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Global Environmental Psychology

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Research Articles [Registered Report]

How Affinity With Places Affects the Indirect Experience of Climate Extreme Weather Events

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Abstract

When news media talk about climate change, they often report on extreme weather in places around the world. One factor that may explain perceptions of such reports and reactions to them is people's relationships with affected places. We test a framework of place affinity, as indicated by several place beliefs, to describe these people-place relationships. Based on previous research and two pilot studies, we employed a three-condition between-participants experiment to test whether place affinity helps explain reactions to news reports. Participants (N = 972) were either shown one of two reports on extreme flooding events in high-affinity and low-affinity countries or a general article on climate change and flooding (control condition). Reading about extreme weather in a high-affinity place invoked stronger emotional reactions than for other conditions. There were no differences in risk perception, policy support or behaviour between conditions. Participants' open responses to news articles provided evidence of emotion-focused, problem-focused and meaning-focused strategies, as well as an absence of emotion-regulation. Our study thus contributes to the literature by testing our theoretical framework of place affinity and by investigating factors shaping the effectiveness of climate coverage.

Keywords

climate change perception, climate change mitigation, policy acceptance, extreme weather, psychological distance

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Non-Technical Summary

Background

Climate change is causing extreme weather events all over the world. Some people experience these events directly, but many more read or hear about them in the news. There are many factors that could influence how people react to such news reports, with one of them being the location of the event. In this paper, we therefore wanted to find out whether people's reaction to news about an extreme weather event depends on where this event has taken place, and if so, how.

Why was this study done?

In the near future we can expect climate change to cause an increasing number of extreme weather events around the world, and thus, an increasing number of news reports about these events. It is important to understand whether people's reactions to such events differ depending on their location, especially if these reactions influence their perception of climate change overall, their support for climate policies or their own behaviour. If people's reactions do differ depending on the location of the event, we can make climate change communicators such as journalists, campaigners or policy makers aware that they may need to adjust their reporting style accordingly.

What did the researchers do and find?

We recruited UK residents as participants and divided them into three groups. We asked two of these groups to read a news article about flooding, identical except for the location of the event, which was either Germany or Madagascar. The articles contained descriptions of the flooding, personal anecdotes and quotes as well as a paragraph on how climate change increases flooding events. We asked a third group of participants to read a general article on climate change and flooding, so that we could determine whether any differences in people's reactions were due to the place-mentions and storytelling components. We found that those who read an article about flooding in Germany showed stronger emotional reactions than those reading the general article, measured through the language participants used to summarise the article and their self-reported emotional state. However, only participants' emotional language, and not their emotional state, were different between the Germany and the Madagascar group, and there were no differences in emotional reactions between the Madagascar and the control groups. Likewise, policy support, risk perception and pro-climate behaviour were not at all impacted by the type of article a participant had read. Finally, many participants described strategies they had used to regulate their emotions, such as distancing themselves from the article or brainstorming how they could take mitigating actions. These strategies may have influenced participants' reactions to the article. We were not able to test these influences in this study, but we provide suggestions on how future research could investigate such mechanisms.

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What do these findings mean?
The findings suggest that the location of extreme weather events does not influence readers' views on climate change overall, their support for climate policy or their pro-climate behaviour, and only has limited impact on their emotional reactions. This indicates that climate change communicators do not have to focus on the location of an extreme weather event as a factor that could influence people's views about climate change overall. However, future research has yet to determine the exact role of emotion regulation, as readers may be meeting extreme weather reports with different types of emotion regulation strategies. Emotion regulation strategies can influence whether a reader is motivated to take action or avoid the issue, and an understanding of these would be valuable for assessing the effectiveness of climate communication. Additionally, long-term effects such as the repeated exposure of audiences to different types of news needs further investigation to determine the effect of the location of extreme weather events over time.

Highlights

- We report an experiment to study whether place affinity informs reactions to reports on extreme weather events.
- Emotions, but not risk perception, policy support or behaviour, were stronger in the high affinity condition (Germany) than in the low affinity condition (Madagascar) and control condition.
- Participants employed many emotion-focused, problem-focused and meaning-focused coping strategies.
- Results indicate that location is not a primary influence on perception, but that future research should investigate the role of emotion-regulation strategies and long-term effects.

Global climate change manifests itself in events such as storms, droughts and heatwaves (IPCC Working Group 2, 2022). News media often report on these manifestations because specific incidents more easily generate interest than abstract climate models (e.g., Boykoff, 2008; McGinty et al., 2014; Wozniak et al., 2021). Currently, it is unclear whether such indirect, mediated climate change experiences increase risk perception, worry or action (Howe et al., 2019; Ojala et al., 2021). We argue that instead of trying to determine whether these links exist, it may be more informative to focus on the circumstances under which such links are more or less likely (for similar arguments concerning direct experiences, see Brügger et al., 2021). What all extreme weather events share is that they happen in particular places. How people relate to these places could then be a key factor influencing people's reactions to such events.

Insight into the perception of climate impact locations comes from research on "psychological distance" within Construal Level Theory (CLT; Trope & Liberman, 2010). This

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theory posits that anything can be construed as proximate or distant on four dimensions: spatial (location of an event), social (who is affected), temporal (when the event occurs) and hypothetical (uncertainty). Research applying this theory to climate impact locations has shown how each dimension can be related to climate perceptions (for reviews see Keller, Marsh et al., 2022; Maiella et al., 2020). However, psychological distance can only explain limited aspects of climate change perceptions (Brügger, 2020; Keller, Marsh et al., 2022; Wang et al., 2021), and evidence seemingly supporting CLT has been questioned because of publication bias (Maier et al., 2022). Additionally, with climate change impacts increasing worldwide, most people will feel close to the crisis sooner rather than later. This means that constraining research to distance will limit our understanding of climate impact perceptions (Bradley et al., 2020).

These criticisms of CLT and distance-related research pose a challenge for identifying suitable alternative perspectives on the perception of climate impact locations. In a previous systematic review on the psychological distance of climate change, we concluded that future research would benefit from a bottom-up view to identifying and describing knowledge around objects of study (Keller, Marsh et al., 2022). This allows for collation of research from different fields, building a solid empirical basis for effective theoretical developments. It also limits the risk of being constrained by specific theories that are inappropriate for particular research contexts (Eronen & Bringmann, 2021; Scheel et al., 2021), which may have occurred with research on the psychological distance of climate change (Brügger, 2020; Keller, Marsh et al., 2022).

In the context of extreme weather events, research has already identified multiple facets determining people's relationship with locations and their reaction to climate consequences. We propose that these facets can be described as "place beliefs" (e.g., spatial and social similarity, familiarity and caring for a place and its inhabitants), which together determine people's "affinity" with a place. Below, we review this evidence and summarise previous cross-sectional work linking place affinity to climate concern (Keller, Richardson et al., 2022). We then present the results of two pilot studies investigating participants' affinity with relevant places with and without the context of extreme weather events. Finally, we report an experiment that assesses the effect of these different levels of place affinity on participants' emotions, risk perceptions, personal behaviour, policy support and emotion regulation in relation to reports of extreme weather events.

Place Affinity and Place Beliefs: People's Relationship With Climate Impact Locations

To investigate the effects of *spatial distance* on responses to climate change, previous research has compared participants' reactions to reports about climate impacts in close versus far-away places. In some experiments, seeing impacts in one's own country versus abroad led to increased policy support (Chu & Yang, 2018) and seeing regional

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versus global impacts led to increased perceived risk (Wiest et al., 2015). Additionally, reading news articles about spatially far climate impacts made climate change feel further away, which was related to lower policy support (Chu, 2022) and climate protective behaviour (Loy & Spence, 2020). However, these relationships were based on path models with measured mediators, which only provide limited support for such networks (Montgomery et al., 2018). Other researchers investigating spatial distance have found differing risk perceptions, but not mitigation attitudes or fear (Spence & Pidgeon, 2010), or no effects on policy support, risk perception or pro-climate intentions (Chu & Yang, 2020a, 2020b; Rickard et al., 2016). Emotional reactions were found to be more complex still and potentially linked to emotion-regulation strategies (Chu & Yang, 2019; Ejelöv et al., 2018).

Although these results suggest that reading about extreme weather in different locations could influence risk perception and policy support, it is difficult to determine under which conditions such effects occur. Only one paper presented news about a particular event, a heavy rainstorm (Ejelöv et al., 2018), whilst others summarised general climate consequences. This limits inferences regarding how people perceive reports of extreme weather events. Such research is also lacking in the field of media studies, which often focuses on content or framing analyses (for reviews see Agin & Karlsson, 2021; Dhaher & Gumus, 2022) or that of extreme weather events perceptions, which has not investigated the indirect, mediated experiences that this study focuses on (for a review see Howe et al., 2019).

Additional challenges arise from the choice of places in experimental designs. These have primarily been selected to differ in spatial distance, but it is unavoidable that they also differ in closely linked factors (e.g., the other place beliefs discussed below). Systematically choosing which places to compare, based on a holistic selection of place beliefs, will help inform the extent to which different place beliefs contribute to differences in extreme weather perceptions.

One factor closely related yet distinct from spatial distance is *spatial similarity*. When evaluating extreme weather, people might interpret similar geographies as a cue that similar events could happen at home, which may increase perceived risk. But the similarity with the inhabitants of places can also influence threat perceptions. Social identity theory proposes that people will protect their own social group from harm (Masson & Fritsche, 2021), and this social group can be based on *social similarity* (e.g., profession, hobby, societal categories; Fielding & Hornsey, 2016) or *social intimacy* (e.g., close personal connection, friends and family; Wang et al., 2019). Consequently, climate impacts in places with high social similarity and/or social intimacy may be associated with higher risk perceptions and willingness to address the threat.

