

Lost in Time: Climate Change Communication
Temporal Framing, Perspective-Taking, and Sustainable Intentions

MSc Thesis



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Abstract

Climate change communication presents a significant and pressing challenge for social and scientific spheres alike. One major barrier in promoting climate concern and sustainable behaviour change is psychological distance, i.e., the perception that climate change is distant from oneself in the here and now. Temporal distance may prove particularly interesting in risk analysis research, considering the current focus on future predictions in communication strategies. Overcoming temporal distance, however, requires tailored, interactive interventions.

The present study adapts and combines two methods from previous research by comparing current frames in perspective-taking scenarios vs. future and control frames and their influence on sustainable attitudes and intentions. Participants ($n = 73$) were recruited via convenience sampling and assigned to read one of three perspective-taking vignettes: current (year 2023), future (year 2050) or control (neutral subject). All data was collected via an online questionnaire which included items on demographics, temporal distance, sustainable intentions, hopefulness, and concerns about climate change. Our analyses found only small and nonsignificant differences between temporal framing groups for both concerns and sustainable intentions. An exploratory analysis based on self-reported temporal distance did, however, find a significant effect on general sustainable motivation through concerns but no effect on intentions to reduce meat-eating. Low hopefulness scores were found to moderate the interactions between temporal framing, concerns, and sustainable intentions. This research provides important insights regarding the importance and malleability of temporal distance, as well the inflexibility of meat-eating, and the potential role of hopefulness in climate change communication and mitigation.

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Introduction

Communication about climate change is a paramount, yet contentious, issue for scientific and social spheres alike. The most recent Intergovernmental Panel on Climate Change report reveals that global temperatures have increased faster since 1970 than any other 50-year period, and approximately 3.5 billion people now live in climate change-vulnerable areas (IPCC, 2023). Although more traction is being made with political and public awareness of climate change, greenhouse gas emissions are still 12% higher than in 2010 and current communication strategies are failing to engender feelings of urgency, citizen engagement and sufficient tangible behavioral change (IPCC, 2023). Even arguably simple, yet highly effective, individual behaviour changes remain lacking. One relevant example is reducing meat-eating. The livestock industry is now estimated to account for 14.5% of greenhouse gas emissions globally (FAO, 2013). Despite increased awareness of the industry's negative impact, and enhanced advocacy, accessibility and industry associated with plant-based diets, global meat consumption has more than quadrupled since 1961 (Ritchie et al., FAO, 2021). This discrepancy between widespread recognition of climate change risks and the contributing behaviors, yet insufficient behavioural adjustment, is cited in scientific literature as the “attitude-behaviour” or “intention-behavior” gap, which has presented a significant challenge in communication to date (van der Linden, 2014).

So why is it difficult to produce motivating climate change communication? Some explanations may be found in the characteristics of the phenomenon itself. Firstly, climate change is essentially a statistical, prolonged effect concerning long-term changes in the earth's temperatures and weather patterns. This makes it difficult for individuals to experience climate change directly, independently, and resonantly, due to its vast scope and lack of detectable “situation” in our daily lives, thereby undermining motivation and mitigation (van der Linden, 2014). In addition, the most salient weather events related to climate change are more likely to take place in the near future rather than the present, leaving room for denial, doubt, and procrastination in the current age (Hammonds, 2020). These factors combine with the reality that most climate change consequences are faced by communities in Central-East Africa, the Middle East, and South-East Asia: many of whom produce the lowest GHG emissions, making climate change further invisible to societies who need to change most (Schor, 2015).

These confounding features, most notably the perceived temporal lag in climate change, have prompted European governments and scientists to rely more on framing climate change in future terms rather than focusing on its present developments (Jones et al., 2016). A renowned example is the 2015 Paris Agreement, which set goals to keep global warming to no more than 1.5 °C above pre-industrial levels and to achieve net-zero emissions by 2050. However, considering our earth's temperature is now predicted to exceed 1.5 °C as soon as the mid-2030s and the conflict with our psychological predispositions to rely on “direct experiences in the here and now” (Pahl & Bauer, 2011, p. 156), the effectiveness of this strategy proves suspect. Considering the lack of behavioural change and essential failure of climate communication to date, this begs the question: How exactly do we move climate change closer in our minds? Would it better to situate climate change communication in the present, to essentially “live in the moment”?

Risk Perceptions

Risk perceptions, which refer to the process of assessing various signals about uncertain events and forming an individual judgment about the type, likelihood, and severity of harm associated with these events, are an important predictor in climate change mitigation behaviours (Bradley et al., 2020). Risk perception has been a focus of psychological research for several decades, which has led to the formation of two diverging frameworks (Siegrist & Árvai, 2020). The affective model proposes that emotional processes precede and trigger the formation of our thoughts and cognitions towards risk perceptions. The cognitive, or analytical, model proposes the inverse, namely that when faced with a threat, cognitive processes manifest first, which then engenders salient emotions or affect associated with this risk perception (van der Linden, 2014). More recently, however, “dual models” of risk perceptions have been increasingly supported as a more comprehensive and advanced framework, suggesting that affective and cognitive processes work in parallel and consistently interact with one another, to guide both the activation of basic emotions and reflexes, as well as more complex decision-making, including risk perceptions (van der Linden, 2014). These processes are also theorised to interact with various extraneous external and internal variables, such as knowledge, social norms, personal norms, context, and demographic factors (Siegrist & Árvai, 2020). All these factors play a role in generating, framing, and adjusting conceptualisations of climate change risks, which in turn, encourage or

undermine pro-environmental behaviour change. Affective reactions have been investigated as particularly important mediating factors, including the emotion of hopefulness. Although previously claimed useful for positive receptions to climate change communication (Chadwick, 2015), newer studies suggest that the role of hopefulness may be overstated (Ettinger et al., 2021), or even sometimes counterintuitive (Marlon et al., 2019) in promoting sustainable attitudes and behaviours. Hence, personal, or affective factors such as hopefulness are important moderating variables which should prove interesting to explore in risk analysis research.

Psychological heuristics, or cognitive shortcuts which often lead to biased and flawed perceptions, are also proposed as important mechanisms in generating risk perceptions towards climate change (Zhao & Luo, 2021). One important example is the availability heuristic, which cites the reliance on our most easily accessible memories or thoughts (those which are most familiar or salient to us) when considering a potential threatening subject (Siegrist & Árvai, 2020). In a study by Taylor and colleagues (2014), people who reported having personally experienced intense flooding or heat discomfort, and people who noted significant memories of weather change in recent years, showed higher beliefs and concerns about climate change. Thus, personal experience, previous exposure, and salient memories alter our attitudes towards climate change risks. Similarly, confirmation bias, i.e., the process of selectively attending to information signals which confirm our pre-existing beliefs and ignoring or reinterpreting signals which conflict with our beliefs, influences both reactions to climate change communication and general attitudes towards the risk of climate change (van der Linden, 2014). Cognitive rigidity, which cites an inability or resistance to change one's beliefs when presented with new information, is thought to be responsible in generating confirmation biases (Zhao & Luo, 2021). Finally, optimism bias, which refers to how individuals rate their own likelihood of being affected by a hazard as much lower than others (Sharot, 2011), is a major mechanism in the underestimation of climate change risk (Siegrist & Árvai, 2020). In considering these factors altogether, it can be confirmed that climate change risk perceptions are complex, subjective, and dependent on a variety of factors, which may elucidate why communication strategies have struggled to elicit significant behaviour change to date, and why more integrated, innovative, and research-backed approaches are now required.

