



# Meditation, Not Information? A Survey Experiment Probing the Effects of Meditation Practice on Affective Polarization and Pro-Environmentalism

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## Abstract

**Objectives** Climate change is one of the most pressing issues of our time. However, current policies are insufficient to keep climate change at manageable levels. In the United States, this is partly because attitudes and opinions on climate change have become increasingly divided along political party lines, making effective policymaking difficult. The existing literature has focused chiefly on cognitive (i.e., informational) approaches to increasing climate change awareness, which are often counterproductive due to patterns of biased information processing. We examined whether meditation can reduce affective polarization and the partisan divide on climate change.

**Method** Using a preregistered survey experiment with 500 US respondents, we investigated whether a short (10-min) meditation practice would render partisans less polarized and more pro-environmental. Participants completed either a mindfulness meditation practice designed to cultivate awareness of thoughts and sensations, a loving-kindness meditation practice designed to cultivate unconditional love and compassion, or no meditation.

**Results** Self-identified Republicans who completed the loving-kindness meditation subsequently reported significantly lower polarization scores compared to Republicans who did not meditate. Surprisingly, self-identified Democrats who completed the mindfulness meditation exhibited higher anthropocentrism than Democrats who did not meditate. This suggests that mindfulness meditation may, in some cases, reduce some aspects of pro-environmentalism.

**Conclusions** Our results suggest that a short loving-kindness meditation can reduce polarization among Republicans. A form of mindfulness that cultivates awareness of thoughts and sensations but not interpersonal connectedness can have unintended side effects by fostering an anthropocentric worldview among Democrats.

**Preregistration** This study was preregistered (<https://osf.io/nza78>).

**Keywords** Mindfulness · Political polarization · Affective polarization · Climate change

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## Introduction

In her keynote speech at the World Economic Forum in 2020, former German Chancellor Angela Merkel addressed two of the most pressing issues of our time: climate change and political polarization. Observing that a growing rift is dividing societies, with young, impatient protestors on one side and “a huge group of people who don’t think [climate action] is urgent” on the other, Merkel warned that “there are already considerable social conflicts” revolving around the issue of climate change. She insisted that reconciling facts with emotions is nothing short of “the greatest social task” we face today (World Economic Forum, 2020).

Developments across countries demonstrate that public opinion on climate change has become increasingly polarized over the last decade, with people sorting themselves into opposed camps and discussions growing emotional in both the United States (US) (Dunlap et al., 2016; McCoy et al., 2018) and Europe (McCright et al., 2016). This so-called issue polarization sweeps away common ground and makes compromises difficult. The *Gilets jaunes* protests in France are a cautionary tale of what can happen if social and environmental issues are played against each other (Fisher, 2020): a divide over substance can translate into an affective divide between groups of people. In the United States, animosity between party members, known as affective polarization (Iyengar et al., 2019), has reached unprecedented levels (McCoy et al., 2018), with discrimination based on party affiliation exceeding discrimination based on race (Iyengar & Westwood, 2015). Investigations into cross-national social media discussions echo these findings: analyzing Twitter discussions about major climate change conferences from 2014 to 2021, Falkenberg et al. (2022) observed that opinions became increasingly ideologically polarized. Affective polarization follows suit, with intergroup hostility between believers and disbelievers rising, as Tyagi et al. (2021) highlight in their analysis of Twitter discourses from 2017 to 2019.

These processes of issue and affective polarization are mutually reinforcing; as animosity grows, issue positions harden, and vice versa (Rogowski & Sutherland, 2016). In the United States, this dynamic is particularly worrisome in the context of climate change, which is one of the most pressing issues humanity is facing. Attitudes toward climate change mitigation policies are polarized along party lines (Dunlap et al., 2016), hindering effective policymaking and implementation (e.g., Abramowitz & Saunders, 2008).

A traditional approach to promoting climate action builds around the information deficit model. This model implies that if people knew more about climate change, they would be more likely to act on it. However, educating people about the causes and consequences of climate change rarely yields the expected effects. Biased patterns of information-seeking and processing hinder attitudinal and behavioral changes and amplify rather than alleviate existing polarization due to backfire effects (Burdein et al., 2006; Druckman & Lupia, 2016; Nyhan & Reifler, 2015; Zhou, 2016). More recent approaches, therefore, intended to tackle the issue by taking into account people's identity or emotions (Ahler & Sood, 2018; Cakanlar, 2024; Levendusky, 2018; Long et al., 2022; Ma & Hmielowski, 2022), an avenue along which our paper proceeded, as well. Building on recent research on meditation and its effect on reducing affective polarization (Simonsson et al., 2022a, 2022b, 2022c, 2023), we investigated whether a short meditation intervention can increase pro-environmentalism and reduce polarization simultaneously.

In the United States, political ideology significantly drives environmental attitudes, particularly toward climate change (Dunlap & McCright, 2008; Hazlett & Mildenerger, 2020). Initially a cross-cutting issue, climate change has been increasingly subsumed under left-wing politics. At the same time, individuals on the right of the political spectrum tend to be less supportive of environmental protection and climate action (Dalton, 2009). For example, although most Republicans and Democrats acknowledge the existence of climate change, Democrats are more likely to believe in the human contribution to climate change. In 2014, 70% of Republicans and 93% of Democrats expressed some level of belief in anthropogenic climate change, while in 2016, these figures shifted to 63% for Republicans and 89% for Democrats (Van Boven et al., 2018), suggesting that the gap has widened.

Bipartisan opinion gaps can grow because political parties respond accordingly by catering to their different electorates (Knill et al., 2010; S. Lim & Duit, 2018). This relationship is particularly well studied in the US context (Currie & Choma, 2018), where climate change and its causes, as well as appropriate policy responses, continue to be one of the most contentious issues in the political system (Pew Research Center, 2022, 2023).

Another reason for the self-reinforcing nature of bipartisan opinion gaps is *biased information-seeking and processing*. To provide a recent example, Gustafson et al. (2019) described the negative trajectory of bipartisan support of the Green New Deal (GND), a US climate change and economic renewal policy proposal. Before the GND was in the national spotlight, most members of both parties supported it. Four months later, polarization was apparent, with Democrats more strongly in favor of the GND than Republicans were. Selective information-seeking is likely to underlie this development: Republicans who had heard much about the GND were most against it. The opposite was true for Democrats; the more they heard about it, the more they supported it. This example and other examples (e.g., Burdein et al., 2006; Druckman & Lupia, 2016; Peterson & Iyengar, 2021) suggest that partisans gather and process new information to reinforce their previous beliefs, some of which are derived from their party affiliation.

Simply providing climate skeptics with information on climate change often results in backfire effects that increase (rather than reduce) climate skepticism (Druckman & McGrath, 2019) and might, at least partially, explain the inconsistent findings regarding the relationship between education and climate attitudes. While more educated people support climate action in Europe (Meyer, 2015), in the US, the positive relationship between more education and pro-climate action holds for Democrats but not Republicans (Hamilton, 2011).