An alternative perspective from CLT suggests that feeling socially distant does not necessarily engender less engagement, but rather elicits changes in the factors used for decisions and evaluations (Brügger et al., 2016; Trope & Liberman, 2010). For example,

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believing climate impacts to affect loved ones (proximity) would make one focus on low-level, concrete information such as others' opinions in evaluating a threat. Perceiving impacts as only affecting strangers (distance) would make one focus on abstract, personal values and ideology. Cross-sectional CLT studies indicate that in Western samples, perceiving threats to similar people (e.g., other Westerners) is related to higher concern (Spence et al., 2012). Threats to developing countries were not necessarily related to concern, but were sometimes related to willingness to act (Shackley, 2021; Spence et al., 2012). Problematically, this literature assumes that Westerners generally feel low social similarity with people in developing countries. This makes it difficult to investigate nuances in social similarity and the results may not generalise to other, non-WEIRD (Western, Educated, Industrialised, Rich, Democratic) samples. Additionally, these results are based on cross-sectional data, which cannot indicate causal mechanisms or the malleability of the variables.

Another term used to explain place affinity is *objects of care* (Wang et al., 2018). This concept suggests that people are less likely to experience strong emotions about abstract climate change but are more likely to respond to threats to specific objects they care about (e.g., certain people, places or nature). In the context of extreme weather events, reading about impacts to a place one cares about might result in a stronger willingness to address this threat. Finally, feelings of care and high similarity may be more likely to exist when people feel *familiar* with a place. On the other hand, familiarity could work independently, enabling people to contextualise and understand extreme weather events in a particular place.

In open-ended comments on climate impact locations (Keller, Richardson et al., 2022), participants also linked place and risk perceptions to aspects of inequality. These were places' *responsibility for causing climate change* (including that of populations, social, legal, economic and political systems, currently and historically) as well as their *vulnerability*. Participants indicated larger concern for places perceived as more vulnerable and less responsible for climate change (Keller, Richardson et al., 2022). Vulnerability can be defined as a place's or population's sensitivity to a hazard and their ability to respond and recover from it (Cutter & Finch, 2008). Although perceived vulnerability of impact locations has only been researched in very specific contexts such as tourist perceptions (Huebner, 2012), we included it as a place belief as the aforementioned results indicate it may influence people's responses to extreme weather events. Similarly, evidence regarding perceived responsibility is sparse, but shows that it may influence reactions to climate impacts. For example, a shared sense of responsibility can be the basis for identification with a place or population. This can lead to an in-group sentiment and the motivation for climate action to protect this in-group (Swim & Bloodhart, 2018). In contrast, being told that one's own group has responsibility for causing climate change has been associated with perceiving the issue to be less controllable, engendering lower concern and policy support (Jang, 2013).

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Previous Evidence on the Place Affinity Framework and Climate Change Impact Locations

A previous study tested the framework of place affinity using a cross-sectional questionnaire (Keller, Richardson et al., 2022). Participants were asked to name places they thought were impacted by climate change and rate their familiarity, social similarity and care towards them. Findings indicated that people's affinity with a place they saw as currently or soon to be affected predicted their overall climate concern at a strength comparable to belief in climate change and its human causes. However, affinity with places affected in the distant future did not predict concern, and worry was not predicted by either current or distant future place affinity.

Although this latter study indicated that place affinity and place beliefs may be useful concepts to understand perceptions of climate change impact locations, it had several limitations. The design allowed participants to freely name places they thought were severely and negatively impacted by climate change. This resulted in many place types (e.g., cities, countries, landscapes) that were difficult to compare between different categories and different levels of place affinity. Because of this complexity, only a small number of place beliefs and dependent variables were measured. These limitations mirror those with research reviewed above, in particular that cross-sectional data only provide preliminary indications regarding causal networks, and existing relationships do not guarantee that place affinity can be manipulated. Additionally, previous studies typically focused on selected aspects of place beliefs or distance, tended to measure limited and often difficult-to-compare dependent variables, and, when experimental, often involved unsystematic manipulations (see Keller, Marsh et al., 2022). We therefore build upon previous work by conducting an experiment to compare the causal effects of different levels of place affinity, as indicated by a wider selection of place beliefs, and on a variety of personal and system-level outcome variables in an ecologically valid but under-researched context (i.e., the perception of extreme weather events through news media).

The Present Study: Applying Place Affinity to Climate Change Reporting

This study investigated whether place affinity, as indicated by several place beliefs, can inform an understanding of people's reactions to a news article about an extreme weather event related to climate change. We conducted a three-condition, between-participants experiment in which participants were shown one of two fabricated news articles on a recent extreme weather event (differing only by location) or a general article about weather induced by climate change as a control. Our aim was to mimic a real-life situation that people experience (and will increasingly experience). We conducted two pilot studies to identify how levels of place affinity with affected countries differ from each

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other and to determine which countries to include in the experimental manipulations. Supplementary materials to all studies in this article can be accessed at Keller et al. (2023b).

Pilot Study 1: Countries Cluster Along Levels of Place Affinity

First, we explored participants' affinity with relevant countries and whether they could be represented in different affinity clusters. We focused on UK participants to provide a comparable reference point for affinity levels, and for comparability with previous research (Keller, Richardson et al., 2022). Additionally, UK residents, as citizens with a globally high socio-economic status, have considerable influence in helping or hindering climate action (Nielsen et al., 2021) and are therefore valuable to understand as a sample.

We identified 17 countries in which similar, extreme weather events occurred as in the UK, as these would later enable us to produce identical news articles differing only by country name. We then presented country names and flags (including the UK) to 102 participants and asked them to rate place beliefs toward each country (familiarity, geographical similarity and perceived distance, social similarity and intimacy, caring, perceived vulnerability and responsibility). All items were measured on a five-point Likert scale, for example, "How familiar with this place do you feel?", 1 ("not familiar at all") to 5 ("extremely familiar"). To gather a relatively diverse sample, participants were recruited through Prolific, which provides high-quality data (Peer et al., 2022). Participants with UK residence for at least 10 years were eligible (to increase similar baseline affinity with the UK). All were paid the equivalent of the UK hourly minimum wage (£7.50). The full process, materials and analysis are available in Keller et al. (2023b, S1).

For each place belief, a median score was calculated across participants and entered into a k-means cluster analysis, resulting in four clusters: high place affinity (UK), medium affinity (Germany, Italy, USA, Australia), low-medium affinity (South Africa, India, Japan) and low affinity (Bahamas, Bolivia, Afghanistan, Pakistan, Siberia, South Sudan, Niger, Mozambique, Madagascar).

These results indicated that UK residents regard countries with similar extreme weather experiences within four categories of place affinity. These findings provided a first overview of patterns of affinity with relevant places and suggested that we can distinguish between distinct affinity groups. However, the countries were presented without context. Therefore, as a next step, we tested whether these four groups could still be differentiated when participants rated place affinity after reading reports about extreme weather events in those places.

Pilot Study 2: Clusters are Reduced in the Context of Climate Change Reporting

To investigate the four affinity clusters in the context of extreme weather news, we showed participants one of four news articles and asked them to rate affinity with the

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place. To represent the four clusters, we chose the country closest to each centroid: high affinity (UK), medium affinity (Germany), low-medium affinity (South Africa) and low affinity (Madagascar). All countries have recently experienced flooding, as focused on in the stimuli.

The stimuli were realistic, online news articles that were general enough to reflect events that had occurred in each country. To fulfil these criteria, we collated flooding reports for each country from BBC Online (a relatively neutral news source used by UK readers across the political spectrum; Pew Research Center, 2018) and based the structure and content of stimuli on those articles, ensuring the inclusion of factual information (e.g., damage, responses, climate change link) and personal stories (e.g., affected locals, politicians, scientists). Stimuli were equivalent in all conditions except for place references. As participants were told the articles were fictitious for ethical reasons, we increased realism by specifying that the reports were realistic and based on previous events, and by including the storytelling components to increase similarity to real articles and engagement (Morris et al., 2019). The full materials and results are available in Keller et al. (2023b, S2 and S4.1.2).

Our aims for Pilot Study 2 were to test whether the four levels of place affinity could be replicated in the news context, and to pre-test the experimental stimuli for the main experiment. UK residents (n = 99, procedure and eligibility as Pilot Study 1) were shown one of the four articles. All except one participant recalled the correct country they had read about, confirming that the place mentions were salient enough. Participants found the articles understandable, interesting and engaging, and somewhat relevant across all conditions.

We conducted a MANOVA and discriminant analysis to investigate differentiation between the four conditions. MANOVA test statistics, Wilk's λ = 0.32, $F(24, 224)$ = 4.51, p < .001, suggested there was a significant difference between conditions on a linear combination of the place beliefs, with an effect size of η_p^2 = 0.44. To investigate how conditions were differentiated from one another, we ran a discriminant analysis. Discriminant analyses are recommended as post hoc tests in preference to individual ANOVAs and pairwise comparisons because they show differentiations in the linear combination of the dependent variables (i.e., place beliefs) rather than testing them separately (Denis, 2020; Tabachnik & Fidell, 2013). Figure 1 shows that there were some differences between all conditions, but both UK/Germany and South Africa/Madagascar had very similar place affinity levels.

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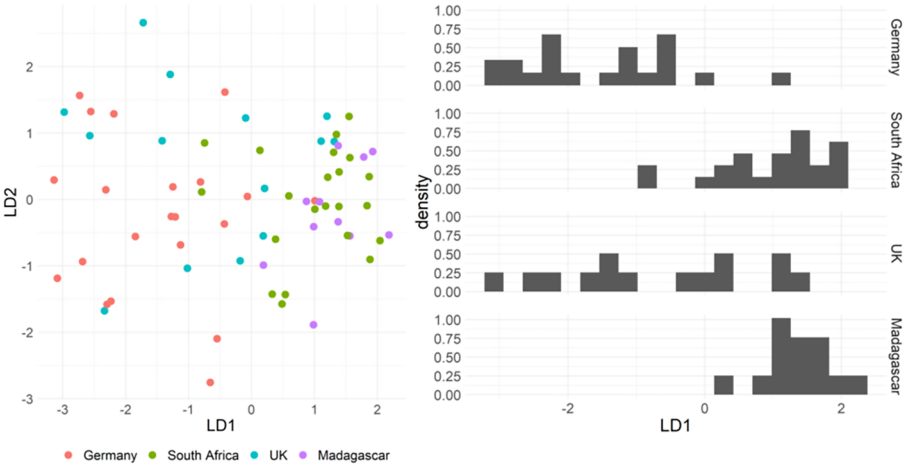
Figure 1

Scatterplot (Left-Hand Graph) and Histogram (Right-Hand Graph) Showing the Discriminant Function Values



Note. In the histogram, overlapping distributions between conditions signify less separation between groups. The scatterplot shows individual values of cases on the linear discriminant Functions 1 and 2. Interpretation focuses on LD1 (x-axis), which achieves better separation than LD2 (see also Keller et al., 2023b, S2.1 and S2.4.1).

