



How do I feel when I think about taking action? Hope and boredom, not anxiety and helplessness, predict intentions to take climate action

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ABSTRACT

This research examines the extent to which four anticipatory emotional reactions (hope, anxiety, helplessness, and boredom) that arise *when contemplating participating in public-sphere climate action* predict intentions to engage in such action. In a large, geographically diverse sample of American adults visiting informal science learning centers (e.g., zoos, aquariums; $N = 4964$), stronger feelings of hope robustly predicted greater intentions to act ($\eta^2_p = .22$, a large effect); whereas stronger feelings of boredom robustly predicted decreased intention to act ($\eta^2_p = .09$, a medium effect). Both of these feelings had significantly more predictive power than political orientation ($\eta^2_p = .04$, a small-to-medium effect). The extent to which respondents felt anxious or helpless was not strongly correlated with their intentions to take action ($\eta^2_ps \approx 0.01$, a small effect). These findings highlight the underexplored connection between how people feel when they contemplate taking climate action and their intentions to engage in such action.

1. Introduction

Effectively addressing the interconnected human causes of global climate change will be facilitated by widespread public engagement in a variety of public-sphere behaviors, such as civic action and talking with others, to achieve coordinated climate action (Geiger, Swim, & Fraser, 2017; Goldberg, van der Linden, Maibach, & Leiserowitz, 2019; Habermas, 1971; Parks, Joireman, & Van Lange, 2013; Rees & Bamberg, 2014; Stern, 2000; Swim, Geiger, Sweetland, & Fraser, 2018). Contradicting the view that emotional reactions foster irrational and maladaptive behavior, research reveals that emotional experiences can play a key role in facilitating constructive behaviors on societal threats (Brosch, 2021; Fessler & Haley, 2003; Smith & Mackie, 2016; Yang, 2000). Previous research on emotional reactions related to climate change has focused chiefly on assessing emotional reactions related to climate change at a broad level. As we explain below, this literature has suffered from largely inconsistent results. We propose that these mixed results could arise because people do not make decisions about whether to take action on climate change when contemplating the threat of climate change in the abstract. Instead, individuals might be more influenced by feelings that arise when they *directly contemplate taking action on the issue*. Thus, in this project, we take the targeted approach of

measuring and comparing emotional reactions when contemplating the possibility of taking public-sphere action.

1.1. Emotional reactions and climate action

Emotional reactions are felt experiences that arise from appraisals about one's environment and thus provide affective information about an individual's present situation and potential future outcomes (Schwarz & Clore, 1983). In the present work, we focus on *anticipatory emotional reactions* - states such as hope and anxiety which are *experienced in the present* in response to contemplating possible future actions or events. Anticipatory emotional reactions contrast with anticipated emotions, which are not necessarily experienced in the present moment but rather affective forecasts of how one *expects to feel* in the future; Baumgartner, Pieters, & Bagozzi, 2008; Loewenstein, Weber, Hsee, & Welch, 2001; Wilson & Gilbert, 2003; Xu & Guo, 2019). Anticipatory emotional reactions can result from a variety of future possibilities, including possible threats that may occur in the future, and relevant to the current work, possible actions that one could take in the future. Within these specific contexts, anticipatory emotional reactions provide information that can either motivate or demotivate goal pursuit (see Oettingen, 2012).

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Much past work on feelings and climate change has focused on assessing people's emotional reactions – specifically, hope and anxiety (and the related emotion of fear) - *to climate change in general* (e.g., Nabi, Gustafson, & Jensen, 2018; Rees, Klug, & Bamberg, 2015; Roeser, 2012; Smith & Leiserowitz, 2014; Wang, Leviston, Hurlstone, Lawrence, & Walker, 2018) rather than anticipatory emotional reactions that occur when contemplating *taking action* on climate change. This previous work has produced mixed results as to how these reactions, especially hope and anxiety (i.e., "climate anxiety"), might predict engagement with climate change and support for climate-friendly policies. Some research suggests that hope motivates over anxiety (Bury, Wenzel, & Woodyatt, 2019; Ojala, 2012; O'Neill & Nicholson-Cole, 2009; Smith & Leiserowitz, 2014), while other work highlights the motivating power of anxiety over hope (Hornsey & Fielding, 2016; Tannenbaum et al., 2015; van Zomeren, Pauls, & Cohen-Chen, 2019; van Zomeren, Spears, & Leach, 2010). Still other work suggests that both can be motivating (Nabi et al., 2018) or that the effects might differ depending on other factors, such as the audience's political orientations or how hope is defined (Feldman & Hart, 2016; Marlon et al., 2019).