In the context of US Democrats and Republicans, a divide over affect accompanies an ideological divide over substance. The development of ideological polarization is not yet foreseeable (Abramowitz & Saunders, 2008; Fiorina et al., 2008; Menchaca, 2023). However, hostility between rival political partisans, known as *affective polarization*, is increasing in the US. Whether measured using feeling thermometers, trait attributions, or social distance indicators, citizens increasingly dislike and distrust those from the other party (Iyengar et al., 2019; Tyler & Iyengar, 2023). Driven by a surge in out-party animus, affective polarization has reached unprecedented levels, with discrimination based on party affiliation exceeding racial discrimination (Iyengar & Westwood, 2015).

The consequences of affective polarization can disrupt the social fabric of democracies and inhibit effective measures against climate change. The increasingly negative affect toward out-party members spawns socially homogenous interpersonal networks (Gimpel & Hui, 2015) that amplify like-minded views while warding off contradictory information. The resulting social homophily can have two adverse effects. For example, homogenous groups reinforce selective information exposure and processing mechanisms, thereby hardening issue positions even further (e.g., Santos et al., 2021). Furthermore, fewer social contacts across group boundaries diminish the need and willingness to compromise (e.g., Barberá, 2020). Breaking this self-reinforcing cycle is vital to finding solutions to societal problems that require support from different groups.

With these negative consequences of affective polarization becoming apparent, the search for solutions has accelerated and become primarily concerned with the redefinition of group boundaries. To varying degrees, four strands of literature indicate that highlighting commonalities over differences is critical for overcoming affective polarization. First, framing scholars have found that broadening the middle ground is crucial. Portraying news in a civil tone in partisan media reduces affective polarization (Druckman et al., 2019), irrespective of issue agreement (Skytte, 2021). Second, when leaders connect warmly and show mutual respect, affective polarization is lower (Huddy & Yair, 2021). The same pattern is visible among citizens; when the public is portrayed as moderate, affective polarization drops (Levendusky & Malhotra, 2016). Second, flipping the ills of group identity, Levendusky (2018) found that priming the superordinate American identity lowers hostility between partisan groups. However, simply shifting the line that separates ingroups from outgroups is risky, as Wojcieszak and Garrett (2018) have pointed out. The resulting increased importance of national identity could negatively impact foreigners if it exacerbates polarization on the issue of immigration. Third, Ahler and Sood (2018) deconstructed group identity by highlighting the diversity of

supposedly homogenous ideological camps. When common misperceptions about group members are corrected, social threat and perceived hostility plummet (see also Druckman et al., 2022). Fourth and finally, when the boundaries of group identity are blurred by enhancing intergroup contact, whether real or imagined, direct or indirect, out-party hostility between members of opposed groups is attenuated (Miles & Crisp, 2014), particularly in the political domain (Warner & Villamil, 2017; Wojcieszak & Warner, 2020).

If treatments are perceived as autonomy-limiting, participants are inclined to counteract the external control by rebelling against the perceived source of pressure, which leads to increased hostility (Bail et al., 2018; Legault et al., 2011). For another, the *universality of effects* is limited. Interventions targeting specific outgroups (e.g., opposing partisans) might reduce intergroup bias in one case but could engender another with a boundary shift that produces a new outgroup (Wojcieszak & Warner, 2020).

We expect meditation to outperform traditional approaches to political polarization and environmental inaction. In contrast to other intervention strategies, meditation does not require deconstructing existing group identities or developing communication frames. Instead, it addresses the emotional aspects of polarization and biased reasoning. In this sense, it is universal in its application and potentially less prone to backfiring. The following section discusses the principles of meditation, before outlining how its practice might reduce polarization and increase climate change awareness.

### **Cultivating Common Ground: How Meditation Practice Might Increase Pro-sociality and Pro-environmentalism**

Meditation can be broadly defined as a mental practice in which an individual focuses attention on a particular object (e.g., the breath, an image, an emotion) or openly monitors the flow of conscious awareness (Farias et al., 2020). Mindfulness meditation (MM) and loving-kindness meditation (LKM) are two of the most widely applied types (Fox et al., 2016). Mindfulness is the ability to “pay attention in a particular way: on purpose, in the present moment, and non-judgmentally” (Kabat-Zinn, 1994, p. 7), thereby developing a detached mindset that allows for neutral responses to external stimuli. LKM builds on this foundation but involves intentionally cultivating feelings of kindness and connectedness by silently wishing oneself and others well (Salzberg, 1995). While MM and LKM are considered inseparable in the Buddhist tradition (Brach, 2020), current secular practice and research have begun disentangling them, revealing their different mechanisms and effects. The following section acknowledges these developments and reviews the extant

research on the relationship between MM/LKM and affective polarization/pro-environmentalism.

### Meditation Practice and Affective Polarization

For several decades, the *intrapersonal* effects of MM have attracted enormous scholarly attention, showing that both dispositional mindfulness and mindfulness inductions benefit psychological and physical health and cognitive functioning (Creswell, 2017; Creswell et al., 2019; Jha et al., 2007; Keng et al., 2011). However, exploration of the *interpersonal* effects of mindfulness has gained momentum only recently.

Accumulating evidence suggests that dispositional mindfulness affects not only how we relate to ourselves but also the way we relate to others. Mindful people are more empathic (Birnie et al., 2010; Hunsinger et al., 2014) and compassionate (D. Lim et al., 2015), forgiving (Karremans et al., 2020), prosocial (for a meta-study, see Donald et al., 2019), and less prejudiced (Fuochi et al., 2023; Nicol & De France, 2022; Salvati et al., 2019; Verhaeghen & Aikman, 2020).

Experimental studies have suggested that this relationship is more than correlational, rendering meditation a potential lever for reducing affective polarization. Randomized controlled trials and quasi-experiments have found mindfulness meditation to reduce implicit bias (Lueke & Gibson, 2015; for an overview, see Oyler et al., 2022; Schimchowitsch & Rohmer, 2016; Tincher et al., 2016), reliance on stereotypes (Ingold & Lueke, 2023), explicit prejudice toward various stigmatized groups (Hunsinger et al., 2014), and discriminatory behavior (Lueke & Gibson, 2016). Conversely, mindfulness interventions have been shown to improve intergroup attitudes (Alkoby et al., 2017; Zheng et al., 2023) and make people more likely to help others who suffer (Condon et al., 2013), regardless of whether these others are strangers or acquaintances (Berry et al., 2023).

Similarly, brief LKM inductions have the potential to reduce implicit bias against homeless and African American people (Kang et al., 2014; Stell & Farsides, 2016), alleviate intergroup anxiety (Parks et al., 2014), enhance future contact intentions with outgroup members (Parks et al., 2014), increase feelings of social connectedness and positivity toward strangers (Hutcherson et al., 2008; Parks et al., 2014), and foster empathy and compassion (Chen et al., 2021). Drawing on the benefits of both MM and LKM, two studies suggest substantial attitudinal and behavioral changes following months-long school interventions (Berger et al., 2018; Flook et al., 2015).

