Not all Boomers: Temporal Orientation Explains Inter- and Intra-Cultural Variability in the Link between Age and Climate Engagement

Nathaniel Geiger (nathangeiger@zoho.com)
Indiana University Bloomington https://orcid.org/0000-0003-1724-1081
Bryan McLaughlin
Texas Tech University
John A Velez
Indiana University

Research Article

Keywords: younger adults and teenagers, populations, Climate

Posted Date: February 24th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-229534/v1

Not all Boomers: Temporal Orientation Explains Inter- and Intra-Cultural Variability in the Link between Age and Climate Engagement

Nathaniel Geiger[1], Bryan McLaughlin[2], & John Velez[1]

[1] The Media School, Indiana University

[2] Department of Advertising, Texas Tech University

Acknowledgements: Thanks to Lizbeth Benson for developing ideas around socioemotional selectivity theory.

Corresponding author: Nathaniel Geiger, The Media School, 0030H Franklin Hall, Indiana University, Bloomington, IN 47405

Email: nathangeiger@zoho.com.

Word count: 9,968

Abstract

Some previous work suggests that older adults, relative to younger adults and teenagers, are less engaged with climate change; yet, this pattern is not consistently found across all countries or populations. Here, we consider whether temporal orientation might act as a boundary condition for age effects on climate change engagement. We assess whether cultural (Study 1) and inter-individual (Study 2) differences in temporal orientation moderate the tendency for older adults to be less engaged with climate change than younger adults. Study 1 (N = 44,387) reveals that amongst European countries, countries with a greater long-term orientation tend to show a weaker (i.e. less negative) relationship between age and the salience of climate change (i.e., cognitive engagement with the topic). Study 2 (N = 798) demonstrates that in the US, the negative relationship between age and climate action intentions becomes smaller in magnitude (i.e. less negative) among those higher in consideration of future consequences, but increases in those higher in consideration of immediate consequences. These findings support the notion that it is a confluence of age and present orientation (and low future orientation) that that drives age-related declines in climate engagement.

Not all Boomers: Temporal Orientation Explains Inter- and Intra-Cultural Variability in the Link between Age and Climate Engagement

A society grows great when old[er adults] plant trees whose shade they know they shall never sit in. – Greek proverb

In 2019, the meme *"OK Boomer"* was popularized amongst teenagers and young adults to express frustration about their perception that older adults (i.e., from the Baby Boomer generation), who hold disproportionate power and wealth relative to younger generations (New America, 2019), are out of touch with the realities of the modern world and are not adequately engaged with solving major societal issues, such as climate change. Public opinion data suggests a kernel of truth in this stereotype: at least in the US, age is associated with reduced concern and engagement with the issue (Hamilton, 2011; McCright, 2010; Reinhart, 2018). One possible explanation for this relationship could be that older adults do not believe that they will be personally affected by the issue. Indeed, previous work suggests that older adults (relative to younger adults) are less likely to perceive that the issue will pose a serious threat in their lifetimes (Reinhart, 2018). Thus, on average, older adults might be more likely to prioritize issues perceived to affect them in the present instead of seemingly less pressing issues such as climate change that might appear to have fewer implications for their personal lives (Hurlstone et al., 2020). In the present work, we suggest a different possibility – that the age gap, rather than being driven by all older adults, is moderated by *temporal orientation*, which is the extent to which a person directs their thoughts towards immediate or future concerns (Lee at al., 2017; Maglio & Trope, 2019).

The extent to which people integrate future concerns into present decision-making can vary across both individuals and cultures. For example, in the US, where there is a robust

negative relationship between age and climate change concern (Reinhart, 2018), there are many notable counterexamples of older American adults who prioritize taking action on climate change. Many environmental activist groups considered 78-year-old Senator Bernie Sanders to have the strongest climate action platform of any of the 20+ major candidates in the 2020 US Democratic presidential primary (e.g., Herndon, 2020). Similarly, many other prominent voices in the environmental movement are middle-aged or older, including former politician Al Gore (age 73 in 2021), 350.org founder Bill McKibben (age 60 in 2021), and billionaire activist Tom Steyer (age 64 in 2021). There is also cross-cultural variation in the relation between age and climate engagement, as the negative relationship between age and climate engagement is reduced, or in some cases reversed, depending on the country and region (Poortinga et al., 2019).

This manuscript uses temporal orientation to extend past work on age and climate engagement. We seek to demonstrate that age is not just a demographic factor that predicts climate inaction. Rather, we predict that age interacts with the extent to which a person focuses on the present or future (i.e., temporal orientation) to determine their concern about and engagement with climate change. The moderating role of temporal orientation on this relationship can be explained, in part, by *socioemotional selectivity theory*, which suggests that older adults are more likely than younger adults to consciously tune out negative information unless that information is emotionally meaningful to them (Carstensen et al., 1999). Thus, because future-oriented older adults, relative to present-oriented older adults, are more likely to ascribe greater meaning to future-oriented concerns such as climate change, we propose that they are likely to engage more deeply with climate change. Below, we explore this notion in greater detail.

Temporal Orientation, Age, and Climate Engagement

Most previous work suggests that older adults report lower concern about environmental issues than younger adults (Van Liere & Dunlap, 1980; Wiernik et al., 2013), particularly with regard to global environmental issues with abstract, diffuse impacts perceived as not directly relevant to their personal lives, such as climate change (Jianguang, 1993; McCright, 2010; Poortinga et al., 2011, 2019). Here, we argue that the relationship between age and climate change engagement cannot be fully understood without considering individuals' relationship to the future (i.e., temporal orientation). Temporal orientation refers to the tendency to focus the mind toward immediate and concrete concerns, on the one hand, versus future and abstract concerns, on the other (Maglio & Trope, 2019). Those focused more toward the present (and less toward the future) spend greater time considering present outcomes (rather than future outcomes), and tend to engage in greater temporal discounting of future outcomes, preferring smaller rewards in the present to larger rewards in the future (Green et al., 1996; Löckenhoff et al., 2011).

Because environmental issues are viewed by most as pressing concerns about the future (but somewhat less so in the present; Miniard et al., 2020) and environmental considerations feature prominently in many individuals' visions of the future (Kantenbacher et al., 2020), it is perhaps unsurprising that those with greater future time orientation are more environmentally engaged (see Milfont et al., 2012 for a meta-analysis). The tendency to engage in temporal discounting (related to present time orientation, see above) is associated with reduced climate action (Jacquet et al., 2013). Further, experimentally priming individuals to consider the future (for example, by asking participants to consider the legacy that they want to leave for future generations, or by making future events feel closer), leads to more future-oriented decisions in an

environmental game (Hurlstone et al., 2020), greater donations to environmental causes (Zaval et al., 2015), and greater subsequent (self-reported) engagement in everyday pro-environmental behaviors (Soliman et al., 2018). Leaving a legacy can help individuals cope with concerns of their own mortality, as legacies provide a way to continue to be meaningful even after death—a concern that may be particularly acute for older individuals. These concerns can have an important, positive impact on society, as the desire to leave a legacy can motivate an individual to engage in altruistic behavior that benefits future generations (M. Fox et al., 2010; Wade-Benzoni, 2006).

In short, having a long-term temporal orientation appears to make outcomes occurring far away in time seem more relevant and meaningful. Temporal orientation is not just an individual trait, however. It can also vary across cultures, as some cultures place more emphasis on focusing on the present and immediate gratification (e.g., the United States), whereas other cultures place more emphasis on looking towards the future and leaving a legacy for future generations (e.g., Germany; many East Asian countries; Hofstede, 2011).