Psychological Distance

A particularly influential feature of climate change risk perceptions is that many people believe the proposed risks of climate change are distant from their current selves (Spence et al., 2012). Psychological distance (PD), first cited in the seminal construal level theory (CLT) by Trope and Liberman (2010), describes this perception that an object is distant from our reference point, namely ourselves in the here and now. PD is theorised to manifest across four dimensions: spatial (physical distance), social (differences between groups/people), hypothetical (uncertainty), and temporal (time) (Spence et al., 2012) and is considered a major barrier in public engagement with climate change communication (Wang et al., 2019). This is because the more distant an object is perceived to be from oneself, the more abstract and/or general its mental construal becomes (Trope & Liberman, 2010). Higher levels of abstraction are, in turn, theorised to undermine our acceptance, certainty, and level of behavioural engagement in a subject, as well as covertly reinforcing pre-existing cognitive heuristics like optimism bias (Keller et al., 2022; Wang et al., 2019). In applying this to the sphere of sustainability, when individuals view climate change as distant from themselves in space, social sphere, likelihood, and time, their conceptualisations of climate change, in turn, become vague and uncertain. This disincentivises climate action, as specific, effective behaviours for such a “far away” and complex issue become too difficult to conceive and act upon (Wang et al., 2019). Thus, a negative association between PD and pro-environmental intentions or behaviours has been posited as a potential psychological mechanism in the insufficient climate mitigation and adaptation to date.

This relationship has served as a focus in various sustainability studies. However, inconsistent results have been produced in both correlational research and experimental manipulation studies with some studies conveying strong associations between the variables (e.g., Jones et al., 2016; Chu & Yang, 2020), whilst others showed little connection between PD and sustainable intentions or behaviours (Stanley et al., 2021; Wang et al., 2019). These inconsistencies are theorised to occur due to both external factors, such as context and demographics, and important mediating variables, which include general concern about climate change (Spence et al., 2012), affective reactions, such as fear, anxiety, and hope (Sheppard, 2012), and “personal relevance” or previous direct experience with climate change events (Keller

et al., 2022). Variability in the types of manipulation used in experimental study are also thought to contribute to these contrasting results, which makes it challenging to currently integrate research (Keller et al., 2022). Overall, PD is considered a complex, multifaceted variable with interrelated dimensions that may have dynamic influence on climate change attitudes and behaviour.

Overcoming psychological distance will, therefore, require innovative, research-backed strategies in climate change communication. According to Sheppard (2012), the most crucial step in reducing psychological distance is to make climate change local, personal, imaginable, and visible in our communication. Given that personal experience with climate change-related weather events is a significant determinant of reduced psychological distance, increased climate concerns and greater sustainable intentions (McDonald et al., 2015; Spence et al., 2011; Keller et al., 2020; van der Linden et al., 2015), an intervention which simulates or replicates this experience may produce similar effects. One method of achieving this “imitation” may be achieved through perspective-taking methods. Perspective-taking involves perceiving a topic or situation from a certain viewpoint. It is considered a powerful tool to enhance understanding of others, increase empathy, and reduce biases through a “self-other merging” process (Sassenrath et al., 2022). In environmental research, perspective-taking has been shown to increase environmental concerns, with a moderating role of dispositional empathy (Schultz, 2000; Sevillano et al., 2007). Perspective-taking to specifically overcome temporal distance is investigated in a study by Pahl and Bauer (2011). Participants in this research were presented with a scenario vignette focused on the negative experiences of climate change in the year 2105 and were asked either to imagine themselves in the scenario of the vignette or to focus on the objective facts of the vignette. The study demonstrated that the perspective-taking condition proved more effective in promoting pro-environmental intentions and behaviour than the objective information and control conditions. This research suggests perspective-taking methods may provide an interactive method of manipulating and/or overcoming psychological distance, by increasing personal relevance towards climate change, which in turn, promotes pro-environmental attitudes and sustainable intentions.

Given the focus on long-term horizons and predicted future impacts in current climate change communication, temporal distance may be of particular interest for research regarding

climate change risk analysis (McDonald et al., 2015; van der Linden, 2014). In fact, a major PD study by Spence and colleagues (2012) found that whereas higher spatial distance sometimes increased climate concerns (specifically when environmental inequality was emphasised), higher temporal distance was consistently associated with decreased concerns and intentions. This was reflected in research by Jones et al. (2017), wherein perceived geographic distance was unrelated to climate change concern, whilst temporal distance had stronger, predicted effects on both concern and intentions. Hence, temporal distance may have a particularly evident or potent influence on pro-environmental attitudes and intentions. Considering that climate change communication to date has focused primarily on future frames, and the substantial evidence of the negative impact of temporal distance, re-evaluated or novel climate change communication are now required. Could we reduce temporal distance towards climate change by situating our messages in the present? And can we combine this new technique with pre-existing interactive strategies such as perspective-taking?

The present research aims to address these queries by comparing the influence of perspective-taking scenario vignettes with different timeframes. Specifically, the research will investigate whether a perspective-taking scenario surrounding climate change in the current age (year 2023) will lead to lower temporal distance (H1) and greater sustainable intentions (H2) than a scenario situated in the future (year 2050) and a control scenario (neutral subject). Sustainable intentions will be measured through general sustainable motivation and intentions to reduce meat-eating. Additionally, we hypothesise that temporal framing will interact with concerns about climate change to influence sustainable intentions (H3), based on evidence from Spence et al. (2012) and Jones et al. (2017). This research will also assess the statistical interactions between temporal framing, demographic factors, and concerns about climate change. Finally, hopefulness will be examined in an exploratory analysis as a potential moderating variable in these interactions and effects. The relevant research questions are therefore listed, as follows:

RQ1: How does temporal framing in perspective-taking influence sustainable intentions?

RQ2: Do concerns about climate change mediate the relationship between temporal distance and sustainable intentions?

Methods

Design

This research followed an experimental, between-subjects design. Temporal framing served as the single independent variable in this study, with three conditions: current, future, or control. Participants assigned to the current condition were expected to report lower temporal distance than participants in the future condition. The control condition was included as a neutral comparison group and was expected to report the highest temporal distance overall. The main dependent variable in this study was sustainable intentions, which was measured through two variables: general sustainable motivation and intentions to reduce meat-eating. This variable was chosen as our specific sustainable behaviour because reducing meat-eating is known to be one of the most effective individual behaviour changes for reducing GHG emissions (Willett et al., 2019). Concerns about climate change, demographic variables, and hopefulness were also measured as potential mediating and moderating variables.

Participants

The required sample size was first estimated by consulting Pahl & Bauer's (2011) study, in which a large effect size was conveyed between perspective-taking conditions in climate change scenarios ($F(2, 71) = 6.56, p = .002, \eta^2 = .16$). A partial eta squared value of .16 converted to $f^2 = 0.19$ (Lenhard & Lenhard, 2016). This figure was used in a power analysis run over G-power 3.1, which found that the minimum sample size required was 54 participants ($\alpha = .05, \text{power} = .80$). However, deviations from the above research, and the additional mediation analysis included in the present study meant more participants were potentially required. Research by Jones et al. (2017) outlines the relevant correlations between each mediation pathway. According to Fritz & MacKinnon (2007), these correlations convert to a target sample of 36 participants. In the present study, 73 eligible participants were recruited, sufficiently meeting both target sizes.

Eligible participants included anyone aged 18 or over, and anyone who reported eating meat/fish. Out of the total 92 participants, 15 were excluded, either because they reported being aged under 18, reported being vegan or vegetarian, or did not complete the survey in its entirety. Vegans/vegetarians were excluded, as they have been shown to express elevated levels of pro-

environmental intentions and investment (Miguel et al., 2020; Harrington et al., 2022). The present study wishes to assess the efficacy of perspective-taking to improve environmental engagement within the larger, general community. Hence, this exclusion could improve targetability of the intervention and representativeness of results.

Of these 73 participants, 47 reported as female (64.4%), 18 as male (24.7%), and 8 as nonbinary/other (11%). The mean age of participants was 25.1 years (SD = 6.76), and most participants reported identifying as politically liberal ($n = 28$, 38.4%). See Table 2.1 for an overview of the political orientation frequencies. 23 participants were assigned to the current perspective-taking condition, 25 to the future, and 25 to the control.

Table 2.1

Frequencies of Political Stance

Levels	Counts	% of Total	Cumulative %
Very Liberal	23	31.5 %	31.5 %
Liberal	28	38.4 %	69.9 %
Somewhat Liberal	5	6.8 %	76.7 %
Moderate	10	13.7 %	90.4 %
Somewhat Conservative	4	5.5 %	95.9 %
Conservative	3	4.1 %	100.0 %

Materials

This study was conducted entirely online, hosted on Qualtrics software (<https://www.qualtrics.com>). The IV (temporal framing) was manipulated through perspective-taking vignettes which varied in their language and subject.

