liberal Democrats. Table 2 shows detailed participant demographics.

2.2 Ethics

Ethical advice was obtained from the Department of Language Studies, the Psychology Department and the Research Support Office at Umeå University. The study complies with GDPR and EPM guidelines. Following the recommendations, additional precautions were taken to protect the researchers from potential harassment and abuse from anti-environmentalists. This included not disclosing any identifiable information and providing only the researchers' first name and institutional alias associated with the university's email address. A statement requiring participants to explicitly confirm that they understand the nature of the research was also included in the consent form (Appendix B1).

2.3 Instruments and Materials

DQ

The demographic questionnaire (DQ) consisted of a 7-item questionnaire (appendix A1). Participants were asked to indicate their age, gender, highest level of education attained, occupation, political ideology (6-point Likert-type scale ranging from very liberal to very conservative) and political affiliation (binary choice between Democrats or Republican). We included these items as they help characterise the population, determine the generalisability of the results and identify any relevant discrepancies between our population and samples previously tested. It was important to distinguish between political ideology and affiliation to account for non-partisan individuals. The last item of the DQ consisted of a question on whether they believe climate change to be real and primarily anthropogenic (binary choice between yes or no). We measured the prevalence in our sample, so it was possible to relate climate beliefs and attitudes as reports for conservatives vary greatly, and we wanted to ensure the belief was pre-existing and

not induced by the article (Funk & Kennedy, 2020; Steen et al., 2014; Van Boven et al., 2018).

Reading task

The reading task required participants to read a fictional article, which consisted of a short paragraph reporting on recent climatological findings, experts' warnings and the measures that the US federal government has taken to address these. The texts used for the stimuli were taken from Flusberg and colleagues' (2017) study (see Figure 2), specifically the control and the WAR metaphor texts, and they were subsequently modified (see Figure 3). We used a fictional article, as opposed to an actual article, to minimise the risk of participants having read it. Our fictional article has been shown to resonate with some populations in an experimental context (Flusberg et al., 2017), and reflects the most recent example of the WAR frame used in climate change metaphor and political ideology research at the time this study was conducted. The modifications we made and the additional demographic data we collected, including political affiliation and ideology, allowed us to characterise the participant population and explain variation in the data in a nuanced way, testing the replicability of previous findings and expanding on them (Reijnierse et al., 2015; Steen et al., 2014).

The reading task split into two conditions: control and metaphor. The article presented in the control condition (Figure 3), titled "the issue of climate change", was modified so that it did not include any figurative language and style present in the original text (Figure 2). This was necessary to maximise the impartiality and objectivity of the control reading, so direct cross-condition comparisons could be made (Steen et al., 2014). For example, punctuation markers like exclamation marks were replaced by full stops. The number of years and decades referenced in the experts' warnings was removed to avoid participants pondering and questioning the timeframe, and thus prevent perception of threat proximity from becoming a confounding factor. The question that the article opens with was also modified so as to not express the assumption that Americans should address climate change.

The article presented in the metaphor condition (Figure 3), titled "the war against climate change", consisted of a modified version of the original text (Figure 2). Changes were made with the aim of increasing feelings of fear and distress in readers. The punctuation marks from the original text were preserved and more exclamation marks were added for emphasis to elicit strong emotions about the content of the article (Crystal, 2007; Plantin, 2019). The precative mood of the first question, which conveys that the question is a request, was preserved. The precative mood is a type of irrealis mood, which signals unreality or that an event is not known to have taken place, and it is associated with fear constructions

(Lakey, 2016). The penultimate sentence of the article, which includes the verb phrase (VP) "keep away from", was added as motion constructions denoting distancing from a given source of fear, for example ablative and genitive morphosyntactic constructions, are associated with fear (Lakey, 2013, 2016). Lastly, the term "enemy" was used as a linguistic metaphor of climate change as referring to it as a frightening entity should increase feelings of distress (Flusberg et al., 2017). Sixty-three participants completed the control condition ($n_{\text{liberals}} = 32$, $n_{\text{conservatives}} = 31$) and an equivalent number completed the metaphor condition ($n_{\text{liberals}} = 31$, $n_{\text{conservatives}} = 32$).

In both conditions, the paragraph was prefaced by a note stating that the article was written by a science journalist, who has no political affiliation or party, has never voted, and is not interested in politics. This was to control for author identity and source bias as conservative participants could assume the article was written by a liberal due to the framings of climate change typically used by liberal media outlets (Feinberg & Willer, 2013).

CAQ

The climate attitude questionnaire (CAQ) consisted of a 7-item questionnaire measuring participants' support for governmental policies and individual actions to de-escalate the impact of climate change on 6-point Likert-type scales (appendix A2). Scores range from 0 to 42, with higher scores indicating greater support for action addressing climate change. The items were adapted from Okonski and colleagues' (in preparation-b) policy and individual action subscales due to their high within-respondent consistency, and were measured with Cronbach's alpha to reflect pairwise correlations between items ($\alpha_{\text{CAQbaseline}} = .94$, $\alpha_{\text{CAQtarget}} = .94$) (Hajjar, 2018). The CAQ's items were presented in a table before the task but the items were administered individually in the post-task CAQ to avoid participants changing their answers.

