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Can you picture it? Effects of positive and negative depictions of climate futures on climate action intentions

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ABSTRACT

Media messages about climate change are often negative, depicting dire future consequences if action is not taken. While the fear elicited by such messages may motivate audiences, there is growing evidence that hope is also an important driver of engagement in climate action. We conducted a pre-registered experiment with U.S. adults to examine how depictions of positive and negative climate futures (separately and in combination) impact climate action intentions through emotions, counterarguing, and ability to imagine a positive future. We also examined collective efficacy and government efficacy as moderators. Findings shed light on the under-researched impacts of positive climate messaging, revealing benefits as well as risks. Moreover, results highlight the potential for counterarguing to hinder desirable responses to climate futures messaging, offer insights into effects of messages featuring both positive and negative elements, and point to the importance of audiences' pre-existing government and collective efficacy beliefs in the processing of climate messages.

Transformative action is urgently needed to address the threat of climate change. Perhaps not surprisingly, media depictions of climate futures are often apocalyptic (Svoboda, 2016; Yazell, 2020). Although fear in response to such media depictions can motivate climate action (Schneider-Mayerson, 2018), there is active scholarly debate on whether a steady stream of fear serves to sustainably motivate or simply overwhelm audiences (Clayton, 2020; Heeren & Asmundson, 2023; Hornsey & Fielding, 2016; O'Neill & Nicholson-Cole, 2009; Sullivan & White, 2020). Qualitative work has highlighted a public desire for more positive climate messaging (Engblom et al., 2019; Griffin, 2017), and surveys have found evidence of climate fatigue (Morrison et al., 2018) and curiosity about climate solutions (Leiserowitz et al., 2023). Furthermore, there is evidence that hope can motivate climate action (Feldman & Hart, 2016; Geiger et al., 2021b). Along these lines, scholars have called for further investigation into positive conceptions of climate futures (Hajer & Versteeg, 2019; Wright et al., 2020), which could very well elicit the hope and imagination necessary to spur action.

The purpose of this work is to investigate the effects of climate future messages in which humanity either succeeds or fails in addressing climate change over the coming decades. We experimentally examine how hope, imagining a positive future, and fear in response to depictions of positive and negative climate futures might motivate climate action. Moreover, because information about positive climate futures or specific climate solutions may be perceived as unrealistic or undesirable by some groups, we also investigate how counterarguing in response to positive climate messaging could impede motivation to join in climate action. Finally, we consider whether audience responses to these messages depend on pre-existing beliefs about collective and government efficacy.

1. Literature review

1.1. Cautionary climate messaging & fear

Fear is a "negatively-valenced emotion" (Witte, 1992, p. 331) aroused by "the threat of a future harm" (Lazarus, 1991, p. 235). As such, contemplating climate change commonly evokes feelings of fear, despair, and anxiety (Geiger et al., 2021a; Hickman & Marks et al., 2021; Martin et al., 2021), as can media portrayals of climate change (Doherty & Clayton, 2011), which range from bleak to apocalyptic. News coverage frequently highlights the negative effects of climate change alongside challenges in implementing solutions (Feldman et al., 2017; Hase et al., 2021). Such news focused on negative impacts elicits greater

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fear than news about actions to address climate change (Feldman & Hart, 2021). Climate fiction (cli-fi), an increasingly common entertainment genre, often features possible negative consequences of climate change, and cli-fi films and literature (e.g., *The Day After Tomorrow*) invite audiences to imagine a future in which humanity catastrophically fails to address climate change, leaving little room to contemplate climate solutions (Svoboda, 2016). Likewise, cli-fi literature frequently focuses on negative effects of climate change, offering "no clear route to a better destination" (p. 315) for frightened readers (Schneider-Mayerson, 2017). Such narratives act as "cautionary fables" (p. 313) about characters' struggles to survive in post-apocalyptic settings ravaged by climate change (Schneider-Mayerson, 2017). Based on this terminology, we use the term *cautionary messages* to refer to negative depictions of climate futures.

Because fear typically motivates behavior to mitigate a threat (Lazarus, 1991; Witte, 1992), fear can function as an important catalyst for attitude and behavior change (Tannenbaum et al., 2015; Witte & Allen, 2000), including promoting conversations about climate change and pro-environmental lifestyle changes (Schneider-Mayerson, 2018). However, there is an active scholarly debate around the value of threat-focused messaging compared to more positive approaches (Hornsey & Fielding, 2020). Some scholars in both environmental psychology and media psychology have warned that focusing solely on cautionary messages that evoke fear could discourage adaptation and mitigation efforts because they present climate change as an insurmountable issue and make people feel helpless and hopeless (O'Neill & Nicholson-Cole, 2009; Sullivan & White, 2020). Others suggest that maintaining awareness of a threat is important to avoid creating a false sense of security and encouraging complacency (Hornsey & Fielding, 2016). Recent work examining impacts of climate anxiety has found that while anxiety can positively predict engagement in pro-environmental behaviors (Whitmarsh et al., 2022), it is also negatively associated with mental wellbeing (Gago, Sargisson, & Milfont, 2024) and there is not consensus on how to balance pro-environmental outcomes and audience wellbeing when it comes to anxiety-inducing climate messaging (Shao & Yu, 2023). Moreover, there is some evidence that motivating effects of climate anxiety weaken if people simultaneously experience strong feelings of distress (Lukacs et al., 2023), and some scholars suggest that low to moderate levels of anxiety may be constructive while high levels of anxiety may be unhelpful (Heeren & Asmundson, 2023).

Studies on fear-evoking climate messages have yielded mixed results, with some showing greater action intentions resulting from exposure to pessimistic rather than optimistic messaging (Hornsey & Fielding, 2016), while others have found that fear-evoking messages can yield increases in action intentions similar to humorous messages in comparison to unrelated control messaging (Skurka, Niederdeppe, Romero-Canyas, & Acup, 2018). Still other research found little impact of either threatening or hopeful messages (Ettinger, Walton, Painter, & DiBlasi, 2021). Meanwhile, some work testing combinations of threat and action information has found that high threat messaging is associated with higher levels of both fear and action intentions, while others have found no effects (Palosaari, Herne, Lappalainen, & Hietanen, 2023). Finally, in investigating impacts of action and impact information, scholars have identified both fear and hope as motivators of climate policy support (Feldman & Hart, 2018). Overall, based on existing scholarship, it would be a gross oversimplification to suggest that fear- (or hope-) evoking messaging is either good or bad across the board (Chapman, Lickel, & Markowitz, 2017). Instead, we consider the idea that threat-focused messaging and negative future depictions have often dominated within the realm of climate change and that "there should be a diversity of messages around climate change" (Hornsey & Fielding, 2020, p. 24). Thus, we turn our attention to the possible impacts of messages presenting what the world might look like if humanity succeeds in addressing climate change–an understudied messaging approach.

1.2. The potential impact of positive alternatives

Climate messaging focused on benefits of action and desirable outcomes could motivate the public by depicting a future worth working toward (Kundzewicz et al., 2020). Inspiring visions of the future could generate transformative movement toward positive changes to meet climate goals (Tàbara et al., 2018) and inform the kinds of climate change solutions people embrace (Yusoff & Gabrys, 2011). Indeed, in qualitative work examining climate related media, people have voiced a desire for more solutions-oriented climate messaging, often in the form of specific mitigation strategies they can support to combat the climate change impacts (Engblom et al., 2019; Griffin, 2017). Meanwhile, longitudinal survey research in Australia has highlighted possible climate fatigue among the public based on decreasing levels of engagement with climate change both in action and conversation (Morrison et al., 2018). Moreover, surveys among the American public have consistently found high levels of interest in learning more about effective climate solutions (Leiserowitz et al., 2023).

