Climatic Change (2020) 161:9–19
https://doi.org/10.1007/s10584-019-02552-0

# Emotional foundations of the public climate change divide

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Received: 12 February 2019 / Accepted: 2 September 2019 / Published online: 18 October 2019


## Abstract

The worldwide rise of climate skeptical political leaders endangers sorely needed political efforts to mitigate climate change. In addition, climate skepticism expressed by the political elites may spread to the electorate, thus ultimately affecting mitigation actions at the population level. It is crucial to better understand the psychological mechanisms underlying elite influences on public opinion formation and polarization. Here we show how affective processes contribute to these top-down influences using longitudinal data in the context of the 2016 U.S. presidential election. Findings revealed a general decrease in climate change beliefs immediately after the presidential election (November 2016). We moreover found an increase in positive emotions and a decrease in negative emotions toward the Republican Party after the election of President Trump. Most importantly, the positive emotional shift towards the Republican Party mediated the decrease in climate change beliefs: Individuals with pronounced increases in positive emotions toward the Republican Party most strongly reduced their belief in climate change after the presidential election. The effect was intensified among Republican partisans, pointing towards a mechanism underlying political polarization. Using data based on a major real-world political event, our findings illustrate how partisans update their beliefs by referring to the positions of relevant political authorities. We moreover demonstrate how emotions drive top-down influences of political leaders on partisans' opinions and beliefs. Finally, our findings reveal how intensified emotions can contribute to the aggravation of the public climate change divide.

Given the climatic changes observed in recent years, developing a more sustainable lifestyle is among the most pressing tasks facing our planet and its inhabitants (IPCC 2014). Political elites play

**Electronic supplementary material** The online version of this article (https://doi.org/10.1007/s10584-019-02552-0) contains supplementary material, which is available to authorized users.

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an important role in societal processes related to global environmental changes and their mitigation (Brulle et al. 2012; Egan and Mullin 2017; Kousser and Tranter 2018; McCright 2010; Unsworth and Fielding 2014). In addition to their legislative power to initiate or end environmental policies, the positions they express may serve as cues the electorate uses to inform their own beliefs and opinions (e.g., Brulle et al. 2012; Dunlap et al. 2016; Krosnick et al. 2000; Layman et al. 2006). The recent rise of climate skeptical political leaders around the globe (Crouzeilles et al. 2017) increases the danger that elite skepticism spreads to the electorate, ultimately decreasing the general willingness to pursue climate change mitigating actions on the population level.

The relevance of political elite cues for mass opinion formation and polarization becomes evident in the context of climate change beliefs. In the USA, the reality of climate change and its human origins has become polarizing ideological topics (Ehret et al. 2018; Hahnel and Brosch 2016; Hornsey et al. 2018; Van Boven et al. 2018). Provocatively speaking, the question of whether or not someone believes in anthropogenic climate change can almost be boiled down to one's affiliation to the Democratic or Republican Party (Dunlap et al. 2016; Hahnel and Brosch 2016). The link between political partisanship and climate change beliefs has intensified over the last decades and cannot be reduced to related sociodemographic differences such as age, gender, race, income, or education alone (Dunlap et al. 2016; Dunlap and McCright 2008; Egan and Mullin 2017; for sociodemographic influences on climate change beliefs see: Hornsey et al. 2016; McCright and Dunlap 2011). Opinion formation and polarization seem to trickle down from the political elite to the electorate, as elite polarization predated the public divide over the issue (Brulle et al. 2012; Dunlap et al. 2016; Dunlap and McCright 2008; Egan and Mullin 2017; Krosnick et al. 2000).

Not much is known about the psychological mechanisms underlying elite influences on public climate change opinion (Hahnel and Brosch 2016). However, ample research on human cognition illustrates that humans tend to simplify challenging cognitive processes by substituting simple attributes for more complicated ones and by relying on alternative information sources (Morewedge and Kahneman 2010; Sunstein 2005). Instead of actively elaborating the likelihood of climate change, a complex topic with an intangible and uncertain nature, they may base their beliefs on selected information cues coming from authorities associated with the issue (Krosnick et al. 2006; McCright 2010; Petty and Cacioppo 1986). In the USA, climate change is strongly associated with politics, as belief in anthropogenic climate change has become a Democratic trademark, whereas climate change skepticism is associated with the Republican Party (Dunlap et al. 2016; Dunlap and McCright 2008; Egan and Mullin 2017; Hahnel and Brosch 2016; Hornsey et al. 2018; Van Boven et al. 2018).