These results suggest that the experiment successfully manipulated place affinity. However, although there were four distinct categories of place affinity in Pilot Study 1 (when participants rated countries without context), these were reduced to two distinct categories of high and low affinity in Pilot Study 2, when rated in the context of news articles about extreme weather events. It is possible that the contextual information about climate change or the storytelling elements smoothed out more subtle differences between places, focusing only on starker affinity differences. As we focus primarily on effects in an ecologically valid context, we decided to pursue these two conditions in the main experiment, which tested for differences in emotional, behavioural and attitudinal reactions towards reports of extreme weather events in places with high or low place affinity.

Main Experiment

We conducted a three-condition, between-participants experiment to test the effects of newspaper reports on extreme weather events in a high or low affinity place, compared to a general climate change article on flooding as a control condition. We chose this control because Pilot Study 2 suggested that more subtle differences in place affinity are less relevant in the context of climate change related extreme weather events. In the

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main experiment, we therefore wanted to control for the extent to which the climate change and flooding information was responsible for effects, or whether place affinity can contribute to effects. As the control, we used an article that reports on climate change flooding, but without any mention of particular places or people. This has the theoretical benefit of allowing more stringent conclusions to be drawn regarding what has caused the effects, and the practical benefit of facilitating recommendations concerning information that should be included in climate communication (or omitted, should we unexpectedly find the control to be more effective than the low-affinity condition).

We were interested in both individual-level and system-level forms of climate-mitigation support, leading us to investigate the dependent variables of emotional reactions, risk perceptions, policy support and pro-climate behaviour. Our primary research question was therefore:

> **RQ1**: How is the reaction to news articles about an extreme weather event influenced by place affinity with the location of that event?

Based on the foregoing literature review, we hypothesised that reading about a specific extreme weather event compared to a general climate change article would result in stronger reactions, as would reading about a high-affinity place versus a low-affinity place. The hypotheses are detailed in Table 1.

In addition to these main hypotheses, we were interested in whether emotion-regulation strategies influence people's reactions to threats to different places. Positive and negative emotions are an important driver of climate perception and action (Brosch, 2021; Ojala et al., 2021). However, they can be met with very different emotion-regulation strategies, which may influence people's reactions to climate risks. People have been found to engage in action to address the problem, to grieve or otherwise engage with their emotions, or to distance themselves from the issue to avoid or manage distress (Pihkala, 2022a; Wullenkord & Ojala, 2023). For example, Ojala (2012), applying the Transactional Model of Coping (Lazarus & Folkman, 1984), found that to manage climate worry, young people used problem-focused coping (action), emotion-focused coping (avoiding, regulating or minimising emotions) and meaning-focused coping (finding meaning in unavoidable threat).

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Table 1

Main Experiment Hypotheses

	Treatment versus control	**High versus low place affinity**
Dependent variable	**Reading about an extreme weather event compared to a general climate change article (control) will lead to:**	**Reading about an extreme weather event in a high-affinity versus low-affinity place will lead to:**
H1 Emotional reactions	**H1a**: Stronger emotional reactions	**H1b**: Stronger emotional reactions
H2 Risk perceptions	**H2a**: Higher perceived climate change risk	**H2b**: Higher perceived climate change risk
H3 Policy support	**H3a**: Higher policy support	**H3b**: Higher policy support
H4 Pro-climate behaviour	**H4a**: Higher pro-climate behaviour	**H4b**: Higher pro-climate behaviour

Note. Treatment refers to the high-affinity and low-affinity conditions, thus, each of these hypotheses will be tested through two comparisons (high-affinity vs. control and low-affinity vs. control); see also Table 2.

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Some studies suggest that problem-focused coping, meaning-focused coping or both are associated with more frequent pro-environmental behaviour than emotion-focused coping (Homburg et al., 2007; Ojala, 2013; Ojala & Bengtsson, 2019), and others suggest that together they can lead to collective climate action (Dual Pathway Model; van Zomeren et al., 2010, 2012). We propose that the experience of extreme weather through media reports is a prime example of where such strategies might be employed. A recent review indicates that emotion regulation is an area with important implications, where further research is needed to document and analyse strategies (Pihkala, 2022a). In cases where no empirical base has yet been established, explorative and descriptive research is required to understand underlying phenomena (Scheel et al., 2021). We therefore aimed to contribute to evidence regarding these mechanisms by asking the following secondary, open research question:

> **RQ2**: To what extent are emotion-regulation strategies present in the reactions to news articles about extreme weather events in places with different levels of place affinity?

Method

Experimental Stimuli

We chose a three condition (high affinity, low affinity, control) between-participants design. Pilot Study 2 suggested the UK and Germany as high-affinity countries, and Madagascar and South Africa as low-affinity countries. Of these, we chose Germany for the high-affinity condition, as there were more potential confounders in UK residents' affinity with the UK than towards Germany (e.g., participants' own experience of extreme weather, different places of residence within the UK), and Madagascar for the low-affinity condition, as it had lower affinity ratings than South Africa and would therefore maximise differences between conditions.

We presented the same newspaper articles as developed for Pilot Study 2, with minor changes resulting from participants' comments (e.g., to shorten paragraphs). For the control condition, we showed participants a general climate change article, similar to previous studies presenting general climate news (Chu & Yang, 2020a; Fesenfeld & Rinscheid, 2021; Halperin & Walton, 2018; Loy & Spence, 2020) and based on information by the Intergovernmental Panel on Climate Change (IPCC Working Group 2, 2022). We created the article to be similar to the treatment article regarding information on flooding, consequences to communities and general climate change, but without any mention of particular places or people. The length was slightly shorter than the treatment article (405 vs. 631 words) as it may take more time to read a factual, abstract article compared to one involving storytelling components (all article texts in Keller et al., 2023b, S2).

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Measurements

Full items and analysis plans (e.g., dimension reduction, coding) are available in Keller et al. (2023b, S4.1.1 and S3).

After reading the report, participants were asked to summarise it as if they were sending a message to a friend to explain what they had read and how it made them feel. This was to increase engagement with the report, to check for comprehension and attention, and to assess emotional reactions. As a manipulation check, participants in the treatment conditions rated place beliefs as described for the pilot studies.

Two measures were employed to test H1 (emotional reactions). First, participants rated the extent to which they experienced 13 emotions commonly used in climate psychology (e.g., fear, worry, shame, hope; Pihkala, 2022b) on a scale from 1 ("not at all") to 5 ("very much"). As these measures do not reflect an established instrument, we conducted a Principal Component Analysis to identify any subdimensions and create emotion indices accordingly (using parallel analysis; see S4.1.1, *Detailed analysis plan for procedure*, in Keller et al., 2023b). Second, we analysed the message to a friend through non-computational sentiment analysis (Jost et al., 2019) to identify the message's valence (positive, negative, neutral) and emotional intensity. This returned a sentiment score for each message, which alongside the emotional reaction score(s), were used to test H1. Our hypothesis only compares the strength of emotional reactions, as both positive and negative emotions have been documented in previous research, but the valence is described alongside our tests.

To test H2 (risk perceptions), we employed an eight-item risk-perception measure following van der Linden (2015, 2017). For both personal and societal risk, this included the likelihood of climate change impacts (e.g., "In your judgment, how likely are you, sometime during your life, to experience serious threats to your health or overall wellbeing, as a result of climate change?") and the magnitude of the risks of climate change impacts ("How serious would you rate current impacts of climate change around the world?") as well as levels of worry and concern. The eight items were described in terms of a personal and a societal risk-perception index.

Regarding climate-mitigation policy (H3), reviews have shown a diversity of measures owing to different regional contexts, study designs and lack of theoretical grounding (Kyselá et al., 2019). To ensure an ecologically valid measure, we developed an instrument based on the primary recommendations for climate policy by the Climate Assembly UK (2020). We created statements from recommendations and asked participants to rate these in a third pilot study (n = 102; equivalent procedure and eligibility as the previous ones). The results suggested a unidimensional scale of policy support (Cronbach's α = .90) consisting of 19 policy statements (e.g., "Investing in active transport [e.g., cycling and scootering facilities]") rated on a scale of 1 ("would not support at all") to 5 ("would support completely"). The full methodology and analysis are in Keller et al. (2023b, S3).

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To test H4 (pro-climate behaviour), we measured observed individual behaviour as reviewed by Lange (2023). At the end of the questionnaire, we informed participants that we would give away a £50 online shopping voucher. They were given the choice, in case of winning, either to receive all the money as an Amazon voucher, or to donate some or all of it to their choice of one of five climate-friendly organisations. The dependent measure was the donation amount.

To assess RQ2 (emotion regulation), we employed a measure focusing on situational emotion-regulation strategies, that is, ways of dealing with the news article (rather than those assessing stable traits and strategies, e.g., Panno et al., 2015; Wullenkord & Reese, 2021). Following Ojala (2012), we asked participants who indicated strong negative emotions (scoring 4 or 5 on fear, worry, anxiety, sadness, grief, guilt, shame, anger, frustration, helplessness or embarrassment) to think back to reading the article and describe anything they did or thought to feel less distressed. For participants without strong negative emotions, a projective coping measurement was used where participants were asked to provide guidance to a friend who reacted to their message with distress. The responses were coded to identify any instances of emotion-regulation strategies, such as problem-focused coping, emotion-focused coping and meaning-focused coping.

Sample and Power

The questionnaire was administered through Qualtrics (2022), using fully random assignment to the conditions. To determine an appropriate sample size, we surveyed applicable effect sizes from different areas to use in a power analysis, although we had difficulty finding comparable research designs. As shown in the literature review above, there is a lack of research experimentally comparing perceptions of news articles about specific climate change consequences. More detail on effect sizes and comparability of different research areas (e.g., framing and the experience of extreme weather events) is included in the detailed analysis plan in Keller et al. (2023b, S4.1.1). In summary, we found effect sizes around small benchmarks in the storytelling (Gustafson et al., 2020) and psychological distance literatures (Chu & Yang, 2019) and very small effect sizes in intervention studies (Rode et al., 2021).