A small body of media programming has begun depicting positive climate futures. For example, the film *2040* shows a world in which sustainable solutions are broadly adopted in hopes of combatting despair and convincing viewers that acting on climate change is possible (Gameau, 2020). Some novels have considered "life after oil" themes, which present "plausible alternatives to inspire and guide" (p. 316) change toward a more sustainable future (Schneider-Mayerson, 2017). Thus, we use the term *positive alternative message* to refer to depictions of climate futures in which humanity successfully addresses climate change. Whereas cautionary messages showing dark climate futures could motivate behavior via fear, positive alternative messages focused on successful outcomes could promote action by allowing people to imagine a positive future and by eliciting hope–two mechanisms we unpack in the following sections.

1.2.1. Imagining positive climate futures

One driver of social change in response to undesirable circumstances is the availability of cognitive alternatives, or conceptions of more desirable plausible future outcomes (Tajfel & Turner, 1986). For example, if one football team loses to another, the losing team may still be motivated to improve and continue competing because they believe winning is possible in future games (Tajfel & Turner, 1986). Based on this idea, the collective futures framework posits that beliefs about how society can improve play a role in motivating action to achieve desirable possible futures (Bain et al., 2013). Other scholars have suggested cognitive alternatives involving a better version of society "should make the current state of society seem more changeable" and ultimately "encourage people to participate in collective action aimed at improving society" (Badaan et al., 2020, p. 7). Altogether, this scholarship proposes imagining a better possible future can motivate people to engage in action to make those cognitive alternatives a reality.

Within the context of climate change, imagining a positive future means forming a "conce[ption] of how the status quo could be different" (Wright et al., 2020, p. 2). This could involve being able to picture a more harmonious relationship between humanity and nature or, more specifically, envisioning what life might look like if the world relied on renewable energy rather than fossil fuels (Wright et al., 2020). Ultimately, imagination lays the groundwork for transformational climate action, as picturing a future that is different from the present situation could inspire collective action in support of achieving a more sustainable reality (Wright et al., 2020; Yusoff & Gabrys, 2011). Psychologists have recommended further research examining strategies to make cognitive alternatives more accessible, such as asking people to think about utopian scenarios or showing them media depictions of better societies (Badaan et al., 2020), implying that the ability to imagine a positive future could be impacted in the short-term, even by media messaging.

However, there has been "imaginative failure" (p. 169) in climate media, as many sources of climate content fail to present innovative, equitable solutions to climate change and instead depict persistent inequalities or failed systems (Yazell, 2020). Stories focused on cautionary messages primarily influence ability to imagine the negative effects of climate change (Schneider-Mayerson, 2018), not strategies for avoiding those effects. The capacity to imagine negative outcomes alone may not be enough to spur transformative movement away from fossil fuels and toward sustainable climate solutions; instead, the added ability to imagine a positive alternative worth aspiring to can help drive more comprehensive change (Hajer & Versteeg, 2019). In support of this claim, imagining a positive future predicts identification with environmental activists and willingness to engage in environmental activism (Wright et al., 2020, 2022). This is likely because "in order to work toward social change, people need to have some conception about what that change will look like" (Wright et al., 2020, p. 2). We investigate the role that positive alternative messaging could play in prompting readers to imagine vibrant, rather than solely bleak, climate futures, which could in turn motivate action toward desirable outcomes.

1.2.2. Hope

Hope is an emotion evoked when peopleconsider a desired and important possible outcome that, if achieved, would result in "a better future" (Chadwick, 2015, p. 600). Whereas fear can trigger action to avoid an undesirable consequence (Lazarus, 1991), hope inspires action in order to achieve a desirable outcome (Chadwick, 2015). Compared to messages focused on climate threats, messages describing ways for individuals and organizations to respond to climate change generate hope (Feldman & Hart, 2016, 2018, 2021). Additionally, examples of climate action, growing public awareness of climate change, technological innovations, and humanity's capacity for good are all sources of hope (Geiger et al., 2021a; Marlon et al., 2019). Hope, in turn, positively predicts public climate action intentions, pro-environmental policy support, and environmental advocacy (Feldman & Hart, 2016, 2018; Geiger et al., 2021b; Nabi et al., 2018). Connecting this logic to climate communication, if a message ignites hope by depicting positive potential outcomes, individuals may be inclined to pursue climate-related actions like engaging in activism behaviors or supporting climate-friendly policies.

To summarize our position so far, we posit cautionary and positive alternative messages will operate through different mechanisms: heightened fear for cautionary messaging versus heightened ability to imagine a positive future and hope for positive alternative messaging. We also wish to consider the effects of a combined cautionary + positive alternative message that portrays two possible futures side-by-side, one in which humanity fails to address climate change followed by one in which humanity succeeds, given that a single climate message may discuss both threats and solutions (e.g., Feldman et al., 2017) and may therefore have the potential to harness the advantages of cautionary messaging (evoking fear) as well as the advantages of positive alternative messaging (enhancing ability to imagine a positive future and hope).

1.3. Drawbacks of positive alternative messaging

Although we anticipate a positive alternative environmental message will on the whole promote pro-environmental intentions by driving hope and ability to imagine a positive future, there is also reason to expect such optimistic visions of the future could prompt resistance. Many people feel humanity is unlikely to overcome the challenge of climate change (Hickman & Marks et al., 2021); thus, hopeful depictions of the future may come across as overly optimistic and unrealistic. Alternatively, the solutions depicted in a positive alternative message could be viewed as threatening or undesirable. Recent survey research has demonstrated people can take the threat of climate change seriously while opposing transformational policy solutions, such as the Green New Deal, because they are viewed as inappropriate or extreme (Kantack & Paschall, 2023). In particular, positive alternative messaging is likely to prompt counterarguing, which involves cognitively disagreeing with the arguments presented (Schneider-Mayerson et al., 2023; Slater & Rouner, 2002). Counterarguing decreases favorable responses to persuasive messaging (Petty & Cacioppo, 1986) and has been shown to decrease intentions to comply with advocacy messages (Lillie et al., 2021; Moyer-Guse et al., 2011). Thus, we anticipate that positive alternative messaging could prompt counterarguing, which in turn would discourage intentions to engage in climate action.

1.4. Pre-existing efficacy beliefs as moderators

Individual-level beliefs, such as political ideology, knowledge, and pre-existing attitudes, can influence how people react to climate messaging (Albertson & Busby, 2015; Rode et al., 2021). Here, we consider underexplored moderators, two kinds of pre-existing efficacy beliefs, which are a key factor in decisions to take action to address an issue (Bandura, 1997). Collective efficacy involves perceptions about a group's ability to act and, according to social cognitive theory, impacts groups' goals, plans of action, anticipated outcomes, ability to overcome obstacles, and achievements (Bandura, 1997). The Social Identity Model of Pro-Environmental Action identifies collective efficacy as a key determinant not only of pro-environmental action, but also assessments of environmental threats (SIMPEA; Fritsche et al., 2018). Specifically, SIMPEA predicts that collective efficacy could affect how people react to information about environmental issues (like climate change), such that people with high levels of collective efficacy will view a threat as a challenge to be tackled, while those with low collective efficacy may instead react with denial (Fritsche et al., 2018). Although Fritsche and colleagues (2018) note that there is little research testing collective efficacy in this manner, as it is usually examined as a driver of behavioral outcomes, this logic suggests collective efficacy should moderate reactions to climate messages.