A commentary on much of this work argues that inconsistent findings for the same emotions may reflect an overly simplistic manner of assessing emotional reactions (Chapman, Lickel, & Markowitz, 2017). Chapman and colleagues argue that inconsistencies derive from the unverified assumption that emotions exert consistent effects on climate action regardless of the context in which they are experienced. To illustrate the limitations of such an assumption, Chapman's critique highlights how anger can affect different types of actions: anger might be presupposed to lead to destructive, aggressive behavior, but it may also promote constructive activities aimed to achieve justice and right moral wrongs (also see Van Doorn, Zeelenberg, & Breugelmans, 2014). Another example comes from Hasan-Aslih, Pliskin, van Zomeren, Halperin, and Saguy (2019), who examined the relationship between hope and nonviolent collective action intentions among Palestinians following systematic house demolitions by the Israeli government (an event that was presumably viewed as deeply oppressive and immoral by many Palestinians). Across several correlational and experimental studies, feeling hopeful *about using collective struggle to liberate their society from oppression* predicted greater intentions to engage in nonviolent collective action. In contrast, feeling hopeful *about the possibility of Palestinians and Israelis peacefully coexisting together in the future* (i.e., hope about the situation not directly tied to taking action) predicted null or even lesser intentions to engage in such action.

Together, these examples highlight the psychological perspective that, with regard to consciously controlled decision-making, the link between emotional experiences and action depends on how such feelings influence, and are influenced by, contemplation of specific potential future scenarios (Baumeister, Vohs, Nathan DeWall, & Zhang, 2007;Forgas, 1995). Although incidental emotions (i.e., emotions evoked by unrelated stimuli) *can* influence reactions to climate change (in the form of climate policy support; Lu & Schultdt, 2015), emotional reactions are most likely to influence decision-making on complex issues (e.g., about whether or not to take action on a given issue) when the feelings directly arise from contemplating the various options or actions. Thus, researchers might benefit from directly assessing the emotional reactions that individuals experience when contemplating target behaviors.

Here we assess emotional reactions attributed to thoughts about engaging in public-sphere action to mitigate climate change (rather than contemplation of climate change more generally). We investigated four different anticipatory emotional reactions – *hope, anxiety, helplessness, and boredom* – that have been linked to motivation in a variety of domains (e.g., Miele & Scholer, 2018; Pekrun, 2006; Pekrun & Stephens, 2010) and appear to have potential relevance for promoting or discouraging public-sphere action. Hope and anxiety signal uncertainty of possible outcomes and signal a preference for some outcomes over others, though they can encourage different responses (Ellsworth & Smith, 1988; Ortony, Clore, & Collins, 1990). Helplessness signals a lack

of control over achieving a target goal (Seligman, Abramson, Semmel, & Von Baeyer, 1979). Boredom signals that the target of one's contemplation is meaningless (Van Tilburg & Igou, 2012). Below, we discuss each of these states and their link to engaging in public-sphere climate action.

1.1.1. Hope

Hope emerges when people perceive the potential for a desirable event to arise in the future (Ortony et al., 1990). When individuals feel hope while contemplating a goal, that hope signals that the goal is possible, important, and attainable through personal efforts (Averill, Catlin, & Chon, 2012; Gasper, Spencer, & Middlewood, 2019), thus activating action tendencies (Pekrun & Stephens, 2010) and promoting effort toward one's goal (Roseman, 2011; Snyder, 2002). Given these general effects of hope, several climate change researchers have argued that communicators should seek to instill hope in their audience (e.g., Mann, Hassol, & Toles, 2017; T. A. Myers, Nisbet, Maibach, & Leiserowitz, 2012). As noted above, however, work examining hope related to the *risk* of climate change paints a mixed picture as an effective motivational tool, perhaps because different participants might have different target objects in mind when answering the question. In turn, these different target objects might influence whether individuals take on a problem-focused coping role (motivating action) or an emotion-focused coping role (demotivating action; van Zomeren et al., 2019). In contrast, hope elicited in response to the possibility of *taking specific interpersonal actions* (e.g., discussing climate change) appears to more consistently promote a problem-focused coping role and predicts engagement with those actions (Geiger, Gasper, Swim, & Fraser, 2019; Swim & Fraser, 2014). Furthermore, perceptions of self- and collective efficacy are related to hope about taking action (Carifio & Rhodes, 2002) and these efficacy perceptions also predict pro-environmental behavioral intentions (Doherty & Webler, 2016; Geiger et al., 2017; Jugert et al., 2016). Based on the above review, we hypothesize:

H1. Feeling hopeful when contemplating engaging in climate action will positively predict intentions to engage in such action.