FQ

The fear questionnaire (FQ) consisted of an 8-item self-report questionnaire, scoring fear on a 6-point Likert-type scale (Appendix A3). Scores range from 0 to 48, with higher scores indicating higher levels of phobia. Five items (subscale 1 (s1)) were retrieved from Marks & Mathews's (1979) original fear questionnaire, corresponding to the anxiety-depression subscale, which was selected because of its reliable psychometric properties (Cottraux et al., 1987; Zuuren, 1988). Three additional items (subscale 2 (s2)) were included to measure feelings of threat and unease. The item "I feel anxious" is novel and was included because it measures anxiety directly and without the use of figurative language. The questionnaire

THE ISSUE OF CLIMATE CHANGE

When will Americans start to address excessive energy use and resolve the problems related to air pollution and the use of natural resources? The entire country needs to direct their efforts to address this important issue. The United States is joining the effort to reduce its carbon footprint in the next few decades. The US has approved dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 25% by the year [2025/2115]. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Experts say that if we do not lower emissions in the next [10/100] years, we will experience an increase in extreme weather conditions, more public health problems like a rise in cancer and other diseases, as well as severe economic challenges. This is a situation we can't afford to ignore!

THE WAR AGAINST CLIMATE CHANGE

When will Americans start to combat excessive energy use and kill the problems related to air pollution and the destruction of natural resources? The entire country should be recruited to fight this deadly battle. The United States is joining the campaign to reduce its carbon footprint in the next few decades. The US has approved dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 25% by the year [2025/2115]. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Experts say that if we do not lower emissions in the next [10/100] years, we will experience an increase in extreme weather conditions, more public health problems like a rise in cancer and other diseases, as well as severe economic challenges. This is a war we can't afford to lose!

Figure 2. Original climate framings. The non-figurative framing "The issue of climate change" (top) and the metaphorical framing "The war against climate change" (bottom) loaned from Flusberg and colleagues' (2017) study

had high within-subject consistency ($\alpha_{fqbaseline} = .88$, $\alpha_{fqbaselines1} = .81$, $\alpha_{fqbaselines2} = .7$; $\alpha_{fqtarget} = .86$, $\alpha_{fqtargets1} = .72$, $\alpha_{fqtargets2} = .85$). The pre-task scales were presented in a table but were presented separately in the post-test so participants' answers to individual items were not influenced by the other items. The FQ was the first post-test to increase the odds of catching as much online processing as possible (Okonski & Ferreira, 2019).

THE ISSUE OF CLIMATE CHANGE

Will Americans address energy use and resolve the problems related to air pollution and the use of natural resources? *The country* needs to direct their efforts to address this important issue. The United States is joining the effort to reduce its carbon footprint in the next few decades. The US has approved dozens of projects as part of an effort to reduce greenhouse gas emissions *by more than 25%*. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Experts say that if we do not lower emissions *in the next years,* we will experience an increase in extreme weather conditions, more public health problems like a rise in cancer and other diseases, as well as severe economic challenges. This is a situation we can't afford to ignore.

THE WAR AGAINST CLIMATE CHANGE

When will Americans start to combat excessive energy use and kill the problems related to air pollution and the destruction of natural resources? The entire country should be recruited to fight this deadly battle! The United States is joining the campaign to reduce its carbon footprint in the next few decades. The US has approved dozens of projects as part of an effort to reduce greenhouse gas emissions by more than 25% by the year *2025*. The projects will leverage scientific expertise and individual engagement to improve the energy efficiency of cars and buildings, reduce personal energy use, and increase the use of renewable energies such as wind and solar. Experts say that if we do not lower emissions *in the next few years,* we will experience an increase in extreme weather conditions, more public health problems like a rise in cancer and other diseases, as well as severe economic challenges. We *must keep the enemy away from us! We cannot afford to lose this war!*

Figure 3. Modified climate framings. The non-figurative framing "The issue of climate change" (top) was presented in the control condition and the metaphorical framing "The war against climate change" (bottom) was presented in the metaphor condition. The modified text is italicised

TAQ

The trait aggressiveness questionnaire (TAQ) consisted of a 12-item self-report questionnaire, scoring trait aggressiveness on a 6-point Likert-type scale ($\alpha_{taqbaseline} = .84$) (Appendix A4). It is an abbreviated version of the Buss and Perry (1992) Aggression Questionnaire, preserving all items of the physical aggression subscale (pa) ($\alpha_{taqbaselinepa} = .83$), and three items of the anger subscale (ang) ($\alpha_{taqbaselineang} = .74$). The questionnaire is widely used to measure aggression, and the items

have consistently been found to have high within-respondent consistency and predictive power, including in previous metaphorical framing research (Tremblay & Ewart, 2005; Kalmoe, 2014, 2015). The anger subscale was also used as a post-test ($\alpha_{taqtarget} = .74$) in combination with the target FQ.