Some work has begun examining pre-existing efficacy beliefs as a moderator of message effects. One study revealed perceptions of one's ability to influence government and society moderated the effect of informational messaging about collective environmental impacts, such that higher levels of these beliefs resulted in greater positive impacts on attitudes toward the message, personal efficacy, and pro-environmental behavior intentions (Hornsey et al., 2021). Other research has found collective efficacy moderates the relationship between exposure to information and engagement in sustainable development behaviors (Kang, 2019), and recent work on climate change news stories has called for an investigation of collective efficacy as a moderator of responses to positive and negative messaging (Diamond & Urbanski, 2022). Furthermore, recent critiques of scholarship on climate change, media, and emotion have noted the need to add nuance by examining moderators of message effects (Chapman, Lickel, & Markowitz, 2017). Altogether, there is a need for more work examining the moderating role of collective efficacy on responses to climate messaging.

Similar to how collective efficacy may impact whether climate messaging presents an opportunity for action or an insurmountable threat (Fritsche et al., 2018), government efficacy beliefs may also moderate reactions to proposed climate futures. Government efficacy refers to the perception that a government is responsive to citizens' desires and transparently makes decisions that are beneficial to all citizens (Gil de Zúñiga et al., 2017). Government action is needed to make meaningful progress on climate change (IPCC, 2022) and an efficacious government would work to effectively protect its citizens from the harms of climate change, presumably through implementation of adaptation and mitigation measures supported by its citizens. Thus, people with high government efficacy perceptions may interpret a positive alternative message as a viable outcome to work toward (or a cautionary message as an undesirable alternative that is possible to avoid) because they feel their government can act on climate. Conversely, individuals with low government efficacy perceptions, believing that their government cannot effectively act to protect them from climate change, may interpret positive alternative messaging as unrealistic or cautionary messaging as an overwhelming threat.

Altogether, we argue that people who already believe collective and government action is possible will react more favorably to positive alternative messaging because the optimistic information coheres with their pre-existing view that a sustainable future can be achieved, which means that this message should make them feel especially hopeful, make them more able to imagine a positive future, and make them unlikely to counterargue. By contrast, those who are already doubtful that collective and government action can be taken will likely be more skeptical of humanity's ability to address climate change, and thus will be less likely to accept positive alternative messaging.

1.5. Hypotheses

First, we consider the main effects of our message types on our mediator and outcome variables. Under the assumption that exposure to any messaging about climate change will promote climate-related intentions, we first hypothesize:

H1. Compared to a control message (unrelated to climate change), viewing a cautionary, positive alternative, or cautionary + positive alternative message will result in greater intentions to engage in collective climate action.

Because prior scholarship suggests that descriptions of positive and negative possible climate futures could drive imagination, emotional reactions, and arguments against such outcomes, we predict:

H2. Compared to cautionary and control messages, viewing a positive alternative or a cautionary + positive alternative message will result in a greater ability to imagine a positive future.

H3. Compared to control, positive alternative, and cautionary + positive messages, exposure to a cautionary message will result in greater fear.

H4. Compared to cautionary and control messages, viewing a positive alternative or cautionary + positive alternative message will result in greater hope.

H5. Compared to cautionary and control messages, viewing a positive alternative or a cautionary + positive alternative message will result in greater counterarguing.

Moving on, we examine the roles of imagination, hope, fear, and counterarguing as key cognitive mechanisms that could mediate the impacts of various kinds of climate future messaging. We predict:

H6. Ability to imagine a positive future will mediate the relationship between message type and behavior intentions by positively predicting intention to engage in climate action.

H7. Emotions will mediate the relationship between message type and climate action intentions, such that a) hope and b) fear will positively predict intention to engage in climate action.

H8. Counterarguing will mediate the relationship between message type and climate action intentions by negatively predicting climate action intentions.

Finally, in recognition that people's pre-existing beliefs about government or group action may condition responses to climate messages, we predict:

H9. Collective and government efficacy will moderate the effects of message type on message reactions (a)imagination, b) hope, c) fear and d) counterarguing), such that: the positive alternative and cautionary + positive alternative messages will increase ability to imagine a positive future and hope more strongly for those with higher perceptions of collective and government efficacy than those with lower levels of efficacy; the positive alternative and cautionary + positive alternative messages will increase counterarguing more strongly for those with lower levels of collective and government efficacy than those with higher levels of efficacy.

Fig. 1 visualizes our conceptual model, which considers how the indirect effects of the type of climate messaging will be conditional on a person's prior efficacy perceptions.

2. Methods

Our hypotheses, power analysis, and data plans were pre-registered at AsPredicted: https://aspredicted.org/5LZ_JDG. Data and syntax are available online: https://osf.io/n8gsr/?view_only=fb7d43b6c37d47e38a1406d3609af01a.

2.1. Recruitment

Participants were Amazon MTurk workers recruited through CloudResearch who had previously completed a minimum of 500 tasks with an approval rate of at least 98% ($N = 420$). Individuals 18 years or older and located in the United States were eligible to participate. The authors' institutional review board exempted the study.

2.2. Sample

A power analysis conducted in G*Power based on an effect size (partial $\eta^2 = 0.029$) documented in previous research of a similar nature (Jugert et al., 2016) suggested a minimum of 382 participants. We initially recruited 420 participants. Per our pre-registered exclusion criteria, participants were removed if they did not complete the entire questionnaire ($n = 29$), if they failed one or both attention checks ($n = 30$), and if they streamlined answers ($n = 4$). Though not pre-registered, we also opted to remove participants who took over an hour ($n = 5$) to complete the study. This resulted in a final sample of $N = 382$ useable responses, with an average survey time of 12.05 min ($SD = 6.94$).

Participants ranged from 21 to 76 years old ($M = 42.81$, $SD = 12.25$) and approximately half were women (50.3%). Most participants identified as White (81.2%) or Black (13.1%) and had an undergraduate (37.4%) or graduate degree (26.4%). Almost half of participants (44.5%) identified most with the Democrat party and our sample leaned slightly liberal ($M = 3.78$, $SD = 1.92$ on a scale of (1) extremely liberal to (7) extremely conservative.

2.3. Procedure

Data collection took place in October 2022. After providing consent and before viewing stimuli, participants were asked questions about their government and collective efficacy beliefs. Following these questions, participants were informed they would read a short blog post and answer questions about it. The instructions stated that participants would be able to advance from the blog post to the next screen after 30 s. Participants were then randomly assigned to read a mock blog post in one of four between-subjects conditions: cautionary ($N = 93$), positive alternative ($N = 95$), cautionary + positive alternative ($N = 98$), or control ($N = 96$). After reading the stimulus message, participants answered questions about their emotional reactions, manipulation checks, counterarguing, imagination, and climate action intentions. The last portion of the survey solicited demographic information.