1.1.2. Anxiety

Whereas hope reflects an appraisal focused on desirable possibilities, anxiety emerges when people recognize the potential for undesirable events to arise in the future (Arnau, 2018; Ortony et al., 1990). Anxiety is a high arousal state that can include tension, apprehension, and nervousness (Brooks & Schweitzer, 2011). Although anxiety, like hope, signals both importance and uncertainty (Ellsworth & Smith, 1988), anxiety also signals lack of control (Raghunathan & Pham, 1999) and encourages people to adopt a prevention orientation, seeking out safety from the anxiety-eliciting target object (Higgins, 1998; Roseman, 2011). As noted above, some (but not all) research suggests that anxiety elicited when individuals contemplate the general idea of *climate change* fosters motivation to take action, presumably to reduce the threat posed by climate change. In contrast, however, feeling anxiety *when contemplating taking action* might be associated with avoiding such action. People might feel afraid about being perceived negatively by others if they were to engage in the target action (Geiger & Swim, 2016), including concerns about being associated with stigmatized groups (Swim, Gillis, & Hamaty, 2019), or alternatively, might fear failure (Caraway, Tucker, Reinke, & Hall, 2003) or being taken advantage of by others who fail to cooperate (Insko, Schopler, Hoyle, Dardis, & Graetz, 1990). Thus, we

hypothesize:

H2. Feeling anxiety when contemplating engaging in climate action will negatively predict intentions to engage in such action.

1.1.3. Helplessness

Helplessness is a low arousal, anticipatory emotional reaction to the perception that one has little control over future adverse events (Gelbrich, 2010; Lazarus, 1991).¹ The feeling of helplessness has been studied in a variety of contexts, including an examination of university students' reactions to coursework (Tze, Daniels, Hamm, Parker, & Perry, 2020), consumer responses to negative experiences at hotels (Gelbrich, 2010), and relevant to the present work, as a predictor of climate policy support (Smith & Leiserowitz, 2014). Previous work provides competing hypotheses for the effects of helplessness. Some theoretical models (e.g., the *theory of planned behavior*; Ajzen, 1991) suggest that perceived behavioral control is a key determinant of behavior; thus, feeling helpless (i.e., low behavioral control) might demotivate action. Indeed, some work suggests that feeling helpless or the related judgment that one would be unable to affect change through taking action (i.e., low response efficacy) is negatively related to climate action (Doherty & Webler, 2016; Geiger et al., 2017; Norgaard, 2011; Salomon, Preston, & Tannenbaum, 2017). In contrast, the *social identity model of collective action* (van Zomeren, Postmes, & Spears, 2008) argues that collective action issues are *defined* by personal helplessness because an individual acting alone cannot solve such problems. This model suggests that feeling personally helpless is not demotivating and, in some cases, can even motivate group cohesion and cooperative action to solve collective problems (Fritsche et al., 2017). Consistent with the possibility that feelings of helplessness might not strongly influence climate engagement, Smith and Leiserowitz (2014) found that feeling helpless about climate change did not uniquely predict climate policy support. Yet, this latter work did not directly assess whether people feel helpless when contemplating taking action. Based on these divergent perspectives, we ask the following research question:

Research Question 1: Does feeling helpless when contemplating engaging in climate action predict intentions to engage in such action?

1.1.4. Boredom

Boredom is a feeling reflecting a lack of psychological flow or immersion (Brissett & Snow, 1993). Boredom arises when people have difficulty paying attention to tasks or stimuli and provides an affective signal to disengage from those tasks and stimuli (Westgate & Wilson, 2018). Boredom can arise when there is a perceived mismatch between the cognitive demands of the task and one's mental resources to accomplish it; the task is perceived as either a) too easy (i.e., tedious), or b) too difficult (i.e., overwhelming). Boredom also can result from individuals' perceptions that the task lacks meaning (van Tilburg & Igou, 2013) and intrinsic value (Miele & Scholer, 2018). Thus, people who feel boredom when contemplating engaging in climate action with others might view the action as tedious (too easy), overwhelming (too difficult), or lacking in meaning (low intrinsic value).

Examining anticipatory boredom acknowledges the possibility that one does not need to start a task to feel bored by the task; instead, simply considering the possibility of engaging in a task could lead to boredom. For example, when merely considering the possibility of doing one's

¹ Helplessness has cognitive and affective components and has situation-specific and global components. In this work, we are primarily interested in affective, situation-specific components of helplessness (also see Smith & Leiserowitz, 2014). However, because cognition and affect are interrelated, we also connect conceptually to those who have measured other components of helplessness such as low response efficacy and low perceived behavioral control, which are cognitive components.

taxes a couple of months before they are due, one might become bored and suddenly remember their more exciting plan to go for a hike. Feeling bored when contemplating taking action might reduce narrative transportation (i.e., the tendency to imagine possible scenarios vividly; see McLaughlin, Velez, & Dunn, 2019), a key predictor of intentions to take action (McLaughlin, Velez, Gotlieb, Thompson, & Krause-McCord, 2019). As such, we propose that experiencing anticipatory boredom when contemplating possible future action might have similar effects to other forms of experienced boredom: reduced motivation and effort (Pekrun & Stephens, 2010; Tze, Klassen, & Daniels, 2014) and reduced procrastination (Steel, 2007) within that domain. Consistent with this notion, preliminary work suggests that feeling boredom in reaction to contemplating either climate change or the Covid-19 pandemic (i.e., not taking action specifically, but the topic more generally) predicts lesser intentions to engage in mitigation actions on the respective topics (Geiger, Gore, Squire, & Attari, 2021). Thus, we hypothesize the following:

H3. Feeling bored when contemplating engaging in climate action will negatively predict intentions to engage in such action.