Aging Effects on Climate Engagement

Temporal orientation may influence climate change attitudes because it can affect the extent to which future events or issues feel meaningful. The meaningfulness of issues is particularly relevant for older adults because they tend to avoid negative information if it is not perceived to be emotionally meaningful for them. *Socioemotional selectivity theory* (Carstensen et al., 1999) posits that as individuals age, and thereby perceive that they have less time left to live, they tend to increasingly prioritize deriving emotional meaning and well-being, rather than expanding their horizons or knowledge acquisition. This tendency, on average, leads older individuals to consciously avoid seemingly unnecessary emotional discomfort by attuning less to

abstract future threats that are seemingly unlikely to affect them during their lifetime. Instead, the theory argues that with age, most tend to increasingly narrow their focus to goals that are emotionally meaningful to them, such as maintaining positive social relationships with close friends and family. Consistent with this theory, older adults, relative to younger adults, report lower levels of negative emotions, anxiety, and depression (Lawton et al., 1993), and show better memory for positive stimuli than negative stimuli in laboratory settings (the *positivity effect*; Charles et al., 2003). These findings may reflect Charles and colleagues' (2003) observation that when asking older adults how they regulate their emotions in difficult times, a remarkably consistent response was "I just don't think about [problems or worries]" (p 311). These developmental psychology findings parallel social psychological work on empathy as a motivated process (Cameron & Payne, 2011), which demonstrates that in some situations individuals consciously choose to avoid empathizing with mass suffering.

Socioemotional selectivity theory argues that it is not negative stimuli *per se* that older adults are avoiding, but rather negative stimuli that do not have emotional meaning for the individual. For example, an older adult might find helping their grandchild deal with a successful situation to be emotionally meaningful. Although offering such help might be stressful and evoke negative emotions, at the same time it might provide a meaningful experience that has the potential to strengthen a valued relationship (Carstensen et al., 2003). More generally, the positivity effect found in lab settings may be nullified, or even reversed, in individuals from cultural backgrounds where negative emotions are also considered emotionally meaningful, such as East Asian cultures (Fung et al., 2008, but also see Kwon et al., 2009). This work also aligns with work on the motivated rejection of empathy (Cameron et al., 2019), which demonstrates that people are less likely to avoid empathizing with those suffering when they believe that the

negative emotions they might experience are worth the costs. Extending these perspectives to climate change, older adults, despite their lower tendency to engage with climate change overall, might be likely to contemplate and take action on climate change to the extent to which they find the issue to be emotionally meaningful.

Temporal orientation may influence the extent to which individuals find climate change emotionally meaningful. As noted above, being temporally oriented toward the future seems to predispose individuals to ascribe greater meaning to abstract-seeming, long-term concerns such as climate change. Based on the notion that older adults (relative to younger adults) are more likely to avoid considering or taking action on concerns that do not have emotional meaning, it follows that the relationship between age and (reduced) climate engagement might be strongest for those who orient more toward the present than the future, and weaker or possibly even reversed for those who orient toward the future rather than the present. Similarly, we propose that the negative relationship between age and climate engagement that has been demonstrated in United States samples might be weaker among cultures that have a future-oriented (rather than present-oriented) cultural orientation.

Bidimensionality of Temporal Orientation

Previous work has demonstrated that temporal orientation is theoretically and statistically separable into two negatively related yet distinct dimensions representing consideration of the future and the present (Joireman et al., 2008). This bidimensionality has led to the consideration of two separate potential theoretical explanations of how temporal orientation influences the effects of other predictors of decision-making. The *buffering model* suggests that considering the future buffers against the effects of risk factors of irresponsible decisions. For example, alcohol intoxication increases individuals' aggressive behavior, but this effect is less pronounced in those

who most highly consider future consequences (Bushman et al., 2012).In the case of age and climate engagement, the buffering model would propose that considering future consequences can lead older adults to see addressing climate change as more emotionally meaningful, buffering against the age-related tendency to consciously avoid engaging with such a negative topic. The second model, the *susceptibility model* suggests that it is greater consideration of the present that increases the effect of risk factors toward irresponsible decisions. For example, compulsive buying tendencies are not strongly correlated with the tendency to accumulate credit card debt (i.e., an outcome with low impact in the present but high impact in the future), except among those high in consideration of immediate consequences (Joireman et al., 2010). In the case of age and climate engagement, the susceptibility model would propose that a focus on immediate consequences leads to the promotion of emotionally meaningful goals related to the present, potentially crowding out future-oriented topics such as climate change and increasing the likelihood that such topics will be consciously ignored. Distinguishing between whether buffering model or susceptibility model (or both) explains the age-related decreases in climate engagement, though seemingly subtle, is practically relevant, in part because it helps provide input into whether facilitating engagement with climate change amongst older individuals can best be facilitated by increasing consideration of the future, or decreasing tendencies to act based on present temptations (Joireman & King, 2016).

Based on the above, we make the following hypotheses:

Hypothesis 1: On average, the older someone is, the less they will be engaged with climate change.

Hypothesis 2: Hypothesis 1 will be moderated by temporal orientation such that among those who a) consider the future more or b) the present less in decision-making (or live in

cultural contexts that promote considering the future more and the present less), age-related differences in climate engagement will be less pronounced.

Present Research

In two studies, we examine whether temporal orientation moderates the relationship between age and climate change engagement. As alluded to above, temporal orientation varies at both the cross-cultural level and the individual levels, which we explore separately in Studies 1 and 2, respectively. Study 1 conducts a cross-national examination of temporal orientation at the country level, considering whether European countries that have a longer-term orientation have a weaker (i.e., less negative) relationship between age and salience of climate change. Study 2 examines temporal orientation at the individual level in a US sample, assessing whether American adults that have a longer-term orientation have a weaker relationship between age and intentions to engage in collective action on the topic. Study 2 further separates temporal orientation into consideration of a) future consequences and b) immediate consequences, consistent with the bidimensionality of this construct noted above. In both studies, we control for political orientation because political orientation is related to both temporal orientation (Joireman & Liu, 2014) and climate engagement (Hornsey et al., 2016) and we wanted to ensure that effects of temporal orientation persisted when the effects of political orientation was accounted for.

Study 1

Study 1 combined publicly available online data from multiple sources to explore whether countries which have a less future-oriented temporal orientation show a stronger relationship between age and prioritizing climate change. In Study 1, we operationalize prioritization of climate change in terms of individual differences in issue salience.

Methods

Country-level data on temporal orientation was collected using long-term orientation from Hofstede's cultural values index (Hofstede, 2013; Hofstede & Minkov, 2013). Measures from Hofstede's index have been previously used by cross-cultural researchers assessing cultural differences in environmental engagement (e.g., Eom et al., 2016). Other measures were taken from European Social Survey data (European Social Survey Round 8 Data, 2016), which examines 23 countries (all in Europe plus Israel, total N = 44,387). In order to maximize representativeness of the teenage and adult public residing in private households for each country, European Social Survey researchers conduct face-to-face interviews with samples selected by multistage strict random probability methods based on sampling frames of individuals, households and addresses. We used the data from Round 8 because the other rounds of this survey did not ask participants about climate change. Focusing solely on European countries (and Israel) reduces variance in other country-level cultural predictors which could confound the results, such as collectivism and socio-economic status (Eom et al., 2016, 2018). In terms of statistical power, simulation studies (Scherbaum & Ferreter, 2009) suggest that, as a rule of thumb, studies seeking to assess cross-level interactions should examine at least 30 groups (in this case, countries) and 30 observations per group; by this metric, our dataset was slightly underpowered in terms of number of countries present in the sample. This is unfortunately a common limitation of cross-cultural research which often has to rely on an inherently limited set of upper-level groups, including other research which has used the European Social Survey dataset (e.g., Poortinga et al., 2019).