As there is no clearly corresponding previous research, we think it is important in this applied context to consider the smallest effect size of practical interest (e.g., Lakens, 2022), that is, to assess whether detecting a very small effect size would be useful to theory and practice. Theoretically, place affinity may not be a useful framework for assessing the perception of extreme weather events in the media if it produces very small effect sizes; the same applies from a practitioner's view. We therefore concluded that a design detecting a small effect size represents a good compromise of sensitivity and effective use of resources.

Table 2 contains power calculations for all planned analyses. The analyses requiring the most participants are the between-group ANOVAs for H3 and H4, with N = 969 to

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detect a small omnibus effect of $f = 0.1$ and a small pairwise comparison effect of $d = 0.2$ (Faul et al., 2007). To allow for participant exclusion due to careless responding (see analysis plan), we aimed to overrecruit by 10%, resulting in $N = 1066$.

Participants were recruited from Prolific as in the pilot studies, with the additional criterion of balanced male and female gender identities (but no criteria for other gender identities). Participants' socio-demographics were obtained from Prolific and are reported. Additionally, we asked about and report participants' proximity to water and the community size they live in (see Keller et al., 2023b, S4.1.3 for all items). All research adhered to the APA ethical standards (American Psychological Association, 2017) and ethical approval was obtained through the authors' Institutional Review Board.

Analysis Plan and Preregistration

Table 2 presents the analyses and power calculations for each hypothesis, including MANOVAs for manipulation checks and H1 and H2, ANOVAs for H3 and H4 and a thematic deductive analysis for RQ2. The detailed analysis plan is in Keller et al., 2023b, S4.1.1) and describes the steps to prepare data, the statistical models for manipulation checks and confirmatory hypothesis testing, and conditions to check before drawing inferences (e.g., responding patterns, statistical assumptions, ceiling effects). The analysis plan also describes procedures that were used to analyse the open-response data (i.e., sentiment analysis and thematic coding). Stage 1 of this registered report, the detailed analysis plan and all materials were preregistered before data collection at Keller et al. (2023a).

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Table 2

Design Overview: Analyses and Power Calculations for Each Hypothesis

Research question	Hypothesis	Sampling plan (e.g., power analysis)	Analysis plan	Interpretation given different outcomes
Manipulation check	The conditions differ significantly with respect to place beliefs.	For small effect size ($f^2(V)$ = 0.02), β = .80, α = .05, 2 groups (treatment conditions) and 8 response variables: N = 760	MANOVA (IV: 2 treatment conditions; DV: place beliefs).	Successful if conditions significantly differ from each other, as indicated by MANOVA test statistics. Unsuccessful if conditions do not differ from each other.
RQ1: How is the reaction to news articles about an extreme weather event influenced by the place affinity with the location of that event?	**H1a**: Reading about an extreme weather event will lead to stronger emotional reactions than reading an unrelated article (control).	For small effect size ($f^2(V)$ = 0.02), β = .80, α = .05, 3 groups and 2 response variables: N = 303	MANOVA with discriminant analysis as post hoc test (IV: 3 conditions; DVs: emotions index/ indices and sentiment score).	Hypothesis supported if: (1) MANOVA test statistics indicate significant differences between the conditions; and (2) visual interpretation of graphs (histogram and scatterplot of discriminant function) supports differentiation between conditions. Regarding (2), hypothesis is fully supported if both high- and low-affinity conditions are different from the control, and partially supported if only one of the two treatments differs from the control.
	H1b: Reading about an extreme weather event in a high-affinity place will lead to stronger emotional reactions than in a low-affinity place.	As above	As above	Hypothesis supported if: (1) MANOVA test statistics indicate significant differences between the conditions; and (2) visual interpretation of graphs (histogram and scatterplot of discriminant function) supports differentiation between conditions
	H2a: Reading about an extreme weather event will lead to higher perceived climate change risk than an unrelated article (control).	For small effect size ($f^2(V)$ = 0.02), β = .80, α = .05, 3 groups and 2 response variables: N = 303	MANOVA with discriminant analysis as post hoc test (IV: 3 conditions; DV: both risk-perception scores).	Hypothesis supported if: (1) MANOVA test statistics indicate significant differences between the conditions; and (2) visual interpretation of graphs (histogram and scatterplot of discriminant function) supports differentiation between conditions. Regarding (2), hypothesis is fully supported if both

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Research question	Hypothesis	Sampling plan (e.g., power analysis)	Analysis plan	Interpretation given different outcomes
				high- and low-affinity conditions are different from the control, and partially supported if only one of the two treatments differs from the control.
	H2b: Reading about an extreme weather event in a high-affinity place will lead to higher perceived climate change risk than in a low-affinity place.	As above	As above	Hypothesis supported if: (1) MANOVA test statistics indicate significant differences between the conditions; and (2) visual interpretation of graphs (histogram and scatterplot of discriminant function) supports differentiation between conditions.
	H3a: Reading about an extreme weather event will lead to higher policy support than an unrelated article (control).	ANOVA: For small effect size (f = 0.1), β = .80, α = .05, 3 groups: N = 969 Pairwise comparisons: For small effect size (d = .2), β = .80, α = .017 (Bonferroni adjusted for three comparisons): N = 880	One-way ANOVA (IV: exp conditions; DV: policy support index) with post hoc pairwise comparisons.	Hypothesis supported if: (1) ANOVA omnibus is significant; and (2) pairwise comparison is significant. Regarding (2), hypothesis is fully supported if both high- and low-affinity conditions are different from the control, and partially supported if only one of the two treatments differs from the control. Interpretation focuses on effect size of the pairwise comparison.
	H3b: Reading about an extreme weather event in a high-affinity place will lead to higher policy support than in a low-affinity place.	As above	As above	Hypothesis supported if: (1) ANOVA omnibus is significant; and (2) pairwise comparison is significant. Interpretation focuses on effect size of the pairwise comparison.
	H4a: Reading about an extreme weather event will lead to higher pro-climate behaviour than an unrelated article (control).	ANOVA: For small effect size (f = 0.1), β = .80, α = .05, 3 groups: N = 969 Pairwise comparisons: For small effect size (d = .2), β = .80,	One-way ANOVA (IV: exp conditions; DV: pro-climate behaviour (donation amount)) with post hoc	Hypothesis supported if: (1) ANOVA omnibus is significant; and (2) pairwise comparison is significant. Regarding (2), hypothesis is fully supported if both high- and low-affinity conditions are different from the control, and partially supported if only one of the

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Research question	Hypothesis	Sampling plan (e.g., power analysis)	Analysis plan	Interpretation given different outcomes
		α = .017 (adjusted for three comparisons): N = 880	pairwise comparisons.	two treatments differs from the control. Interpretation focuses on effect size of the pairwise comparison.
	H4b: Reading about an extreme weather event in a high-affinity place will lead to higher pro-climate behaviour than in a low-affinity place.	As above	As above	Hypothesis supported if: (1) ANOVA omnibus is significant; and (2) pairwise comparison is significant. Interpretation focuses on effect size of the pairwise comparison.
RQ2: To what extent are emotion-regulation strategies present in the reactions to news articles about extreme weather events in places with different levels of place affinity?	N/A	N/A	Thematic deductive analysis, with themes described narratively.	Interpretation of results will focus on describing the themes and comparing these to prior research (e.g., Lazarus & Folkman, 1984; Ojala, 2012).

Note. Table design from the Center for Open Science (Center for Open Science, 2022). Power analyses conducted with G*Power (Faul et al., 2007), effect sizes for MANOVA and ANOVA based on Cohen (1988).

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Results

A detailed protocol is available in the supplementary materials for cross-referencing with the preregistered analysis plan (S4.2; Keller et al., 2023b).

Sample

A total of N = 1115 participants were recruited. Following our preregistered analysis plan, we checked for and excluded participants who failed the attention check (n = 3), strongly misrepresented the articles (n = 16), speeders (none), slow responders (n = 49) and straight-liners (n = 75), leading to a final sample of N = 972 participants. Participants were on average 42 years old (SD = 14.1), with 50% female participants (Prolific provides only sex, not gender identity). The majority were in full-time (54%) or part-time employment (19%), or students (9%). Most (82%) had lived in the UK for more than 25 years, and the majority (64%) lived close to a body of water. About a third lived in a town (10,000–100,000 inhabitants), with fewer participants in smaller or larger places. Finally, 20 participants expressed climate denial or scepticism in their open responses.

Data Preparation

Data were prepared as preregistered, with full information in the analysis protocol S4.2 of Keller et al. (2023b). For the emotion scores (H1), three components were identified: negative basic emotions (sadness, worry, helplessness and grief, α = .83), negative self-conscious emotions (shame and embarrassment, α = .81; see Ejelöv et al., 2018 for a discussion of these emotion categories) and hope (single item). For H2 and H3, indices were built as intended, and donation amount was used as the dependent variable for H4. Finally, for RQ2, the first author deductively coded all instances of emotion-focused, problem-focused and meaning-focused coping strategies, and additional distinct types of coping. Codes were merged into themes and exported into tables for further exploration.