Perspective-Taking Vignettes

The vignettes used in this study were created by consulting three main sources. Firstly, the description of Pahl and Bauer's methods (2011) guided the instructions of the perspective-

taking vignettes. Their research suggests that “imagine-self” instructions, or imagining yourself as the protagonist of the scenario, prove more effective than “imagine other” perspective-taking methods (Pahl & Bauer, 2011). Therefore, imagine-self instructions were employed in the present study. Accordingly, no names or descriptions of individuals were included in the study, and any references were kept anonymous, yet personally relevant, e.g., “many of your friends and family...”

Two Guardian newspaper articles: one outlining the future effects of climate change (Watts, 2019) and another outlining important gender inequality events of 2022 (Mahdawi, 2022) guided the content of the future and control vignettes, respectively. The future condition asked participants to imagine themselves recollecting on a series of events which occurred in 2050 because of climate change. These events include extreme storms, governmental disarray, and mass migration. Each outlined event was based on the article's content, which came from sound, scientific predictions likely to occur by 2050 without sufficient preventative climate action. In the control condition, participants were asked to imagine themselves reading a news article focused on important gender inequality events which occurred in 2022, including persecution of women in Iraq, the overturning of *Roe v Wade*, and economic inequality.

For the present condition, supplemental information to match the content of the future condition was searched for by using numerous online informative sources, including the IPCC website. This ensured that both temporal conditions of the vignettes were highly congruent. For example, in the future condition, one line read “Sea levels...**have swamped** coastal cities like Mumbai, Miami, and Jakarta”, whereas the current condition read “Sea levels... **are threatening to submerge** coastal cities like Mumbai, Miami, and Jakarta”. Each vignette measured approximately 350 words in total and followed a similar narrative, with each passage beginning as follows: “The year is 2050/2023. You have just woken up after a restless night’s sleep....”. Moreover, each vignette ended by outlining an effective, achievable behaviour to help mitigate climate change (current and future) or improve gender equality (control). This information was provided at the end of each vignette to enhance response efficacy, i.e., the feeling that a recommended behaviour can make a positive difference in the face of a problem, as research has demonstrated that fear messaging must also emphasise response efficacy to achieve the intended

behavioural adaption (Witte & Allen, 2000). Each of three conditions of perspective-taking vignettes are available to view in Appendix B.

Questionnaires

A series of different scales and items were used and combined to measure various dependent variables. Each of the scales are discussed briefly below. The entire questionnaire is available to view in Appendix B.

Perceived temporal distance

A question regarding perceived temporal distance was included to assess whether the expected differences could be recorded between participants in the current, future, and control vignettes. This variable was measured through an item by Spence et al. (2012), which asked participants to rate their belief about when we will start to feel the effects of climate change. Participants answered on a digital analogue scale ranging from 0 (“we are already feeling the effects”) - 100 (“beyond 100 years”).

Hopefulness

Hopefulness was exploratorily measured as a potential moderating variable using one item. Participants were asked “How hopeful do you feel after reading the perspective-taking scenario?” and asked to rate their hopefulness on a digital analogue scale from 0 (not at all hopeful) - 100 (extremely hopeful).

Sustainable Intentions

Sustainable intentions were measured using two new items. Firstly, general sustainable motivation was measured across a digital analogue scale. Participants were asked to rate how motivated they felt to take action to mitigate climate change after reading the perspective-taking scenario, from 0 (not at all motivated) - 100 (extremely motivated). Intention to perform a specific sustainable behaviour; namely reducing meat-eating, was also measured. Participants were asked to estimate the number of plant-based meals they planned to consume in the following 7 days, based on 3 meals a day (minimum = 0, maximum = 21). A correlation analysis was conducted to assess whether a close association between these variables could be found. The

analysis found that these variables were only moderately correlated ($r = .35, p = .002$), which meant that scores were kept as separate dependent variables.

Concerns about climate change

Concerns about climate change were theorized in this research to mediate the relationship between temporal framing and sustainable intentions. Concerns were measured using an adapted version of Spence and colleague's (2012) scale, with 3-items measured on a digital analogue scale from 0 (not at all concerned) - 100 (extremely concerned). Each item measured a different aspect of environmental concern: general concern, personal concern, and concern for society. The scores of each item were averaged to create a mean, ranging from a minimum of 0 to maximum of 100. The reliability of this scale was tested through Jamovi with Cronbach's alpha and was found to meet the minimum score of .7 for reliability ($\alpha = .9$).

Pre-testing

The materials and questionnaires used in this study were finalised after a pre-testing phase. This pre-testing was conducted to assess whether the perspective-taking vignettes were effective in inducing differences in perceived temporal distance. Additionally, the pre-testing aimed to evaluate whether the materials were easy to read, whether manipulation was highly transparent, which may lead to biased responses, and whether the vignettes could be made more effective by including other, suggested details. Results found that assignment to perspective-taking vignettes did produce differences in perceived temporal distance, although non-significant, the vignettes were quite easy to read, and the manipulation was not overly transparent. All materials used in the pre-testing are available to view in Appendix A.

Procedure

Ethical approval for the present research was granted by the Faculty of Social and Behavioural Science Ethical Committee on March 20th, 2023, under the number 23-0790. Participants were recruited through convenience and snowball sampling via social media (Instagram, WhatsApp, and Facebook) and in person-recruitment, at Utrecht University social events. Participants were provided with a link or QR code to access an online Qualtrics questionnaire, which summarised the study's purpose and framework, outlined the conditions of

participation, and finally asked for consent through the information sheet (Appendix B). Once consent was obtained, participants were asked to fill out basic demographic information. This demographic section of the survey also filtered out any remaining participants who did not meet the inclusion criteria (eating meat and aged over 18). Any ineligible participants were redirected to a customised end-of-survey message which informed them why they were excluded, and that their participation in the research had now ended. Eligible participants were directed to the main body of the research, which began by randomly and blindly assigning them to one of the perspective-taking conditions (future, current, control) using branching and randomization features on Qualtrics. Participants were asked to read the perspective-taking instructions and vignettes carefully. A timing feature on Qualtrics was utilised, which meant that the “proceed button” only appeared after 30 seconds, to ensure participants spent enough time reading and absorbing the perspective-taking activity.

After exposure to the vignettes, participants were asked to answer one question regarding perceived temporal distance. Following this, participants were asked to report their hopefulness, sustainable intentions, and climate concerns. Once all the data was collected, participants were provided with the debriefing letter for this study (Appendix B) This letter informed participants of the true purpose of the study, namely the focus on temporal framing, and requested reconfirmation of consent.

Analysis

The final data collected on Qualtrics was exported to Jamovi software for analysis (The jamovi project, 2022). Descriptive analyses were first performed, to ascertain the mean scores of perceived temporal distance, climate change concerns, hopefulness, and sustainable intentions, as well as the demographic breakdown of the data. Next, a one-way ANOVA was conducted to assess whether differences in sustainable intentions could be detected between experimental groups (future, current, and control). Dummy coding was employed to assign a value to each experimental group (1 = current, 2 = future, 3 = control). Following this, two linear multiple regression analysis were conducted through Jamovi with temporal framing as the categorical independent variable, mean concern about climate change as the covariate, and general sustainable motivation and intentions to reduce-meat-eating as the two separate dependent variables. In addition, a simple mediation was conducted using the medmod module on Jamovi

with jAmm programming, with temporal assignment as the independent variable, general sustainable intentions as the dependent variable, and mean concern as the mediator. A moderated mediation, or conditional mediation, was also conducted using the GLM mediation model in Jamovi, to assess whether hopefulness moderated the direct effect between temporal focus and general sustainable intentions, with concerns as the mediating variable.