Important for our context, LKM also reduced affective polarization in a set of previous studies by Simonsson and colleagues. In the heated political climate of the US, even a brief loving-kindness intervention modestly reduced affective polarization by producing more positive feelings toward

the political outgroup than toward the political ingroup (Democrats vs. Republicans; Simonsson et al., 2022c). Similarly, a brief befriending intervention reduced affective polarization surrounding the Brexit debate in the UK (Remain vs. Leave) by increasing the perceived commonality with the outgroup (Simonsson et al., 2022b). Extending the intervention duration and incorporating both LKM and MM practices, Simonsson et al. (2022a) detected modest reductions in affective polarization following an eight-week mindfulness-based intervention based on the Finding Peace in a Frantic World curriculum (Williams & Penman, 2012).

Alongside increasing research interest, mindfulness has found its way into politics: initiatives to introduce mindfulness as a means of enhancing dialogue between politicians of different parties have been implemented in the US and—most prominently—in the UK (Bristow, 2019; The Mindfulness Initiative, 2023). Qualitative evaluations of mindfulness training with Members of the British Parliament suggest that group-based meditation training helped participants to relate to other politicians and their viewpoints more humanely and constructively (Simonsson et al., 2023).

While the majority of research suggests that both MM and LKM interventions have the potential to improve intergroup relations, research suggests that the relationship between mindfulness meditation and intergroup relations might not be straightforward. For instance, Petersen and Mitkidis (2019) could not detect an increase in tolerance toward outgroup members after a short breathing induction. Other research has identified detrimental effects of meditation practice in the moral domain. Frank et al. (2021) suggested that meditation can induce a self-confirmation process that reinforces prevailing values and expectations rather than reshaping them. Schindler et al., (2019, p. 1066) raise similar concerns, arguing that practicing a “naked form of mindfulness”, devoid of ethical values, can reduce repair intentions by attenuating feelings of guilt (for a critical perspective on mindfulness interventions, see also van Dam et al., 2018).

On a philosophical level, the political potential of mindfulness has been discussed as a cornerstone of sustainable political activism and future-proof transformation in the pluralist field of social justice and environmental protection (Chari, 2016; Ferguson, 2016; Mathiowetz, 2016; Moore, 2016; Rowe, 2016).

### Meditation Practice and Pro-environmentalism

In addition to the potential ameliorative effect on affective polarization, existing research indicates that meditation can also increase pro-environmentalism, which, following Milfont et al., (2019, p. 2), we define as “concern for the environment, and support for environmentally-friendly attitudes, intentions and behaviors”.

In line with this reasoning, correlational evidence suggests that *dispositional mindfulness* is positively related to belief in climate change (Panno et al., 2018), motivation for climate adaptation measures (Wamsler & Brink, 2018), and self-reported pro-environmental behavior (Amel et al., 2009; Barbaro & Pickett, 2016; Hanley et al., 2020; Hunecke & Richter, 2019; Richter & Hunecke, 2020). By comparing long-term practitioners with non-practitioners, Riordan et al. (2022) found that meditation relates to higher pro-environmental attitudes but not to more pro-environmental behavior. Loy and Reese (2019) and Loy et al. (2022) reported that mind–body practitioners exhibited more pro-environmental behavior and climate policy support. These pieces of evidence, however, do not provide evidence that meditation promotes pro-environmentalism.

Experimental studies that could provide causal evidence for the effect of meditative practice on pro-environmentalism are scarce and contradictory. Geiger and colleagues investigated the effects of mindfulness-based interventions (MBIs) on one segment of pro-environmentalism, *sustainable consumption attitudes*, and *behavior* (for an encompassing review of the mindfulness-sustainable consumption nexus, see Fischer et al., 2017; Geiger et al., 2020). They detected moderate effects of MBIs on precursors of sustainable consumption behavior but no effects on actual behavior among adolescents (Böhme et al., 2018) and adults (Geiger et al., 2020; Stanszus et al., 2019). A qualitative investigation into the effects of consumption-specific mindfulness training mirrors this view, suggesting that changes in attitudes do not necessarily translate into action (Frank et al., 2021). Shifting attention to other aspects of consumption, Errman et al. (2021) found that a brief mindfulness induction made participants more likely to choose a pro-environmental hotel option, and Frank et al. (2022) found that a guided introspection exercise can reduce rationalization of meat consumption. Ray et al. (2020) detected increases in *general pro-environmental behavior* (measured via the Pro-Environmental Behavior Scale (PEBS); Whitmarsh & O’Neill, 2010) following a 4-week online meditation program. Results of a waitlist-controlled trial involving a 10-week mindfulness-based intervention tailored toward climate-friendly leadership suggest that pro-environmental behavior increased at both the individual and the organizational level. However, the effects on pro-environmental attitudes were small (Ramstetter et al., 2023). Findings did not replicate in a randomized controlled trial involving an 8-week MBSR intervention with an active control condition: increases in pro-environmental behavior were not unique to the mindfulness intervention but also unfolded following a structurally equivalent health enhancement program (Riordan et al., 2022). Aiming to distinguish the effects of different meditation practices, a recent survey experiment found that walking meditation (but not LKM or MM

interventions) increased pro-environmental intentions and climate change policy support (Bayle-Cordier et al., 2023).

Taken together, evidence of a causal effect of meditation on pro-environmentalism remains equivocal. Furthermore, due to selection biases and small sample sizes (Thiermann & Sheate, 2021), the available results must be interpreted with caution. In contrast to the ameliorative effect of meditation on affective polarization, its effect on pro-environmentalism is empirically less well supported.

Does meditation causally affect pro-environmentalism, and if yes, what aspects are affected to what extent? To address this question, we employed a series of measures of attitudes and intentions regarding climate change and the environment. The rationale behind choosing attitudes and intentions is based on theories of behavior, including the theory of reasoned action (Fishbein & Ajzen, 1975) and the theory of planned behavior (Ajzen, 1985). These theories agree that for “planned” or “reasoned” pro-environmental action to happen, people first need to have pro-environmental attitudes. To measure these attitudes, we used general measures of environmental concern, as well as specific measures of belief in (the anthropogenic nature of) climate change and the belief that humans have more rights than the rest of nature and should rule about nature, which has been referred to as anthropocentrism (Dunlap et al., 2000). To measure pro-environmental intentions, we measured people’s willingness to personally and collectively pay for costly climate action at the cost of wealth, freedom, and opportunity.