The weight of external source cues in the formation of personal beliefs and attitudes has been shown to depend on affective reactions to specific source attributes such as authority, status, or power (Briñol and Petty 2009). When facing highly complex topics, individuals tend to bypass comprehensive information processing and to instead adopt simplified messages and opinions, especially from authorities associated with positive emotions (Petty and Cacioppo 1986). In the climate change domain, previous research has illustrated the important role of affective evaluations as an internal source of information that individuals refer to in order to update their climate change beliefs and risk perceptions (Leiserowitz 2006; van der Linden 2014, 2015; van der Linden et al. 2015b).

In the USA, the political arena has been dramatically emotionalized over the last decades (Banda and Cluverius 2018; Iyengar and Krupenkin 2018; Iyengar et al. 2012), pointing to an elevated relevance of partisan emotions in the formation of climate change beliefs in the American Public. Affective polarization, the difference between one's affective reactions

towards the own party and the opposing party, steeply increased from the early 2000s and peaked in the context of the 2016 US presidential election (Iyengar and Krupenkin 2018). Similar to elite influences on public climate change beliefs, ideological and affective polarization at the elite level predated affective polarization at the level of the general electorate. These top-down influences seem to be grounded in the nature of highly polarized political environments that provide more frequent and intense threats to partisans' own political identity, thus resulting in heightened affective polarization in the electorate (Banda and Cluverius 2018; Rogowski and Sutherland 2016).

Election outcomes play an important role in the elicitation and differentiation of partisan emotions (Beasley and Joslyn 2001; Granberg and Nanneman 1986). The associated gains or losses of influence inherent to an election outcome can drastically modify the power distribution among the political elite, resulting in shifts in affective reactions towards the winning and losing side. Along these lines, it has been shown that positive attitudes toward the winning side tend to increase after election outcomes (Beasley and Joslyn 2001; Granberg and Nanneman 1986). Intriguingly, members of the losing side were even more likely to shift towards more positive evaluations towards the winner. This affective shift has been explained by a motivation to reduce cognitive dissonance (Festinger 1962; Frenkel and Doob 1976), resulting from the incongruence of one's prior preferences and the new political reality. Increasing positive emotions towards the winning side thus can be seen as an internal strategy to adapt one's preferences to a changing political landscape (Beasley and Joslyn 2001).

In the context of the 2016 US presidential election, we expected bipartisan affective shifts after the election to render cues from the winning side more salient, which in turn should become a more pertinent input into individual belief systems. In light of the victory of climate skeptical political leaders, top-down influences were expected to attenuate the electorate's belief in climate change, driven by affective shifts towards the winning party. Applying a longitudinal design to test this hypothesis, we tracked climate change beliefs and emotions felt toward the Republican and the Democratic Party in US voters before and after the 2016 presidential election (October and November 2016). That is, we aimed to test the extent to which shifts in emotions *felt toward* the main US parties impact changes in climate change beliefs after the presidential election. This approach thus differs from the emerging line of research examining how emotional content in political messages evolves and how it impacts judgment and decision making (see e.g., Brady et al. 2017, 2019).

## 1 Methods

### 1.1 Data collection and participants

Data was assessed in two waves, before (October 04–06) and after (November 23–28) the 2016 US presidential election. Recruitment was conducted by a market research institute (ResearchNow) aiming for a representative sample of American voters across the USA. Only individuals eligible to vote in the presidential election took part in the study.

In order to obtain a broad empirical base of US voters' ratings before and after the US presidential election, we aimed to collect pre-post data from a final sample of 400 participants. To ensure this empirical base, data collection at wave 1 encompassed 605 participants to account for a sample dropout of up to 33%. Following this strategy, the wave 2 survey was closed after the pre-defined number of completed surveys has been attained, resulting in 412 participants (209 female) who

completed both study waves (age range 18–81, $M = 50.7$, $SD = 15.11$). The sample statistics of both study waves are depicted in Table SM1-1 in the Supplementary Material 1. To exclude that sample attrition was systematically influencing our results, we conducted several dropout analyses on the complete wave 1 sample, analyzing the extent to which baseline emotions toward the main US parties and baseline climate change beliefs as well as a series of demographic variables were associated with dropout between the two study waves. Of the large range of examined variables, age, gender, and civil status were associated with study dropout in that mean age was lower and the proportion of women and individuals living in a partnership was higher in the sample completing only wave 1. To test whether these influences on dropout might have affected the main analyses conducted in this study, we subsequently analyzed the relationship between the identified variables and each of the key change variables examined in the present research. Results showed that neither age nor gender nor civil status was associated with any of the key variables. Please refer to Supplementary Material 2 for more details on the dropout analyses.