Main Analysis

Manipulation Check

First, we tested whether the experimental conditions differed from each other on the combination of the place beliefs (place affinity). We had preregistered a MANOVA; however, on checking the assumptions, we found that care, vulnerability and responsibility were not sufficiently correlated with the remaining beliefs to be integrated into a single model (Keller et al., 2023b, S4.2). We therefore conducted a MANOVA with familiarity, spatial distance and similarity and social similarity and intimacy, with additional t-tests to check for differences in levels of care, vulnerability and responsibility. The MANOVA indicated a significant difference between the conditions, Pillai's trace V = 0.43, F(5, 637) = 96.6, p < .001, η_p^2 = 0.43. Care, t(656) = -2.66, p = .008, d = -0.21, 95% CI [-0.33,

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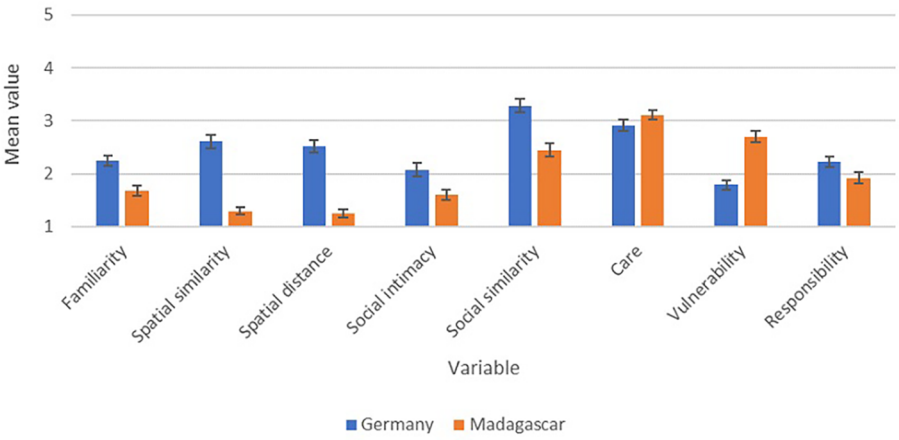
-0.05]; vulnerability, Welch's $t(615) = 11.9$, $p < .001$, $d = 0.94$, 95% CI [0.76, 1.06]; and responsibility, Welch's $t(612) = 4.07$, $p < .001$, $d = 0.33$, 95% CI [0.16, 0.45], were also significantly different between the conditions, together confirming the success of the manipulation.

Figure 2 shows the mean values of the place beliefs, demonstrating the direction of differences (not pre-registered but helpful for interpretation). Of note is that participants expressed more care and perceived vulnerability for Madagascar, with other place beliefs rated higher for Germany. A follow-up discriminant analysis indicated that spatial distance and spatial similarity were most important in the separation of the two conditions within the MANOVA (Keller et al., 2023b, S4.2).

Figure 2

Mean Values and 95% CI Intervals for All Place Beliefs, by Experimental Condition



Main Hypotheses

Table 3 includes all descriptives for the main analysis variables and Table 4, a summary of all hypothesis tests.

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Table 3

Descriptives for Main Analysis Variables

		Negative emotions						
Statistic	**Condition**	**Basic**	**Self-conscious**	**Hope**	**Personal risk**	**Societal risk**	**Policy support**	**Donation amount (out of £50)**
N	Total	972	972	972	972	972	972	909
	Germany	336	336	336	336	336	336	317
	Madagascar	322	322	322	322	322	322	304
	Control	314	314	314	314	314	314	288
M	Total	3.40	1.98	2.17	3.34	4.07	4.03	17.4
	Germany	3.47	1.65	2.06	3.36	4.04	4.01	17.3
	Madagascar	3.49	1.94	2.14	3.31	4.05	4.05	17.5
	Control	3.23	2.38	2.32	3.34	4.11	4.03	17.5
SD	Total	0.94	1.02	1.06	0.96	0.89	0.57	14.9
	Germany	0.92	0.82	1.03	0.97	0.92	0.59	14.7
	Madagascar	0.93	1.01	1.12	0.95	0.86	0.54	15.2
	Control	0.95	1.09	1.00	0.96	0.87	0.57	14.9

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Table 4

Results for Main Experiment Hypotheses

	Treatment versus control	**High versus low place affinity**
Dependent variable	**Reading about an extreme weather event compared to a general climate change article (control) will lead to:**	**Reading about an extreme weather event in a high-affinity versus low-affinity place will lead to:**
H1 Emotional reactions	**H1a**: Stronger emotional reactions Sentiment score: partially supported (Germany vs. control). Negative emotions: partially supported (small visual difference, biggest for Germany vs. control). Hope: partially supported (Germany vs. control).	**H1b**: Stronger emotional reactions Sentiment score: supported. Negative emotions: not supported. Hope: not supported.
H2 Risk perceptions	**H2a**: Higher perceived climate change risk. Not supported.	**H2b**: Higher perceived climate change risk. Not supported.
H3 Policy support	**H3a**: Higher policy support. Not supported.	**H3b**: Higher policy support. Not supported.
H4 Pro-climate behaviour	**H4a**: Higher pro-climate behaviour. Not supported.	**H4b**: Higher pro-climate behaviour. Not supported.

Note. Treatment refers to the high-affinity and low-affinity conditions, thus, each of these hypotheses is tested through two comparisons (high-affinity vs. control and low-affinity vs. control).

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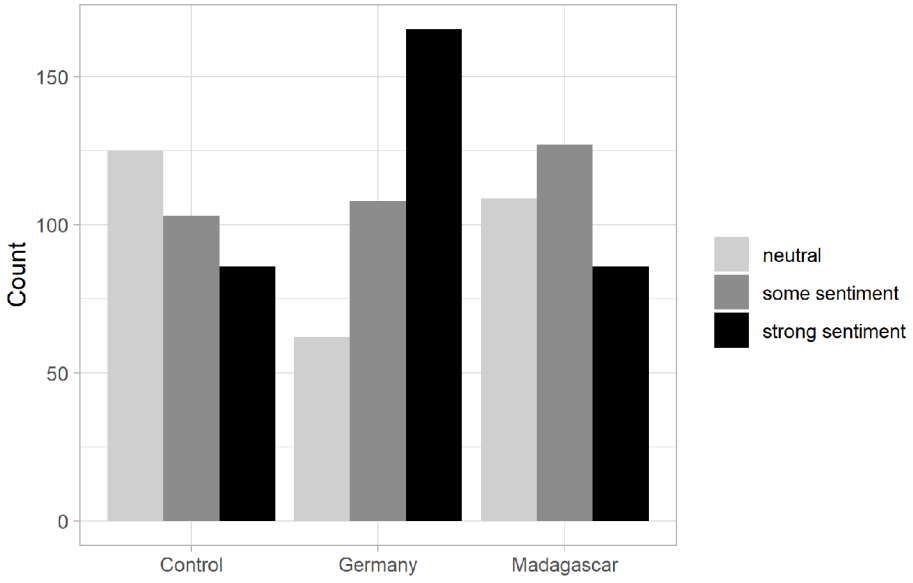
H1: Emotional Reactions — Support for H1 was assessed through three analyses: a χ^2 test for differences in sentiment scores, a MANOVA for negative emotions and an ANOVA for hope.

First, the χ^2 test indicated a significant difference in sentiment score between the conditions, $\chi^2(4) = 60.8$, $p < .001$, with a small effect size of Cramer's $V = .18$. A visual inspection (Figure 3) indicated that participants in the Germany condition expressed stronger sentiment than participants in the control. This difference was less prominent for the Madagascar versus control comparison, thus giving only partial support for H1a (treatment vs control). H1b was supported for the sentiment scores, as participants in the Germany condition expressed stronger sentiment than those in the Madagascar condition.

Figure 3

Sentiment Strength Per Condition



Second, a MANOVA indicated a small significant group difference in negative basic and self-conscious emotions, Pillai's trace $V = 0.16$, $F(4, 1938) = 41.7$, $p < .001$, $\eta_p^2 = 0.08$. A discriminant analysis showed that both emotion types similarly contributed to the differences (S4.2). However, as Figure 4 shows, separation was primarily between the Germany and the control condition. Regarding the negative emotions, H1a (treatment vs control) was therefore partially supported, and H1b (Germany vs Madagascar) was not supported.

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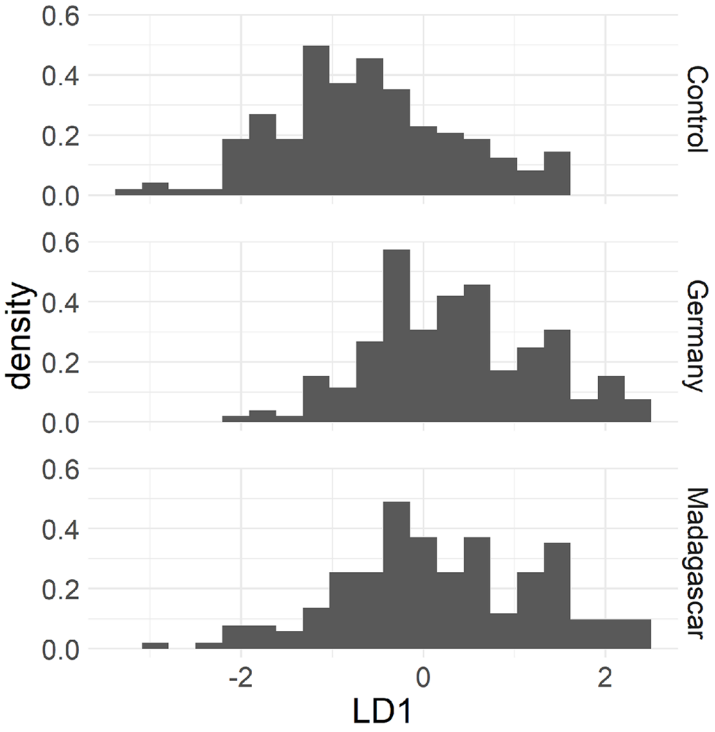
Figure 4

Histogram of Linear Discriminant Function



Finally, an ANOVA was conducted for hope, which was not sufficiently correlated with the negative emotions to be integrated with the MANOVA (Keller et al., 2023b, S4.2). The model was significant, $F(2, 969) = 5.29$, $p = .005$, $\eta^2 = .011$, with participants experiencing more hope in the control than in the Germany condition, $t(969) = -3.18$, $p = .005$, $d = -0.25$, 95% CI [-0.40, -0.10], and no other significant comparisons. Regarding hope, these results provide partial support for H1a (treatment vs control), but no support for H1b (Germany vs Madagascar).

In summary, H1a was partially supported through all emotion measures, indicating stronger emotional reactions in the Germany condition than in the control condition. H1b, however, was largely rejected, since only the sentiment score differed between the Germany and Madagascar condition.

H2, H3 and H4: Risk Perceptions, Policy Support, Pro-Climate Behaviour — A MANOVA on personal and societal risk perceptions indicated no group differences, Pillai's trace $V = 0.01$, $F(4, 1938) = 1.46$, $p = .212$, $\eta_p^2 = 0.003$. ANOVAs for policy support

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and pro-climate behaviour, as seen in Table 4, indicated no significant differences either. Group differences remained non-significant when adjusted for ceiling effects (Keller et al., 2023b, S4.2).