1.2. Political polarization

Climate change is politically polarized in the United States (Pew Research Center, 2019) and other English-speaking countries (E. K. Smith & Mayer, 2019). In these regions, an overwhelming majority of political liberals report concern about and support action to address climate change, while political conservatives tend to be less concerned and are more ambivalent about taking action (Jenkins-Smith et al., 2020). A meta-analysis (Hornsey, Harris, Bain, & Fielding, 2016) conducted on data collected across multiple countries finds that political partisanship and self-reported ideology are moderate and robust predictors of climate change belief (correlated at $r = .30$ and $r = 0.15$, respectively). Other work finds similar links between political views and the propensity to take climate-relevant action (Nabi et al., 2018). Political views also could correlate with affect that arises when contemplating taking action on climate change. For example, if climate action is less meaningful to political conservatives, on average, than to political liberals, then political conservatives might feel more bored than do political liberals when considering the possibility of engaging in climate action. Thus, when assessing relations between emotional experiences and intentions to take action, we control for political orientation (to verify that feelings predict action above and beyond political orientation) and also address the following research question:

Research Question 2: Do any of the feelings mentioned above predict climate action intentions more strongly than does political orientation?

An additional possibility is that political orientation might moderate the effects of emotional reactions on climate change action. Even when liberals and conservatives feel the same way about climate action, they may react differently to specific emotional experiences. For example, liberals may be more likely to act based on positive feelings, such as hope, while conservatives may be more likely to act based on negative feelings, such as anxiety (Cornwell & Higgins, 2013, also see; Feldman & Hart, 2016). These possibilities are speculative; we do not have any *a priori* predictions about how political orientation might moderate these relationships, so we ask the following research question.

Research Question 3: Does political orientation moderate any of the links between emotional reactions and public sphere climate action intentions, such that some reactions more strongly (or weakly) predict such intentions among political liberals than conservatives?

2. Present research

We examined the degree to which the four above-mentioned

emotional reactions and political orientation predicted intentions to engage in public-sphere climate action among a large sample of visitors to aquariums and zoos; a broad population that has shown receptivity to climate change engagement efforts (Falk et al., 2007; Swim, Geiger, Fraser, & Pletcher, 2017). We focus on public-sphere behaviors based on the scope of climate change and the need for widespread cultural and political change to address the issue; as well as theory suggesting that emotional reactions are particularly useful in signaling whether one should interact with others in service of a broader goal (e.g., Fessler & Haley, 2003). We collected as large of a sample as practically feasible, which afforded us not only a study with high statistical power to examine the statistical significance of various predictors, but also to obtain relatively accurate measurements of effect sizes and to differentiate the relative predictive power of different predictors in a multiple regression analysis.

3. Methods

3.1. Participants and procedure

Respondents ($N = 4964$) were adult visitors to one of 116 informal science learning centers (ISLCs, e.g., zoos and aquariums) around the US who volunteered to complete all relevant measures in a survey following a request to do so immediately after a presentation at an interactive exhibit or other institutional space between 2012 and 2016.² Consistent with typical demographics of ISLC visitors (Association of Zoos & Aquariums, 2016), the sample was disproportionately educated (66% had a four-year college degree), female (64%), and liberal (46% Very Liberal/Liberal vs. 21% Very Conservative/Conservative) relative to the US population (US Census Bureau, 2019). Among the 71% of participants who selected an ethnic identification, 79% identified as White/Caucasian; other common racial identifications were Hispanic (7%), Asian (6%), and Black/African American (4%). Power analyses using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007) indicated $>99\%$ power to detect effects of small, medium, and large sizes (as denoted by Cohen, 1988) in a multiple regression analysis with five predictor variables (i.e., the four emotional experiences and political orientation; see below).

3.2. Measures

Measures were collected as part of a more extensive survey (see Supplemental Materials), with some measures used in a program evaluation [Authors]. Means, standard deviations, and intercorrelations between measures are listed in Table 1. Both histograms (see Supplemental Materials) and skewness and kurtosis checks (all skewness $< \pm 1$; all kurtosis $< \pm 2$) suggested relative normality and lack of excessively restricted ranges.