2.4. Stimulus development and pilot testing

We formatted the stimuli as blog posts and adapted the content of the treatment messages from passages in Eric Holthaus's (2020) book *The future earth: A radical vision for what's possible in the age of warming.* Although the content differed, both the cautionary and positive alternative messages followed a similar structure: introducing what the

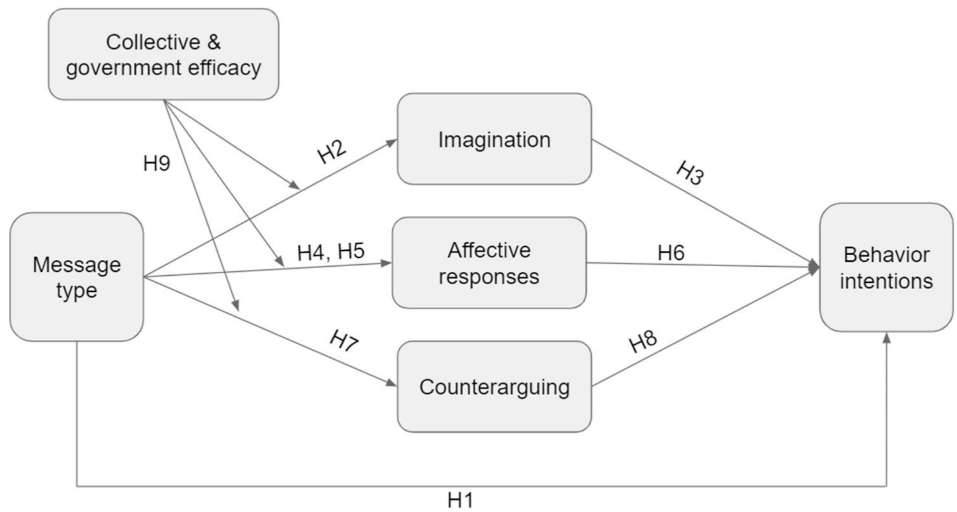

Fig. 1. Conceptual Model
Note: Message types included cautionary, positive-alternative message, cautionary + positive alternative, and control.

planet could look like in 2040 with or without people coming together to enact changes, two paragraphs describing the world in 2040 (e.g., burning of fossil fuels or banning them; maintaining or changing the current agricultural system), and concluding with how people may fail or succeed in coming together over a few decades to make positive decisions. The cautionary message was titled, "Our Dark Climate Future" (233 words) and included an image of Earth half glowing orange with fire. It discussed how life on Earth may look in 2040 if people fail to come together to enact climate change solutions. For example, temperatures, coastal flooding, and rates of vector borne diseases could increase and conventional industrial agriculture practices could damage the environment and increase emissions. The positive alternative message was titled, "Our Bright Climate Future" (245 words) and included a standard image of Earth. It discussed positive changes to the planet in 2040 if people came together to address climate change. The message explained how burning fossil fuels could become illegal, animals and water systems could have legal protections, and substantial investments into regenerative agriculture could help local ecosystems. Both messages used "we" throughout and ended with a statement about human actions (not) addressing climate change to emphasize the role of people coming together to act, and the consequences for the planet.

The cautionary + positive alternative message was titled, "Our Dark or Bright Climate Future" (485 words) and combined the text from the other two messages. It began by stating "humanity has two choices for our climate future" and explained the negative consequences of not coming together to take climate action, using the same text as the cautionary message. The message shifted halfway: "Our second choice for our climate future is to put the planet first." The positive alternative message text was then presented. Both images were included in the combination message in their respective sections. The control message was about an innocuous, unrelated topic (handwashing) and was of similar length (249 words).

We conducted a pilot test with $N = 150$ participants which confirmed that messages were of similar quality and were perceived as either cautionary or positive. See supplemental materials for full stimulus text, pilot test results, and main study manipulation check results.

2.5. Measures

Unless otherwise indicated, items were measured on a 1 (strongly disagree) to 7 (strongly agree) Likert scale. See Appendix for full measures.

2.5.1. Government efficacy

We asked participants how they think the government handles a variety of social issues to avoid sensitizing participants to the study purpose: childhood poverty, climate change, and the opioid epidemic. Each topic included six items (adapted from Gil de Zuniga et al., 2017) (e.g., "When it comes to climate change … the US government works on everyone's behalf"). ($\alpha = 0.97$; $M = 3.22$, $SD = 1.63$).

2.5.2. Collective efficacy

Participants were informed that they would answer questions about how they think groups of concerned citizens can handle a variety of social issues. Questions about childhood poverty and the opioid epidemic were again included as distractor items. Five items assessed collective efficacy (adapted from Jugert et al., 2016) (e.g., "If we decided to fight climate change as a society, collective action would be possible,") ($\alpha = 0.96$; $M = 5.11$, $SD = 1.47$).

2.5.3. Emotions

Participants were asked to indicate how much they felt several emotions on a 1 (not at all) to 7 (extremely) scale (adapted from Hickman & Marks et al., 2021; Nabi & Myrick, 2019; Watson & Clark, 1994). Three items measured hope (hopeful, optimistic, encouraged) ($\alpha = 0.92$; $M = 3.27$, $SD = 1.84$). One item measured fear ($M = 2.70$; $SD = 1.99$). Other measured emotions are not reported in this study.

2.5.4. Ability to imagine a positive future

The ability to imagine a positive future included ten items from Wright and team's (2020) environmental cognitive alternatives scale (e.g., "I can easily imagine a world where people see themselves as integrated with nature, rather than masters over the natural world,") ($\alpha = 0.94$; $M = 4.16$, $SD = 1.35$).

2.5.5. Counterarguing

Counterarguing consisted of four items adapted from Moyer-Gusé and Nabi (2010) and Niederdeppe et al. (2015) (e.g., "I did not accept the points made in the blog post,") ($\alpha = 0.94$; $M = 3.28$, $SD = 1.84$).

2.5.6. Climate action intentions

Climate action intention included seven items on a 1 (very unlikely) to 7 (very likely) scale (adapted from Hart & Feldman, 2016; Landmann & Rohmann, 2020). Participants were asked to indicate how likely they are to engage in various actions over the next 12 months, such as "convince others to engage in climate action," ($\alpha = 0.94$; $M = 3.82$, $SD = 1.72$).

3. Results

3.1. Data analysis

We assessed main effects with ANCOVAS (Table 1) using Bonferonni comparisons, and we tested hypotheses of mediation and moderation using PROCESS Macro models (Hayes, 2018) in SPSS. Although not pre-registered, all analyses controlled for political ideology.

3.2. Direct effects

H1 predicted that a cautionary, positive alternative, or cautionary + positive alternative message (compared to a control message) would increase intention to engage in climate action. There were no significant effects of condition on climate action intentions, therefore, H1 was not supported.

H2 predicted that a positive alternative or a cautionary + positive alternative message (compared to a cautionary or control message) would increase ability to imagine a positive future. There were no significant effects on ability to imagine a positive future, so H2 was not supported.

H3 stated a cautionary message (compared to positive alternative, cautionary + positive, and control messages) would result in greater fear. There was a significant effect of message type on fear, with the cautionary message evoking significantly greater fear than the positive alternative and control conditions. However, the cautionary + positive alternative condition also evoked greater fear compared to the positive alternative and control messages. Therefore, H3 was partially supported.

H4 predicted a positive alternative or cautionary + positive alternative message (compared to cautionary and control messages) would result in greater hope. There was a significant main effect of condition on hope, such that the positive alternative message evoked greater hope than the cautionary and cautionary + positive alternative messages. Notably, the cautionary + positive alternative message did not prompt increased hope compared to the control and cautionary messages. Thus H4 was partially supported.

H5 predicted that viewing a positive alternative or a cautionary + positive alternative message (compared to a cautionary or control message) would result in greater counterarguing. There was a significant main effect of message type on counterarguing. Specifically, the positive alternative and cautionary + positive alternative messages elicited greater counterarguing compared to the control message but not compared to the cautionary message. Therefore H5 was partially supported. We note, however, that the control message was about a thematically unrelated topic, so counterarguing of the control message may not be as intuitive a comparison to counterarguing of the treatment messages.

3.2.1. Moderation & moderated mediation

We used PROCESS model 10 (moderated mediation with parallel mediators) to address H6-9 with 5000 bootstrapped samples. Although our preregistered hypotheses only refer to mediation and moderation, not moderated mediation per se, our hypotheses considered together naturally suggest the need to examine a model of moderated mediation. See Figs. 2–6 for visualization of significant moderation effects, Tables 2 and 3 for a summary of significant (p <.05) moderated mediation effects, and Fig. 7 for a visualization of moderated mediation results. Moderation effects were probed using the Johnson-Neyman technique at −1 SD, mean, and +1 SD.