Political affiliation was measured using the item "Which party corresponds most to your political ideology?" (response options: Democratic Party/Republican Party/other) in wave 1. Of the sample that conducted both study waves, 176 participants reported to be most affiliated to the Democratic Party, 157 to the Republican Party, and 79 to other parties (e.g., Libertarian/Green Party). Only self-classified Democrats and Republicans were included in the main analyses, resulting in a final sample of 333 participants.

### 1.2 Materials

reported scales were assessed in both study waves. Means and standard deviations of all dependent variables separated by study wave (pre/post election) are provided in the Supplementary Material 3.

#### 1.2.1 Emotions toward the two main US parties

Emotions felt toward the Democratic and Republican Party were measured using an adapted version of the Partisan Affect Scale (Greene 2002). Ten items reflecting positive and negative emotions were presented in a matrix with two columns representing the two parties. Participants were instructed to indicate to which extent the emotions describe how the parties made them feel *at the current moment*, using a scale from 1—*not/slightly* to 6—*extremely*. Four items reflected positive emotions (delighted, relaxed, proud, safe; average internal consistency across waves $\alpha_{DemPar} = .922/\alpha_{RepPar} = .942$); six items reflected negative emotions (angry, disgusted, annoyed, sad, hostile, embarrassed; average internal consistency across waves $\alpha_{DemPar} = .933/\alpha_{RepPar} = .953$). Emotion changes were assessed by computing the difference in positive emotions and negative emotions toward the Republican Party and toward the Democratic Party between the two study waves.

#### 1.2.2 Climate change beliefs

Climate change beliefs were measured using an adapted version of the Psychological Distance to Climate Change Scale (Spence et al. 2011). Items assessed geographical and social distance to climate change (3 items), certainty/skepticism (2 items), as well as perceived human influences on climate change (2 items). Items were formulated as statements, participants indicated the extent to which they 1—*disagree* or 8—*agree* with them. Items were averaged into one scale (average internal consistency across waves $\alpha = .832$), with higher values

indicating stronger belief in climate change. The difference score between waves served as the dependent variable.

### 1.3 Data analysis

We ran mixed analyses of variance (ANOVAs) using the statistical software SPSS (version 24) to examine the effect of time (pre/post election; within-subject) and party affiliation (Democrat/Republican; between-subjects) on emotions toward the two main US parties as well as on climate change beliefs. Thus, analysis of changes was conducted within subjects based on the final sample of 333 participants, reducing the likelihood that sample attrition between study waves systematically affected pre-post election differences.

As the between-subjects factor party affiliation was based on self-classification rather than experimental randomization, which is likely to result in baseline differences in the dependent variables (for partisan differences in climate change beliefs see for example: Dunlap et al. 2016; Iyengar and Krupenkin 2018), we tested the robustness of the applied ANOVA approach by means of a series of linear mixed models, including random effects for subject, time, and party affiliation as well as additional covariates as fixed effects. Comparisons of model fits of the more complex models with the baseline linear model supported the more parsimonious analytic approach reported in the main manuscript. For more information on the additional analyses including model fits for each model, please refer to Supplementary Material 4.

To examine indirect effects of time on climate change beliefs via changes in emotions toward the parties, we applied the recently developed within-participant mediation path-analytic framework (Montoya and Hayes 2017; Montoya 2018). As compared to classic approaches in which inferences about within-subject mediation are based on a series of hypothesis tests (i.e., component approach; Judd et al. 2001), in the path-analytic framework, inferences about indirect effects are based on one overall test of the product of the a and b paths (i.e., index approach), typically using bootstrapping procedures. This technique has become an established method in the analysis of between-subject mediation (see e.g., Preacher and Hayes 2004). Besides the various advantages of the path-analytic framework (for more information see e.g., Hayes and Scharkow 2013; Montoya and Hayes 2017), recent research emphasized that index approaches in mediation analyses can increase the risk of inflated type I errors as compared to component approaches (Yzerbyt et al. 2018). In order to address this potential shortcoming, we additionally tested our main hypothesis following the component approach to test within-subject mediation as proposed by Judd and colleagues (Judd et al. 2001). Results of the joint-significance approach supported the findings of the applied path-analytic approach. The additional analysis is reported in the Supplementary Material 4.