Participants' ages were directly reported in the dataset (M = 49, SD = 19, range = 15 to 100). Political orientation was assessed via a single-item measure asking participants to place

themselves on a political 0 "left" to 10 "right" scale (M= 5.16, SD = 2.24). Because we wished to control for the effects of political orientation when assessing the effects of long-term orientation and long-term orientation was assessed at the country level, we needed a country-level measure of political orientation, which we obtained by averaging participants' data for each country to obtain an average political score for that country.[1] The issue salience of climate change was assessed via a two-item composite measure (α = .69, M = 3.01, SD = 0.89) consisting of an average of the following items: 1) affective salience of climate change ("How worried are you about climate change?") on a 1 "Not worried at all" to a 5 "Extremely Worried" scale, and 2) cognitive salience of climate change ("How much have you thought about climate change before today?") on a 1 "not at all to 5 "a great deal" scale. We excluded participants who had previously indicated that they believed that the world's climate was "definitely not changing" (n = 978, 2% of the sample)[2].

Results

We conducted multilevel modeling analyses using the *lme4* (Bates et al., 2014) package in *R* (R Core Team, 2020), with *lmerTest* (Kuznetsova et al., 2015) enabled to assess statistical significance. Although the number of countries available in the dataset was too small to permit adequate statistical power for a between-country analysis, a preliminary analysis conducted at the country level showed that salience of climate change was marginally higher amongst countries with an older average age (e.g., France, the "oldest" country, has an average sample age of 52 vs. the Czech Republic, the "youngest" country, has an average sample age of 46),

[1] In supplemental analyses, we also considered the following additional country-level moderators: 1) average education level, 2) GDP per capita, and 3) population density (with the latter two taken from 2016 World Bank data. Whether included simultaneously or separately, none of these variables significantly moderated the age-climate salience relationship, thus, for simplicity we do not present them in analyses in text.

[2] Results are similar if these participants are included.

$r(21) = .36$, $p = .09$. To avoid this possible confound, we centered each individuals' age relative to the average age of the country in which they lived. Analyses below are similar if this centering process is not conducted.

We examined whether countries higher in future time orientation showed a weaker (less negative) relationship between age and climate salience using the following multilevel model:

$$Climate\ Salience = \beta_{0c} + \beta_{1c}(Age_{ci}) + e_{ci} \quad (1)$$

The equation indicates that for each individual i residing in country c, Climate Salience$_{ci}$ is modeled as a function of a person specific intercept, β_{0c}, their age (relative to the average age of their country in the sample), β_{1c}, and residual differences, e_{ci}. Country-specific coefficients were simultaneously modeled as a function of country-level predictors as modeled in the following equation,

$$\beta_{0c} = \gamma_{00} + \gamma_{01}(Long\ Term\ Orientation_i) + \gamma_{02}(Political\ Orientation) + u_{0c} \quad (2)$$

$$\beta_{1c} = \gamma_{10} + \gamma_{11}(Long\ Term\ Orientation_i) + \gamma_{12}(Political\ Orientation) + u_{1c} \quad (3)$$

In these equations, γ_{01} and γ_{02} describe how country-level differences in long-term orientation and political orientation predict climate salience, and γ_{11} and γ_{12} describe how country-level differences in long-term orientation and political orientation predict differences between countries in the relationship between age and climate salience. γ_{00} and γ_{10} are sample-level parameters describing the prototypical country in the sample. Random effects (u_{0c} and u_{1c}) were allowed to covary, but were orthogonal to the residual error, e_{ci}. The interaction terms, γ_{11}

and γ_{12}, were added in Step 2 after main effects were assessed. A model comparison test suggested that adding interaction terms improved model fit, $\chi^2(2) = 5.99$, $p = .05$.

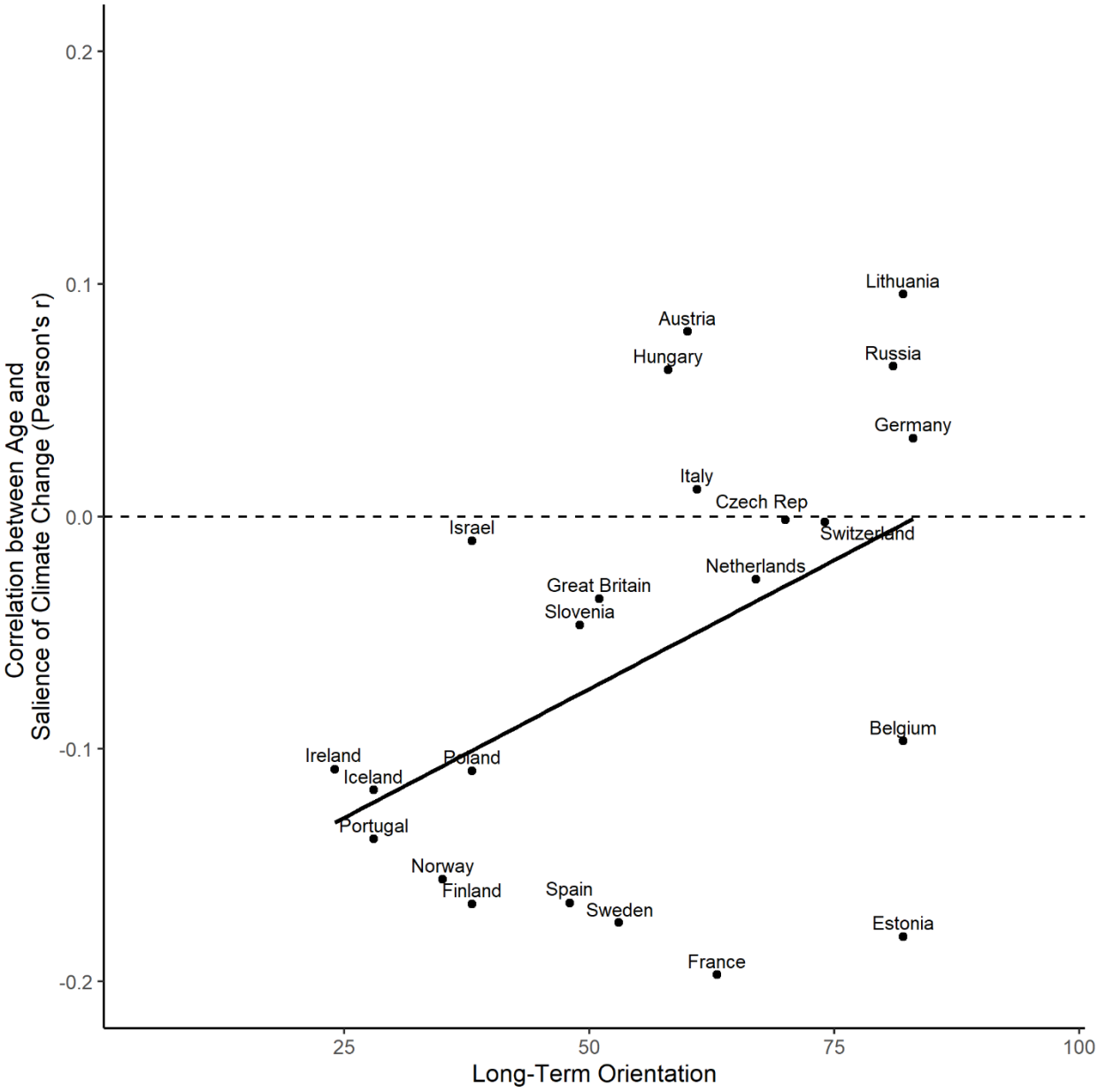

Fig 1. Results from Study 1: Regression results and scatterplot showing the association between country-level long-term orientation and the within-country correlation between age and climate salience.