Results

Descriptive analysis

Overall, participants in this study reported low temporal distance. Most people believed the effects of climate change are already happening or will happen in the next ten years ($M = 12.6$, $SD = 24.6$). In addition, most people were moderately or strongly concerned about climate change ($M = 67.7$, $SD = 27.6$). However, nearly all participants rated their concern about the effects of climate change for themselves personally ($M = 54.4$, $SD = 32.3$) as significantly lower than concern for general society ($M = 77$, $SD = 29.5$); [$t(72) = 8.0$, $p < .001$.]

In terms of sustainable intentions, participants showed moderate levels of both general motivation for climate change mitigation ($M = 57.7$, $SD = 27.4$) and intentions to reduce meat-eating ($M = 10.9$, $SD = 5.78$). Considering the maximum scores for these variables were 100 and 21 respectively, these scores can be considered close to the midpoint of the range. Hopefulness, our exploratory moderator variable, was rated quite low overall ($M = 35.5$, $SD = 25.2$).

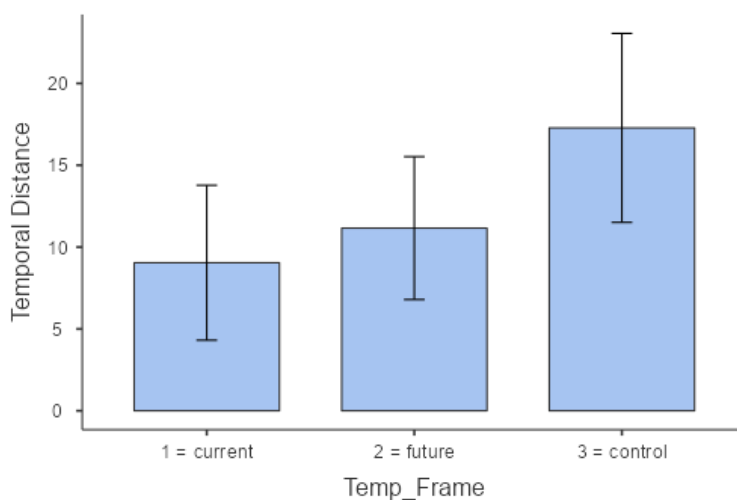
Hypotheses Testing

A manipulation check question about perceived temporal distance was included to test the first hypothesis of this study. This item assessed whether the vignettes were successful in inducing the expected PD for each condition. Specifically, we expected participants assigned to the current condition would show lower temporal distance than participants in both the future and control conditions. Analysis found that although the current condition produced slightly lower temporal distance scores on average ($M = 9.04$, $SD = 22.47$) than the future ($M = 11.2$, $SD = 21.8$) and control ($M = 17.3$, $SD = 28.9$) conditions, these differences were not significant ($F = 0.62$, $p = .541$). Hence, we can conclude that our expected PD outcomes did not manifest in the sample, suggesting our manipulation in this study was not entirely effective.

To account for this ineffectiveness, we continued our investigation of temporal assignment (current, future, and control conditions) as intended, but also examined the self-reported temporal distance score from our manipulation check question (0-100) in exploratory analyses to assess whether differences could be found using these scores.

Graph B.

Temporal Distance Score Frequencies



Note. This graph shows the frequencies of responses following the question “When, if it all, do you think we will start to feel the effects of climate change?”

0 = “Already happening”, 20 = “In the next 10 years”, 40 = “In 25 years”, 60 = “In 50 years”, 80 = “In 100 years”, 100 = “Never/Past 100 years”.

Our second hypothesis suggested there would be a main effect of temporal framing (current/future/control) on general sustainable motivation and intentions to reduce meat-eating. A one-way ANOVA with dummy coding for each temporal framing condition (1 = current, 2 = future, 3 = control) found no significant differences between conditions for both general sustainable motivations, ($F(2, 45.6) = 1.52, p = .229$), and intentions to reduce meat-eating, $F(2, 45.4) = 1.13, p = .332$. In fact, the mean score for general sustainable motivation was slightly higher in the future condition ($M = 62.9, SD = 22.8$) compared to the current ($M = 60.6, SD =$

27.4). The control condition reported the lowest general motivation overall, as expected ($M = 49.7$, $SD = 30.7$).

Contrastingly, for meat-eating, the average score in the current condition was slightly higher ($M = 12.2$, $SD = 6.35$) than the future condition ($M = 11.2$, $SD = 4.82$). Again, the control condition scored the lowest overall, as predicted ($M = 9.56$, $SD = 6.04$). Assumptions for both ANOVAs were checked. Although our data sufficiently met the assumption of equal variances, it violated the assumption of normality in the case of both ANOVAs according to the Shapiro-Wilk test ($W = .96$, $p = .018$ and $W = .96$, $p = .034$). We were unable to identify any salient outliers from our dataset which may have directly caused the violation. Consequently, we ran another ANOVA using the non-parametric Kruskal-Wallis test. This test failed to detect significant differences between groups for both general sustainable motivation ($X^2 = 2.88$, $p = .237$) and intentions to reduce meat-eating ($X^2 = 3.61$, $p = .164$). Hence, the second hypothesis that participants assigned to the current temporal condition would report higher sustainable intentions than the control and future conditions was rejected.

We also conducted two linear multiple regression analyses to assess the effects of temporal framing on general motivation and reducing meat-eating scores amongst other potential mediating variables. The first linear regression concluded that concern about climate change was the only significant variable to mediate differences in general sustainable motivation scores ($\beta = .387$, $t = 3.26$, $p = .002$). The second regression found that political stance was the only statistically significant variable to mediate differences in intentions to reduce meat-eating ($\beta = 2.18$, $t = 3.66$, $p < .001$). In fact, political stance was correlated with numerous outcome variables, such that individuals who reported identifying as liberal reported less temporal distance, higher concern about climate change, and greater sustainable intentions. It should be noted that differences in intentions to reduce meat-eating between the control and current conditions neared significance ($\beta = 2.95$, $t = 1.9$, $p = .062$), suggesting that with additional participants or a different experimental paradigm, more conclusive results may have been recorded. Assumptions of autocorrelation, normal distribution, and multicollinearity were checked for both linear regressions and no violations were detected.

The third hypothesis proposed that concerns about climate change would mediate the relationship between temporal framing and sustainable intentions. Our mediation analysis

suggested that the total effect of temporal framing on both general sustainable motivation ($\beta = 5.56, t = 1.43, p = .152$) and reducing meat-eating ($\beta = 1.33, t = 1.64, p = .102$) was not significant. Concern about climate change had a significant direct effect on general motivation ($\beta = .472, t = 4.69, p < .001$), but not on reducing meat-eating ($\beta = .02, t = 1.05, p = .294$). The third hypothesis was therefore, also rejected.

Exploratory analysis

Considering that our vignettes were unsuccessful in inducing the expected temporal distance, we conducted secondary exploratory analyses using the self-reported temporal distance scores (0-100) to test both hypotheses.

A correlation matrix was first conducted, which found that temporal distance was positively associated with general sustainable motivation ($r = .47, p < .001$) and concern about climate change ($r = .611, p < .001$). See Table 3.1 for an overview of temporal distance correlations. Next, a mediation analysis was performed, which found that the total effect of temporal distance on general sustainable motivation through concerns about climate change was significant ($\beta = .52, t = 4.49, p < .001$). Both the direct pathway of temporal distance on general sustainable motivation ($\beta = .30, t = 2.16, p = .031$), and the indirect pathway through climate concerns ($\beta = .27, t = 2.37, p = .018$) were significant. Lower self-reported temporal distance was associated with greater general sustainable motivation ($\beta = .30, t = 2.16, p = .031$) and concerns about climate change ($\beta = .69, t = 6.6, p < .001$). Contrastingly, no differences in scores between lower temporal distance and intentions to reduce meat-eating were found ($\beta = .008, t = 0.23, p = .821$).