In the applied mediation path-analytic model, emotion and climate change belief *change scores* served as mediator and dependent variable, respectively[1]. The independent variable time was modeled as a constant resulting in *a* and *c′* paths reflecting mean changes in emotions and climate change beliefs, respectively. In order to test indirect effects for Republicans and Democrats separately, conditional effects of time on emotion changes were computed for both groups (Republicans/Democrats). The conditional effects thus represented mean changes of the respective group across time. We estimated direct and indirect effects by means of maximum likelihood estimation using the R package lavaan (Rosseel 2012). Indirect effects were tested using bootstrap techniques (10,000 samples).

[1] The grand mean-centered means of emotions at t1 and t2 (mediator variables) served as covariates in the dependent variable models (cf., Montoya and Hayes 2017).

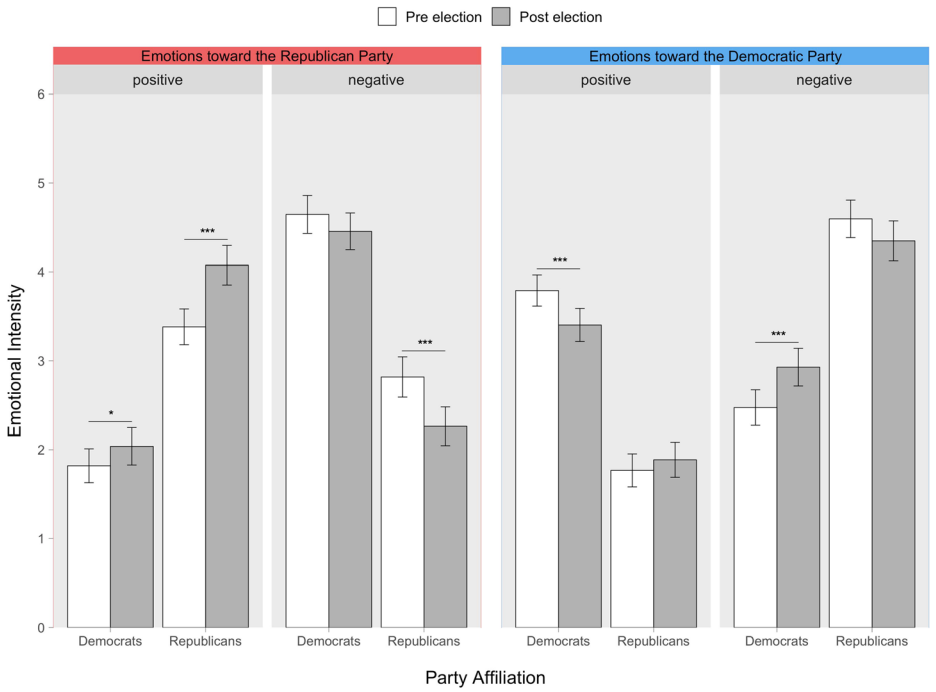


**Fig. 1** Impact of the 2016 U.S. presidential election on emotions toward parties. The impact of party affiliation (Republicans/Democrats) on positive and negative emotions toward the Republican Party and Democratic Party across the 2016 US presidential election period (pre/post election assessment). Error bars depict 95% confidence interval, *$p < .05$, ***$p < .001$

## 2 Results

Findings revealed that positive emotions toward Republicans as the winning party increased, $F(1,331) = 59.72$, $p < .001$, $\eta_p^2 = .15$, while negative emotions decreased, $F(1,331) = 25.63$, $p < .001$, $\eta_p^2 = 0.07$ (see Fig. 1). These effects were more pronounced for Republican than for Democratic voters (time X party affiliation interaction for positive emotions $F(1,331) = 16.15$, $p < .001$, $\eta_p^2 = .05$, for negative emotions $F(1,331) = 6.12$, $p = .014$, $\eta_p^2 = .02$). The opposite pattern was observed for emotions felt towards the Democratic Party: positive emotions by Democrats toward the Democratic Party decreased (interaction $F(1,331) = 17.54$, $p < .001$, $\eta_p^2 = .05$), while negative emotions increased (interaction $F(1,331) = 20.55$, $p < .001$, $\eta_p^2 = .06$).