Overall, age negatively predicted climate salience, b = -.05, SE = .02, β = .06,[3] t(22.12) = -3.01, p = .007. Yet, as predicted, this effect was moderated by the temporal orientation of the country, b = .04, SE = .02, β = .04, t(20.49) = 2.42, p = .02. As shown in Figure 1, among countries with a more long-term temporal orientation, the negative relationship between age and climate salience was smaller in magnitude. The effect of age was not moderated by the average political orientation of participants' in the country, b = .07, SE = .09, β = .01, t(20.25) = 0.75, p = .46.

Discussion

Study 1 results show that at least within the European continent (and Israel), county-level temporal orientation moderates the relationship between age and climate salience. These results also provide a theoretical explanation for Poortinga and colleagues' (2019) findings that the negative relationship between age and climate engagement shows significant variance across the European continent. Our results suggest that this variance can be explained in part by cross-cultural differences in temporal orientation.

Visually examining the figure also suggests that long-term orientation may not predict all of the cross-national variance in this relationship. Among the countries studied here, there appears to be a fairly consistent negative relationship between age and salience of climate change. However, the figure virtually suggests a significant amount of heterogeneity in this relationship amongst countries that are higher in LTO. The remaining differences may in part reflect differences in other cultural values, such as collectivism, egalitarianism, harmony, and uncertainty avoidance (Eom et al., 2016; Kasser, 2011). Further, amongst countries higher in LTO, various idiosyncratic factors may heighten or lower the emotional meaningfulness of

[3] Standardized measures of effect size tend to be smaller in multilevel models compared to OLS regression (Snijders & Bosker, 2011).

climate change. For example, in Austria, data was collected during an presidential election year in which the Green Party candidate received a majority of the votes (Smale, 2016). The salience of this election and the popularity of a candidate belonging to an overtly pro-environmental party may have raised the meaning of environmental issues amongst older adults and explained the positive relationship between climate change salience and age in Austria. Conversely, Estonia is a country that is heavily dependent on shale oil extraction for energy and jobs (International Energy Agency, 2013). This economic reliance on fossil fuels as a part of the country's history could lead to additional discomfort when considering the possibility of reducing dependency on fossil fuels (a major component of climate action), which perhaps explains the sharply negative relationship between climate change salience and age in Estonia despite the high LTO of the country. However, there are likely numerous possible explanations for countries that diverge from the general trend; future work is needed to explore these speculations.

Study 2

Study 2 examines whether the pattern identified in Study 1 also applies when temporal orientation is evaluated at the individual level rather than the country level. We surveyed US adults, a country which would fall somewhat below average (relative to the countries used in Study 1) on the cross-cultural measure of long-term orientation (Hofstede & Minkov, 2013). However, because this measure is not considered to be valid for assessing differences in temporal orientation at the individual level, in Study 2 we instead assessed differences in temporal orientation using the bidimensional *consideration of future consequences* scales (Joireman et al., 2012), which has been previously used as a predictor of pro-environmental intentions (Joireman & Liu, 2014) and separately examines consideration of future consequences (CFC-F) and consideration of present consequences (CFC-I).

We also made two additional changes to the study design. First, reflecting the focus of the consideration of future consequences measures as focused on behavioral outcomes (see Methods), we assessed behavioral intentions to engage in collective climate action, rather than salience of climate change. Second, we heightened salience of climate change by asking participants to first complete a writing task where they were asked to consider the topic of climate change before completing survey questions.

Methods

Participants

We used Dynata, a market research firm formerly known as SSI, to recruit 1180 US adult participants. Dynata uses quota sampling to recruit samples whose demographic profiles closely mirror those of the target population (in this case the US adult public), Dynata's recruitment process reduces low-quality responses that have become common in studies that instead use Amazon's Mechanical Turk (MTurk) to recruit participants (Ahler et al., 2018). We selected a fairly large sample size because we were unsure of what effect size to expect and detecting statistical interactions requires a much larger sample than main effects (Giner-Sorolla, 2018; Giner-Sorolla et al., 2019). After eliminating participants who took less than half of median time (501 seconds) to complete the survey (a key identifier of those who rushed through the survey; Leiner, 2019; Malhotra, 2008; n = 321, 25% of sample) and those who reported that did not believe climate change was occurring (n = 61, 6% of sample), our sample contained 798 participants[4]. A power analysis using G*Power 3.1 (Faul et al., 2007) indicated that our sample had 81% power to detect a "small" effect in a regression (defined as $R^2_{partial} = .01$; Cohen, 1988).

[4] Results were similar if excluded participants were included.

Demographically, participants roughly reflected the US adult population (U.S. Census, 2014). Participants were 375 men, 479 women and 2 participants who identified as transgender. Participants' ages ranged from 18 to 98 (median = 48). Participants identified as 73% White, 16% Black or African American, 2% American Indian or Alaska Native, 4% Asian, 1% Native Hawaiian or Other Pacific Islander, and 2% "Other". Hispanic/Latino identification was asked in a separate question; 10% of participants identified as such (5% chose not to answer the question). Politically, participants identified as 40% Democrat, 22% Republican, 31% Independent, 3% Libertarian Party, 1% Green Party, and 1% "Other" (10% chose not to answer the question)[5].

Procedure

All participants completed an online survey. Participants were first primed to think about climate change via a writing task, then completed survey measures listed below as part of a battery of measures (some were used in another project). The full survey, data, and analyses are available at [insert OSF.io url here upon publication].

Measures

Age

Age was calculated by subtracting the year participants claimed that they were born from 2019 ($M = 47$, $SD = 17$, median = 48, range = 18-97).

Temporal Orientation

We measured temporal orientation using the *consideration of future consequences* scale (specifically, the CFC-14; Joireman et al., 2012), which divides consideration of future consequences into future (CFC-F, e.g., "I consider how things might be in the future, and try to

[5] Nationally representative polling of US adults (rather than registered or likely voters) tends to consistently reveal more that more Americans identify as Democrat than Republican (Pew Polling, 2020). However, our numbers are somewhat skewed toward Democrats, relative to the general public, in part because those excluded for climate change denial were disproportionately Republican.

influence those things with my day to day behavior."; α = .88) and immediate (CFC-I, e.g., "My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions."; α = .92) subscales on -3 "Strongly disagree" to 3 "Strongly agree" scales. As shown in Table 1, the two subscales were only weakly negatively correlated, empirically supporting their bidimensionality.

Political orientation (covariate)

Political orientation was measured via averaging two items assessing social and economic conservatism on a -3 "Very liberal" to +3 "Very conservative" scale (α = .89).

Behavioral Intentions

Participants indicated their intentions to engage in three different forms of climate action (e.g., "How likely would you be to volunteer or donate money to an organization working to reduce climate change" on a -3 "Very unlikely" to 3 "Very Likely' scale; α = .87; derived from Swim et al., 2019).

Results

Zero-order correlations between all measures are shown in Table 1. As shown in the table, there is only a weak, nonsignificant negative correlation between age and consideration of future consequences (CFC-F), and a weak-to-moderate, negative correlation between age and consideration of immediate consequences (CFC-I). This suggests that younger adults consider the immediate consequences of their actions somewhat more (on average) than older adults when making decisions, but consider future consequences approximately equally to older adults.

Table 1
Study 2 means, standard deviations, and correlations with confidence intervals.