Table 3.1.*Descriptives and Correlation Matrix*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Temporal Distance	12.6	24.6	—						
2. Meat Eating	10.9	5.78	-.06	—					
3. General Motivation	57.7	27.4	-.47***	.36**	—				
4. Gender	1.88	2	-.034	-.017	-.017	—			
5. Age	25.1	23	.25*	.005	-.001	.004	—		
6. Mean Concern	67.7	27.6	-.61***	.131	.484***	.07	-.058	—	
7. Political Stance	2.36	1.41	.43***	-.31**	-.31**	-.28**	.39**	-.46***	—

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

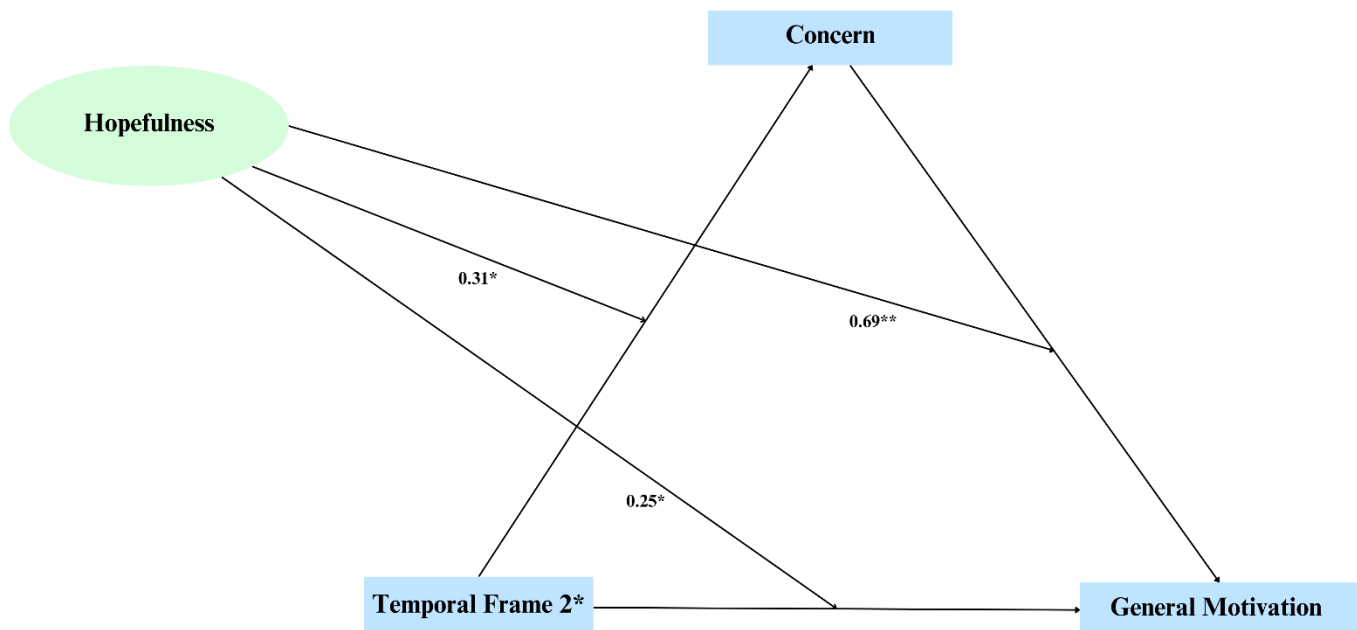
Exploratory conditional mediation analysis

Hopefulness was included in this study as a potential moderator variable. An exploratory conditional mediation analysis was conducted in Jamovi using GLM mediation software, to assess whether hopefulness moderated the interactions between temporal framing, sustainable intentions, and climate concern. Overall, hopefulness had a significant average effect on the interactions between concern and general sustainable motivation ($\beta = .68$, $t = 3.4$, $p < .001$). This analysis divided hopefulness scores into average (M), low ($M - SD$) and high ($M + SD$)

categorisations. Our analysis found that when hopefulness scores were average, hopefulness had a direct negative effect on differences in general motivation scores between the current and control conditions ($\beta = .28, t = 2.4, p = .016$). More simply put, the combination of less than average hopefulness scores and assignment to the current condition led to greater general sustainable motivation. Interestingly, this analysis also found a significant direct effect of temporal frame (current vs control) on general motivation when hopefulness scores were average ($\beta = -.28, t = 2.4, p = .016$). When hopefulness scores were low, they also had a significant total effect on differences in general sustainable motivation scores between the current and control conditions ($\beta = .51, t = 2.4, p = .018$). Thus, extremely low hopefulness scores combined with assignment to the current vs. control also led to greater general sustainable motivation. When hopefulness scores were high, no significant effects were recorded across any pathway. Additionally, we found no evidence of influence on intentions to reduce meat-eating at every level of hopefulness scores.

Figure 3.1.

Estimated Path Model for Conditional Mediation.



Note. Temporal Frame 2 in this figure refers to the comparison of current vs control condition.

* $p < .05$, ** $p < .001$

Discussion

The purpose of this study was to investigate the effects of temporal framing in perspective-taking vignettes on temporal distance, climate change concern, and sustainable intentions. Sustainable intentions included both general motivations to perform sustainable behaviours and a specific intention to reduce meat-eating. More explicitly, we wished to assess whether perspective-taking vignettes about climate change situated in the current age (year 2023) would reduce temporal distance, increase concerns about climate change, and promote sustainable intentions more effectively than vignettes situated in the future (year 2050) and a control vignette about gender equality. Furthermore, we hypothesized that concerns about climate change would mediate the relationship between temporal framing and sustainable intentions. Hopefulness was also included in an exploratory analysis as a potential covariate and moderating variable in these interactions.

In this study, participants assigned to the current condition did not convey significant differences in temporal distance compared with participants in the future and control conditions. In essence, this suggests that our vignettes were unsuccessful in “inducing” the intended PD and failed to significantly reduce temporal distance in the current condition, as proposed by our first hypothesis. These results are somewhat consistent with Jones et al. (2017) study who found that participants assigned to a proximal video condition did not convey statistically significant differences in temporal distance compared to a distal video condition (although their results approached significance). Interestingly, other PD variables included in their study, namely social and hypothetical distance, demonstrated significant differences on their outcome variables (Jones et al., 2017). Hence, it can be hypothesised that temporal distance may be difficult to manipulate through single experimental methods. It is important to note that the standard deviations for the temporal distance scores in our study were quite high, suggesting high levels of variability from the mean. Whilst examining the data, we noticed most participants reported either the minimum or very high temporal distance scores. This reflects research demonstrating the growing polarization of climate change in media coverage, political discourse, and public opinion (Chinn et al., 2020; Zhou, 2016). Thus, scores concentrated on either end of the temporal distance scale may have skewed findings in the present research.

Our nonsignificant results may also have occurred due to a ceiling effect noted in the data. Most participants believed the effects of climate change were already happening (76.7%, $n = 56$). This consensus of low temporal distance may have occurred because participants had pre-existing knowledge or direct personal experience of climate change (McDonald et al., 2015), or because exposure to any type of perspective-taking (regardless of temporal framing) is related to prosocial attitudes and behaviours (Fang et al., 2019). These findings also reflect the recent IPCC report that whilst awareness of climate change is high, tangible behaviour adjustment and mitigation remains low (IPCC, 2023). This ceiling effect was likely reinforced by most participants identifying as politically liberal (76.4%, $n = 56$), particularly since political stance was significantly correlated with most of our outcome variables, such that liberals had lower temporal distance and higher concern and intentions than conservatives (See Table 2.1). In a similar vein, Chan & Faria (2022) showed that political conservatism predicted lower sustainable intentions, which they attributed to greater fixed world beliefs, i.e., the belief that human activity has little effect on the natural environment, and low perceptions of instrumentality regarding climate mitigation behaviours in conservatives. Hence, external demographic variables, namely political stance were identified as important mediating variables in this study which may have skewed our findings to non-significance.

Our analyses found only small and nonsignificant differences in sustainable intention scores between participants assigned to the current condition compared with the future and control conditions. This finding contradicts Jones and colleagues (2017) study, who conveyed that participants assigned to a proximal video condition had stronger intentions for sustainable behaviours compared to those assigned to a distal video condition. Considering that our vignettes did not have the expected effect of inducing temporal distance, it is safe to assume that our vignettes were not engaging or interactive enough to promote behavioural outcomes. Including visual features or video footage could potentially increase the salience of perspective-taking scenarios, thereby improving their impact and results.