One can expect meditation to affect pro-environmentalism via the same mechanisms outlined for affective polarization above. Meditation increases *connectedness* not only with others but also with nature (Adventure-Heart & Provee, 2017; Ray et al., 2020; Thiermann & Sheate, 2022), a known predictor of pro-environmentalism (Barragan-Jason et al., 2022; Whitburn et al., 2020). Analogously, *adaptive emotion regulation strategies* facilitate adequate engagement with information in intergroup conflict (Halperin, 2014a) and climate change debates (Panno et al., 2015). In addition, *increases in compassion* are positively linked to stronger beliefs in anthropogenic climate change (Lu & Schuldt, 2015), pro-environmental intentions (Pfattheicher et al., 2016), and the willingness to make lifestyle changes to avert climate change (Dickinson et al., 2016).

## The Present Study

This study moved beyond this state of the art, investigating whether two different kinds of meditation, mindfulness meditation and loving-kindness meditation, can help overcome the intertwined challenge of affective polarization and climate change. Insights into the mechanisms of meditation practice suggest that three interdependent processes

might engender these effects: First, research suggests that both LKM and MM increase *connectedness with others* (Adventure-Heart & Proeve, 2017; Hutcherson et al., 2008; Kok & Singer, 2017) and *with nature* (Adventure-Heart & Proeve, 2017; Lengieza & Swim, 2021; Ray et al., 2020). Meditation practices typically allow people to understand better that they are not living in isolation but are inevitably connected to others and nature. Consequently, individuals should recognize and understand that climate change affects all human beings.

Second, meditation tends to help individuals *constructively engage with their emotions* (Frank et al., 2022; Hölzel et al., 2011). Adaptive emotion regulation strategies facilitate adequate engagement with information not only in the context of intergroup conflict (Halperin & Gross, 2011; Halperin & Pliskin, 2015; Halperin, 2014b) but also in the context of climate change (Panno et al., 2015; van Valkengoed et al., 2023).

Third, meditation can increase *compassion for others* (Birnie et al., 2010) and *for nature* (Pfattheicher et al., 2016), allowing people to recognize and care about the fact that—while they may not yet be affected by climate change—others already are or will be soon. Increases in compassion are positively linked to a stronger belief in anthropogenic climate change, pro-environmental intentions (Pfattheicher et al., 2016), and the willingness to make lifestyle changes to avert climate change (Dickinson et al., 2016).

While both meditation practices, MM and LKM, are positively associated with markers of pro-sociality and pro-environmentalism, LKM aims to intentionally cultivate kindness and compassion for others (Salzberg, 2011). In particular, the effect of LKM on connectedness is considered profound as “loving-kindness is a quality of the heart that recognizes how connected we all are” (Salzberg, 2011, p. 177). Therefore, we speculate that LKM has a larger effect than MM on affective polarization. Literature suggesting a more prominent effect of LKM on other-focused concern (Boellinghaus et al., 2014) and positive emotions (Fredrickson et al., 2017), both linked to stereotype and prejudice reduction, corroborates this claim.

Based on these theoretical expectations, we derived the following hypotheses: First, we expected that both the mindfulness and loving-kindness treatments would lead to lower affective polarization than a control treatment, with the loving-kindness treatment yielding a stronger effect. Second, we expected both the mindfulness and the loving-kindness treatments to promote pro-environmentalism, with the loving-kindness treatment having a more pronounced effect.

Using an original survey experiment, we empirically tested whether meditation can increase pro-environmentalism and reduce affective polarization. By randomly allocating participants to the meditation groups, we controlled

for the apparent selection into meditation uptake that plagues purely observational studies. Therefore, our study expanded on previous studies by Simonsson et al. (2022a, 2022b, 2022c) who tested the effects of an 8-week meditation course and brief mindfulness or befriending meditation interventions on polarization. To sum up, the rationale for this study was to explore the potential of two types of meditation, mindfulness meditation, and loving-kindness meditation, as tools to address the dual challenges of affective polarization and climate change. We hypothesized that these meditation practices would foster a sense of connectedness, facilitate constructive emotional engagement, and enhance compassion, promoting pro-environmentalism and reducing affective polarization.

## Method

### Participants

We conducted a randomized controlled survey experiment to test our preregistered hypotheses (<https://osf.io/4xfnw>). Participants were recruited via Prolific Academic, an online crowdsourcing platform. Like Amazon MTurk, Prolific produces data quality comparable to traditional participant pools. Prolific, however, offers advantages in that it draws on a more diverse participant pool, with participants being more naïve to experimental tasks and fairly reimbursed through ethical pricing (Peer et al., 2017). Using Prolific’s pre-screening function, we recruited 698 US citizens aged 18 or above who identified either as Democrat or Republican, excluding Independents and non-identifiers from our sample. To achieve a balanced sample regarding party identification, we recruited participants in seven waves from June 18, 2021, to October 4, 2021. To avoid participant biases, our study was advertised using a non-informative title (“Public Opinion and Contemporary Issues: Your Values and Beliefs”).

The sample size was determined based on a previous study, which found that a 10-min loving-kindness meditation led to lower political polarization between Democrats and Republicans in the United States ( $d=0.31$ ) than a 10-min audio recording about mindfulness meditation (Simonsson et al., 2022c). A power analysis with the R package *pwr* (Champely et al., 2020) suggested that to detect an effect of equivalent size ( $f=0.15$ ) at 80% power and an alpha of 0.05 in a one-way ANOVA would require a sample size of 432 participants. To control for the multiple comparisons problem that results from conducting three statistical tests in total (the dependent measures being two measures of political polarization and one measure of pro-environmental attitudes), we divided the alpha by 3. This resulted in a recommended sample size of 564 (188 per group). In anticipation of having to exclude participants, we decided to oversample

by 10%, which resulted in the preregistered sample size of  $n = 618$ .

## Procedure

Participants who decided to participate in the study were directed to an online questionnaire to complete the questionnaire and undergo treatment. After completing the survey experiment, participants were debriefed with information about the study goal.

Respondents were randomly assigned to one of the following three conditions. Participants in the mindfulness meditation (MM) group listened to a 10-min mindfulness meditation focusing on the impermanence of thoughts and sensations. During the recording, participants had to find a comfortable posture in an undisturbed atmosphere that allowed them to attend to arising sounds, thoughts, and sensations. The recording encouraged participants to approach feelings and thoughts with a kind, curious attitude and to notice their tendencies to label or judge them. Participants were repeatedly reminded to observe how thoughts and sensations arise and dissolve, to refrain from judgment, and to return to the present moment by focusing on the breath.

Participants in the loving-kindness meditation (LKM) group listened to a 10-min meditation encouraging them to generate warmth and friendship toward themselves and others. In a comfortable posture in an undisturbed atmosphere, listeners were asked to wish themselves well by repeating positive affirmations (e.g., “May I be safe and free from suffering”). If thoughts and emotions arose, participants were asked to acknowledge them non-judgmentally and return to the present moment by focusing on their breath. Participants then recalled a loved one and wished him or her well in the same way. To widen the circle of kindness, the meditation asked participants to extend these wishes to someone difficult and, finally, to all living beings. Both audio files were recorded by Mark Williams and are based on a well-established mindfulness curriculum (Williams & Penman, 2012) and have been used previously by Simonsson et al., (2022a, 2022b, 2022c). Section B of the Supplementary information provides transcripts of the MM and LKM interventions.