Republicans were in general less likely to believe in climate change than Democrats, $F(1,331) = 122.14$, $p < .001$, $\eta_p^2 = .27$ (see, e.g., Dunlap et al. 2016; Van Boven et al. 2018). In line with findings by Zawadzki and colleagues (Zawadzki et al. 2019), belief in climate change decreased significantly from before to after the presidential election, $F(1,331) = 4.84$, $p = .028$, $\eta_p^2 = .01$. Party affiliation in itself did not moderate the temporal changes in climate change beliefs, $F(1,331) = 0.07$, $p = .788$, $\eta_p^2 < .01$. However, consistent with our hypothesis, the temporal changes were mediated by affective shifts. The applied within-participant mediation model confirmed that observed increases in positive emotions toward the Republican Party fully accounted for the decrease in climate change beliefs after the presidential election (see Fig. 2, indirect effect $ab = -0.05$; 95% $CI_{ab}$ [− 0.111, − 0.003]).

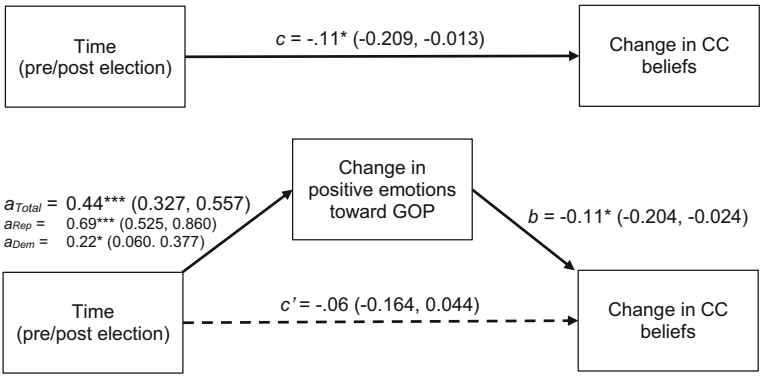


**Fig. 2** Election effects on climate change beliefs mediated by affective shifts. Within-participant mediation path-analytic model (Montoya 2018; Montoya and Hayes 2017) examining the impact of the 2016 US presidential election on *changes* in climate change (CC) beliefs via changes in positive emotions toward the Republican Party (GOP). The 95% confidence intervals are provided in parentheses. $^{*}p < .05$, $^{***}p < .001$

We subsequently tested whether indirect effects differed as a function of party affiliation. The stronger increase in positive emotions toward the Republican Party observed in Republicans as compared to Democrats (see Fig. 1) in turn resulted in a stronger decrease in climate change beliefs (indirect effect Republicans $ab = -0.08$; 95% $CI_{ab}$ [− 0.164, − 0.004]; difference indirect effects Republicans vs. Democrats − 0.05; 95% CI [− 0.123, − 0.007]). Even though the effect was stronger for Republicans, the same mediation was evident for Democrats ($ab = -0.03$; 95% $CI_{ab}$ [− 0.077, − 0.001]). Neither negative emotions toward the Republican Party nor emotions toward the Democratic Party were associated with decreases in climate change beliefs ($ab < 0.01$).

## 3 Discussion

Consistent with the notion that voters update their beliefs based on cues from the political elite, we found a general decrease in climate change beliefs immediately after the 2016 US presidential election. Underlining the important role of emotion in this process, we moreover observed that the top-down influence on climate change beliefs was completely mediated by an affective shift towards the Republican Party, in that individuals with a more pronounced increase in positive emotions toward the GOP more strongly reduced their belief in climate change after the election of President Trump. Beliefs about the reality of climate change, a topic that should be evaluated based on scientific data, thus turned into a political issue conveyed via emotional pathways.

The observed affective shift towards the Republican Party was bipartisan, in that both Republicans and Democrats experienced more positive emotions toward the Republican Party after the election. Similarly, both Republicans and Democrats showed reductions in climate change beliefs immediately after the election, which in both cases was mediated by the observed affective shift. Our results thus provide first evidence for a powerful general affective mechanism via which elite cues can have an impact on beliefs at the population level. Nevertheless, we also found that the net effect of the affective mechanism was more pronounced in Republican voters, who showed a stronger affective shift and thus a stronger reduction in climate change beliefs post election. These results point out how intensification of emotions toward the political elite (see also Levendusky and Malhotra 2016) can contribute to the public climate change divide.

The observed increases in positive emotions towards the winning side corroborate previous research revealing stronger positive attitudes towards the winner after US elections, especially driven by a change in attitudes of members of the losing side (Beasley and Joslyn 2001). Congruent with these findings, we observed that elevated positive emotions toward the Republican Party were also evident for Democrats, which is moreover in line with the idea that voters are motivated to decrease cognitive dissonance due to a discrepancy between one's prior preferences and the new political reality (Beasley and Joslyn 2001; Granberg and Nanneman 1986). Future research should apply longitudinal within-subject designs in order to examine to what extent these cognitive mechanisms persist over time or rather reflect short time coping strategies.