3.2.1. Emotional reactions from contemplating climate action

Participants indicated the extent to which they felt various emotional reactions to contemplating engaging in public-sphere climate action, via the following prompt “when you reflect on your ability to participate with others to address climate change, do you feel:” on 4-point “definitely do not feel this” to “definitely feel this” scales, coded from -1.5 to $+1.5$ to create a midpoint of zero. The questions were asked after the specific

behaviors were introduced (see Climate Action Intentions, below), suggesting that specific climate action behaviors had been primed and most participants would presumably be considering similar behaviors when answering these items. Supporting the validity of our measure, qualitative work (Kantenbacher, Miniard, Geiger, Yoder, & Attari, 2021) indicates that participants can spontaneously imagine taking climate action and express feelings experienced in response to this contemplation.

The four emotional reactions were: a) *hope* - a four-item measure: hopeful, optimistic,³ confident, assured ($\alpha = 0.89$), b) *anxiety* - a three-item measure: nervous, on edge, uneasy, ($\alpha = 0.90$), c) *helplessness* - a three-item measure: helpless, powerless, lacking control ($\alpha = 0.90$), and d) *boredom* - a three-item measure: a three-item measure: bored, indifferent, not caring ($\alpha = 0.91$). See Supplemental Materials for results of a confirmatory factor analysis.

3.2.2. Political orientation

Political orientation was assessed using a five-point, single-item measure ranging from *very liberal* (-2) to *very conservative* ($+2$).

3.2.3. Climate action intentions

Participants indicated their *intentions* to engage in four public-sphere actions to mitigate climate change and to foster cooperation toward that goal (take civic action to address climate change, encourage people to become engaged in learning about climate change, share what I know about climate change, give money to organizations that address climate change) on a -2 to $+2$ Likert scale ($\alpha = 0.89$; see Table 1 for descriptive statistics). Convergent evidence from other work suggests that many Americans report willingness to engage in these types of actions (Leiserowitz et al., 2019). We assessed behavioral intentions rather than self-reported previous behavior because we were interested in understanding how anticipatory feelings experienced in the present might influence *future* behavior. Private-sphere behaviors were also assessed for exploratory purposes (see survey measures in Supplemental Materials) but are not analyzed here because the focus here is on feelings about working with others and, therefore, suggestive of public-, rather than private-, sphere behaviors.

4. Results

We conducted a multiple linear regression, regressing climate action intentions onto political orientation and the four measured emotional reactions. Collinearity was not a concern (all VIFs < 2.5). To examine whether the effect sizes of predictors were significantly different from one another, we reran the regression model with all variables standardized (hence, providing standardized beta coefficients). We then conducted linear hypothesis tests using the *car* package (Fox et al., 2018) in *r* (R Core Team, 2020), employing Bonferroni corrections for these 15 pairwise multiple comparisons ($\alpha = 0.05/15 = 0.0033$). All results are reported in Table 2.

4.1. Emotional reactions

Climate action intentions were strongly and positively predicted by hope, $b = 0.64$, $SE = 0.02$, 95% CI [0.61, 0.68], $t(4964) = 37.28$, $p <$

² Interclass correlation analyses showed that 8% of the total variance in the outcome measure resided at the level of the institution and another 8% of the total variance in the outcome measure resided at the level of the presentation, with the remaining 84% residing at the level of the respondent. For simplicity, coherence in effect size metrics, and due to lack of an *a priori* reason for these factors to influence results, we ignore presentations and institutions in analyses. Results are similar when random slopes and/or intercepts are added to the model.

³ Other work suggests that optimism can be empirically distinguished from hope (see Gasper et al., 2019), but here they empirically form a singular construct and are treated as unidimensional. Additionally, the terms assured and confident might be viewed as reflecting self-efficacy rather than an emotional reaction. The data revealed that treating hope and optimism as one variable and assured and confident as another seemed unwarranted given that a CFA, and a post hoc EFA, indicated that they formed a cohesive factor. Moreover, removing these items decreased, rather than increased, the reliability of the scale. Thus, it seemed prudent to combine these items.

Table 1

Means, standard deviations, and correlations with confidence intervals.

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5
1. Political conservatism	-0.37	1.04					
2. Hope	0.33	0.62	-.06** [-.09, -.03]				
3. Boredom	-0.91	0.62	.23** [.20, .26]	-.12** [-.14, -.09]			
4. Anxiety	-0.60	0.72	-.06** [-.09, -.04]	-.20** [-.23, -.17]	.40** [.38, .42]		
5. Helplessness	-0.49	0.70	-.05** [-.08, -.02]	-.26** [-.29, -.23]	.41** [.39, .43]	.54** [.52, .56]	
6. Climate Action Intentions	0.70	0.88	-.28** [-.31, -.26]	.45** [.43, .47]	-.31** [-.34, -.29]	-.04** [-.07, -.02]	-.09** [-.12, -.07]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$.

Table 2

Predictors of climate action intentions.