Participants in the control group did not undergo any treatment. Instead, they were instantly redirected to the post-intervention section of the survey, where affective polarization, pro-environmental, climate change attitudes, and potentially mediating variables were probed.

To ensure high data quality, we excluded participants who failed one or more of the three *attention checks*. They were (a) a question about what the audio file instruction asked them to do ( $n_{\text{failed}} = 32$ ); (b) an item in the environmental attitudes battery asking them to choose a particular answer option ( $n_{\text{failed}} = 46$ ); and (c) the time spent on the survey page that instructed participants to meditate for at least 10 min

( $n_{\text{failed}} = 76$ ). In addition, a *manipulation check* after the intervention inquired whether participants could let thoughts come and go (MM) or generate feelings of kindness (LKM). Subjects choosing the *not at all* option were also excluded from the sample ( $n_{\text{failed}} = 4$ ), resulting in a final sample size of  $n = 541$ . The sample was slightly smaller than planned, lowering the statistical power from the desired 80 to 78%. Figure E1 in the Supplementary information presents a visual illustration of the exclusion procedure.

## Measures

Before treatment, we collected demographic information (e.g., gender, age, education, income) and measured political orientation (“Where would you place yourself on this scale in general?”; 1 = *Extremely liberal*; 7 = *Extremely conservative*). In addition to people’s general political orientation, we asked them, “In terms of social and cultural issues, how liberal or conservative are you?” and “In terms of economic issues, how liberal or conservative are you?” (1 = *Extremely liberal*; 7 = *Extremely conservative*). We also measured party affiliation by asking people to categorize themselves as *strong/weak/lean Democrats*, *strong/weak/lean Republicans*, or *pure Independents*. Regarding key demographics, our sample was slightly more liberal (sample mean = 3.82, population mean = 4.09), more female (sample percentage: 67.2, population percentage: 50.6 percent), younger (sample median = 27.0, population median = 38.5 years), and more ethnically diverse (sample share Caucasian = 73.8%, population share Caucasian = 76.3%) than a truly representative US sample (American National Election Studies, 2021; United States Census Bureau, 2021). Importantly, the treatment and control groups did not differ significantly regarding key demographics (Table C1/S9 in the Supplementary information).

After the intervention, we measured *affective polarization* using two widely applied measures similar to a previous study (Simonsson et al., 2022c). First, a *thermometer scale* was used to probe participants’ feelings toward members of their party and the other party on a 100-point scale, with 0 indicating cold and unfavorable and 100 indicating warm and favorable (Lelkes & Westwood, 2017). Polarization scores were calculated as the difference in feeling scores between a respondent’s party and the opposition party. Second, *trait ratings* assessed respondents’ susceptibility to stereotypes by asking them to rate how well eight attributes (e.g., intelligent, generous, selfish, mean) described in- and outgroup members (Iyengar et al., 2012). We calculated polarization scores as the difference between ingroup and outgroup scores for positive traits (e.g., intelligent) and vice versa for negative traits (e.g., selfish) so that higher scores indicated more polarization. We then obtained an average trait polarization score. Unlike Simonsson et al. (2022c), who asked

respondents to rate both voters and elected officials when completing the polarization measures, participants in our study only rated voters, thereby avoiding contamination from elite to mass polarization. Another difference was that our study did not include a trust measure because there was no evidence that loving-kindness meditation reduced trust-related polarization. In addition, we only measured affective polarization after the intervention rather than pre- and post-intervention, as Simonsson et al. (2022c) did. The internal consistency of the trait rating indicator of affective polarization indicators was acceptable, with  $\alpha=0.87$  ( $\omega=0.90$ ) for Democrats and  $\alpha=0.86$  ( $\omega=0.91$ ) for Republicans.

After the intervention, we measured *pro-environmentalism* using a battery of measures related to affect, cognition, intention, and values. We measured people's *environmental concern* (3 items;  $\alpha=0.70$ ;  $\omega=0.73$ ; e.g., "The balance of nature is very delicate and easily upset") and people's *willingness to pay for costly climate action* as a society (2 items;  $\alpha=0.63$ ; e.g., "The state should do more to advance society's climate mitigation goals, even if it means restricting the freedom and opportunities of individuals."). In addition, we measured people's *belief in climate change* (4 items;  $\alpha=0.82$ ;  $\omega=0.84$ ; e.g., "I do not believe that global warming is really happening"; reverse-scored) and *anthropocentrism* (3 items;  $\alpha=0.71$ ;  $\omega=0.75$ ; e.g., "Humans were meant to rule over the rest of nature"), which is antithetical to pro-environmentalism and should be interpreted in reverse. The items of these subscales were drawn from the New Environmental Paradigm Scale (Dunlap et al., 2000), the Special Eurobarometer 490 (European Commission: Directorate-General for Climate Action, 2019), the Swiss Environmental Panel Study (Quoß et al., 2021), and the Environmental Attitudes Inventory (Milfont & Duckitt, 2010). Participants responded using a 5-point scale ranging from *strongly disagree* to *strongly agree*. Section A of the Supplementary information provides a complete list of the items.

After the intervention, we also administered other scales to measure constructs related to meditation, including *dispositional mindfulness* as assessed with the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007), *self-compassion* with the self-compassion scale (Neff, 2016), *compassion with others* with the Others scale of the Sussex-Oxford Compassion Scale (SOCS-O; Gu et al., 2020), and *emotion regulation* using the Non-reactivity subscale of the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2022). Table C2/S10 provides means and standard deviations of all measures used in the study.

## Data Analyses

To test our hypotheses, we conducted a series of linear regression models with our two experimental conditions

(LKM, MM) as the predictor, and affective polarization and environmentalism as the dependent variables while controlling for party affiliation (0 = Democrat; 1 = Republican), age, gender (0 = male; 1 = female), income (1 = \$14,999 or less, 9 = \$200,000 and over), and education level (1 = did not complete high school; 6 = advanced degree; see Table C1/S9 for a summary of these variables). As preregistered, we did not model any interactions between the predictors.