Table 5 holds information on equivalence testing, which we conducted exploratively to determine whether group means were equivalent as well as statistically inseparable (not preregistered; Caldwell, 2022; Lakens et al., 2018). Mean differences for all variables were statistically equivalent, supporting the conclusion that participants' risk perceptions, policy support and pro-climate behaviour were not affected by condition.

Table 5

ANOVA Results With Equivalence Testing

Dependent Variable	*df*1	*df*2	*F*	*p (null)*	η_p^2	Equivalence bound	*p (equivalence)*
Personal risk	2	969	0.27	.765	.00	.01	.003
Societal risk	2	969	0.73	.481	.00	.01	.015
Policy support	2	969	0.43	.651	.00	.01	.006
Pro-climate behaviour	2	906	0.001	.999	.00	.01	> .001

Note. Equivalence bounds are based on the smallest effect size of interest as determined for power analyses above.

Research Question 2: Emotion Regulation

Many participants across conditions, and in both the self and projective emotion-regulation measures, described the three strategies of emotion-focused (n = 197, 20%), problem-focused (n = 139, 14%) and meaning-focused (n = 105, 11%) coping. Additionally, a substantial number of participants used no regulation strategies (n = 383, 39%) or gave unclear (n = 31, 3%) or irrelevant (n = 72, 7%) responses. For conciseness, we only outline the different themes below, with a more detailed analysis contained in Keller et al. (2023b), S4.2 (analysis protocol). Due to the setup of this question, a quantitative comparison of strategies is not possible, and results should therefore be regarded as qualitative in nature.

Many participants engaged in emotion-focused coping to reduce negative feelings. Some distracted themselves or told their friend "don't worry about it", others distanced themselves by emphasising the fictionality of the event or the physical and temporal distance towards it. Further, some participants used physical regulation such as breathing exercises, and a few resolved to speak to others about their feelings.

Low self-efficacy was a commonly reported barrier against engaging in problem-focused coping. Of those who did feel able to address flooding or climate change, planned actions ranged widely from recycling to donations to political action. Sometimes, participants engaging in problem-focused coping simultaneously reminded themselves of their own or societal progress to create positive feelings, in a form of meaning-focused coping.

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Finally, a considerable number of participants chose not to regulate their emotions. Many gave no reason, but some indicated that they preferred to sit with their emotions, and others stated that they did not feel distressed enough to have to regulate their reaction.

Overall, there were a large number of emotion-regulation strategies present in participants' reactions, partly with complex interdependencies with other variables such as self-efficacy. Although no formal comparisons can be made based on these data, there seemed to be a general overlap in strategies in all conditions.

Discussion

Extreme weather events caused by the climate crisis are increasing around the world. Research frequently suggests that the location of these events influences how people react to them. However, a mixed body of evidence leaves it unclear whether and how variables such as psychological distance (Keller, Marsh, et al., 2022), caring (Wang et al., 2018), or social identity (Fielding & Hornsey, 2016) impact the direct and indirect perception of extreme weather events.

In this registered report, we aimed to conduct a robust test of how place-related and distance-related factors influence the perception of extreme weather through media reports, a context common in everyday life but not well understood by research (Dhaher & Gumus, 2022; Howe et al., 2019). We asked participants to read an article about flooding in a high-affinity (Germany) and a low-affinity place (Madagascar) as well as a neutral article (control) to assess any effects caused by strong differences in their place affinity. We addressed several of the limitations of previous literature, providing a more holistic conceptualisation of place-related and distance-related effects through the construct of place affinity, developing manipulation and measurement through several pilot studies and preregistering the analysis. Results showed that differences in place affinity did not affect risk perceptions, policy support and pro-climate behaviour. Instead, explorative analysis showed that they were statistically equivalent, indicating that all articles had an equal effect on these dependent measures or that the measures were uninfluenced by any of the articles. There were some differences in emotional reactions, which were stronger in the high-affinity condition than the control (discussed later).

Overall, these findings lead us to conclude that the location of extreme weather events does not seem to impact most short-term reactions to fictional, but realistic media reports. There are several routes forward from these findings. First, more experimental work could explore circumstances under which place-related effects are (not) present. Several methodological choices in this study could have influenced our results, such as presenting an abstract article as a control condition, presenting fictional articles, or not presenting imagery. Future work could employ a location-neutral, but less abstract control article, include more imagery or test other media forms such as video. Additionally, as many climate beliefs are relatively stable (Jenkins-Smith et al., 2020) and strongly

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related to stable individual characteristics (Hornsey et al., 2016), longitudinal research could investigate how place-related perceptions change over time (e.g., Shehata et al., 2022).

A second potential way forward, however, is to acknowledge that place-related and distance-related effects may not be the most fruitful approach to understand the perception of climate change and extreme weather events. Reviews have documented inconsistent evidence around these variables (Brügger, 2020; Keller, Marsh, et al., 2022) and this research can be unintentionally damaging by maintaining a false "distance narrative" (van Valkengoed et al., 2023). These reviews criticise Construal Level Theory, basis of most previous research, for being too restrictive and limited in describing a complex problem such as climate change. However, despite our more holistic integration of distance with related variables such as care, social identity and familiarity, participants reacted very similarly even to stark differences in place affinity. Therefore, we suggest that researchers consider other avenues in understanding the perception of extreme weather news reports. For example, a next step could involve having participants react to a large selection of media reports differing on a large number of potentially relevant factors, including location, but also news source (Cheng & Gonzalez-Ramirez, 2021), framing (e.g., Nabi et al., 2018), and imagery (O'Neill, 2013). Analysis could then compare which factors most prominently determine people's reactions to such reports. This would allow researchers to focus on important factors and make specific recommendations to climate communicators regarding the design of such reports, as the present study suggests that the consideration of place alone does not lead to significantly different perceptions.

Finally, emotional reactions may warrant further investigation, as these were the only outcome (partially) affected by location in this study. These differences existed primarily between the high-affinity and the control condition and were either non-existent in other comparisons or only present in the sentiment score (emotional language used to summarise the article). Overall, differences between Germany and the control were far more pronounced than any others, suggesting that the combination of storytelling and high affinity may have increased affective responses. This coheres with research showing that storytelling about climate impacts evokes both worry and compassion (Gustafson et al., 2020). Feelings of compassion especially may have been stronger in the high-affinity than the low-affinity group due to higher social similarity and intimacy (Masson & Fritsche, 2021), which could lead participants to experience stronger emotional reactions.

Investigating such mechanisms around affective reactions is valuable as emotions can be a powerful predictor of pro-climate action (Brosch, 2021), especially in response to extreme weather events (Ojala et al., 2021). However, even if extreme weather reports induce strong emotions, they do not necessarily translate into concern and action. Research on emotion regulation demonstrates that confrontation with the climate crisis can be met with action, emotional engagement or distancing, leading to various

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levels of pro-climate action (Pihkala, 2022a). These types of responses, in the form of problem-oriented, meaning-oriented and emotion-oriented coping (Lazarus & Folkman, 1984; Ojala, 2012) were all described by our participants in their responses to reading the article. Problem-focused coping has been closely linked with pro-environmental behaviour, but is less likely to occur when people engage in distancing (Wullenkord & Ojala, 2023). Consequently, it is worth testing whether stimulating particular forms of emotion regulation increases people's risk perception, policy support and pro-climate behaviour when confronted with extreme weather reports in high-affinity or low-affinity locations. Previous research has also documented that individuals tend to have different emotion-regulation "toolboxes", which they draw upon to regulate specific situations (Grommisch et al., 2020). It is thus possible that our participants' reactions to the extreme weather reports were shaped by their personal emotion-regulation "toolbox"; linking such individual strategies of emotion regulation with climate perceptions may help further understand people's reactions to climate communication.

Limitations and Future Directions

There are several limitations as a result of trade-offs taken in designing this study. First, we prioritised creating almost identical materials between conditions, which meant that articles had to be fictional. As participants commented on this aspect as something that influenced their emotion processing, a future study may benefit from using real articles. News articles also vary in many more aspects than the location of events, which can only be disentangled to a limited degree in an experimental study. This means that our findings only have limited generalisability to other articles and should instead be interpreted as only a laboratory test of one aspect of realistic articles. Second, our measures were limited in that we did not include pre-measures so as not to bias participants. To understand whether the articles all had the same effect, or all had no effect whatsoever, future research may want to include pre-post comparisons. This could be integrated with a closer look at the emotion-regulation processes and their relationship with other variables, which we were only able to investigate superficially in our open measure. Finally, our sample was restricted to UK participants and therefore does not necessarily generalise to other national contexts; further research is needed to establish whether place affinity has similar effects (or lack thereof) for other audiences.

Conclusion

In conclusion, this experiment tested whether place affinity influences participants' reactions to reports of extreme weather events. Levels of risk perceptions, policy support and pro-climate behaviour were equal in the high-affinity, low-affinity and control conditions. Emotional reactions were stronger in response to the high-affinity condition than the control and the low-affinity conditions. Participants also spoke about a large

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number of emotion-regulation strategies that may have influenced their reactions to the reports. We recommend that researchers focus on identifying alternative factors that may influence the perception of extreme weather events in the media more strongly than place-related and distance-related variables, and pay particular attention to emotional reactions and emotion-regulation strategies.

Openness and Transparency Statements

The present article has been checked by its handling editor(s) for compliance with the journal's open science and transparency policies. The completed *Transparency Checklist* is publicly available at: https://doi.org/10.23668/psycharchives.15221

Author Contributions.

Elias Keller: Conceptualization. Methodology. Writing – original draft. Writing – review & editing.
John E. Marsh: Conceptualization. Resources. Writing – review & editing. Supervision. Project administration.
Beth H. Richardson: Conceptualization. Resources. Writing – review & editing. Supervision.
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Diversity Statement. In the list below, the check mark (☑) indicates which steps were taken to increase diversity within the context of this paper. Steps that were not taken or did not apply are unmarked (☐).