Variable	*M*	*SD*	1	2	3	4
1. Age	47.21	16.65				
2. CFC-F	0.91	1.04	-.03 [-.10, .04]			
3. CFC-I	-0.48	1.31	-.20** [-.27, -.13]	-.16** [-.23, -.10]		
4. Political conservatism	-0.14	1.73	.16** [.10, .23]	-.15** [-.22, -.08]	.07* [.00, .14]	
5. Climate action intentions	0.15	1.74	-.13** [-.20, -.06]	.59** [.54, .63]	-.08* [-.14, -.01]	-.33** [-.39, -.27]

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 $p < .01$.

Age and Climate Engagement Intentions

We first explored the relationship between age and climate engagement intentions in a bivariate regression. While running diagnostic tests on this relationship, a studentized Breusch-Pagan test (used to verify homoskedascity; Breusch & Pagan, 1979) revealed heteroskedascity among the results, $\chi^2(1) = 16.37$, $p < .001$, suggesting that variance in climate engagement intentions was not constant amongst those of different ages. Thus, we examined the relationship between age and climate engagement intentions using location-scale regression (Rigby & Stasinopoulos, 2005), using the *mgcv* package (Wood & Wood, 2015) in R (R Core Team, 2020). Location-scale regression allows both mean outcome values (similar to a normal regression) and the variance in the outcome measure to vary as a function of predictors. Results suggested that age was negatively associated with environmental engagement, $b = -.013$, $SE = .004$, $z = -3.39$, p

< .001, estimated[6] η_p^2 = .02. However, as shown in Figure 2, this linear relationship was qualified by the standard deviation of the outcome measure also increasing with age, b = .005, SE = .002, z = 3.19, p = .001. Follow-up tests using the *car* package (J. Fox et al., 2018) in R, which statistically compared decreases in the mean to increases in the standard deviation to examine whether the two were statistically different, suggested that those at 1SD above the mean on the outcome measure of environmental engagement did not significantly decline with age, although there was a marginally significant downward trend, b = -.008, $\chi^2(1) = 3.34$, p = .07. In contrast, 1SD below the mean on the outcome more sharply decreased with age, b = -.018, $\chi^2(1) = 20.46$, $p < .001$.

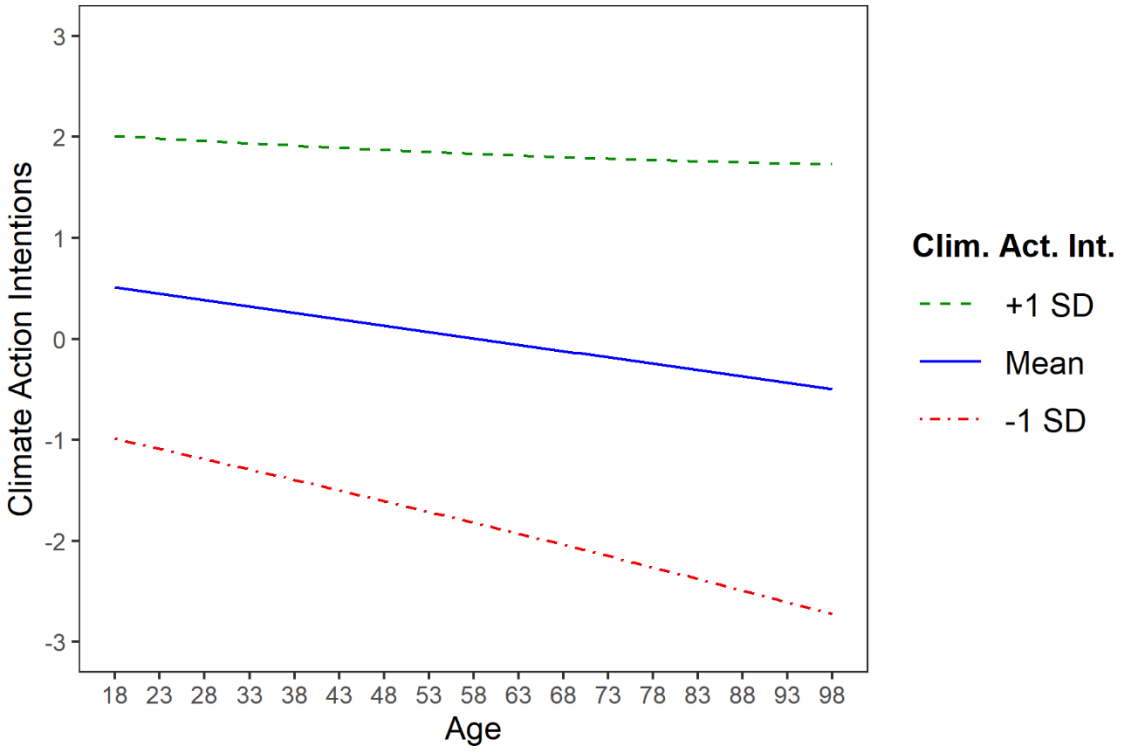

Fig 2. Location-scale model from Study 2: Location-scale regression from study 2 showing a net decrease and an increase in variation in self-reported climate intentions with age.

[6] Effect size was estimated using standard OLS regression.

Temporal Orientation, Age, and Climate Engagement Intentions

We conducted a multi-step linear regression model to examine 1) main effects of temporal orientation and 2) interaction between temporal orientation and age. Throughout both steps, we control for political orientation, and in Step 2 the interaction between political orientation and age (see Supplemental Analyses for more information on the interaction between political orientation and age on climate engagement)[7]. Studentized Breusch-Pagan tests revealed that heteroskedascity was no longer statistically significant in either step of the model, $\chi^2(4) = 8.33$, $p = .08$; $\chi^2(7) = 13.13$, $p = .07$, suggesting that OLS regression would be most appropriate for these analyses for simplicity. See Table 2 for a full report of regression results.

[7] Results are similar, and somewhat larger in magnitude, if political orientation is not included. We also conducted additional supplemental analyses in which we found that the age-climate relationship was not moderated by a) gender, b) education level, or c) income.

Table 2
Study 2 regression results.

Main Effects and Interactions

	Civic Engagement Intentions	
	Main Effects (95% CI)	Interactions (95% CI)
Age	-0.01**	
	(-0.01, -0.002)	
CFC-F	0.94***	
	(0.84, 1.03)	
CFC-I	0.02	
	(-0.05, 0.09)	
Political conservatism	-0.23***	
	(-0.29, -0.17)	
Age x CFC-F		0.01*
		(0.001, 0.01)
Age x CFC-I		-0.01***
		(-0.01, -0.01)
Age x Political conservatism		-0.005**
		(-0.01, -0.002)
Constant (Intercept)	0.55**	0.12
	(0.20, 0.90)	(-0.59, 0.84)
R^2	0.42	0.45
F Statistic	142.89*** (df = 4; 785)	91.41*** (df = 7; 782)

Note: Main effects are included, but not reported, in Step 2. *p<.05, **p<.01, ***p<0.001

Interaction tests and floodlight analyses using the Johnson-Neyman technique (Spiller et al., 2013) suggested evidence for both buffering and susceptibility hypotheses. Supporting the *buffering hypothesis*, CFC-F interacted with age to predict climate engagement, $b = .006$, $SE = .003$, $t(782) = 2.33$, $p = .02$, $\eta^2_p = .01$. As visually depicted in Figure 3a, floodlight analyses (examining each interaction separately) revealed that age only negatively predicted climate

engagement intentions ($p < .05$) for those near or below the midpoint on CFC-F (below 1.07, 58% of the sample). Supporting the *susceptibility hypothesis*, CFC-I interacted with age to predict climate engagement, $b = -.01$, $SE = .002$, $t(782) = -4.40$, $p < .001$, $\eta^2_p = .02$. As visually depicted in Figure 3b, floodlight analyses revealed that age only negatively predicted climate engagement intentions for those near or above the midpoint on CFC-I (above -0.64, 54% of the sample). Indeed, for those extremely low in CFC-I (less than -2.03, 11% of the sample), age *positively* predicted climate engagement intentions. Unexpectedly, for younger respondents (39 and younger, 36% of the sample), CFC-I was *positively* related to intentions to take action.