We analyzed the data as close as possible to our preregistered analysis plan, but we deviated from this plan in several ways. First, we ran fixed-effects regression analyses for each measure instead of a mixed-effects model in which the different measures were modeled as different levels of a random factor. We did this because this modeling choice would be incompatible with the concept of a random effect. For exploratory purposes, we also fitted these models to the subsamples of Democrats and Republicans, excluding the party affiliation predictor. Second, we also ran a version of these models in which we standardized the predictor and outcome variables (Tables D2/S12 and D3/S13 in Section D of the Supplementary information) to obtain standardized regression coefficients ( $\beta$ ) that serve as effect size measures. We interpreted the standardized regression coefficients following Acock (2008), with  $\beta=0.10$  indicating a small,  $\beta=0.30$  a medium, and  $\beta=0.50$  a large effect. A third deviation from the preregistered analysis plan was that the number of participants in the final sample ( $n=541$ ) was smaller than the figure from the preregistered power analysis. We achieved a statistical power of 78% instead of 80%.

We also preregistered and tested a third hypothesis, according to which the effects of the mindfulness interventions are mediated by self-compassion, compassion with others, emotion regulation, connectedness with nature, anthropocentrism, and dispositional mindfulness (see <https://osf.io/nza78>). Because these analyses yielded hardly any indirect effects, we reported these results in Table D1/S11 of the Supplementary information.

## Results

### Treatment Effects on Affective Polarization

The results, summarized in Table 1, partially support *Hypothesis 1* that a brief meditation intervention can reduce affective polarization. Republicans who completed the loving-kindness meditation (but not Democrats or Republicans who completed the mindfulness meditation) were less affectively polarized than participants in the control group. This effect was small ( $\beta = -0.13$ ). Note that this effect was significant only when affective polarization was measured via the thermometer scale, not via trait ratings. In the latter case, the effect was slightly weaker ( $\beta = -0.12$ ), as indicated

**Table 1** Results of the regression analyses of the effects of the mindfulness meditation (MM) and the loving-kindness meditation (LKM) on four aspects of affective polarization. Unless stated otherwise, the numbers given in the table represent regression coefficients (*b*) and

standard errors (SE; in parentheses). Among Republicans, LKM reduced affective polarization, as measured using the thermometer rating scale

	Thermometer ratings			Trait ratings		
	(1a) Overall	(1b) Republicans	(1c) Democrats	(2a) Overall	(2b) Republicans	(2c) Democrats
Intercept	<b>44.165***</b> (6.531)	<b>21.609**</b> (8.225)	<b>37.596***</b> (9.600)	<b>0.742***</b> (0.185)	<b>0.560*</b> (0.252)	0.446 (0.261)
Mindfulness meditation	-1.101 (2.949)	1.124 (3.820)	-2.707 (4.304)	-0.095 (0.084)	-0.033 (0.117)	-0.154 (0.117)
Loving-kindness meditation	-4.318 (2.854)	<b>-7.483*</b> (3.760)	0.088 (4.100)	-0.118 (0.081)	-0.198 (0.115)	-0.015 (0.112)
Age	0.004 (0.131)	0.264 (0.152)	-0.339 (0.227)	0.003 (0.004)	0.006 (0.005)	-0.001 (0.006)
Female	1.298 (2.749)	<b>-9.780**</b> (3.402)	<b>13.621**</b> (4.287)	0.084 (0.078)	-0.129 (0.104)	<b>0.326**</b> (0.117)
Income	0.479 (0.502)	0.132 (0.668)	0.577 (0.713)	<b>0.034*</b> (0.014)	<b>0.051*</b> (0.020)	0.015 (0.019)
Education	1.450 (0.991)	0.637 (1.274)	2.711 (1.480)	0.030 (0.028)	-0.035 (0.039)	<b>0.105**</b> (0.040)
Party identification: Republican	<b>-27.437***</b> (2.435)			<b>-0.431***</b> (0.069)		
$R^2$	0.208	0.079	0.067	0.089	0.053	0.061
Adj. $R^2$	0.197	0.058	0.046	0.077	0.031	0.040
<i>N</i>	536	267	269	536	267	269

\*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$ ; SE in parentheses

by Model 2a. Note that the loving-kindness meditation had almost no effect among Democrats ( $\beta = 0.001$ ).

Exploratory analyses revealed that party affiliation did not significantly moderate the effects of the interventions. Therefore, we have no evidence that the loving-kindness intervention affected affective polarization more among Republicans than among Democrats. It is merely the case that the effect among Republicans was sufficiently large to reach significance, whereas the effect among Democrats was not. Affective polarization was also predicted by party and gender. First, Republicans were less polarized than Democrats. The latter effect was medium to large ( $\beta = 0.45$ ). When assessed via trait ratings of voters, Democrats' affective polarization scores were also higher than those of Republicans ( $\beta = -0.27$ ), indicating a small- to medium-sized effect. Republican women were significantly less polarized than their male counterparts ( $\beta = -0.18$ ), whereas Democratic women were significantly more polarized than Democratic men ( $\beta = 0.21$ ). Higher education was associated with more affective polarization in terms of trait ratings among Democrats ( $\beta = 0.18$ ), but not (significantly) among Republicans ( $\beta = 0.12$ ). Finally, higher income was associated with higher affective polarization based on the trait rating measure (Table 1).

Considering the subdimensions of pro-environmentalism, we found that Democrats who completed the MM expressed higher anthropocentrism than control group participants (Table 2). That is, they agreed more with items such as "Humans were meant to rule over the rest of nature." The size of this effect, however, was small ( $\beta = 0.13$ ). The remaining indicators of environmentalism (environmental concern, belief in climate change, and willingness to pay) did not vary significantly based on which group participants were in (Table 2).

Party affiliation, age, gender, education, and income were related to our indicators of pro-environmentalism. First, all five indicators of pro-environmentalism were lower among Republicans than among Democrats. The coefficients ranged from  $\beta = -0.26$  to  $\beta = -0.54$ , indicating small to medium effect sizes. See Table D3/S13 for the results of a standardized version of the regression model reported in Table 2, which is informative about effect size. Second, gender had small to medium effects on several measures of pro-environmentalism. Women scored higher on environmental concern ( $\beta = 0.18$ ) and expressed more belief in climate change ( $\beta = 0.13$ ) and lower anthropocentrism ( $\beta = -0.25$ ). Notably, female gender predicted climate change beliefs among Democrats ( $\beta = 0.30$ ), but not significantly among Republicans

**Table 2** Results of the regression analyses of the effects of the mindfulness meditation (MM) and the loving-kindness manipulation (LKM) on four aspects of pro-environmentalism (Hypothesis 2). Unless stated otherwise, the numbers given in the table represent regression coefficients (b) and Standard errors (SE; in parentheses). Neither the MM nor the LKM increased led to significant increases in any of the measures. Among Democrats, the MM increased anthropocentrism, which is antithetical to pro-environmentalism