H6 predicted that the ability to imagine a positive future would mediate the relationship between positive alternative and cautionary + positive alternative messages and climate action intentions. H9a predicted that positive alternative and cautionary + positive alternative messages would increase ability to imagine a positive future more strongly for those with higher perceptions of efficacy than those with lower levels of efficacy. The indices of moderated mediation indicated there were no significant conditional indirect effects of any message type via imagination, indicating efficacy beliefs did not moderate indirect effects through ability to imagine a positive future. Thus, H6 and H9a were not supported. Despite the absence of a significant moderated mediation effect, we note that imagination was positively associated with intentions ($B = 0.37$, $p < 0.001$).

H7a predicted that hope would act as a mediator between positive alternative and cautionary + positive alternative messages and action intentions, such that hope would positively predict intentions. Additionally, H9b predicted that positive alternative and cautionary + positive alternative messages would increase hope more strongly for those with higher perceptions of government and collective efficacy. There was a significant interaction between the positive alternative condition (vs. control) and collective efficacy (Fig. 2), such that the positive alternative message increased hope compared to control but only for participants with collective efficacy beliefs above the sample mean. However, the indices of moderated mediation did not indicate any significant conditional indirect effects of any message type through hope. Instead, there was only an unconditional negative indirect effect of the cautionary condition, because the cautionary message reduced hope compared to the control. Thus, H7a was not supported and H9b was partially supported.

H7b predicted that fear would mediate the relationship between the cautionary message and action intentions, and H9c predicted that government and collective efficacy would have a moderating effect on fear.

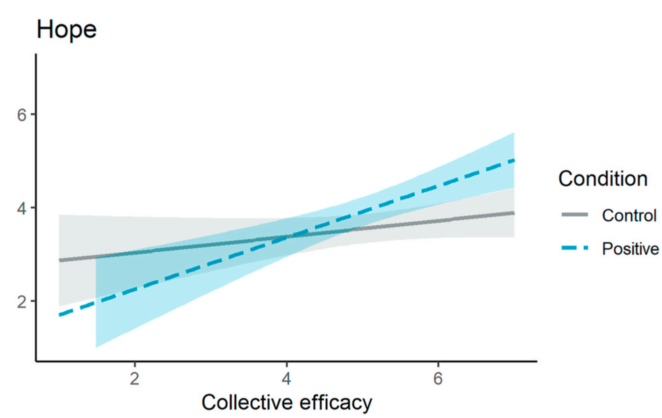

Fig. 2. Moderating effect of collective efficacy on hope.

Table 1
Direct effects of message types on climate action intentions and mediators.

	Cautionary (n = 92)	Positive (n = 94)	Cautionary + positive (n = 97)	Control (n = 95)	F	Partial η^2	p
Climate action intentions	4.20 (0.17)	3.78 (0.17)	3.68 (0.16)	3.65 (0.16)	2.38	0.02	0.07
Imagination	4.29 (0.14)	4.24 (0.14)	3.94 (0.14)	4.19 (0.14)	1.32	0.01	0.27
Fear	3.88_a (0.18)	2.07_b (0.18)	3.21_a (0.18)	1.63_b (0.18)	32.01	0.21	<0.001
Hope	2.52_a (0.18)	3.99_c (0.18)	3.09_{ab} (0.18)	3.55_{bc} (0.18)	12.04	0.09	<0.001
Counterarguing	3.09_{ab} (0.18)	3.57_b (0.18)	3.54_b (0.17)	2.86_a (0.17)	3.99	0.03	<0.01

Note: Estimated marginal means and standard errors are shown. Means with no subscript in common differ at $p < 0.05$. We used Bonferonni post-hoc comparisons. Analyses controlled for political ideology and four participants were excluded who did not report political ideology.

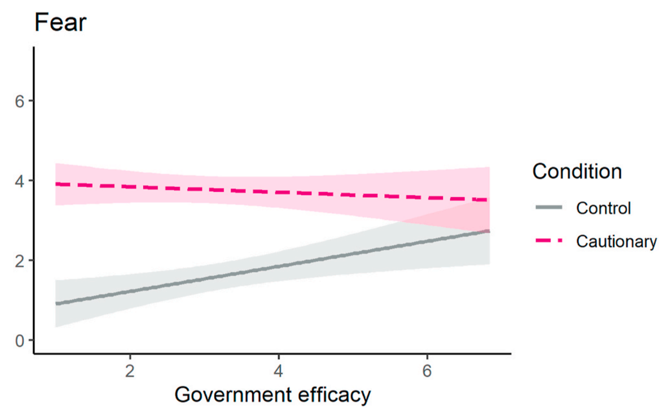

Fig. 3. Moderating effect of government efficacy on fear.

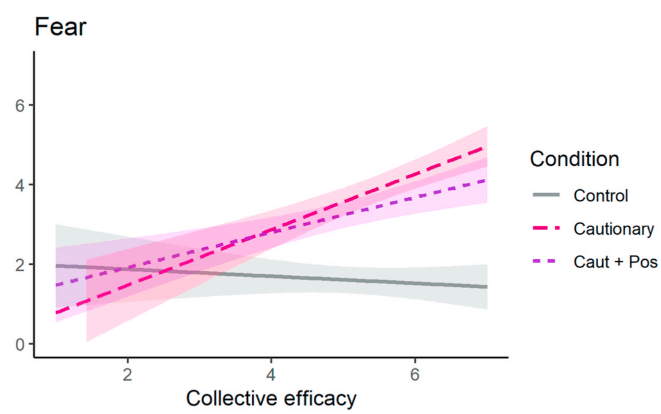

Fig. 4. Moderating effect of collective efficacy on fear.

Government efficacy moderated the effect of the cautionary message on fear (vs. control), shown in Fig. 3. The cautionary condition increased fear (compared to the control) most strongly among participants with low levels of government efficacy, and this effect weakened but remained significant for participants at mean and high levels of government efficacy. Referring to the indices of moderated mediation, there was a significant positive indirect effect of the cautionary message via fear across all levels of government efficacy, but these effects were stronger for participants with low levels of government efficacy.

Collective efficacy moderated the effect of the cautionary and cautionary + positive alternative conditions on fear (vs. control), as shown in Fig. 4. The cautionary and cautionary + positive alternative conditions increased fear (compared to the control message) the most among participants with relatively higher levels of collective efficacy but also had weaker (but significant) effects among those with collective efficacy beliefs at the sample mean and 1 SD below the mean. Looking at the indices of moderated mediation, there were significant positive indirect effects of the cautionary and cautionary + positive alternative messages via fear across levels of collective efficacy, but these effects were stronger for participants with high levels of collective efficacy. Therefore, H6b was supported and H9c was partially supported.

H8 posited that counterarguing would mediate the effect of positive

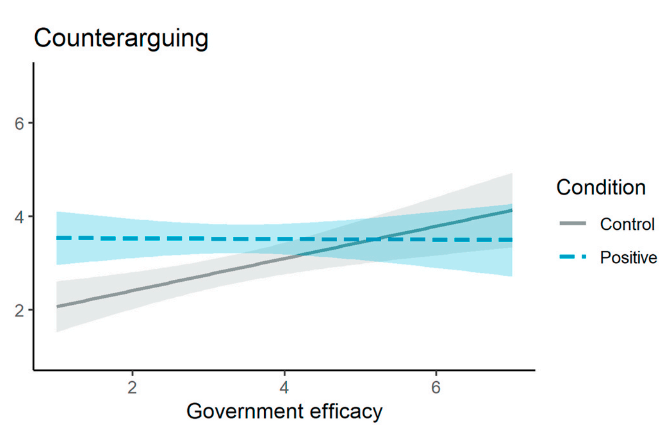

Fig. 5. Moderating effect of government efficacy on counterarguing.