Despite previous substantial evidence regarding the power of perspective-taking for prosocial and sustainable behaviours, more recent studies have suggested the pathway is not always straightforward or guaranteed. Research by Sassenrath and colleagues (2022) describes the counterproductive egocentric processes which sometimes arise after perspective-taking,

namely if individuals discern criticism of their behaviours or overestimate differences between themselves and the target of the scenario. Despite our use of “*imagine-self*” instructions in this study to avoid perceived differences between self-perceptions and the target, some reactive egoism may have occurred if participants did not adequately identify or imagine themselves within scenario and/or sensed critique of their behaviour. Additionally, the reliance on self-report measures in the pre-testing of our vignettes may have produced misleading results regarding their effectiveness and accessibility (Sassenrath et al., 2022).

The third and final hypothesis, that climate change concerns would mediate the relationship between temporal framing and sustainable intentions, was also rejected in the present study. This conflicts with research by Spence et al. (2012), who found concern about climate change to comprise a significant mediating variable between temporal distance and preparedness to reduce energy use. In the present study, concerns about climate change were moderately high overall, and did have a significant direct positive effect on general sustainable motivation, but did not significantly interact with temporal distance to influence intentions. However, personal concern was consistently rated lower than concern for general society. This suggests that participants perceived themselves to be socially distant from climate change, i.e., that they believe the effects of climate change will not affect themselves personally or similar others (Spence et al., 2012). These findings also indicate that participants did not sufficiently relate to the personalised perspective-taking scenario. Standard deviation was again high in concern scores, reinforcing the assumption that participants in this study conveyed polarised beliefs about climate change. Therefore, we estimate that self-reported evidence of social distance, lack of self-identification during the perspective-taking exercise, and polarised scores may be responsible for our findings.

The nonsignificant results between temporal framing groups led us to perform an additional exploratory analysis, which focused on the self-reported temporal distance scores (0-100) from our salience check question. We found these scores were significantly correlated with concerns about climate change and general sustainable motivation. Moreover, our mediation analysis found that temporal distance had a significant total effect on general sustainable motivation through concerns. This reflects a myriad of studies which demonstrate that lower psychological distance is associated with greater concern about climate change and sustainable

behavioural intentions (Spence et al., 2012; Chu & Wang, 2020, etc.) Thus, it can be deduced that temporal distance is, in fact, an influential variable in determining climate change attitudes and sustainable intentions, yet it may prove difficult to manipulate through experimental methods. This holds relevant implications for future research and communication strategies. Novel, multifaceted interventions may now be required to change the way people think about climate change in relation to time. This may involve interactive media projects, including the use of video games or virtual environments. A relevant example of this is research by Fox and colleagues (2020), who found that a game involving a virtual river clean-up (which was described as temporally and spatially close) led to greater risk perceptions of climate change and sustainable behaviours. Incorporating interactive, creative technology, may therefore, prove crucial to reduce PD and motivate tangible behaviour change more effectively.

Hopefulness was included in an exploratory conditional mediation analysis. This analysis was conducted provide new insights for the currently inconsistent findings regarding the role of hope in motivating sustainable behaviour change (Ettinger, 2021, Chadwick, 2015). Our analysis assessed whether perceived levels of hopefulness in participants following the perspective-taking exercise influenced interactions between variables. It was discovered that lower hopefulness scores, combined with assignment to the current vs. control condition, led to significantly higher general sustainable motivation. This provides an interesting perspective to the already mixed literature on the role of hope in climate change communication. A fascinating study by Marlon and colleagues (2019) reveals the complex nature of hopefulness and climate change mobilisation, including the division of hopefulness into “constructive hope” (hope regarding the growing awareness and progress in climate change mitigation) and “false hope” (hope that divine intervention will solve climate change). Their research shows that whereas constructive hope leads to greater environmental policy support and engagement, false hope leads to the opposite (Marlon et al., 2019). It is, therefore, possible that participants with higher levels of hopefulness in this study relied mostly on false hope beliefs, which diminished their feelings of personal responsibility and undermined their motivation for sustainable behaviour change.

Interestingly, no significant differences could be found between temporal framing groups nor between temporal distance scores in relation to intentions to reduce meat-eating. In fact, aside from political stance, intentions to reduce meat-eating were not correlated with any of the

outcome or demographic variables included in this study. Meat-eating, therefore, presents itself as a unique environmentally detrimental, habitual behaviour which may be particularly difficult to target and change. As Graça et al., (2019) outline, numerous interacting factors make meat-eating an inflexible predominant social norm, including social context, tradition, familiarity, repetitive enactment, and deemed cultural importance. In addition, many people perceive the environmental issues surrounding meat-eating on an infrastructural, institutional level, such as focus on government subsidies or corporate lobbying. In doing so, the power of individual behaviour adjustments for changes in supply-demand, which dictate production and emissions levels are underestimated and demotivated (Rust et al.,2020). Hence, it may be that this indirectness of impact, as well as interacting personal and social factors associated with meat-eating require more intensive, targeted behavioural interventions to effectively promote sustainable change.

Limitations

The present study was constrained by several limitations. Firstly, we relied solely on self-report measures throughout the survey, making responses vulnerable to confounding human cognitions, such as social desirability and/or negative response biases (Vesely & Klöckner, 2020; Giormini et al., 2022). Objective measures for relevant variables in this study would have provided more reliable conclusions about the effects and interactions of our intervention. Additionally, we did not employ a pre-post-test design, meaning we were unable to estimate how previous knowledge or attitudes towards climate change and sustainable behaviour may have influenced results. Specifically, a pre-post design would have allowed us to discern whether our vignettes were ineffective because participants were already knowledgeable regarding the current and future implications of climate change, or because the vignettes were not ideally designed.

It is also important to note that the survey was distributed using convenience and snowball sampling. Despite some diversity in age and political stance, most participants were young, liberal, females. Given that this specific demographic is consistently found to have higher concerns about climate change and sustainable intentions than other population groups (Strapko et al., 2016; Zhao, 2016), the representativeness and generalisability of our results are somewhat comprised.

Finally, this study was limited to investigating sustainable behavioural intentions as its primary outcome variable, rather than actual mitigative behaviour. Even though behavioural intentions are often a strong predictor of behaviour, their association is not definite, as is elaborated in literature surrounding the intention-behaviour gap (Jones et al., 2017). This means we were unable to account for the situational and social factors which motivate or discourage tangible sustainable behavioural change, which proves increasingly essential in academic and societal spheres.

Recommendations

Although the hypotheses in this study were rejected, our research still provides important insights regarding the manipulation of temporal distance and its implications for motivating sustainable behaviour change. Many studies regarding climate risk perceptions have focused on the concept of psychological distance and its influence on sustainable behaviours, but few have focused on one element or dimension of PD like the present study on temporal distance (Jones et al., 2017). Future research could employ an orthogonal design, to differentiate between the individual elements of PD and assess their specific impact or salience in climate change attitudes and behaviour. Likewise, further studies in this domain should assess how PD interventions can overcome specific outcome variables, particularly unsustainable behaviours that are resistant to change, such as meat-eating (Graça et al., 2019).

In addition, little longitudinal research on temporal distance or other dimensions of PD has been conducted to date. Studies of this kind would provide valuable knowledge regarding the long-lasting effects of climate change communication on PD and sustainable intentions or behaviours. Finally, greater exploration into novel, interactive forms of perspective-taking should be conducted to identify the most effective method to overcome psychological distance, promote climate change concerns, and motivate sustainable behaviour change.

Conclusion

The present study investigated the effect of temporal framing, and the interaction effects of climate change concern and temporal framing, on sustainable behavioural intentions. Although our manipulation of temporal framing in perspective-taking vignettes did not influence

the outcome variables, self-reported temporal distance did produce significant differences in general sustainable motivation and concern about climate change. This highlights the important, yet potentially inflexible, nature of temporal distance in climate change attitudes and sustainable behavioural intentions. Further research regarding interactive methods of overcoming temporal distance, and its interactions with important demographic or related cognitive factors, is recommended to combat barriers in climate risk perceptions and facilitate widespread mitigative climate action.