	Environmental concern				Climate change belief				Willingness to pay				Anthropocentrism					
	(1a) Overall		(1b) Demo- crats		(2a) Overall		(2b) Demo- crats		(3a) Overall		(3b) Demo- crats		(4a) Overall		(4b) Demo- crats		(4c) Republi- cans	
Intercept	<b>13.28***</b> (0.49)	<b>13.79***</b> (0.58)	<b>1.66***</b> (0.76)	<b>18.37***</b> (0.69)	<b>13.77***</b> (1.10)	<b>18.72***</b> (0.79)	<b>6.88***</b> (0.38)	<b>6.69***</b> (0.49)	<b>4.83***</b> (0.55)	<b>4.68***</b> (0.57)	<b>4.68***</b> (0.57)	<b>4.68***</b> (0.75)	<b>7.04***</b> (0.83)					
Mindfulness meditation	-0.31	-0.03	-0.56	-0.37	-0.59	-0.09	-0.12	-0.07	-0.15	0.49	0.76*	0.20						
Loving- kindness meditation	(0.22)	(0.26)	(0.35)	(0.31)	(0.51)	(0.35)	(0.17)	(0.22)	(0.26)	(0.26)	(0.34)	(0.38)						
Age	0.18	0.28	0.08	0.54	0.56	0.55	0.04	-0.03	0.13	-0.21	0.14	-0.59						
Female	(0.21)	(0.25)	(0.35)	(0.30)	(0.50)	(0.34)	(0.16)	(0.21)	(0.25)	(0.25)	(0.32)	(0.38)						
Income	<b>-0.03***</b> (0.01)	<b>-0.03*</b> (0.01)	<b>-0.03*</b> (0.01)	<b>-0.07***</b> (0.01)	<b>-0.07***</b> (0.02)	<b>-0.07***</b> (0.02)	<b>-0.02*</b> (0.01)	<b>-0.02</b> (0.01)	<b>-0.01</b> (0.01)	<b>0.03*</b> (0.01)	<b>0.03</b> (0.02)	<b>0.02</b> (0.02)	<b>0.02</b> (0.02)					
Education	<b>0.96***</b> (0.20)	<b>1.20***</b> (0.26)	<b>0.80*</b> (0.31)	<b>1.03***</b> (0.29)	0.50 (0.45)	<b>1.76***</b> (0.35)	0.21 (0.16)	<b>0.61**</b> (0.22)	-0.11 (0.23)	<b>-1.55***</b> (0.24)	<b>-1.98***</b> (0.34)	<b>-1.21***</b> (0.34)						
Party iden- tification: Republican	-0.05 (0.04)	-0.07 (0.04)	-0.04 (0.06)	-0.02 (0.05)	0.04 (0.09)	-0.09 (0.06)	-0.02 (0.03)	-0.01 (0.04)	-0.03 (0.05)	-0.03 (0.05)	-0.01 (0.04)	-0.03 (0.06)	-0.03 (0.07)					
	-0.01 (0.07)	<b>-0.18*</b> (0.09)	0.15 (0.12)	0.12 (0.10)	0.28 (0.17)	-0.05 (0.12)	<b>0.22***</b> (0.06)	<b>0.21**</b> (0.08)	<b>0.23**</b> (0.09)	<b>0.29***</b> (0.09)	<b>0.36**</b> (0.12)	0.23 (0.13)						
	<b>-1.96***</b> (0.18)		<b>-3.86***</b> (0.26)				<b>-2.11***</b> (0.14)					<b>2.19***</b> (0.21)						
R <sup>2</sup>	0.28	0.20	0.07	0.38	0.07	0.22	0.34	0.06	0.04	0.33	0.27	0.14						
Adj. R <sup>2</sup>	0.27	0.18	0.05	0.38	0.05	0.20	0.33	0.04	0.02	0.32	0.25	0.13						
N	536	269	267	536	267	269	536	269	267	536	269	267	536	269	269	267	267	267

\*\*\* $p < 0.001$ , \*\* $p < 0.01$ ; \* $p < 0.05$

( $\beta=0.07$ ). In contrast, Democratic women were more willing than Democratic men to pay collectively ( $\beta=0.18$ ), whereas this was not the case among Republican women and men ( $\beta=-0.03$ ). Third, there were small to medium effects of age: Older participants expressed less environmental concern ( $\beta=-0.14$ ), less belief in climate change ( $\beta=-0.19$ ), less willingness to pay ( $\beta=0.10$ ), and higher anthropocentrism ( $\beta=0.10$ ). Fourth, there was a small positive relationship between income and anthropocentrism: Higher income was associated with higher anthropocentrism ( $\beta=0.12$ ).

## Discussion

Current policy approaches fail to induce the changes needed to reach the aim of the Paris Agreement on Climate Change. In the US, one crucial factor forestalling effective climate policies is a polarized partisan debate between Democrats and Republicans about the importance of climate action. Disagreement on this issue fuels and is fueled by affective polarization between partisans. In this situation, where deep-seated political ideology affects how people perceive climate change, cognitive (i.e., informational) approaches to increase climate change awareness and action fail due to biased information processing (i.e., motivated reasoning). Providing facts about climate change can even be counterproductive because it hardens climate-skeptical positions.

We probed the potential of meditation to reduce affective polarization and increase environmental concern using an online survey experiment that included a 10-min audio meditation intervention. Based on a sample of more than 500 US respondents, the analysis revealed that loving-kindness meditation, a meditation type that intentionally creates feelings of warmth toward self and others, reduced affective polarization among Republicans. Note that this was only the case when affective polarization was measured via a thermometer scale. We did not observe the effect among Democrats. Yet, the effect of the manipulation did not significantly interact with participants' party affiliation: While we found that LKM significantly reduced Republicans' affective polarization, we do not know whether the effect was smaller for Democrats, as the interaction term did not reach statistical significance. In addition, our results suggest that meditation does not equal mindfulness. While LKM was partially effective at reducing affective polarization among Republicans, we found no evidence that mindfulness meditation (MM) also reduced affective polarization among either Democrats or Republicans. Our findings thereby partly support experimental evidence suggesting an ameliorative effect of different meditation interventions on affective polarization in different settings (UK: Simonsson et al., 2022a, 2022b, 2023; US: Simonsson et al., 2022c). Furthermore, our results echo recent research that shows that Democrats were more

polarized than Republicans, with Democratic women holding the most adverse opinions of members of the outgroup (for similar findings, see Ondercin & Lizotte, 2021).

Explanations for Republicans' higher receptivity to LKM interventions might be twofold. For one, Republicans' lower baseline levels of affective polarization and the accompanying greater openness might allow for a heightened impact of LKM. For another, characteristics such as group norms or psychological traits associated with conservative ideology could play a role. Republicans' increased readiness to embrace love and compassion through LKM could, for instance, be tied to their comparatively higher levels of religiosity (Layman, 1997; Legee & Kellstedt, 1993; Olson & Green, 2006). Further research would be necessary to disentangle these possibilities and explore the complex interplay between political orientation, religiosity, and openness to compassion-based practices.