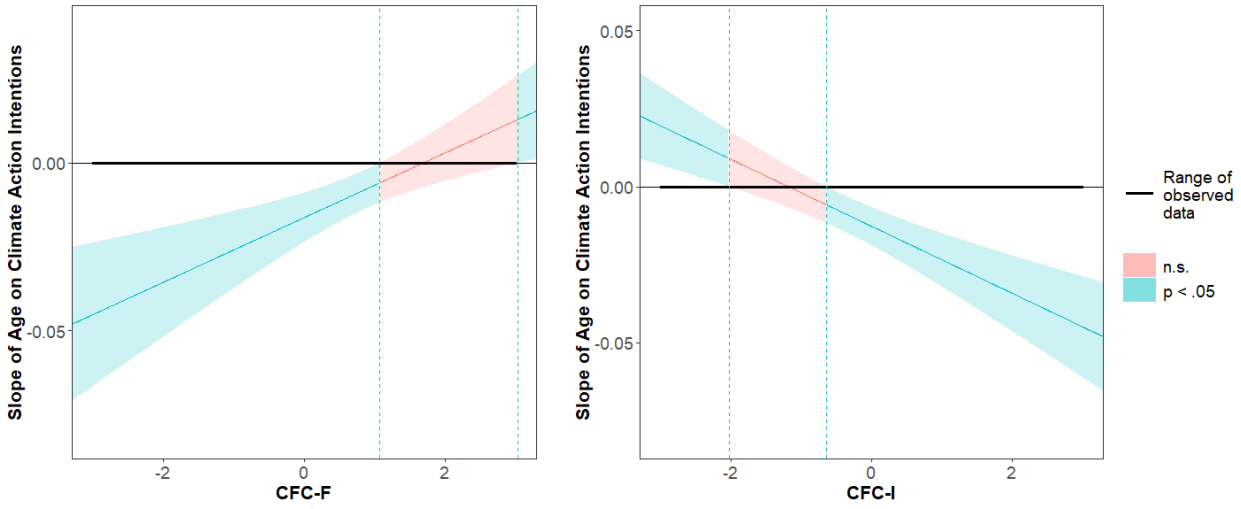

Figure 3. Results from Study 2 demonstrating that the relationship between age and climate salience is moderated by CFC-F (a) and CFC-I (b).

Discussion

Study 2 replicates and extends the findings of Study 1 at the individual level. First, on average older adults reported overall less climate engagement than did younger adults in this US adult sample. We further found that variance in climate engagement was not homogenous amongst all ages. Rather, climate engagement showed greater variability among older adults than younger adults. Combined with the overall main effect of age on climate engagement, these

trends together showed that older adults on the higher end of self-reported behavioral intentions (i.e., one standard deviation above the mean for their age) were statistically similar in self-reported behavioral intentions to younger adults on the higher end of self-reported behavioral intentions, while older adults on the lower end were far lower in self-reported behavioral intentions than younger adults on the lower end. Although unclear, one possibility for the reduced variability amongst younger adults is that it could reflect a ceiling effect (e.g., younger adults' engagement with climate change is clustered at a higher level reflecting greater awareness of the issue amongst this age group).

Second, results provide evidence for both buffering and susceptibility hypotheses: among those who were high in consideration of future consequences (i.e., high in buffering) or, independently, low in consideration of immediate consequences (i.e., low in susceptibility), there was no relationship between age and climate engagement. Interestingly, the pattern of results for CFC-I was slightly different than expected: although the interaction was in the expected direction, there was no main effect of CFC-I predicting reduced climate action intentions when controlling for CFC-F. Although, as expected, CFC-I was negatively associated with reduced climate action intentions in older adults, an unexpected pattern emerged for younger adults whereby CFC-I was positively associated with climate action intentions after controlling for CFC-F. We speculate that this could possibly reflect some younger adults' perception that climate change is a problem that is affecting them in the present (as well as the future; Rickard et al., 2016). Nonetheless, more work is needed to examine this possibility.

General Discussion

Across two studies, we demonstrate the moderating effect of temporal orientation on the relationship between age and climate engagement. Although there was an overall negative

relationship between age and climate engagement in both studies, this relationship was moderated by cultural- and individual-level temporal orientation, such that there was no significant relationship between these two variables among those living in highly future-oriented countries (Study 1) or who were themselves highly future-oriented or not very present-oriented (Study 2). This work suggests that in contrast to the common framing of antagonism between older and younger generations on climate change (Tikkanen, 2020), older adults in fact have a more complex and diverse relationship to the topic.

This work points to the potential importance of using of socioemotional selectivity theory to understand how and when older adults are likely to take action on social issues. Our results are consistent with the notion that older individuals with a present- (rather than future-) oriented temporal orientation may be consciously choosing to avoid considering the effects of climate change. Our work also has potential links to the work on empathy avoidance as a motivated process (Cameron et al., 2019; Cameron & Payne, 2011); as it suggests the possibility that older adults may be particularly likely to engage in such empathy avoidance. Future work is needed to elucidate the psychological mechanisms underlying our findings and identify possible boundary conditions (see Supplemental Materials for a preliminary analysis of mechanisms). In particular, despite multiple decades of work into socioemotional selectivity theory, future work is still needed to develop a direct measure of emotional meaningfulness that would be helpful to directly understanding the direct to which topics such as climate change are emotionally meaningful to individuals.

The work also extends other work which has suggested potential interrelated avenues for increasing engagement with climate change amongst older adults. First, encouraging older adults to think about the consequences of their actions in the future (e.g., thinking about the

legacy they wish to leave) may be particularly effective at increasing climate change engagement amongst this population (Hurlstone et al., 2020; Zaval et al., 2015). Second, because older adults tend to increasingly value relationships with close others (Van der Goot et al., 2019), younger adults and even children and teenagers may be particularly well-suited to encourage climate engagement amongst their older loved ones (Lawson et al., 2019). Third, older adults, in particular, might become more engaged with climate change when the positive affective consequences of becoming engaged are made clear (i.e., they believe that engaging with climate change will make them feel good; Van der Goot et al., 2019).

Our work relied on samples which may have afforded us the ability to detect patterns that much work would overlook. Many studies which have assessed the relationship between temporal orientation and climate action (e.g., Joireman & Liu, 2014) have used undergraduate student populations or online samples such as MTurk, both of which are heavily biased toward younger adults. In contrast, the sampling strategy used across both of the present studies was able to recruit a sample whose ages more closely matched the population distribution of adults.

Limitations and Future Directions

A limitation of the present work is that we only explore climate engagement in Western countries (Europe, Israel, and the US). The regions explored in the present work tend to reflect areas that have had historically high per capita emissions and thus are disproportionately to blame for climate change, yet will largely be spared from the worst impacts of climate change relative to many other regions of the world which have contributed less to the problem (e.g., Latin America). Given these differences, we are unable to speculate whether our results would extend to other regions of the world.