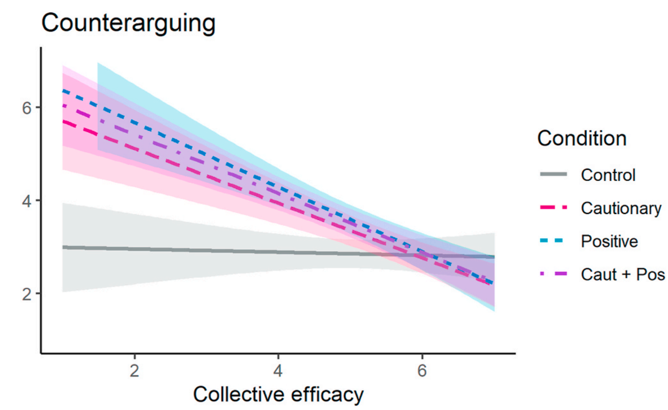

Fig. 6. Moderating effect of collective efficacy on counterarguing.

Table 2
Moderated mediation results: Government efficacy.

	Level of government efficacy	Effect	95% CI LLCI	95% CI ULCI	Index (LLCI, ULCI)
Positive > counterarguing > climate action	−1 SD	−0.12	−0.28	−0.02	0.035
	Mean	−0.07	−0.15	−0.01	(0.002,
	+1 SD	−0.01	−0.08	0.06	0.01)
Cautionary > fear > climate action	−1 SD	0.75	0.51	1.02	−0.108
	Mean	0.57	0.40	0.77	(−0.22,
	+1 SD	0.40	0.16	0.65	−0.02)

Note: Effects and confidence intervals reported at mean levels of collective efficacy. Only significant results are shown (i.e., if the overall index of moderated mediation was significant at $p < 0.05$). Analysis controlled for political ideology. See supplemental materials for full results.

Table 3
Moderated mediation results: Collective efficacy.

	Level of collective efficacy	Effect	95% CI LLCI	95% CI ULCI	Index (LLCI, ULCI)
Cautionary > counterarguing > climate action	−1 SD	−0.12	−0.25	−0.02	0.056
	Mean	−0.04	−0.11	0.00	(0.01,
	+1 SD	0.04	−0.02	0.12	0.12)
Positive > counterarguing > climate action	−1 SD	−0.16	−0.31	−0.04	0.066
	Mean	−0.07	−0.15	−0.01	(0.01,
	+1 SD	0.03	−0.05	0.11	0.13)
Cautionary + positive > counterarguing > climate action	−1 SD	−0.15	−0.29	−0.03	0.060
	Mean	−0.06	−0.13	−0.01	(0.01,
	+1 SD	0.03	−0.03	0.11	0.12)
Cautionary > fear > climate action	−1 SD	0.25	0.03	0.47	0.222
	Mean	0.57	0.40	0.77	(0.12,
	+1 SD	0.90	0.65	1.18	0.34)
Cautionary + positive > fear > climate action	−1 SD	0.26	0.07	0.46	0.149
	Mean	0.47	0.32	0.67	(0.06,
	+1 SD	0.69	0.47	0.96	0.25)

Note: Effects and confidence intervals reported at mean levels of government efficacy. Only significant results are shown (i.e., if the overall index of moderated mediation was significant at $p < 0.05$). Analysis controlled for political ideology. See supplemental materials for full results.

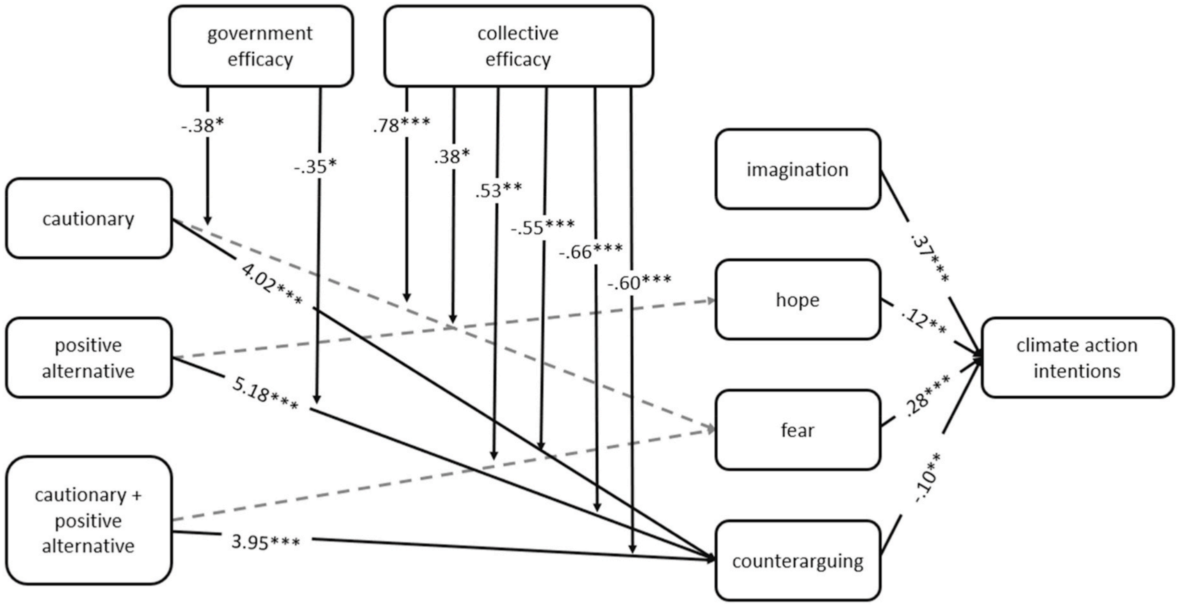

Fig. 7. Moderated Mediation Results

Note: Ordinary least squares (OLS) coefficients (unstandardized) taken from the PROCESS output are shown. *significant at <0.05, **significant at <0.01, ***significant at <0.001. Gray dashed lines denote non-significant paths. Other nonsignificant paths were also excluded from the figure. Analysis controlled for political ideology.

alternative and cautionary + positive alternative messages on action intentions, with counterarguing ultimately negatively predicting intentions. H9d predicted that the positive alternative and cautionary + positive alternative messages would increase counterarguing (vs. the control and cautionary messages) more strongly for those with lower levels of government and collective efficacy. Government efficacy moderated the effect of the positive alternative message on counterarguing, such that participants with low and average levels of government efficacy counterargued this message more than control (Fig. 5). There was no difference in counterarguing of the positive alternative message compared to the control message for participants with high levels of government efficacy. The index of moderated mediation was significant for the positive alternative condition, and there was a negative indirect effect of the positive alternative message on climate action intentions via counterarguing for participants at low and average levels of government efficacy.

Collective efficacy moderated the effects of all conditions on counterarguing compared to the control message. For participants with low and mean levels of collective efficacy, all messages increased counterarguing, but there was no difference in counterarguing for participants with high collective efficacy (Fig. 6). As such, the index for moderated mediation was significant for the cautionary, positive alternative, and cautionary + positive alternative conditions. Namely, there was a significant negative effect of all conditions on climate action intentions via counterarguing but only for participants with low (all messages) and average (positive alternative and cautionary + positive alternative) levels of collective efficacy. H8 was supported and H9d was partially supported. See Table 4 for a summary of our findings.