Although Republicans and Democrats were both more likely to experience stronger positive emotions towards the Republican Party after the election, the observed increases were stronger for Republicans. Overall, this pattern resulted in a widened emotional gap between Republicans and Democrats. Whereas previous research has shown that polarization among voters is likely to increase after elections (Beasley and Joslyn 2001; Granberg and Nanneman 1986) and after the mere act of voting (Frenkel and Doob 1976), the present study adds to these findings by demonstrating how this affective polarization can translate into ideological polarization in the climate change context.

The present study examined shifts in partisan emotions and climate change beliefs immediately after the 2016 US presidential election outcome (i.e., November 2016), thus covering a time period in which the Trump administration was elected by the American Public but not yet officially in power. While the present study observed increased positive emotions toward the Republican Party and associated lower climate change beliefs directly after the election outcome was known, these effects have been reported to be attenuated (or even reversed) after the Trump administration took office in January 2017 (Koerth-Baker 2019). In accordance, Zawadzki and colleagues (Zawadzki et al. 2019) found that public climate change beliefs returned to pre-election levels after the US withdrawal from the Paris Agreement. Along the same lines, post-election increases in public climate change concerns were associated with stronger media attention and public reactance after major policy decisions and messaging counteracting efforts to mitigate global climate change (Koerth-Baker 2019; Schwartz 2019).

Although the current data is unique as it traces changes in emotions and climate change beliefs concurrently across a major real-world political event, due to the impossibility of experimental aleatory assignment, this strategy also imposes limitations on the causal interpretation of the results. Our research thus invites future studies to confirm the link between emotions toward elites and climate change beliefs in a controlled setup. Specifically, future research could provide positive and/or negative affective cues toward political parties by means of an experimental manipulation and test whether potential changes in partisan emotions toward the respective parties are associated with changes in climate change beliefs (for examples of within-subject mediation models based on experimental designs, see van der Linden et al. 2019; van der Linden et al. 2015a).

Another qualification of the applied longitudinal study design is due to the attrition rate between the two study waves. Even though the applied dropout analyses did not indicate systematic influences of study dropout on the main variables of interest (see Supplementary Material 2), the relatively high attrition between the two study waves attenuates the generalizability of the results. In this light, although increases in positive emotions towards the Republican Party were bipartisan, we cannot exclude that individuals who felt more positive about the election outcome were also more inclined to take part in the second study wave after the election. Supporting this notion, the level of older male individuals, who have been shown to be more likely to support President Trump (Choma and Hanoch 2017; Fitzduff 2017), was

elevated in the final sample completing both study waves as compared to the sample only completing wave 1.

While the present research corroborates previous findings on the relevance of affect and emotion for judgment and decision making within the climate change domain (Leiserowitz 2006; van der Linden 2014, 2015) and beyond (Hahnel and Brosch 2018; Lerner et al. 2015), future research should extend the spectrum of examined constructs to more cognitive variables to disentangle the unique and common influences of affect and cognition on temporal changes in partisans' climate change beliefs (for research on differential effects of affect and cognition on climate change beliefs and risk perception, see Leiserowitz 2006; van der Linden 2014, 2015).

The present research has implications for communication strategies aiming to promote more sustainable lifestyles. In addition to providing factual knowledge about environmental issues (IPCC 2014), communication strategies need to address the increasing relevance of non-factual information cues such as opinions expressed by political authorities as well as affective reactions towards them. Raising awareness about these "secondary" cognitive and affective influences on public beliefs is needed to increase the effectiveness of communication campaigns and to contribute to a well-informed electorate that supports efforts to mitigate climate change.

**Author contributions** UH, CM, and TB planned, designed, and executed the research and analyzed the data. UH wrote the first draft of the manuscript. CM and TB contributed to subsequent drafts. All authors reviewed the manuscript and approved the final version.

**Funding information** This work was supported by a grant from the Swiss National Research Foundation (grant number PYAPP1_160571) awarded to TB and is part of the activities of SCCER CREST (Swiss Competence Center for Energy Research), supported by the Swiss Innovation Agency (Innosuisse).

## Compliance with ethical standards

**Ethical approval** The study was approved by the ethical committee of the Faculty of Psychology and Educational Sciences of the University of Geneva and conducted in accordance with the ethical guidelines of the institution.

**Informed consent** Informed consent was obtained from all participants.

**Conflict of interest** The authors declare that they have no competing interests.

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