	Unstandardized Beta (95% CI)	Standardized Beta	η^2_p
Political orientation	-0.15*** (-0.17, -0.13)	-0.18 _a	0.041
Emotions			
Hope	0.64*** (0.61, 0.68)	0.45 _b	0.219
Anxiety	0.14*** (0.11, 0.18)	0.12 _c	0.013
Helplessness	0.09*** (0.06, 0.13)	0.07 _c	0.005
Boredom	-0.43*** (-0.47, -0.39)	-0.30 _d	0.088

Note. *** $p < .001$. CI = confidence interval. In the standardized betas column, values that do not share any subscript letters are significantly different from one another (using the absolute value and using Bonferroni corrections for 15 multiple comparisons). Model $R^2 = 0.34$.

.001, $\eta^2_p = .22$ (a large effect size; Cohen, 1988), and hope's predictive power was statistically greater than each of the three other emotional reactions, $ps < .001$. Conversely, climate action intentions were negatively predicted by boredom, $b = -0.43$, $SE = 0.02$, 95% CI [-0.46, -0.39], $t(4964) = -21.87$, $p < .001$, $\eta^2_p = .09$ (a medium effect size; significantly larger than the remaining two emotional reactions, $ps < .001$). In contrast, intentions to engage in climate action were only weakly predicted by anxiety, $b = 0.14$, $SE = 0.02$, 95% CI [0.11, 0.18], $t(4964) = 8.13$, $p < .001$, $\eta^2_p = .013$, and helplessness, $b = 0.09$, $SE = 0.02$, 95% CI [0.06, 0.13], $t(4964) = 5.09$, $p < .001$, $\eta^2_p = .005$.

Following previous work examining interactive effects of combinations of emotions on action (Miller, Cronin, Garcia, & Branscombe, 2009), we also conducted exploratory analyses examining a) whether any combination of two emotional reactions exerted interactive effects on intentions to engage in climate action (e.g., an interaction between hope and anxiety), and b) whether there was a curvilinear (quadratic) relationship between any of the emotional reactions and intentions to engage in climate action. Examining effect sizes of all possible interactions here suggested no practically significant effects present, all $\eta^2_p < .01$. Similarly, there were no practically significant curvilinear effects present, all $\eta^2_p < .01$.

4.2. Political orientation

Intentions to engage in climate action were predicted by greater political liberalism, $b = 0.15$, $SE = 0.01$, 95% CI [0.13, 0.17], $t(4964) = 14.58$, $p < .001$, $\eta^2_p = .041$ (a small to medium effect size). Effect size comparisons revealed that both hope and boredom predicted climate action intentions more strongly than did respondents' political

orientation, $\chi^2(1) = 232.39$, $p < .001$, $\chi^2(1) = 33.96$, $p < .001$, respectively (see Table 2). We also tested whether political orientation moderated any of the relations between feelings and climate action intentions; only the effect of hope on climate action intentions was moderated by political orientation, $b = 0.08$, $SE = 0.02$, $p < .001$, $\eta^2_p = .005$ (a small effect size), all other $ps > .05$. Simple slope analyses (Aiken, West, & Reno, 1991) indicated that hope predicted climate action intentions for both political liberals (-1), $b = 0.58$, $SE = 0.02$, $p < .001$ and political conservatives (+1), $b = 0.74$, $SE = 0.03$, $p < .001$, but the relation was stronger among those more conservative (see Figure S1 in Supplemental Materials).

5. Discussion

The data reveal that emotional reactions resulting from contemplating engaging in public-sphere climate action predict intentions to engage in such action. Specifically, the level of hope and boredom respondents experienced when contemplating taking action robustly predicted behavioral intentions, but the level of anxiety and helplessness experienced did not. As we explain in greater detail below, the patterns in our results are consistent with the notion that emotional reactions signaling whether the action might help meet valued goals were the best predictors of intentions to engage in climate action (Pekrun & Stephens, 2010).

Consistent with the argument that feeling hopeful *about taking action* is key to taking action (e.g., Geiger et al., 2019; McAfee, Doubleday, Geiger, & Connell, 2019), our results demonstrate that feeling hope when contemplating taking climate action is a strong predictor of climate action intentions. Importantly, our study assessed how hopeful people feel when contemplating *personally* taking public-sphere action. In contrast, messages which increase hope about *distant others* (e.g., those with low perceived similarity to oneself) or technological fixes solving climate change might not promote action (e.g., Hornsey & Fielding, 2016). As van Zomeren et al. (2019) point out, contextual information around feelings of hope can influence whether the hope primarily serves to make people feel better or whether hope promotes problem-solving behavior (also see Marlon et al., 2019). Thus, future work is needed to examine whether such contextual information could moderate hope's effect on climate action.