LKM interventions appear to be partially effective in reducing affective polarization; however, they are not the sole means of addressing intergroup tensions. A recent study by Voelkel et al. (2024) evaluated 25 treatments, including befriending meditation, for their impact on affective polarization. While LKM demonstrated the anticipated positive effects, it was not among the most impactful interventions. Notably, alternative approaches, such as watching a video showcasing individuals building connections despite holding opposing political views and being informed that the majority of Democrats and Republicans belong to a "tired majority" (Voelkel et al., 2024) that is frustrated by polarization, were found to be more effective at reducing partisan animosity. These interventions highlight the value of narrative-driven and socially oriented strategies in promoting mutual understanding across political divides.

We did not find a significant effect of either type of meditation on measures of environmental concern, connectedness with nature, or willingness to pay for costly climate action on either side of the political spectrum. This indicates that neither MM nor LKM markedly reduced polarization regarding the issue of environmentalism. These findings mirror existing studies in the meditation-sustainability nexus that failed to detect causal effects of meditation (Frank et al., 2021; Geiger et al., 2020). Still, we found that participants who completed MM endorsed anthropocentrism more strongly, as they agreed more with items like "Humans were meant to rule over the rest of nature." The unintended negative effect of MM suggests that cultivating awareness of thoughts and sensations without cultivating compassion may not reduce polarization but foster an anthropocentric worldview. Similarly, Schindler et al. (2019) observed that breathing meditations did not affect people's intentions to repair damage after causing harm, or even reduce these intentions.

Common definitions of mindfulness mirror the optionality of loving-kindness in mindfulness practice. Mindfulness

is defined as paying attention in a particular way: on purpose, in the present moment, and non-judgmentally (Kabat-Zinn, 1994). This is even though compassion and wisdom are crucial to mindfulness (Boyce, 2011). In Buddhist practice, mindfulness is inextricably linked with the systematic cultivation of compassion, love, and kindness. The decoupling of mindfulness from loving-kindness in Western societies has led critics to conclude that “McMindfulness” (Purser, 2019) is just the latest self-help commodity of a profit-driven marketing industry. Future research should move beyond the narrow focus on mindfulness (van Dam et al., 2018) to an integrated understanding (and application) of meditation.

### Limitations and Future Research

To put our findings into perspective, we mention three limitations of our study and point to potential avenues for future research. First, our survey experiment assessed the immediate effects of meditation only. Whether and how these effects endure remains subject to future research. Also, and more importantly, specific effects of the meditation interventions used in our studies might not have unfolded in the relatively short time the survey took people to complete. It may be fruitful to trace the effects of similar interventions over an extended time frame.

Second, our interventions were extremely short. Both affective polarization and pro-environmentalism form over years, often decades. One should not expect a single-session, 10-min audio intervention to permanently change deeply entrenched attitudes and sentiments. Given these considerations, it is even more astonishing that we saw reduced polarization among Republicans following meditation. To gain a more nuanced picture of the effects of meditation on affective polarization and pro-environmentalism, future studies should investigate the effects of prolonged meditation practice.

Third, our findings must be treated with caution because we measured pro-environmentalism and affective polarization using self-report measures. Although self-report measures are widely used in existing research, and their psychometric properties have been demonstrated, they remain susceptible to social desirability bias, misperception, and misinterpretation (e.g., Brutus et al., 2013). Future studies should apply behavioral measures of both affective polarization and pro-environmentalism, including survey experiments probing people’s willingness to take reconciliatory and pro-environmental action. For instance, concerning pro-environmentalism, one could investigate whether respondents are willing to sign pro-environmental petitions, donate to pro-environmental charities, or invest in CO<sub>2</sub> offsetting projects. Future studies that attempt this should rely on behavioral paradigms that have been repeatedly used to study pro-environmental behavior in the context

of donation decisions, product choices, energy conservation, waste management, and advocacy for environmental causes (for an overview, see Lange, 2022). Finding adequate measures of behavioral affective polarization, which do not at the same time tap into discriminatory behavior, is less straightforward. One option would be to offer participants to listen to short podcasts or opinion pieces by different politicians and record how often they are willing to listen to the opinion piece by politicians from the other party.

Fourth, we did not investigate how prior meditation experience modulates the effects of the meditation treatments. There are at least two possibilities. On the one hand, the effects may be more effective among experienced meditators because it is easier for them to enter a meditative state. On the other hand, because habitual loving-kindness meditation fosters compassion (for a review, see Bankard, 2015), experienced mediators may be more mindful and compassionate to start with and, therefore, have less room to improve. Future studies should take both possibilities into account.

Fifth, although our sample size was reasonable, it was below the figure suggested by our preregistered power analysis, thus raising the possibility that we were unable to detect some of the effects of meditation. Although in null hypothesis testing, non-significant findings cannot count as evidence for the null hypothesis, future studies should be especially careful not to interpret some of our null results as evidence of absence of effects.

Sixth, the present study only provides evidence on the effects of meditation in the United States. It is unclear whether our findings generalize to other countries and cultural contexts.

With well-recognized benefits to physical and mental well-being, meditation practice has become a recognized treatment for mental health conditions and a standard tool in personnel development in the corporate world, schools, and universities. Meditation practice has spiked during the COVID-19 pandemic and is expected to proliferate (Statista, 2022). If the depolarizing effects of meditation can be confirmed in larger samples with longer interventions, meditation may be translated into interventions that help alleviate social tensions between partisans. Policy approaches targeting the intertwined challenge of affective polarization and climate change might seize the opportunity and join forces with existing meditation programs in community settings.

By fostering feelings of love and kindness toward others, including political outgroups, LKM uniquely positions itself as a tool to promote mutual understanding and bridge divides. Unlike general mindfulness practices, which cultivate present-moment awareness, LKM emphasizes relational aspects, making it particularly effective in addressing the emotional and interpersonal barriers that underlie political polarization. This potential for mutual understanding suggests that LKM could enable both Democrats and

Republicans to engage with each other's perspectives more constructively—for instance, by encouraging Democrats to more thoughtfully consider Republican environmental arguments and reducing Republicans' defensiveness toward climate-related evidence. Future research should further investigate this bidirectional potential of LKM to facilitate meaningful dialogue across ideological divides.

Putting heart over head and cultivating loving-kindness toward others may be a valuable tool in overcoming partisan hostility that forestalls efficient climate mitigation action. More research is needed to determine precisely when and in whom mindfulness promotes fruitful political discourse and effective climate action.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s12671-025-02525-8>.

**Author Contribution** LR, GS, and JK conceptualized and designed the experimental method of the paper; LR, GS, and JK collected data; LR and JK analyzed the data and interpreted results together with GS; LR, JK, EJ, and GS drafted and revised the manuscript and approved the final version for submission.

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**Data Availability** The data and the code used to analyze the data are available on OSF (<https://osf.io/4xfnw>).

## Declarations

**Ethics Approval** The study was approved by the University of Salzburg's ethics committee.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Competing Interest** The authors declare no competing interests.

**Use of Artificial Intelligence** We did not use any Artificial intelligence tools in the research presented here.

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