2.4 Procedure

Participants were invited to participate in the study via Prolific, where they were provided with a summary of the project, a detailed participant information sheet (Appendix B2) and the researchers' contact details in case they wished to request more information. Subjects were fully briefed about the project and the nature of the readings; what was required of them; what information would be collected; and their rights, such as withdrawing from the study without providing a reason and having their data removed from the database. After accepting to participate, the subjects were redirected to PsyToolkit (Stoet, 2010, 2017), where the study was coded and deployed and where the data were collected and safely stored. Participants provided informed consent and subsequently completed the components described in the previous section as shown in Figure 4. The mean (M) completion time was 5.47 minutes with a Standard Deviation (SD) of 2.236735. A comparison of means across the two conditions – control and metaphor – was carried with a t-test (t) ($M_{controlcondition} = 5.46$m, $SD = 2.123793$; $M_{metaphorcondition} = 5.48$m, $SD = 2.361363$), which together with the p-value (p) revealed the completion time did not differ significantly between the two, $t(122.63) = .03967$, $p = .9684$. However, the mean completion time for the reading task specifically was 43777 ms ($SD = 33858.6$) and it was significantly higher in the control condition, which indicates the metaphorical text was read faster ($M_{controlcondition} = 49714$ ms, $SD = 39851.94$; $M_{metaphorcondition} = 37839$ ms, $SD = 25524.1$), $t(105.54) = 1.9916$, $p = .049$.

2.5 Analytic approach

The anonymised data were imported, treated and analysed in R 4.0.4 (R Core Team, 2021) with its dependencies and packages tidyverse (Wickham et al., 2019), plm (Croissant & Millo, 2008, 2018) and stargazer (Hlavac, 2018). Initial analyses were run to characterise the participant population, followed by multiple linear regressions conducted to assert what factors contributed to the variation in climate attitudes described in the previous section.

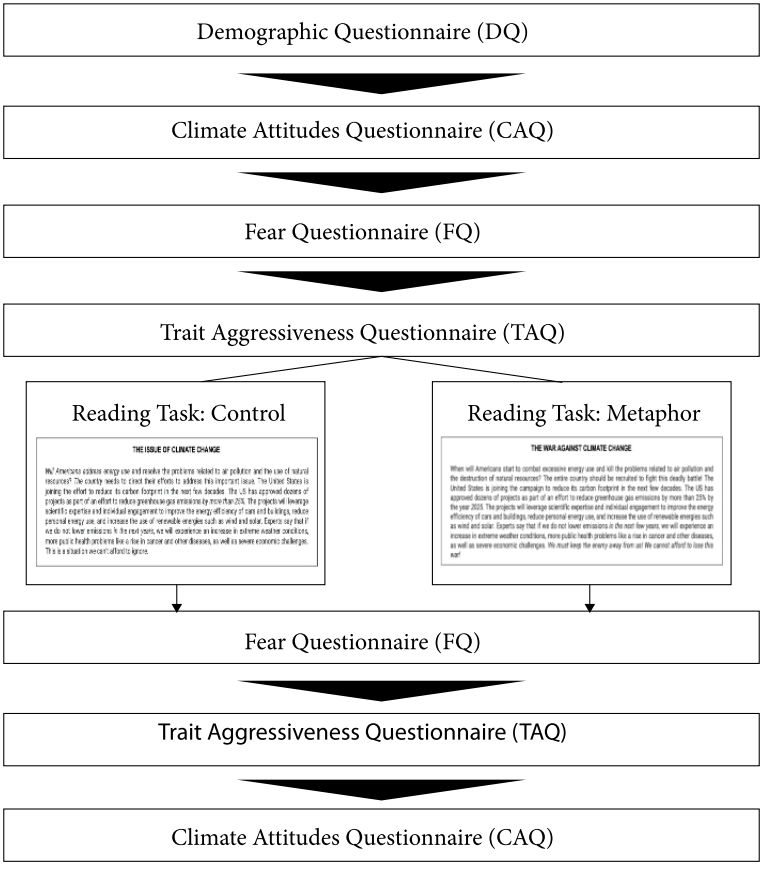

Figure 4. Study Diagram. The components of the study, including the questionnaires and reading task, are presented in the order participants completed them

3. Results

3.1 Initial analyses

Demographic analyses

We first conducted descriptive analyses to characterise the participant population. We investigated whether the relative frequencies of different political ideologies were evenly split for the six categories (very liberal, liberal, more liberal than conservative, more conservative than liberal, conservative and very conservative) using a chi-square test (Kraska-MIller, 2013), and found some political ideology memberships were significantly more prevalent than others, $\chi^2(5, 126) = 41.333$, $p < .001$. Democrats were almost evenly split between liberal and very liberal (48%

versus 46%), whereas Republicans were concentrated in the conservative category (60%). Republicans were on average significantly older than Democrats ($M_{\text{Republicans}} = 40$ years versus $M_{\text{Democrats}} = 31$ years), $t(108.62) = 3.846$, $p < .001$. As for gender, the differences between groups were not significant regarding affiliation ($\chi^2(2,126) = 1.4009$, $p = .5$) and ideology ($\chi^2(10,126) = 7.2511$, $p = .7$). There are no significant differences to report in education level relative to political ideology ($\chi^2(25,126) = 14.261$, $p = .96$) and affiliation groups ($\chi^2(5,126) = 2.3105$, $p = .81$), or in occupation relative to political ideology ($\chi^2(35,126) = 46.783$, $p = .09$) and affiliation groups ($\chi^2(7,126) = 9.1343$, $p = .24$).