Further, it is unclear whether our results are generalizable to other environmental issues. Though there is limited research distinguishing climate engagement from other forms of environmental engagement (see Swim & Whitmarsh, 2018 for a review), one study suggests that older Chinese adults were more concerned than younger Chinese adults about *concrete* environmental issues (such as local pollution), but less concerned than younger adults about *abstract or global* environmental issues (such as climate change; Jianguang, 1993). Further, given the potential consequences of the threat of climate change, contemplating the topic may induce an existential threat for some, which can modulate pro-environmental responses (Fritsche & Häfner, 2012).

Our results are further limited by our use of behavioral intentions rather than measured behavior as the outcome measure in Study 2. In support of the use of behavioral intentions as a rough proxy for behavior, a meta-analysis of pro-environmental behavior suggests that intentions to engage in pro-environmental behavior are a strong and robust predictor of actual behavior (van Zomeren et al., 2008). Further, longitudinal work suggests that the relationship between behavioral intentions and subsequent (self-reported) pro-environmental behavior is not influenced by self-deception or impression management concerns (Vilar et al., 2020). Nonetheless, it is possible that patterns could differ if actual behavior were assessed. For example, given that CFC-I is associated with reduced self-control (Joireman et al., 2008), it is possible that those high in CFC-I may be less likely than others to follow through with their intentions.

Future work should delve more deeply into the psychological mechanisms by which future orientation moderates age effects on climate engagement (see Supplemental Materials for a preliminary mediation analysis). Work is needed to develop and test a measure of emotional

meaningfulness. Additionally, it seems highly plausible that future-oriented older adults (relative to future-oriented younger adults) might be less likely to think about direct future consequences to themselves as they may anticipate not being alive as distant future events unfold. Yet, our work leaves unclear whether future-oriented older adults tend to be primarily concerned about the effects of climate change on themselves, on others, or whether they are motivated by how they wish to be remembered (i.e., legacy motives; Schultz, 2001; Zacher et al., 2011). These distinctions have practical relevance for strategies to engage older adults, as, for example, if future-oriented older adults who engage with climate change are primarily concerned with their legacies, communicators could consider appealing to such legacies in order to engage older adults who are already future-oriented and potentially encourage less future-oriented older adults to focus more on the future (see Hurlstone et al., 2020; Zaval et al., 2015). Thus, researchers should consider conducting qualitative work to better understand how older adults who are already engaged with climate change think about the issue. In doing so, researchers might consider incorporating work on future self-continuity (Hershfield et al., 2011), temporal discounting (Jacquet et al., 2013), legacy motives (Zaval et al., 2015), and responses to existential threats (Fritsche & Häfner, 2012).

In addition, future work should also test other predictions of socioemotional selectivity to provide additional evidence for the utility of the theory within this context. For example, while age differences in climate engagement could be due to age effects (e.g., individuals becoming less engaged as they age), or cohort effects (e.g., individuals who grew up at an earlier time being less engaged than individuals who grew up at a later time), socioemotional selectivity theory proposes that differences between older and younger adults are related to changing

priorities that occur with age and therefore should be explained by age effects, rather than cohort effects. Longitudinal work is needed to verify this proposition.

Conclusion

The present work demonstrates the synergistic effect of age and temporal orientation on (dis)engagement with climate change. Our work shows that it is not age itself that predicts climate inaction, but rather, the interplay between age and a focus on the present (rather than the future). Our results provide a more nuanced picture than previous work as to this relationship, and also provide preliminary evidence for a possible psychological explanation as for why (some) older adults may be less likely to engage with the topic: namely, that present-oriented older adults may be especially likely to tune out the phenomenon. Our work also suggests the potential importance of fostering future thinking and promoting more future-oriented (and less present-oriented) older individuals to positions of power. This work sheds light and nuance on the poorly-understood age gap that has been identified in climate engagement and demonstrates the importance of better understanding how older adults relate to climate change.

Declarations

Funding: Funding: No external funding was used to support this work

Conflicts of interest/Competing interests: None

Ethics approval: All research was approved by the Institutional Review Board at Texas Tech University. This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments.

Consent to participate: All survey respondents provided implied consent.

Consent for publication: All authors gave consent for publication.

Availability of data and material: Data will be made publicly available on OSF upon publication.

Code availability: R code will be made publicly available on OSF upon publication.

Author contribution: NG, BM, and JV designed the research; BM collected data; NG & JV analyzed the data; NG, BM, & JV wrote the paper.

Figures

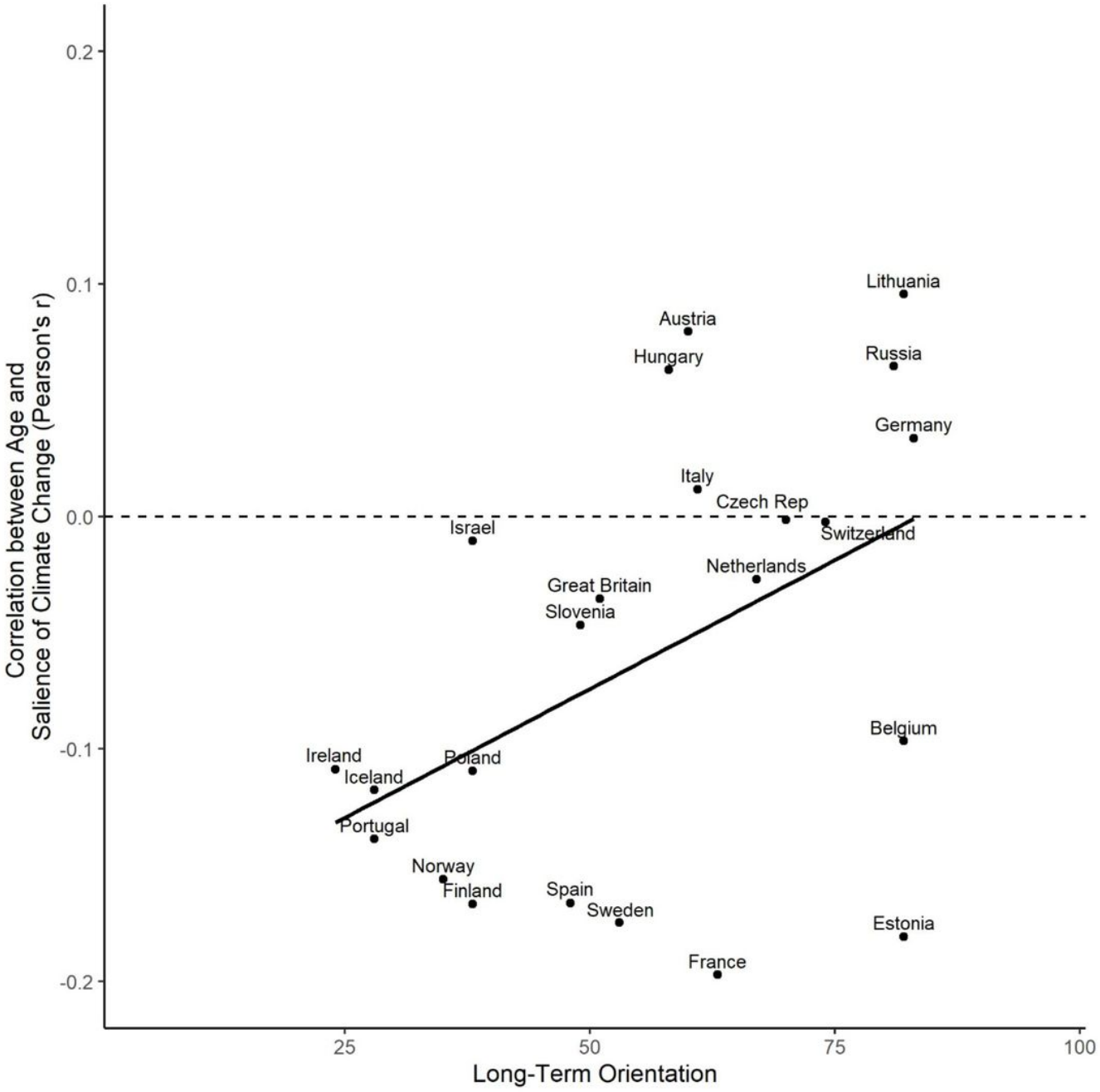

Figure 1

Results from Study 1: Regression results and scatterplot showing the association between country-level long-term orientation and the within-country correlation between age and climate salience.