4. Discussion

This online experiment tested the impacts of a cautionary message focused on future negative consequences of climate change, a positive alternative message describing a positive future in which a variety of mitigation and adaptation measures are adopted, and a message combining these cautionary and positive elements. Specifically, we examined the effects of these messages on climate action intentions via ability to imagine a positive future, hope, fear, and counterarguing. Furthermore, we considered how effects might differ based on collective and government efficacy beliefs.

Scholars have suggested that a closer examination of messages with both positive and negative components is needed because people encounter both kinds of content in everyday media usage (Diamond & Urbanski, 2022). As such, a significant contribution of the present research is its incorporation of a cautionary + positive alternative message, which included information about possible undesirable future outcomes alongside desirable future outcomes depending on the actions humanity engages in over the coming decades. Our results suggest that reactions to this mixed-valence content were quite similar to the cautionary content in terms of reduced hope (compared to the positive alternative message) and increased fear (compared to the positive alternative and control messages). Moreover, there were significant moderation and moderated mediation effects observed for both the cautionary and cautionary + positive alternative messaging, with higher efficacy individuals reporting higher levels of fear and, ultimately, greater climate action intentions. These findings align with prior research showing that messages focused on impacts of climate change and negative depictions of climate futures increase fear (Feldman & Hart, 2021; Schneider-Mayerson, 2018) and that fear motivates climate action (Feldman & Hart, 2016). Ultimately, effects of cautionary content may overshadow positive content later in the message because of a primacy effect, whereby the argument presented first (versus last) is viewed as more persuasive (e.g., Lana, 1961). It is also possible that the message could have been perceived as contradictory by presenting two incompatible views of the future without a clear resolution over which outcome is more likely. In this way, the two views of the future could function like a two-sided message, which includes information both supporting and opposing an argument (Allen, 1991; O'Keefe, 1999). When two-sided messages lead to high ambiguity, message effectiveness decreases (Cornelis et al., 2020). However, adding a refutation (i.e., information that disproves an opposing argument; Allen, 1991; O'Keefe, 1999) to a two-sided message can resolve negative effects of ambiguity (Cornelis et al., 2020). Future research could test dual messages that include a resolution or refutation to see if dual messages function more similarly to positive alternative messages with this additional content.

Another consideration to bear in mind is that threat-focused climate

Table 4
Summary of findings.

Hypothesis	Findings	Conclusion
H1: Positive alternative & cautionary + positive alternative messages will increase climate action intentions.	No condition differences on intentions	Not supported
H2: Positive alternative & cautionary + positive alternative messages will increase ability to imagine a positive future.	No condition differences on imagination	Not supported
H3: A cautionary message will increase fear.	Both cautionary and cationary + positive alternative increased fear	Partially supported
H4: Positive alternative & cautionary + positive alternative messages will increase hope.	Positive alternative increased hope, cautionary + positive alternative did not	Partially supported
H5: Positive alternative & cautionary + positive alternative messages will increase counterarguing.	Both conditions increased counterarguing compared to control, but not cautionary	Partially supported
H6: Ability to imagine a positive future will mediate the relationship between positive alternative and cautionary + positive alternative messages and climate action intentions.	No indirect effects via imagination	Not supported
H7a: Hope will mediate the relationship between positive alternative and cautionary + positive alternative messages and climate action intentions.	Indirect effect of cautionary condition via hope on action intentions	Not supported
H7b: Fear will mediate the relationship between cautionary message and climate action intentions	Conditional indirect effect of cautionary message via fear	Supported
H8: Counterarguing will mediate the relationship between positive alternative and cautionary + positive alternative messages and climate action intentions.	Conditional indirect effect of all messages via counterarguing	Supported
H9a: Government and collective efficacy will moderate effects of positive alternative and cautionary + positive alternative messages on ability to imagine a positive future.	No moderation effects on imagination	Not supported
H9b: Government and collective efficacy will moderate effects on hope in response to positive alternative and cautionary + positive alternative messages.	Moderating effect of collective efficacy on effects of positive alternative message	Partially supported
H9c: Government and collective efficacy will moderate the effects of messages on fear.	Moderating effect of government efficacy on effects of cautionary message; moderating effect of collective efficacy on effects of cautionary and cautionary + positive alternative messages.	Partially supported
H9d: Government and collective efficacy will moderate the effects of positive alternative and cautionary + positive alternative messages on counterarguing.	Moderating effect of government efficacy on effects of positive alternative message; moderating effect of collective efficacy on all messages.	Partially supported

messaging and negative depictions of climate futures are common (Feldman et al., 2017; Hase et al., 2021; Schneider–Mayerson, 2017; Svoboda, 2016). Thus, unfamiliar positive alternative messaging may simply be less believable, and therefore less impactful, to audiences. This is supported by the fact that participants reported greater counterarguing in response to positive alternative and cautionary + positive alternative messages. Such an explanation aligns with fantasy realization theory, which suggests that to act on an imagined positive future possibility, people mentally contrast the desired future with current barriers and must believe there is a high likelihood of success (Oettingen, 2012). Messaging strategies focused on detailed descriptions of successful responses to problems, such as solutions journalism (McIntyre & Lough, 2021), may be better suited to communicating responses to climate change in a thorough, believable manner that evokes less counterarguing. Future work could explore strategies for reducing counterarguing in response to positive climate messaging.

Altogether, there is evidence that cautionary messages can motivate action through fear and may evoke less counterarguing, particularly among highly efficacious audiences. However, we do not wish to suggest that positive alternative, solutions-focused messages are without value, despite the fact that they may be unfamiliar to audiences. Our findings do indicate a positive effect of positive alternative messaging on hope in comparison to cautionary content. Furthermore, results show that hope positively predicted climate action intentions. Thus, it may still be valuable to consider strategies for motivating climate action through hope, not just fear. Along a similar vein, ability to imagine a positive future positively predicted climate action intentions. Ability to imagine a positive environmental future has only been investigated in a handful of studies thus far (e.g., Wright et al., 2020, 2022), so our findings provide valuable insights by demonstrating that simple descriptions of a possible positive future may be insufficient to move the needle on imagination. Instead, more immersive types of media (e.g., narratives, 360-degree media) may be more successful.

Additionally, scholars have noted a need for more research into the role that collective efficacy beliefs play in people's reactions to information about environmental issues like climate change (Diamond & Urbanski, 2022; Fritsche et al., 2018). Our findings underscore the importance of considering how pre-existing efficacy perceptions shape responses to climate communication. Specifically, when people already had high levels of collective efficacy, they were more receptive to positive alternative messaging and less defensive toward climate messaging generally. They felt more hopeful in response to the positive alternative message and counterargued less in response to all messages. These findings are similar to prior work demonstrating people who believe it is possible to influence society report more favorable assessments of messages about collective climate action (Hornsey et al., 2021). Highly efficacious individuals also felt more fearful in response to cautionary and cautionary + positive alternative messages compared to the control, perhaps because these individuals are already knowledgeable about the risks posed by climate change.

Conversely, when people did not think society could respond to climate change, they exhibited more resistance to climate future messaging. This took the form of higher levels of counterarguing in response to cautionary, positive alternative, and cautionary + positive alternative messages. It is possible that low efficacy individuals may be less informed about climate change generally, thus leading to counterarguments against both the likelihood of severe negative consequences described in the cautionary content as well as the necessity or desirability of large-scale solutions discussed in the positive alternative message. Additionally, low efficacy perceptions may coincide with outright climate change denial for some people.