Regarding the last item of the DQ – climate beliefs – most subjects (79%) indicated that they believe recent climate change is real and anthropogenic. The distribution of responses is not however even among Republicans and Democrats; the more conservative the participants, the more likely they were to be climate deniers, $\chi^2(1, 126) = 34.364$, $p < .001$. The participants who disagreed (21%) were all Republicans, totalling 42.9% of the Republican sample. Political ideology groups also differed significantly in their climate beliefs ($\chi^2(5, 126) = 37.649$, $p < .001$) with 63% of climate deniers identifying as conservative, 25.9% as very conservative and 11.1% as more conservative than liberal. Climate sceptics constituted 53.8% of the very conservative group, 44.7% of conservative members and 25% of the more conservative than liberal individuals. These results neither support the reports of Van Boven and colleagues (2018) that over two thirds of conservative Republicans believe climate change to be anthropogenic, nor Funk and Kennedy's (2020) that the majority deny climate change is real and anthropogenic.

Table 2. Participant Demographics. Table showing demographic characteristics of participants based on DQ

	Control Group ($N = 63$)	Experimental Group ($N = 63$)	Overall ($N = 126$)
Age (years)			
Mean (SD)	38 (± 15)	34 (± 12)	36 (± 14)
Gender			
Male	26 (41 %)	36 (57 %)	62 (49 %)
Female	36 (57 %)	27 (43 %)	63 (50 %)
Other	1 (2 %)	0 (0 %)	1 (1 %)
Prefer not to say	0 (0 %)	0 (0 %)	0 (0 %)

Table 2. *(continued)*

	Control Group ($N=63$)	Experimental Group ($N=63$)	Overall ($N=126$)
Education level			
High School or equivalent	19 (30%)	21 (33 %)	40 (32 %)
Bachelor's Degree or equivalent	29 (46 %)	28 (44 %)	57 (45 %)
Master's Degree or equivalent	9 (14 %)	10 (16%)	19 (15%)
Ph.D. or higher	4 (6 %)	2 (3 %)	6 (5 %)
Trade School/Professional apprenticeship	1 (2 %)	0 (0 %)	1 (1 %)
Other	1 (2 %)	2 (3 %)	3 (2 %)
Occupation			
Entry-level job	17 (27%)	18 (29%)	35 (28 %)
Mid-level job	20 (32 %)	14 (22 %)	34 (27 %)
Senior-level job	0 (0 %)	1 (2 %)	1 (1 %)
Student	8 (13%)	10 (16%)	18 (14 %)
Self-employed	7 (11 %)	8 (13%)	15 (12%)
Unemployed	9 (14 %)	8 (13%)	17 (13%)
Retired	2 (3 %)	2 (3 %)	4 (3 %)
Other	0 (0 %)	2 (3 %)	2 (2 %)
Political Ideology			
Very liberal	13 (21 %)	16 (25 %)	29 (23 %)
Liberal	18 (29 %)	12 (19 %)	30 (24 %)
More liberal than conservative	1 (2 %)	3 (5 %)	4 (3 %)
More conservative than liberal	6 (10%)	6 (10%)	12 (10 %)
Conservative	19 (30%)	19 (30%)	38 (30 %)
Very conservative	6 (10%)	7 (11 %)	13 (10%)
Political Affiliation			
Democrat	32 (51 %)	31 (49 %)	63 (50 %)
Republican	31 (49 %)	32 (51 %)	63 (50 %)
Climate beliefs			
Yes	48 (76 %)	51 (81 %)	99 (79 %)
No	15 (24%)	12 (19 %)	27 (21 %)

Climate attitudes

Secondly, we analysed the results of the CAQ to gauge how support for climate action varied within the participant population, and relate it to political affiliation, ideology and task condition. The dependent variable, climate attitudes, had a normal distribution (skew = –.74, kurtosis = –.61). Overall, the scores ranged from the possible minimum 7 to maximum 42 ($M = 29.42$, $SD = 10.71$). The maximum score for both Democrats and Republicans was 42, but no Democrats scored less than 19. The item that received the least support was "I would be willing to boycott businesses that contribute to climate change" ($M = 3.47$, $SD = 1.77$) and the one that received the most support was "I would support tougher fuel efficiency standards for cars and trucks." ($M = 4.52$, $SD = 1.68$). Preferences varied between partisan groups. Conservatives showed preference for the statement "I would support making an individual effort to reduce carbon footprints in my daily life" ($M = 3.68$, $SD = 1.83$) whereas Democrats were more likely to "support an international agreement to limit carbon emissions" ($M = 5.75$, $SD = .54$). Both groups were less "willing to boycott businesses that contribute to climate change", though Democrats were still more enthusiastic about it ($M = 4.57$, $SD = 1.38$) than Republicans ($M = 2.37$, $SD = 1.41$).