Hope about taking action was a stronger predictor of public-sphere climate action intentions than was political orientation and hope about climate action was a somewhat stronger predictor for political conservatives than political liberals. This moderation perhaps reflects the notion that although American conservatives report lower engagement and belief with climate change than do American liberals (Hornsey et al., 2016), many conservatives may be more open to suggestion than might be presumed as their beliefs on the issue may oscillate over time (Jenkins-Smith et al., 2020). Perhaps conservatives' willingness to engage in public-sphere climate action might also be more responsive to

psychological factors (such as emotional reactions) than are liberals', possibly in part because environmental action is relatively less socially normative for conservatives (e.g., Geiger, Pasek, Gruszcynski, Ratcliff, & Weaver, 2020). Our work suggests that it could be useful for advocates to identify conservatives who feel hopeful when contemplating taking climate action with others because these conservatives may be relatively likely to express an intention to take such actions.

The present research is amongst the first to examine a link between climate action and boredom. Emotion theorists argue that like hope, boredom activates action tendencies relevant to engaging in action (Pekrun & Stephens, 2010). However, boredom has the opposite effect of hope, signaling that the action is not meaningful in light of one's valued goals and tending to decrease likelihood of engaging in action. Consistent with this notion, we found that boredom when contemplating taking action was a robust predictor of lesser public-sphere climate action intentions - albeit half the effect size of hope. The relationship between boredom and action intentions raises several future research questions regarding whether making climate change action seem more interesting can increase public engagement. For example, future work could test whether boredom can be decreased and, as a result, actions increase if the effects of climate-related activities with others could better captivate and hold individuals' attention. Possibilities could include encouraging the public to engage in two-way dialogues about possible climate action (C. D. Myers, Ritter, & Rockway, 2017) or *gamification* strategies that seek to make climate action salient in a more controlled, less threatening manner (e.g., the climate education-related video game "Eco," also see Morford, Witts, Killingsworth, & Alavosius, 2014). Another possible strategy to reduce boredom might be to facilitate meaning-making and self-discovery relating to climate action (Huta & Waterman, 2014; Lengieza, Swim, & Hunt, 2019), such as via consideration of the moral aspects of climate action (see Feinberg & Willer, 2013; Markowitz & Shariff, 2012) or by building connections between climate action and other sources of meaning in individuals' lives, such as social relationships (Thomas & Louis, 2013) and valued social identities (see Van Zomeren, 2013).

In contrast to the moderate-to-strong predictive power of hope and boredom, intentions to engage in public-sphere climate action were only weakly predicted by anxiety arising when contemplating such action (Cohen, 1988). One possibility is that those who felt anxiety when contemplating taking action on climate change might be higher in trait anxiety, which is associated with risk aversion (Eisenberg, Baron, & Seligman, 1998). Perhaps many individuals reporting anxiety when contemplating taking action on climate change may also experience anxiety when considering the possibility of negative impacts from climate change occurring as a result of *not* taking action (i.e., "climate anxiety," which we did not directly ask about); together, these two effects may have canceled each other out. Relatedly, feeling anxiety when contemplating taking climate action might exert both an emotion-regulation motivation to avoid considering the source of anxiety (taking action) and a problem-solving motivation to address the risk of climate change itself (see Maner & Schmidt, 2006; Mathews, 1990). Although we did not find any practically significant interactions between anxiety and other emotional reactions, future work should examine whether anxiety interacts with other states not examined here, such as anger, to influence action intentions (Miller et al., 2009).

It is also informative that there was no practically significant association (an effect of $\eta^2_p = .005$ is half of what is conventionally considered a small effect) between helplessness and intentions to take action. Broadly speaking, this result is consistent with the SIMCA (van Zomeren et al., 2008) and the *dual pathway model for climate action* (van Zomeren et al., 2010), which suggests that although feeling helpless might discourage taking action to address health or other individual-level risks, it would not affect one's propensity to take action on large-scale collective risks. Our work extends this theory by suggesting that the lack of connection between helplessness and public-sphere climate action intentions also holds when the helplessness

is elicited specifically in response to contemplating engaging in such action.

5.1. Limitations and future directions

Our cross-sectional survey design cannot identify the causal order of relationships between variables. Our work demonstrates associations between emotional reactions when considering taking public-sphere climate action and intentions to engage in such action. Following terminology commonly used to describe results of multiple regression analyses, we describe these noncausal associations in terms of the predictive power of the predictor variables on an outcome. These associations do not provide evidence as to whether messages stimulating these emotions would influence behavior (see Chapman et al., 2017). For example, although we controlled for political orientation (also see supplemental analyses which control for several additional possible confounds related to the context in which data was collected), cross-sectional survey designs always leave open the possibility that an unmeasured variable (e.g., environmental identity) could both make participants more hopeful when they consider climate action and lead to greater intentions to engage in such action. Future experimental and longitudinal research is needed to examine how specific messages influence behavior and the extent to which emotions experienced at one time predict later behavior (see Chapman et al., 2017).