Our results also offer insight into the role of government efficacy perceptions. In terms of counterarguing, similar to collective efficacy, participants with low and average levels of government efficacy perceptions argued more strongly against positive alternative messaging, which ultimately discouraged climate action intentions. In contrast to findings on collective efficacy, participants low in government efficacy felt greater fear in response to cautionary messaging. This could be because government action is commonly accepted as necessary for addressing large scale issues like the climate crisis, thus feeling that one's government cannot do so elicits greater fear. Altogether, collective efficacy perceptions seemed to have a more substantial moderating impact, and findings provide evidence that collective and government efficacy do not always operate in tandem. This presents opportunities for future research to further examine differing moderating roles of these distinct forms of efficacy.

4.1. Practical implications

All the messages tested in this study elicited beneficial and undesirable reactions. Thus, environmental communication practitioners and climate communication campaign designers will benefit from weighing pros and cons, as well as considering their audience's collective efficacy perceptions, when choosing an appropriate communication strategy. Such complex audience reactions and practitioner considerations are consistent with expert recommendations to avoid over-simplifying climate messages and the emotions they evoke into shallow positive/negative, good/bad, effective/ineffective dichotomies (Chapman, Lickel, & Markowitz, 2017). Climate activists have stressed that a deeply motivating form of radical hope may grow from despair, but this still requires an ability to identify and work toward potential positive outcomes (Stuart, 2020). Therefore, in addition to fear-evoking messaging that raises awareness of threats, diversifying messages to include more hope-evoking content could also prove beneficial. This aligns with scholarly suggestions to offer a variety of climate messages, both negative and positive, to foster action (Hornsey & Fielding, 2020).

Our results indicate that individuals with high levels of government and collective efficacy counterargued less in response to all messages and experienced greater hope in response to the positive alternative condition. Therefore, when communicating positive messaging focused on solutions, practitioners may have more success among audiences already engaged in environmental causes (e.g., activist groups) compared to audiences who are uninformed about or unengaged with climate action. Overall, cautionary messaging may be a reliable strategy for motivating action, although caution should be exercised if audience members are constantly bombarded with negative messages or susceptible to maladaptive fear responses like eco-anxiety. In contrast, positive and cautionary + positive alternative messages may be more helpful among audiences already engaged in environmental efforts, and thus more likely to have high levels of collective efficacy.

4.2. Limitations

This study has several constraints. First, it was conducted among people residing in the United States and therefore has limited generalizability to locations where people are presently experiencing more climate change-related impacts or whose governments are taking more ambitious action to address climate change. Relatedly, climate change is a politically polarized topic in the United States. Our current study would not be well powered to examine differing effects of messages on liberals and conservatives, but future research with more participants could be better suited to examine interactions between message type and political leaning. Our stimuli involved a single, relatively brief message exposure. Future work could consider testing effects of multiple exposures over time (similar to Skurka et al., 2023), which could be particularly useful for examining reactions to unfamiliar content such as positive message elements. In addition, our stimuli consisted of text and a single image. Videos or social media posts featuring more imagery could have different effects. Additionally, average collective efficacy beliefs among our sample were rather high, averaging 5.10 on a seven-point scale, thus our analyses do not provide much insight into impacts among people with very low perceptions of collective efficacy (i.e., 1 or 2 on a 7-point scale). Finally, although climate-related efficacy beliefs capture some of participants' climate beliefs, we did not measure prior climate attitudes, broadly. Future research could benefit from accounting for pre-existing attitudes using established measures (e.g. Chryst et al., 2018).

5. Conclusion

In light of scholarly debates on the merits and impacts of positive versus negative climate messaging and the prevalence of negative climate future depictions in media, it is important to consider the potential impacts of positive alternative messaging that depicts a desirable climate future. Findings from this preregistered experiment confirm the utility of threat-focused cautionary messaging to motivate climate action via fear, while also revealing similar effects of messages that combine cautionary and positive alternative content. These effects are strongest among individuals with high collective efficacy perceptions. Additionally, positive alternative content can evoke counterarguing among audiences with lower levels of government and collective efficacy. Ultimately, audiences may find positive alternative content unfamiliar or unbelievable and, in situations where both desirable and undesirable futures are presented, cautionary content may overshadow effects of positive alternative message elements. Altogether, practitioners should be mindful of audiences' efficacy beliefs when choosing message strategies, and there are rich opportunities for future research to examine message strategies that could reduce counterarguing in response to positive content while also supporting audiences' ability to imagine a positive future.

Data availability statement

Data and syntax are available at this anonymized link https://osf.io/n8gsr/?view_only=fb7d43b6c37d47e38a1406d3609af01a.

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CRediT authorship contribution statement

Cassandra L.C. Troy: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation. **Megan Norman:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Nahyun Kim:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Chris Skurka:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Formal analysis, Conceptualization. **Jessica Gall Myrick:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Conceptualization.

Declaration of competing interest

The authors report there are no competing interests to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2024.102312.

Appendix

Main Study Measures

Government Efficacy

Please indicate how much you disagree or agree with the following statements. When it comes to climate change … (1 strongly disagree-7 strongly agree)

- the US government works on everyone's behalf
- America's government makes decisions based on what citizens want
- American political institutions (e.g., Congress, political parties, etc.) represent all citizens
- the US government provides citizens with solutions
- America's government works well
- the US government's actions are the result of everyone's input

Collective Efficacy

Please indicate how much you disagree or agree with the following statements related to climate change. (1 strongly disagree-7 strongly agree)

- If we decided to fight climate change as a society, collective action would be possible.
- Through collective efforts, we can work together to reduce the negative consequences of climate change.
- We can work together to address climate change.
- Together, we can implement plans to fight the negative consequences of climate change.
- We are capable of doing something against climate change even in the face of unexpected challenges and problems.

Hope

Please indicate how much you feel each of the following emotions at this moment, after reading the blog post. (1 not at all-7 extremely)

- Hopeful
- Encouraged
- Optimistic

Fear

Please indicate how much you feel each of the following emotions at this moment, after reading the blog post. (1 not at all-7 extremely)

- Afraid

Counterarguing

Please indicate how much you disagree or agree with the following statements. (1 strongly disagree-7 strongly agree)

- While reading the blog post, I sometimes found myself thinking of ways I disagreed with what was being presented
- I found myself looking for possible flaws in the way information was presented in the blog post
- I did not accept the points made in the blog post
- I thought of a lot of arguments against what the blog post was saying

Ability to Imagine a Positive Future

Please indicate how much you disagree or agree with the following statements. (1 strongly disagree-7 strongly agree)

- I can easily imagine a world in which we supply all of our energy needs without harming the natural world.
- It is easy to imagine a world where we no longer use fossil fuels.
- I can clearly imagine a world where we exclusively use agricultural practices that protect the natural habitats of animals.
- I can imagine a world where politicians care more about minimizing the population's negative impact on the environment than economic growth.
- I can think of numerous methods of achieving a world where carbon emissions are reduced below current levels.
- I can easily imagine a system in which the government reflects the interests of the natural environment rather than the interests of the wealthy.
- I can easily imagine a world where people see themselves as integrated with nature, rather than masters over the natural world.
- When I imagine what an ecologically sustainable existence for humans would be like, I can picture it in detail.
- A harmonious relationship between humans and the natural world is easy for me to imagine.
- I have a clear understanding of all the ways that a sustainable human existence would differ from our current state of affairs.

Climate Action Intentions

Please indicate how likely you are to engage in the following actions over the next 12 months. (I very unlikely-7 very likely)

- contact government officials to urge them to take action to reduce climate change
- participate in a rally or protest in support of action to reduce climate change
- sign a petition in support of taking action to reduce climate change
- join or volunteer with an organization working to reduce climate change
- donate money to an organization working to reduce climate change
- convince others to engage in climate action
- follow climate action information in the media

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