Overall comparisons revealed that, as hypothesised (*H2*), subjects exposed to the metaphorical framing significantly increased their support for climate action relative to baseline, $t(62) = 2.0824$, $p = .04$, than subjects exposed to the control framing, who, conversely, decreased their support, though insignificantly, $t(62) = .50$, $p = .62$. Please see Table 3 for means and Figure 5 for a graphical representation. This slight decrease is likely due to Democrats' pro-environmental attitudes, which increased significantly after reading the metaphor ($t(30) = 3.2602$, $p < .01$). Republicans' increased too, but not significantly ($t(31) = .41$, $p = .69$). As for the control framing, both Democrats ($t(31) = .14$, $p = .89$) and Republicans ($t(30) = .53$, $p = .60$) insignificantly decreased their climate action support after the reading task.

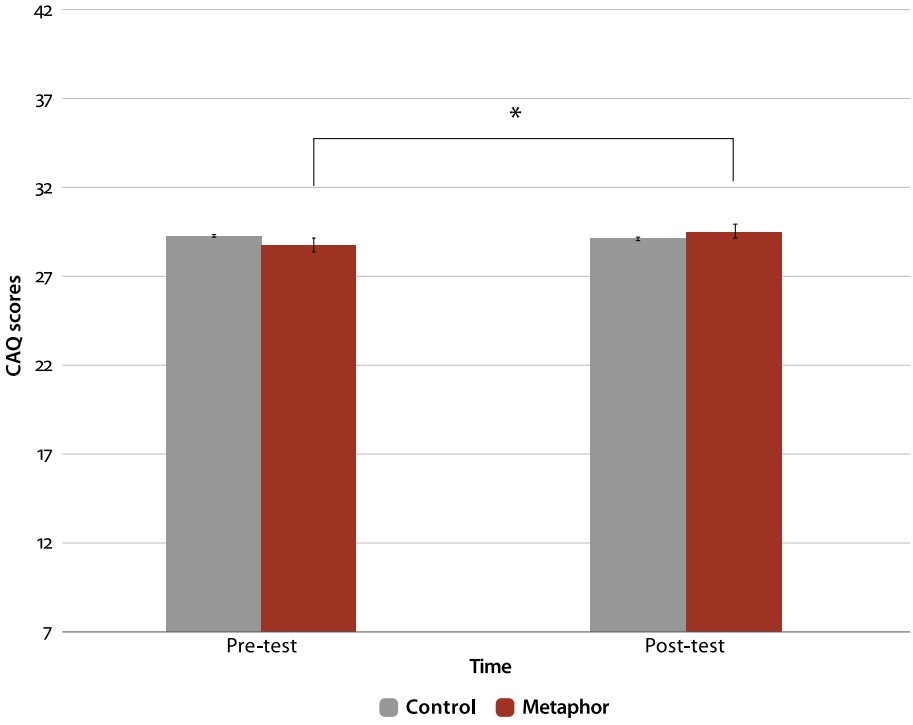

Figure 5. Support for climate action after the reading task. The figure shows how climate attitudes changed after exposure to either the control or metaphorical framing from 7, the minimum score, to 42, the maximum score

Fear analyses

We then analysed the FQ scores to characterise the fear intensity and behaviour of the participant population relative to task condition, and political affiliation. The post-test fear questionnaire scores ranged between a possible minimum 8 and a maximum of 30 ($M = 13.18$, $SD = 5.66$), though the highest score possible was 48. The item that participants scored the lowest overall was "I or my surroundings are strange or unreal" ($M = 1.19$, $SD = .5$), and the highest was "I feel anxious" ($M = 2.1$, $SD = 1.28$), which was the novel item.

As *H1* predicted, participants who read the metaphorical text were significantly more afraid afterwards ($t(62) = 2.5201$, $p < .01$). The fear scores of subjects who read the control text also increased, but not significantly ($t(62) = 1.2632$, $p = .21$). Please see Figure 6. Importantly, Republicans' fear scores increased significantly after reading the WAR frame, $t(31) = 2.4217$, $p = .02$. Democrats' scores increased but not significantly, $t(30) = 1.1023$, $p = .28$, potentially because they were high at baseline. Conversely, the control condition did not significantly impact

the fear scores of Republicans, $t(30) = 1.7089$, $p = .1$, or Democrats, $t(31) = .17247$, $p = .86$. Overall comparisons across conditions revealed that the mean fear scores were higher after exposure to the metaphorical framing ($M = 13.60$, $SD = 6$) than the control framing ($M = 12.76$, $SD = 5.31$), but the difference is not significant, $t(122.16) = -.83357$, $p = .41$. Please see Table 3 for details.