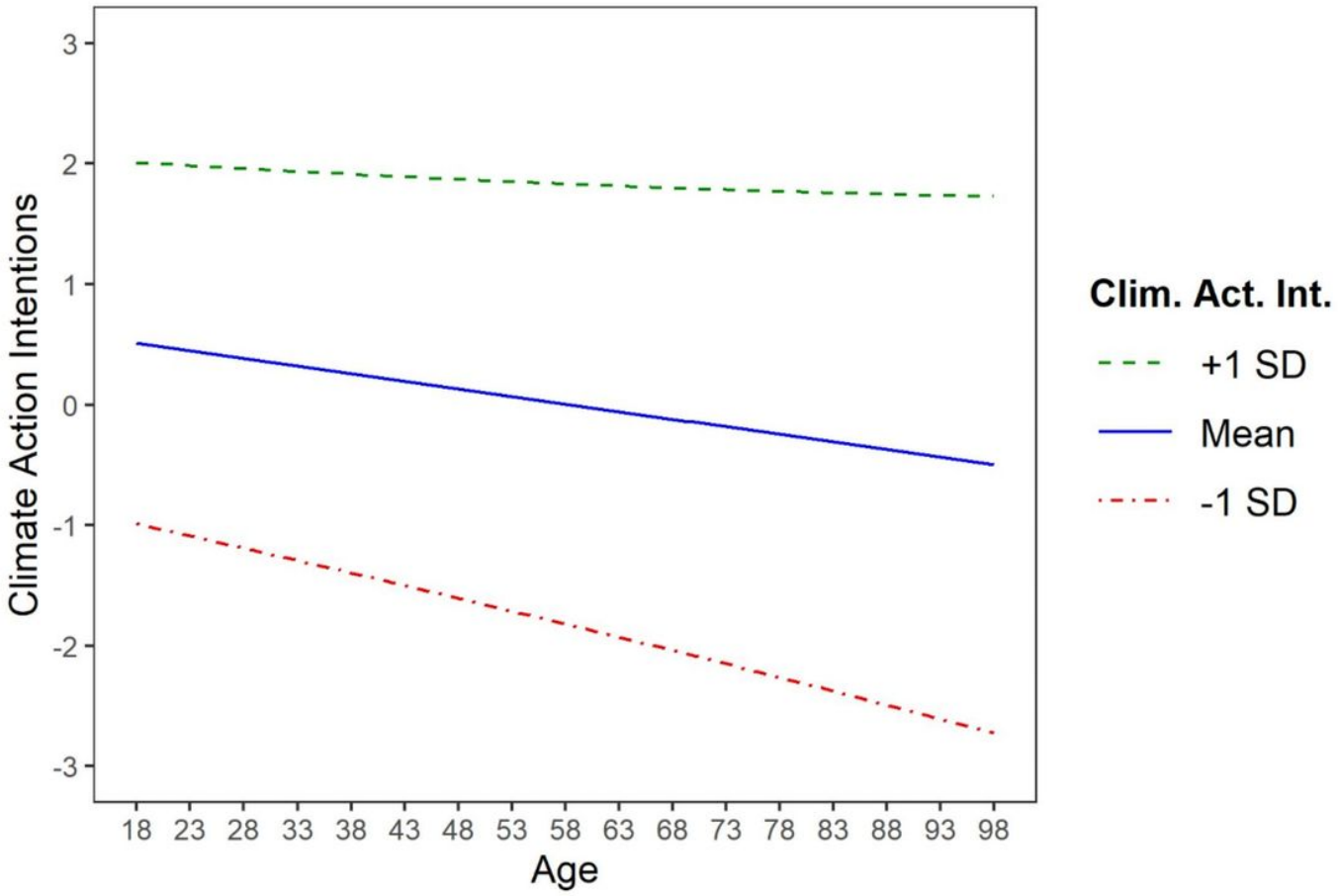

Figure 2

Location-scale model from Study 2: Location-scale regression from study 2 showing a net decrease and an increase in variation in self-reported climate intentions with age.

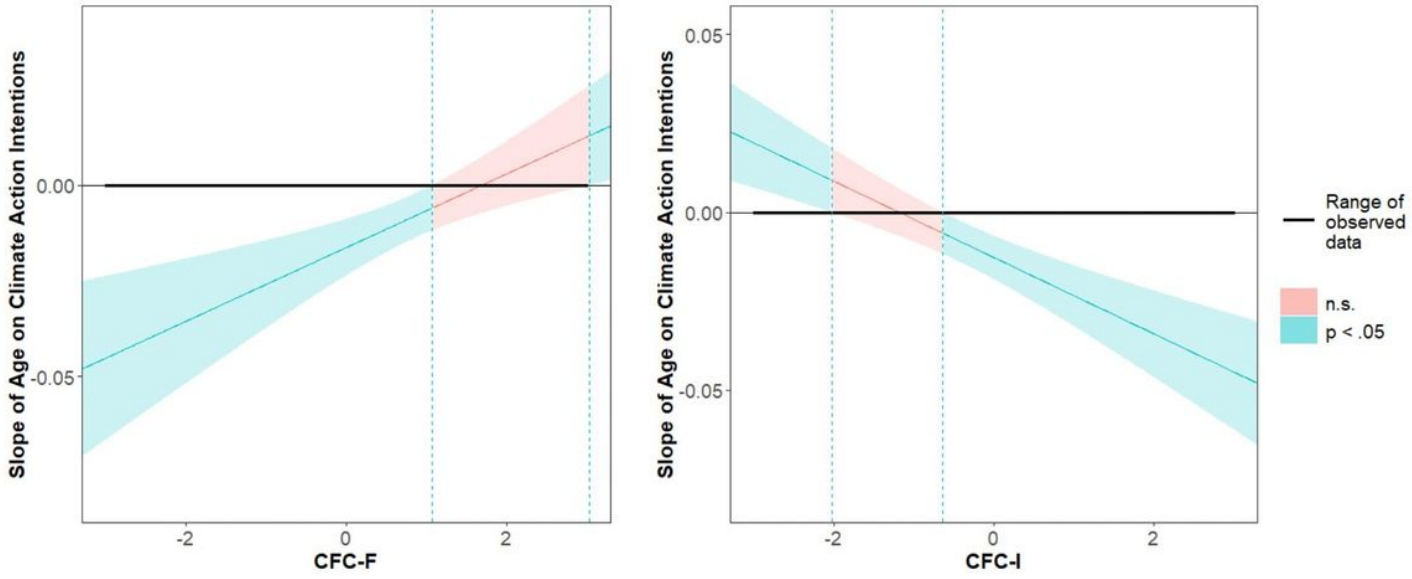

Figure 3

Results from Study 2 demonstrating that the relationship between age and climate salience is moderated by CFC-F (a) and CFC-I (b).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementalMaterials.docx