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Appendix A

Pre-testing Materials

Information Letter

You are invited to participate in the pre-testing of materials for the study

"Perspective-Taking, Climate Change Attitudes, and Sustainable Intentions"

This is a student research project, conducted in fulfilment of a Master's thesis for the track of Social Influence in the MSc programme: Social, Health, and Organisational Psychology.

Purpose of the Study

In this research, we aim to investigate peoples' perspective taking abilities. We also wish to explore individuals' attitudes towards climate change and sustainable intentions.

Outline of the Study

If you agree to participate in the pre-testing of this student research, you will be asked to complete a short questionnaire. The questionnaire will be made up of the following components:

1. Basic demographic questions about your age, gender, etc.
2. A brief perspective-taking exercise, during which you will read a short passage and will be asked to visualise yourself in the scenario, using your own memories and experiences.
3. A questionnaire on your perceptions and attitudes toward climate change.
4. A questionnaire on sustainable intentions.

In total, the questionnaire should take no longer than 10 minutes to complete.

Consent and Participation

You are not obliged to participate in this study. Participation is entirely voluntary. You may

also withdraw your participation at any point during the study, with no disadvantage or penalty. You do not need to provide a reason for discontinuation of participation. You can discontinue by simply closing this tab on your browser.

All information you provide during the study will be kept anonymous. Raw data will be stored anonymously in the faculty server for at least 10 years and will be accessed only by the student, supervisor, and related UU researchers. You cannot ask for your data to be deleted, as no personal data is collected. We ask that you read all instructions thoroughly and answer all questions honestly.

Please note that vegans and vegetarians are NOT eligible to participate in this research. We are looking for any participants that eat meat, fish, and other animal products.

Possible advantages and disadvantages of the research

There are no foreseeable major risks associated with participation in this study. However, some participants may find thinking about climate change or other social issues mildly upsetting, distressing, or uncomfortable. All data included in the study comes from information anyone can encounter in news reports or websites during regular daily activity. In addition, several resources for coping with climate change anxiety will be provided at the end of the study, which are free and accessible for all participants to use. This research will have no adverse consequences for your privacy, as no personal information (name, email, student/ID number) will be collected, and all data will remain anonymous. If you decide to participate in this study, you will provide important information regarding climate change perceptions and attitudes.

Independent Contact Person and Complaints Officer

If you have any questions or remarks about the study, you are free to contact the coordinator of the MSc track Social Influence, Esther Kluwer, by email at: e.s.kluwer@uu.nl

If you wish to make an official complaint about the research, you can send an email to our

complaints officer via the email address: klachtenfunctionaris-fetsocwet@uu.nl

Contact Details Data Protection Officer

<https://www.uu.nl/organisatie/praktische-zaken/privacy/functionaris-voor-gegevensbescherming>

Researcher and Supervisor Contact Details:

If you wish to contact the student researcher or research supervisor, you can use the following contact details:

Researcher: Lily Thornhill - Email: l.r.thornhill@students.uu.nl

Research Supervisor: Lieke Swinkels - Email l.m.j.swinkels@uu.nl

Consent

To participate in the pre-testing of this study, you must give your consent to continue, and agree to the following statements:

- I confirm that I have read the information sheet for the above study.
- I am satisfied that I fully understand the information provided and have had enough time to consider the information.
- I understand that my participation is voluntary and that I am free to withdraw at any time,

without giving any reason, without my legal rights being affected.

- I agree and consent to take part in the above study.

I consent, proceed to survey (1)

I do not consent (2)

Demographics

What is your gender?

Male (1)

Female (2)

Non-binary (3)

Other, please indicate (4) _____

What is your age?

What is your political orientation?

Very Liberal (1)

Liberal (2)

Somewhat Liberal (3)

Moderate (4)

Somewhat Conservative (5)

Conservative (6)

Very Conservative (7)

Are you vegan or vegetarian?

Yes (1)

No (2)

Perspective-Taking Vignettes

Current Condition

Please read the following paragraphs carefully.

Imagine yourself in the following scenario. Use your own memories of familiar places or people, e.g., your bedroom, family, friends, whilst reading the passage.

The year is 2023. You have just woken up after a restless night's sleep due to a disruptive storm. You decide to check your phone for news updates and click on an article outlining the extreme weather events of 2022, which occurred due to climate change. The article discusses how 2022 was the year with the hottest summer ever recorded in Europe, prolonged heatwaves, low levels of rainfalls, widespread drought conditions in Europe and Asia, and a storm causing devastating floods in Pakistan. The effects of climate change are now apparent, and life on earth is beginning to change significantly due to these extreme weather events and their effects on society.

Sea levels have risen approximately 21cm since 1900 and are threatening to submerge large coastal cities like Miami, Mumbai, and Jakarta. The severe weather events experienced worldwide, such as flooding, droughts, wildfires, and intense heat, have led to the displacement of 21.5 million climate change refugees every year, and the deaths or illness of countless others. Climate change is even theorised to bring about more pandemics like that of COVID-19, as increased deforestation and large-scale meat production increases the risk for spreading of disease and pandemic outbreaks. As the current world population of 8 billion only continues to grow, these effects will worsen, unless significant, collective change is brought about.

The lack of urgent action placed on alleviating climate change so far has led to these devastating effects. Behavioural adjustment to climate change is still lacking, and we need to act fast to achieve a safe, happy, and sustainable society. If people today made simple, environmentally friendly behaviour changes, like reducing their consumption of meat, environmental damage can be significantly reduced, or in some cases, prevented altogether.

The proceed button will appear after 30 seconds.

Please read the paragraphs in entirety before proceeding.

Future Condition

Please read the following paragraphs carefully.

Imagine yourself in the following scenario. Use your own memories of familiar places or people, e.g., your bedroom, family, friends, whilst reading the passage.

The year is 2050. You have just woken up after a restless night's sleep due to the third disruptive storm of the week. There are predictions of a hurricane next week, combined with relentless high temperatures of 45 degrees Celsius, which will lead to further drought, infrastructural damage, and health concerns.

The effects of climate change are rampant, and life on earth has changed significantly, due to extreme weather events and their effects on society. Sea levels have now risen over 30cm since 1900, which has swamped big cities like Miami, Mumbai, and Jakarta. On top of this, the significant droughts, flooding, deforestation, and large-scale famine experienced in the last 30 years, has led to the forced migration of 1 billion climate change refugees, and the deaths or illness of countless others.

Many of your family and friends who previously lived abroad in hotter climates have now moved home, only to find that the government and healthcare system are crumbling with the increased demand of residents. Even seemingly fundamental aspects of society, including sports competitions such as the Olympics and World Cup have now been cancelled, as their emissions and heat risk prove too dangerous.

The lack of urgent action placed on alleviating climate change in the past, particularly since 2020, has directly led to these devastating effects. Although people in 2050 are now altering their lifestyle to stop further damage to our planet, we know it is too late to achieve a safe, happy, and sustainable society. If people living in 2023 made simple, environmentally friendly behaviour changes, like reducing their consumption of meat, this damage could have been significantly reduced, or prevented altogether.

The proceed button will appear after 30 seconds.
Please read the paragraphs in entirety before proceeding.

Control Condition

Please read the following paragraphs carefully.

Imagine yourself in the following scenario. Use your own memories of familiar places or people, e.g., your bedroom, family, friends, whilst reading the passage.

The year is 2023. You have just woken up after a restless night's sleep. You decide to check your phone for news updates and click on an article focused on gender inequality. The article runs through a series of important events that occurred in 2022 which demonstrates the extent of gender inequality today. It begins by discussing the landmark decision made by the US Supreme Court to overturn *Roe v Wade*. This decision, made by six unelected justices, ended the right to abortion across the United States, thereby stripping women and pregnant people of their bodily autonomy, and risking the livelihood of millions of people.

You move on to read about the increase in extreme oppression and persecution of women in Afghanistan and Iran, including the banning of Afghan women in higher education, and the death in custody of 22-year-old Mahsa Amini, who was imprisoned after alleged violation of Islamic dress code. These events have led to significant widescale protests in both countries, leading to further unlawful arrests, violence, and civil disorder. These devastating social events also combine with global economic inequality, as predictions suggest that with current levels of progress, it will take 132 years to achieve full gender equality, and political inequality, as women hold only a quarter of seats in national parliaments around the world.