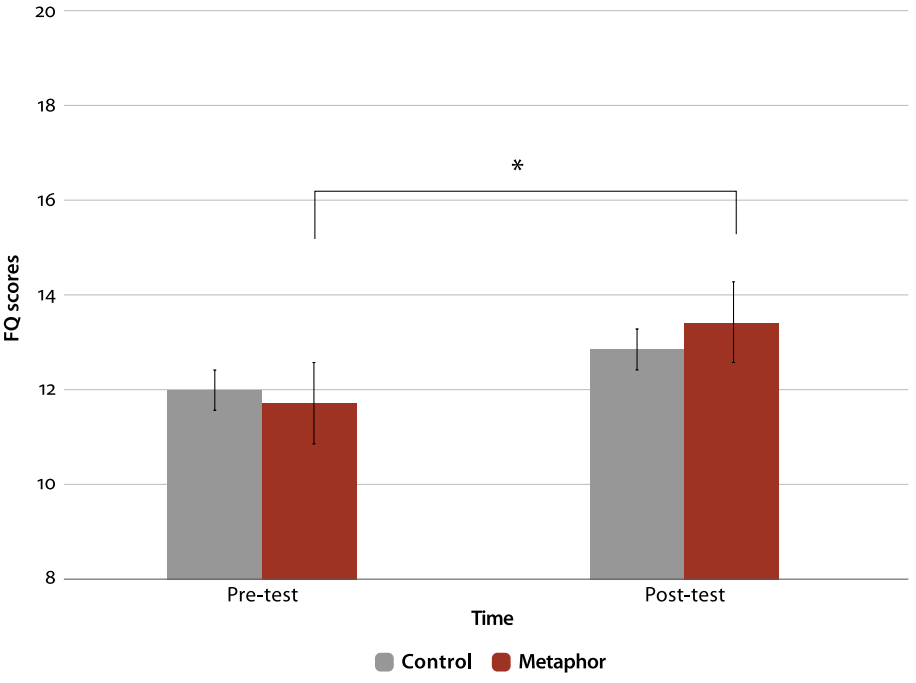

Figure 6. Fear scores. The figure shows how fear scores changed after exposure to both the control and metaphorical framings. The FQ scores range from 8 (the minimum score possible) to 20 rather than 48 (the maximum score possible) so the differences between conditions can more easily be observed

Trait aggressiveness analyses

We also analysed the TAQ scores to characterise the intensity of the anger and associated behaviours of the population relative to task condition and political affiliation. Overall trait aggressiveness scores ranged between a possible minimum 12 and 45 ($M = 22.28$, $SD = 8.98$), though the possible maximum was 72. The mean score of the physical aggression subscale was 17.34 ($SD = 7.67$) out of 9–54, and that of the anger subscale was 4.94 ($SD = 2.52$) out of 3–18. The item that participants scored the highest was "If somebody hits me, I hit back." ($M = 2.94$, $SD = 1.7$) and the lowest was "Once in a while, I can't control the urge

to strike another person." ($M = 1.21$, $SD = 0.6$). Republicans were on average more aggressive ($M = 22.79$, $SD = 9.24$) than Democrats ($M = 21.76$, $SD = 8.77$), replicating previous findings. The same pattern held for the physical ($M_{\text{Republicans}} = 17.73$, $SD = 7.95$ versus $M_{\text{Democrats}} = 16.95$, $SD = 7.42$) and anger subscales ($M_{\text{Republicans}} = 5.06$, $SD = 2.48$ versus $M_{\text{Democrats}} = 4.81$, $SD = 2.57$). The difference between the overall trait aggressiveness scores of Republicans and Democrats is not however significant, $t(123.66) = .64303$, $p = .52$, just like the difference between physical aggression scores, $t(123.41) = .56764$, $p = .57$, and anger scores, $t(123.82) = .56491$, $p = .57$.

Lastly, the anger subscale was also used as a post-test so it was possible to compare feelings of anger relative to baseline across conditions. Participants' anger scores decreased significantly after being exposed to both the metaphorical framing ($t(62) = 2.698$, $p < .01$) and control framing ($t(62) = 3.4404$, $p = .01$). Decreases in anger scores after exposure to the metaphor were also observed for affiliation groups but they were not significant for Republicans ($t(31) = 1.9168$, $p = .07$) or Democrats ($t(30) = 1.9265$, $p = .06$). Conversely, the control condition registered significant decreases for both Republicans ($t(30) = 2.3526$, $p = .03$) and Democrats ($t(31) = 2.5117$, $p = .02$). Please refer to Table 3 for details.

Table 3. Participants' scores in the CAQ, FQ and TAQ. Baseline and post-test scores are presented for the control and experimental groups, including for the questionnaires' subscales

	CONTROL GROUP ($N = 63$)	EXPERIMENTAL GROUP ($N = 63$)	OVERALL ($N = 126$)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
CAQ			
Overall			
Pre-test	29.38 (± 9.49)	28.86 (± 11.11)	29.12 (± 10.29)
Post-test	29.21 (± 10.06)	29.64 (± 11.4)	29.42 (± 10.71)
FQ			
Overall			
Pre-test	11.98 (± 5.54)	11.7 (± 5.27)	11.84 (± 5.43)
Post-test	12.76 (± 5.31)	13.6 (± 6)	13.18 (± 5.66)
Subscale 1			
Pre-test	7.32 (± 3.42)	7.11 (± 3.38)	7.21 (± 3.39)
Post-test	7.48 (± 2.98)	7.68 (± 3.28)	7.58 (± 3.13)