- ☑ Ethnically or otherwise diverse sample(s)
- ☑ Gender balanced sample(s)
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- ☑ Inclusive materials
- ☑ Sampling justification
- ☑ Extensive sample description
- ☑ Discussion of generalizability
- ☑ Diverse reference list
- ☑ Underprivileged / minority author(s)
- ☑ Early career author(s)
- ☑ Degree of privilege/marginalization considered in authorship order
- ☐ Author(s) from sampled population (avoiding 'helicopter science')

Supplementary Materials. The following table provides an overview of the accessibility of supplementary materials (if any) for this paper.

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Type of supplementary materials	Availability/Access
Data	
Study data.	Keller et al. (2023b)
Code	
Analysis code.	Keller et al. (2023b)
Material	
Experimental stimuli.	Keller et al. (2023b)
Study/Analysis preregistration	
Preregistration of experimental hypotheses.	Keller et al. (2023a)
Other	
a. Preprint.	Keller et al. (2022)
b. Complementary detailed results.	Keller et al. (2023b)

Badges for Good Research Practices.

Open data: YES.

Open code: YES.

Open materials: YES.

Preregistration: YES.

Diversity statement: YES.

Note: YES = the present article meets the criteria for awarding the badge. NO = the present article does not meet the criteria for awarding the badge *or* the criteria are not applicable.

References

Agin, S., & Karlsson, M. (2021). Mapping the field of climate change communication 1993–2018: Geographically biased, theoretically narrow, and methodologically limited. *Environmental Communication, 15*(4), 431–446. https://doi.org/10.1080/17524032.2021.1902363

American Psychological Association. (2017). *Ethical principles of psychologists and code of conduct.* APA. https://www.apa.org/ethics/code/

Boykoff, M. T. (2008). Media and scientific communication: A case of climate change. *Geological Society of London, Special Publications, 305*(1), 11–18. https://doi.org/10.1144/SP305.3

Bradley, G. L., Babutsidze, Z., Chai, A., & Reser, J. P. (2020). The role of climate change risk perception, response efficacy, and psychological adaptation in pro-environmental behavior: A two nation study. *Journal of Environmental Psychology, 68*, Article 101410. https://doi.org/10.1016/j.jenvp.2020.101410

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

PsychOpen GOLD

Brügger, A. (2020). Understanding the psychological distance of climate change: The limitations of construal level theory and suggestions for alternative theoretical perspectives. *Global Environmental Change, 60*, Article 102023. https://doi.org/10.1016/j.gloenvcha.2019.102023

Brügger, A., Demski, C., & Capstick, S. (2021). How personal experience affects perception of and decisions related to climate change: A psychological view. *Weather, Climate, and Society, 13*(3), 397–408. https://doi.org/10.1175/WCAS-D-20-0100.1

Brügger, A., Morton, T. A., & Dessai, S. (2016). "Proximising" climate change reconsidered: A construal level theory perspective. *Journal of Environmental Psychology, 46*, 125–142. https://doi.org/10.1016/j.jenvp.2016.04.004

Caldwell, A. R. (2022). *Exploring equivalence testing with the updated TOSTER R package.* PsyArXiv. https://doi.org/10.31234/osf.io/ty8de

Center for Open Science. (2022). *Template-preregistration-RR.rtf.* https://osf.io/93znh

Cheng, H., & Gonzalez-Ramirez, J. (2021). Trust and the media: Perceptions of climate change news sources among US college students. *Postdigital Science and Education, 3*(3), 910–933. https://doi.org/10.1007/s42438-020-00163-y

Chu, H. (2022). Construing climate change: Psychological distance, individual difference, and construal level of climate change. *Environmental Communication, 16*(7), 883–899. https://doi.org/10.1080/17524032.2022.2061027

Chu, H., & Yang, J. (2018). Taking climate change here and now – Mitigating ideological polarization with psychological distance. *Global Environmental Change, 53*, 174–181. https://doi.org/10.1016/j.gloenvcha.2018.09.013

Chu, H., & Yang, J. (2019). Emotion and the psychological distance of climate change. *Science Communication, 41*(6), 761–789. https://doi.org/10.1177/1075547019889637

Chu, H., & Yang, J. (2020a). Risk or efficacy? How psychological distance influences climate change engagement. *Risk Analysis, 40*(4), 758–770. https://doi.org/10.1111/risa.13446

Chu, H., & Yang, J. (2020b). Their economy and our health: Communicating climate change to the divided American public. *International Journal of Environmental Research and Public Health, 17*(21), Article 7718. https://doi.org/10.3390/ijerph17217718

Climate Assembly UK. (2020). *The path to net zero.* UK House of Commons. https://www.climateassembly.uk/recommendations/index.html

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.

Cutter, S. L., & Finch, C. (2008). Temporal and spatial changes in social vulnerability to natural hazards. *Proceedings of the National Academy of Sciences of the United States of America, 105*(7), 2301–2306. https://doi.org/10.1073/pnas.0710375105

Denis, D. J. (2020). *Univariate, bivariate, and multivariate statistics using R: Quantitative tools for data analysis and data science* (1st ed.). Wiley.

Dhaher, C., & Gumus, A. (2022). Lessons from media-centered climate change literature. *Sustainability, 14*(3), Article 1404. https://doi.org/10.3390/su14031404

PsychOpen GOLD

Ejelöv, E., Hansla, A., Bergquist, M., & Nilsson, A. (2018). Regulating emotional responses to climate change–A construal level perspective. *Frontiers in Psychology, 9*, Article 629. https://doi.org/10.3389/fpsyg.2018.00629

Eronen, M. I., & Bringmann, L. F. (2021). The theory crisis in psychology: How to move forward. *Perspectives on Psychological Science, 16*(4), 779–788. https://doi.org/10.1177/1745691620970586

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175–191. https://doi.org/10.3758/BF03193146

Fesenfeld, L. P., & Rinscheid, A. (2021). Emphasizing urgency of climate change is insufficient to increase policy support. *One Earth, 4*(3), 411–424. https://doi.org/10.1016/j.oneear.2021.02.010

Fielding, K. S., & Hornsey, M. J. (2016). A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities. *Frontiers in Psychology, 7*, Article 121. https://doi.org/10.3389/fpsyg.2016.00121

Grommisch, G., Koval, P., Hinton, J. D. X., Gleeson, J., Hollenstein, T., Kuppens, P., & Lischetzke, T. (2020). Modeling individual differences in emotion regulation repertoire in daily life with multilevel latent profile analysis. *Emotion, 20*(8), 1462–1474. https://doi.org/10.1037/emo0000669

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

Halperin, A., & Walton, P. (2018). The importance of place in communicating climate change to different facets of the American public. *Weather, Climate, and Society, 10*(2), 291–305. https://doi.org/10.1175/WCAS-D-16-0119.1

Homburg, A., Stolberg, A., & Wagner, U. (2007). Coping with global environmental problems: Development and first validation of scales. *Environment and Behavior, 39*(6), 754–778. https://doi.org/10.1177/0013916506297215

Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change, 6*(6), 622–626. https://doi.org/10.1038/nclimate2943

Howe, P. D., Marlon, J. R., Mildenberger, M., & Shield, B. S. (2019). How will climate change shape climate opinion? *Environmental Research Letters, 14*(11), Article 113001. https://doi.org/10.1088/1748-9326/ab466a

Huebner, A. (2012). Public perceptions of destination vulnerability to climate change and implications for long-haul travel decisions to small island states. *Journal of Sustainable Tourism, 20*(7), 939–951. https://doi.org/10.1080/09669582.2012.667107

IPCC Working Group 2. (2022). *Climate change 2022: Impacts, adaptation and vulnerability. Summary for policy makers.* IPCC Sixth Assessment Report. https://www.ipcc.ch/report/ar6/wg2/

PsychOpen GOLD

Jang, S. M. (2013). Framing responsibility in climate change discourse: Ethnocentric attribution bias, perceived causes, and policy attitudes. *Journal of Environmental Psychology, 36*, 27–36. https://doi.org/10.1016/j.jenvp.2013.07.003

Jenkins-Smith, H. C., Ripberger, J. T., Silva, C. L., Carlson, D. E., Gupta, K., Carlson, N., Ter-Mkrtchyan, A., & Dunlap, R. E. (2020). Partisan asymmetry in temporal stability of climate change beliefs. *Nature Climate Change, 10*(4), 322–328. https://doi.org/10.1038/s41558-020-0719-y

Jost, F., Dale, A., & Schwebel, S. (2019). How positive is "change" in climate change? A sentiment analysis. *Environmental Science & Policy, 96*, 27–36. https://doi.org/10.1016/j.envsci.2019.02.007

Keller, E., Marsh, J. E., Richardson, B. H., & Ball, L. J. (2022). A systematic review of the psychological distance of climate change: Towards the development of an evidence-based construct. *Journal of Environmental Psychology, 81*, Article 101822. https://doi.org/10.1016/j.jenvp.2022.101822

Keller, E., Marsh, J. E., Richardson, B. H., & Ball, L. J. (2023a). *How affinity with places affects the indirect experience of extreme weather events* [Preregistration of study]. PsychArchives. https://doi.org/10.23668/psycharchives.12693

Keller, E., Marsh, J. E., Richardson, B. H., & Ball, L. J. (2023b). *How affinity with places affects the indirect experience of extreme weather events: Supplementary materials registered report Stage 2* [OSF project page containing data and code for all pilots and main study, all experimental stimuli, detailed results complementing the article]. OSF. https://doi.org/10.17605/OSF.IO/RP5MB

Keller, E., Richardson, B. H., Ball, L. J., & Marsh, J. E. (2022). *From psychological distance to place affinity: How people perceive and react to the location of climate change impacts* [Preprint]. Open Science Framework. https://doi.org/10.31219/osf.io/x4kpa

Kyselá, E., Ščasný, M., & Zvěřinová, I. (2019). Attitudes toward climate change mitigation policies: A review of measures and a construct of policy attitudes. *Climate Policy, 19*(7), 878–892. https://doi.org/10.1080/14693062.2019.1611534

Lakens, D. (2022). Sample size justification. *Collabra: Psychology, 8*(1), Article 33267. https://doi.org/10.1525/collabra.33267

Lakens, D., Scheel, A., & Isager, P. M. (2018). Equivalence testing for psychological research: A tutorial. *Advances in Methods and Practices in Psychological Science, 1*(2), 259–269. https://doi.org/10.1177/2515245918770963

Lange, F. (2023). Behavioral paradigms for studying pro-environmental behavior: A systematic review. *Behavior Research Methods, 55*, 600–622. https://doi.org/10.3758/s13428-022-01825-4

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer.