Future work should also consider which groups and social or collective identities are salient when individuals contemplate climate action, as the salience of these identities could play an important role in stimulating emotional responses and action. For example, when individuals think about taking public-sphere action on climate change, opinion-based groups (i.e., groups formed around shared opinions; Bluc, McGarty, Reynolds, & Muntele, 2007) might become salient. Individuals' propensity to engage in action might be swayed what emotions arise when they think about groups associated with such action, including those who are "very concerned about climate change" (Geiger & Swim, 2018), "environmental activists" (Bashir, Lockwood, Chasteen, Nadolny, & Noyes, 2013), or "political liberals" (Geiger et al., 2020; Mason, 2018). Some might perceive these others as out-group members, potentially activating emotions such as intergroup anxiety when they contemplate taking action (Stephan, 2014). Others might identify with the salient group, which could lead to group-based emotions such as group pride, guilt, or anger when contemplating action (Bissing-Olson, Fielding, & Iyer, 2016; Harth, Leach, & Kessler, 2013; Schneider, Zaval, Weber, & Markowitz, 2017; Smith & Mackie, 2016; Swim & Miller, 1999).

A limitation of this work is that we assessed behavior intentions rather than directly measuring participants' behavior. Because a goal of the present work was to assess how emotional reactions to contemplating taking action predict future action, we measured behavioral intentions rather than asking participants to self-report past behavior. Behavioral intentions might not always reflect what people actually do, for example, when situational constraints or normative pressures prevent follow-through with intentions or when social desirability concerns lead people to falsely report intentions to engage in behaviors (Maki et al., 2019). However, meta-analyses predicting collective action (van Zomeren et al., 2008) and private-sphere pro-environmental behaviors (Kormos & Gifford, 2014) suggests that behavioral intentions are strongly associated with actual pro-environmental behavior. These meta-analyses afford some confidence that patterns of results might be similar if actual behavior were instead measured, albeit likely with smaller effect sizes. Future work might consider daily diary and experience sampling methods (which assess behavior in real-life contexts) or using an ecologically valid measure (i.e., not self-report) of climate action behavior that occurs after the emotional experiences (Clements, McCright, Dietz, & Marquart-Pyatt, 2015).

Our claims here are also restricted to a particular population: visitors to American informal science learning centers (e.g., zoos and

aquariums). This population constitutes a broad, politically, and socio-economically diverse subsection of the American public (these institutions record well over 100 million visitors annually) that are more politically engaged than the general public and thus more likely to be receptive to engaging in climate action (Swim et al., 2017). Additionally, research suggests that this population is more likely than the general population to accord non-human animals rights and to express empathy or concern over their protection from anthropogenic threats (Lerner, Fraser, Voiklis, Saunders, & Meyers, in press). Although the population is somewhat better educated and more politically liberal than the general public (Swim et al., 2017), analyses generally indicated similar conclusions across those of differing political ideologies. Future work should examine whether these findings also apply to less civically engaged populations.

Lastly, future work should continue to examine the interplay between emotional reactions and other psychological reactions that can influence individuals' tendency to take action. For example, other work has examined the predictive power of self-, response, and collective efficacy in promoting climate engagement (Doherty & Webler, 2016; Geiger et al., 2017; Jugert et al., 2016; Thaker, Maibach, Leiserowitz, Zhao, & Howe, 2016; van Zomeren et al., 2010). A recent theoretical model (Brosch, 2021) proposes that the relationship between emotional reactions and action is mediated by efficacy (see Supplemental Materials for a preliminary test of this using the present data).

6. Conclusion

When mobilizing the British people against fascism and the Nazis in World War II, Winston Churchill, in his first speech as Prime Minister to the House of Commons, famously said, "I have nothing to offer but blood, toil, tears and sweat." This quote, and the extensive speech in which it was embedded, acknowledged that the cause would be difficult and attempted to inspire motivating feelings (such as hope) tied directly to the possibility of taking necessary but difficult action. Our results suggest that motivating action on climate change might be similar to Churchill's call to action, indicating robust linkages between specific anticipatory emotional reactions when contemplating public-sphere action on climate change and intentions to engage in such action. More specifically, we found support for the predictive power of emotional reactions that signal whether the action itself might help to meet valued goals: feeling hope and boredom about the possibility of taking action. Broadly, these findings provide insight for those interested in links between anticipatory emotional reactions and the process by which individuals make plans to engage in climate action.

CRediT authorship contribution statement

Nathaniel Geiger: Conceptualization, Investigation, Formal analysis, Writing – original draft, Supervision. **Janet K. Swim:** Conceptualization, Funding acquisition, Investigation, Writing – review & editing, Supervision. **Karen Gasper:** Writing – review & editing. **John Fraser:** Funding acquisition, Project administration, Investigation, Writing – review & editing. **Kate Flinner:** Project administration, Investigation, Writing – review & editing.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2021.101649>.

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