Table 3. *(continued)*

	CONTROL GROUP (*N*=63)	EXPERIMENTAL GROUP (*N*=63)	OVERALL (*N*=126)
	Mean (SD)	**Mean (SD)**	**Mean (SD)**
Subscale 2			
Pre-test	4.67 (± 2.34)	4.59 (± 2 25)	4.63 (± 2.29)
Post-test	5.29 (± 2.79)	5.92 (± 3.17)	5.60 (± 2.99)
TAQ			
Overall			
Pre-test	21.19 (± 8.72)	23.37 (± 9.18)	22.28 (± 8.98)
Physical aggression			
Pre-test	16.49 (± 7.58)	18.19 (±7.72)	17.34 (± 7.67)
Anger			
Pre-test	4.7 (± 2.3)	5.18 (± 2.71)	4.94 (± 2.52)
Post-test	3.7 (± 1.33)	4.3 (± 2.29)	4 (± 1.89)

3.2 Regression analyses

Variables

Binary variables were created to understand and contrast specific subgroups in the models. These include female (female coded as 1), leaning (more liberal than conservative and more conservative than liberal coded as 1), moderates (liberal and conservative coded as 1), strong affiliation (very liberal and very conservative coded as 1), Democrats (Democrats coded as 1), sceptics (no climate beliefs coded as 1), college (bachelor's, master's and PhD, or their equivalent, coded as 1), senior job (mid-level job, senior-level job and self-employed coded as 1), junior job (entry-level job coded as 1), other job (student, retired and other coded as 1), post (post-test coded as 1) and treated (metaphor coded as 1).

Climate support at baseline

Two Ordinary Least Square (OLS) models were built to understand what socioeconomic and psychological factors predicted support for climate action at baseline. The models took the pre-test CAQ as the dependent variable and did not include variables post and treated. The analyses are summarised in Table 4. The first model (OLS1) explored the effects of all variables. The model omitted variable moderates, which is indicative of high collinearity, and returned significant effects for variables senior job, leaning and Democrats. The second model (OLS2)

focused its regressions on the effects that proved significant and nearly significant, and their respective interactions. The model yielded significant effects of factors senior job, strong affiliation, Democrats, trait aggressiveness and a significant interaction between predictors strong affiliation and Democrats. Senior job's significance persisting across models indicates that subjects who were self-employed or had a mid- or senior-level job are more likely to have pro-environmental attitudes than their junior and other job counterpart. TAQ had a significant negative coefficient in OLS2 but it was not significant in OLS1. That may be attributable to the omission of variable moderates as most Republicans, who are more aggressive than Democrats, were concentrated in that binary variable, making TAQ and moderates collinear. Importantly, the negative coefficient informs that the more aggressive the participants were, the less likely they were to show support for climate action. That is consistent with the trait aggressiveness result for Republicans. Lastly, the most important finding concerns the factor Democrats, significant in both models, and its interaction with variable strong affiliation. Democrats, and especially very liberal Democrats, were strongly associated with positive climate attitudes.

Metaphorical framing effects

Random Effects (RE) and Fixed Effects (FE) models were conducted next to understand what factors predicted attitudinal changes in climate action support. Both models were built so that it was possible to directly compare how the results differed when the effects were calculated across and within subjects respectively. Variables post and treated were multiplied, creating a new variable post-treated, to test for a main effect of metaphorical framing. The results are summarised in Table 5. Both RE1 and FE1 documented a main effect of framing, which according to the significant interaction between post-treated and Democrats in RE2 and FE2, was driven by Democrats. That means that the effects are reliable and not model specific. Further, RE2 also generated a significant interaction between strong affiliation and Democrats, which complements the latter result by specifying that the WAR frame motivated attitudinal changes in very liberal Democrats, who responded by significantly increasing their support for climate action. There were no other findings consistent across models.

Table 4. Support for climate action before the reading task. OLS coefficients are presented with standard errors in parentheses

	CAQ — Baseline Attitudes	
	OLS1	**OLS2**
Age	−0.005 (0.067)	
Female	0.893 (1.565)	
College	0.388 (1.607)	
Senior job	3.874** (1.917)	3.603** (1.410)
Junior job	−0.214 (2.060)	
Leaning	5.097* (2.666)	3.150 (2.182)
Moderates	2.410 (2.492)	
Strong affiliation		−4.924** (2.486)
Democrat	14.870*** (2.586)	10.401*** (1.781)
Sceptics	−3.210 (3.167)	
FQ	0.018 (0.140)	−0.628 (0.438)
TAQ	−0.056 (0.088)	−0.372* (0.214)
FQ × TAQ		0.027 (0.018)
Strong affiliation x Democrat		7.644** (3.197)
Constant	19.452*** (4.930)	30.176*** (5.340)
Observations	126	126
R^2	0.453	0.477
Adjusted R^2	0.401	0.441
Residual Std. Error	7.970 ($df = 114$)	7.694 ($df = 117$)
F Statistic	8.592*** ($df = 11; 114$)	13.336*** ($df = 8; 117$)

Significance levels
* $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Table 5. Changes in support for climate action. OLS coefficients are presented with standard errors in parentheses