Loy, L. S., & Spence, A. (2020). Reducing, and bridging, the psychological distance of climate change. *Journal of Environmental Psychology, 67*, Article 101388. https://doi.org/10.1016/j.jenvp.2020.101388

Maiella, R., La Malva, P., Marchetti, D., Pomarico, E., Di Crosta, A., Palumbo, R., Cetara, L., Di Domenico, A., & Verrocchio, M. C. (2020). The psychological distance and climate change: A

PsychOpen GOLD

systematic review on the mitigation and adaptation behaviors. *Frontiers in Psychology, 11*, Article 568899. https://doi.org/10.3389/fpsyg.2020.568899

Maier, M., Bartoš, F., Oh, M., Wagenmakers, E.-J., Shanks, D., & Harris, A. J. L. (2022). *Publication bias in research on construal level theory* [Preprint]. PsyArXiv. https://doi.org/10.31234/osf.io/r8nyu

Masson, T., & Fritsche, I. (2021). We need climate change mitigation and climate change mitigation needs the 'We': A state-of-the-art review of social identity effects motivating climate change action. *Current Opinion in Behavioral Sciences, 42*, 89–96. https://doi.org/10.1016/j.cobeha.2021.04.006

McGinty, E. E., Webster, D. W., Jarlenski, M., & Barry, C. L. (2014). News media framing of serious mental illness and gun violence in the United States, 1997-2012. *American Journal of Public Health, 104*(3), 406–413. https://doi.org/10.2105/AJPH.2013.301557

Montgomery, J. M., Nyhan, B., & Torres, M. (2018). How conditioning on posttreatment variables can ruin your experiment and what to do about it. *American Journal of Political Science, 62*(3), 760–775. https://doi.org/10.1111/ajps.12357

Morris, B. S., Chrysochou, P., Christensen, J. D., Orquin, J. L., Barraza, J., Zak, P. J., & Mitkidis, P. (2019). Stories vs. facts: Triggering emotion and action-taking on climate change. *Climatic Change, 154*(1–2), 19–36. https://doi.org/10.1007/s10584-019-02425-6

Nabi, R. L., Gustafson, A., & Jensen, R. (2018). Framing climate change: Exploring the role of emotion in generating advocacy behavior. *Science Communication, 40*(4), 442–468. https://doi.org/10.1177/1075547018776019

Nielsen, K. S., Nicholas, K. A., Creutzig, F., Dietz, T., & Stern, P. C. (2021). The role of high-socioeconomic-status people in locking in or rapidly reducing energy-driven greenhouse gas emissions. *Nature Energy, 6*(11), 1011–1016. https://doi.org/10.1038/s41560-021-00900-y

Ojala, M. (2012). Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change? *International Journal of Environmental and Science Education, 7*(4), 537–561.

Ojala, M. (2013). Coping with climate change among adolescents: Implications for subjective well-being and environmental engagement. *Sustainability, 5*(5), 2191–2209. https://doi.org/10.3390/su5052191

Ojala, M., & Bengtsson, H. (2019). Young people's coping strategies concerning climate change: Relations to perceived communication with parents and friends and proenvironmental behavior. *Environment and Behavior, 51*(8), 907–935. https://doi.org/10.1177/0013916518763894

Ojala, M., Cunsolo, A., Ogunbode, C. A., & Middleton, J. (2021). Anxiety, worry, and grief in a time of environmental and climate crisis: A narrative review. *Annual Review of Environment and Resources, 46*(1), 35–58. https://doi.org/10.1146/annurev-environ-012220-022716

O'Neill, S. J. (2013). Image matters: Climate change imagery in US, UK and Australian newspapers. *Geoforum, 49*, 10–19. https://doi.org/10.1016/j.geoforum.2013.04.030

PsychOpen GOLD

Panno, A., Carrus, G., Maricchiolo, F., & Mannetti, L. (2015). Cognitive reappraisal and pro-environmental behavior: The role of global climate change perception. *European Journal of Social Psychology, 45*(7), 858–867. https://doi.org/10.1002/ejsp.2162

Peer, E., Rothschild, D., Gordon, A., Evernden, Z., & Damer, E. (2022). Data quality of platforms and panels for online behavioral research. *Behavior Research Methods, 54*(4), 1643–1662. https://doi.org/10.3758/s13428-021-01694-3

Pew Research Center. (2018). *In Western Europe, public attitudes toward news media more divided by populist views than left-right ideology*. Pew Research Center. https://www.pewresearch.org/journalism/2018/05/14/in-western-europe-public-attitudes-toward-news-media-more-divided-by-populist-views-than-left-right-ideology/

Pihkala, P. (2022a). The process of eco-anxiety and ecological grief: A narrative review and a new proposal. *Sustainability, 14*(24), Article 16628. https://doi.org/10.3390/su142416628

Pihkala, P. (2022b). Toward a taxonomy of climate emotions. *Frontiers in Climate, 3*, Article 738154. https://doi.org/10.3389/fclim.2021.738154

Qualtrics. (2022). *Qualtrics experience management* [Software]. Qualtrics. www.qualtrics.com

Rickard, L. N., Yang, Z. J., & Schuldt, J. P. (2016). Here and now, there and then: How "departure dates" influence climate change engagement. *Global Environmental Change, 38*, 97–107. https://doi.org/10.1016/j.gloenvcha.2016.03.003

Rode, J. B., Dent, A. L., Benedict, C. N., Brosnahan, D. B., Martinez, R. L., & Ditto, P. H. (2021). Influencing climate change attitudes in the United States: A systematic review and meta-analysis. *Journal of Environmental Psychology, 76*, Article 101623. https://doi.org/10.1016/j.jenvp.2021.101623

Scheel, A. M., Tiokhin, L., Isager, P. M., & Lakens, D. (2021). Why hypothesis testers should spend less time testing hypotheses. *Perspectives on Psychological Science, 16*(4), 744–755. https://doi.org/10.1177/1745691620966795

Shackley, M. J. (2021). Localizing discussions of climate change effects may not increase students' willingness to engage in pro-environmental behavior. *Interdisciplinary Journal of Environmental and Science Education, 17*(4), Article e2257. https://doi.org/10.21601/ijese/11149

Shehata, A., Johansson, J., Johansson, B., & Andersen, K. (2022). Climate change frame acceptance and resistance: Extreme weather, consonant news, and personal media orientations. *Mass Communication & Society, 25*(1), 51–76. https://doi.org/10.1080/15205436.2021.1967998

Spence, A., & Pidgeon, N. (2010). Framing and communicating climate change: The effects of distance and outcome frame manipulations. *Global Environmental Change, 20*(4), 656–667. https://doi.org/10.1016/j.gloenvcha.2010.07.002

Spence, A., Poortinga, W., & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis, 32*(6), 957–972. https://doi.org/10.1111/j.1539-6924.2011.01695.x

Swim, J. K., & Bloodhart, B. (2018). The intergroup foundations of climate change justice. *Group Processes & Intergroup Relations, 21*(3), 472–496. https://doi.org/10.1177/1368430217745366

Tabachnik, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

PsychOpen GOLD

Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review, 117*(2), 440–463. https://doi.org/10.1037/a0018963

van der Linden, S. (2015). The social-psychological determinants of climate change risk perceptions: Towards a comprehensive model. *Journal of Environmental Psychology, 41*, 112–124. https://doi.org/10.1016/j.jenvp.2014.11.012

van der Linden, S. (2017, March 29). *Determinants and measurement of climate change risk perception, worry, and concern.* Oxford Research Encyclopedia of Climate Science. https://doi.org/10.1093/acrefore/9780190228620.013.318

van Valkengoed, A. M., Steg, L., & Perlaviciute, G. (2023). The psychological distance of climate change is overestimated. *One Earth, 6*(4), 362–391. https://doi.org/10.1016/j.oneear.2023.03.006

van Zomeren, M., Leach, C. W., & Spears, R. (2012). Protesters as "passionate economists": A dynamic dual pathway model of approach coping with collective disadvantage. *Personality and Social Psychology Review, 16*(2), 180–199. https://doi.org/10.1177/1088868311430835

van Zomeren, M., Spears, R., & Leach, C. W. (2010). Experimental evidence for a dual pathway model analysis of coping with the climate crisis. *Journal of Environmental Psychology, 30*(4), 339–346. https://doi.org/10.1016/j.jenvp.2010.02.006

Wang, S., Hurlstone, M. J., Leviston, Z., Walker, I., & Lawrence, C. (2019). Climate change from a distance: An analysis of construal level and psychological distance from climate change. *Frontiers in Psychology, 10*, Article 230. https://doi.org/10.3389/fpsyg.2019.00230

Wang, S., Hurlstone, M. J., Leviston, Z., Walker, I., & Lawrence, C. (2021). Construal-level theory and psychological distancing: Implications for grand environmental challenges. *One Earth, 4*(4), 482–486. https://doi.org/10.1016/j.oneear.2021.03.009

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

Wiest, S. L., Raymond, L., & Clawson, R. A. (2015). Framing, partisan predispositions, and public opinion on climate change. *Global Environmental Change, 31*, 187–198. https://doi.org/10.1016/j.gloenvcha.2014.12.006

Wozniak, A., Wessler, H., Chan, C.-h., & Lück, J. (2021). The event-centered nature of global public spheres: The UN climate change conferences, Fridays for Future, and the (limited) transnationalization of media debates. *International Journal of Communication, 15*, 688–714. https://ijoc.org/index.php/ijoc/article/view/14843/3344

Wullenkord, M. C., & Ojala, M. (2023). *Climate-change worry among two cohorts of late adolescents: Exploring macro and micro worries, coping, and relations to climate engagement and well-being* [Preprint]. PsyArXiv. https://doi.org/10.31234/osf.io/g9pm7

Wullenkord, M. C., & Reese, G. (2021). Avoidance, rationalization, and denial: Defensive self-protection in the face of climate change negatively predicts pro-environmental behavior. *Journal of Environmental Psychology, 77*, Article 101683. https://doi.org/10.1016/j.jenvp.2021.101683

PsychOpen GOLD