	CAQ — Attitudinal Changes			
	RE1	**RE2**	**FE1**	**FE2**
Post	−0.175 (0.361)	−0.194 (0.363)	−0.175 (0.361)	−0.197 (0.357)
Treated	−1.476 (2.012)	−0.779 (1.559)		
Post-Treated	0.952* (0.511)	−0.029 (1.156)	0.952* (0.511)	0.147 (1.221)
Female		1.219 (1.445)		
Senior job		3.358** (1.466)		
Leaning		3.492* (2.112)		
Strong affiliation		−3.303 (2.442)		
Democrat		10.607*** (1.747)		
FQ		−0.039 (0.135)		−0.007 (0.141)
TAQ		−0.105 (0.098)		
FQ x TAQ		0.004 (0.005)		0.002 (0.005)
Strong affiliation x Democrat		5.119* (3.015)		
Post-Treated x Democrat		1.802** (0.709)		2.046*** (0.754)
Post-Treated x strong affiliation		−0.965 (0.755)		−0.637 (0.804)
Post-Treated x Senior job		1.187* (0.699)		0.993 (0.746)
Post-Treated x TAQ		−0.007 (0.040)		−0.019 (0.043)
Constant	29.381*** (1.328)	22.986*** (2.953)		
Observations	252	252	252	252
R^2	0.019	0.376	0.038	0.125
Adjusted R^2	0.007	0.333	−0.948	−0.861
F Statistic	4.877	141.317***	2.438* (df= 2; 124)2.110**	(*df* = 8; 118)

Significance levels
* $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

4. Discussion

The study explored the effectiveness of the WAR metaphorical framing of climate change in inducing emotional responses and attitudinal changes towards climate action amongst US Republicans (50%) and Democrats (50%). Specifically, it tested if a WAR metaphor could induce fear and anger, and if these negative emotions together with personality trait aggressiveness led to an increase in support for climate action.

*H*1, which posited that the WAR frame of climate change was a fear-inducing metaphor resulting in negative emotions fear and anger, was partly confirmed. The metaphor did not induce anger. Pre- and post-test anger scores showed that both the control and experimental groups registered significant decreases in anger scores. These decreases were significant for both partisan groups after exposure to the control framing, but not the metaphor. Conversely, there was a significant effect of framing on the fear scores as they increased significantly in the metaphor condition, but not the control condition. Fear analyses revealed that Democrats did not register significant increases in their fear scores (likely due to their high baseline scores) but Republicans did. This is a novel finding, which together with the fact that most Republicans said they believe climate change to be anthropogenic, suggests that their climate inaction is not due to affective indifference. More specifically, Republicans reading about the climate crisis were likely to experience this affective response only in the presence of the WAR metaphor, suggesting that this particular metaphorical framing elicits an affective response in a conservative audience.

*H*2, which stated that the WAR frame of climate change is more effective than non-metaphorical framings in persuading individuals to develop positive attitudes towards climate action, was confirmed by the main effect of framing found. The effect was led by Democrats, who registered significant attitudinal changes after being exposed to the metaphor. The climate attitudes scores of both political groups in the metaphor condition further corroborate the hypothesis as participants significantly increased their support for climate action after the reading task. On the other hand, both samples decreased their climate action support in the control condition. This result was not mediated by fear. The regression analyses did not find FQ to be a significant predictor of climate attitudes, even though the WAR frame induced fear. This can be explained by the fact that Democrats developed more pro-environmental attitudes when their fear scores did not increase significantly, whereas Republicans did not significantly improve their climate attitudes but reported the expected fear responses.

*H*3 tested if the WAR frame of climate change is more effective than non-metaphorical framings in persuading high-trait aggressiveness individuals to change their behaviour and support climate action. The hypothesis was rejected based on the absence of significant interactions. These results can be explained by the fact that Republicans scored higher on trait aggressiveness than Democrats and also supported climate action the least, which suggests the interaction between trait aggressiveness and climate attitudes was a partisanship-driven phenomenon.

The WAR frame of climate change "the war against climate change" proved to be an important tool to explore the nuanced relationship between climate attitudes, beliefs, political ideology, affective responses, and personality trait aggressiveness. This study showed, for the first time, that Republicans can engage with climate communication when this is tailored to their affective and cognitive profile, such as the WAR metaphorical framing used in this study. As Republicans experienced fear but did not report attitudinal changes, the findings suggest their climate inertia is due to factors other than apathy. The opposite was true for Democrats, so the reason why the metaphorical framing was effective in triggering attitudinal changes cannot be asserted.

These results build upon prior metaphor work in this area by looking at nuances of affective responses and linking those to metaphor realisation. The affective responses of Democrats and Republicans in pre-testing revealed that Democrats had higher fear states initially, but that Republicans showed greater fear responses after exposure to the metaphorical framing of climate change. This increased fear did not immediately translate into greater climate action.

This WAR metaphorical framing of climate change, as well as the factors underlying its realisation and the attitudinal changes it instigates, should be explored further in the context of climate communication. Unlike non-metaphorical and other previously tested metaphorical frames, it has the potential to reach the wider American population, including conservatives and not just liberals. Future work in this area could investigate how affective responses impact the realisation of metaphorical frames and their subsequent impact on attitudes, beliefs and behaviours.

Funding

My current affiliation is Lancaster University but the study was funded in part by the Department of Language Studies of Umea University.

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Publication history

Date received: 26 April 2024
Date accepted: 9 March 2025
Published online: 14 April 2025