The lack of urgent action placed on improving gender equality so far has led to these negative developments and events. Individual and collective action for increased gender equality is still lacking, so we need to act fast to achieve a safe, happy, and equal society. If people today made simple motivated acts, such as standing up against stereotyping and harassment, donating to gender equality charities, and supporting female authority figures or leaders, gender equality could be improved, or in some cases fully achieved, across the globe.

The proceed button will appear after 30 seconds.

Please read the paragraphs in entirety before proceeding.

Effectiveness of Vignettes

How well were you able to imagine or visualise yourself in the scenario of the perspective-taking activity?

- Not well at all (1)
- Slightly well (2)
- Moderately well (3)
- Very well (4)
- Extremely well (5)

How easy was it to read the perspective-taking scenario and follow the visualisation instructions?

- Not easy at all (1)
- Slightly easy (2)
- Moderately easy (3)
- Very easy (4)
- Extremely easy (5)

What memories or images popped into your head whilst reading the perspective-taking scenario?

Temporal Distance

Saliency Check

Please rate your belief about when we will start to feel the effects of climate change.

0 = "We Are Already Feeling the Effects"

20 = "In the next 10 years"

40 = "In the next 25 years"

60 = "In the next 50 years"

80 = "In the next 100 years"

100 = "Beyond 100 years/Never"

0 20 40 60 80 100

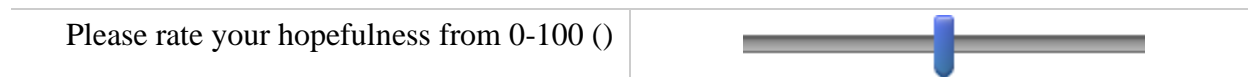


Hopefulness

After reading the perspective-taking scenario, how hopeful do you feel?

(0 = not hopeful at all - 100 = extremely hopeful)

0 10 20 30 40 50 60 70 80 90 100



General Sustainable Motivation

To what extent does the perspective-taking scenario motivate you to take action to mitigate climate change?

(0 = Not at all motivated - 100 = Extremely motivated)

0 10 20 30 40 50 60 70 80 90 100




How motivated do you feel? ()	
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Climate Change Concerns

Please answer the following questions on a scale from 0 -100

0 (Not at all concerned) - 100 (Extremely Concerned)

0 10 20 30 40 50 60 70 80 90 100

How concerned, if at all, are you about climate change, sometimes referred to as global warming? ()	
How concerned are you about the effects that climate change may have on you personally? ()	
How concerned are you about the effects that climate change may have on society as a whole? ()	

Manipulation Check and Suggestions

What do you think was being manipulated in the perspective-taking scenario?

Do you have any suggestions on how to make the perspective-taking activity easier and/or more impactful?

Debriefing Letter

Thank you for participating in this study! Your participation is greatly appreciated.

Purpose of the Study

Initially, you were informed that this research aimed to investigate individuals' perspective-

taking abilities and climate change attitudes. In reality, the research has a specific focus on how the emphasis on time in climate change communication may influence attitudes towards climate change and sustainable intentions. This is because temporal distance, or how much imagined future events deviate from the present reality, is considered a major barrier to pro-environmental behaviour change and engagement.

Participants were assigned to one of three manipulated perspective-taking conditions: current (set in 2023), future (set in 2050), or control (paragraphs about gender inequality). Psychological perspective-taking, which involves perceiving a topic or situation from a certain viewpoint, has been cited as a powerful tool to enhance understanding of others, increase empathy, and reduce biases. This study was organised to assess whether perspective-taking methods may also help to overcome temporal distance regarding climate change, generate more favourable attitudes towards climate change, and promote sustainable intentions. Additionally, the study was organised to investigate whether a presently set or future-imagined scenario proves more effective in promoting pro-environmental attitudes and behavioural intentions.

Unfortunately, we could not provide you with all the details of our investigation prior to your participation, as we needed to ensure all reactions and responses were unbiased and instinctive. If all details were revealed at the start of the study, responses may have been influenced or shaped according to our instructions, which reduces the reliability and authenticity of the study. We regret not providing entirely transparent information but hope that participants understand this is a necessary step to guarantee the reliability and meaningfulness of this research.

Confidentiality

We wish to emphasise that although the purpose of the study differs slightly from the originally stated purpose, all other information provided in the consent form and survey is correct. This includes all information regarding anonymity, data storage, and confidentiality.

Now that you are made aware of the true purpose of the study and our manipulation of perspective-taking methods, you are free to decide that you no longer wish for your data to be used in our research. If you would like your responses not to be included, simply close this tab on your browser or click “I do not consent” at the end of this page. If you want your answers to be included, please click “I consent, collect my responses” at the end of this page.

Reconfirmation of Consent

After learning the true purpose of the study, do you consent to your responses being collected?

- I consent, collect my responses (1)
 - I do not consent (2)
-

Appendix B

Main data collection materials

Information Sheet

You are invited to participate in a study entitled:

“Perspective Taking, Climate Change Attitudes, and Sustainable Intentions”

This is a student research project, conducted in fulfilment of a Master’s thesis for the track of Social Influence in the MSc programme: Social, Health, and Organisational Psychology.

Purpose of the Study

In this research, we aim to investigate peoples’ perspective taking abilities. We also wish to explore individuals’ attitudes towards climate change and sustainable intentions.

Outline of the Study

If you agree to participate in this student research, you will be asked to complete a short questionnaire. The questionnaire will be made up of the following components:

1. Basic demographic questions about your age, gender, etc.
2. A brief perspective-taking exercise, during which you will read a short passage and will be asked to visualise yourself in the scenario, using your own memories and experiences.
3. A questionnaire on your perceptions and attitudes toward climate change.
4. A questionnaire on sustainable intentions.

In total, the questionnaire should take no longer than 10 minutes to complete.

Consent and Participation

You are not obliged to participate in this study. Participation is entirely voluntary. You may also withdraw your participation at any point during the study, with no disadvantage or penalty. You do not need to provide a reason for discontinuation of participation. You can discontinue by simply closing this tab on your browser.

Please note that vegans and vegetarians are not eligible to participate in this research!

Any individual who eats meat/fish and is aged 18 or over can participate in this research.

All information you provide during the study will be kept anonymous. Raw data will be stored anonymously in the faculty server for at least 10 years and will be accessed only by the student, supervisor, and related UU researchers. You cannot ask for your data to be deleted, as no personal data is collected. We ask that you read all instructions thoroughly and answer all questions honestly.

Possible advantages and disadvantages of the research

There are no foreseeable major risks associated with participation in this study. However, some participants may find thinking about climate change or other social issues mildly upsetting, distressing, or uncomfortable. All data included in the study comes from information anyone can encounter in news reports or websites during regular daily activity. In addition, several resources for coping with climate change anxiety will be provided at the end of the study, which are free and accessible for all participants to use. This research will have no adverse consequences for your privacy, as no personal information (name, email, student/ID number) will be collected, and all data will remain anonymous. If you decide to participate in this study, you will provide important information regarding climate change perceptions and attitudes.

Independent Contact Person and Complaints Officer

If you have any questions or remarks about the study, you are free to contact the coordinator of the MSc track Social Influence, Esther Kluwer, by email at: e.s.kluwer@uu.nl

If you wish to make an official complaint about the research, you can send an email to our complaints officer via the email address: klachtenfunctionaris-fetsocwet@uu.nl

Contact Details Data Protection Officer

<https://www.uu.nl/organisatie/praktische-zaken/privacy/functionaris-voor-gegevensbescherming>

Researcher and Supervisor Contact Details:

If you wish to contact the student researcher or research supervisor, you can use the following contact details:

Researcher: Lily Thornhill - Email: l.r.thornhill@students.uu.nl

Research Supervisor: Lieke Swinkels - Email l.m.j.swinkels@uu.nl

Consent

To participate in this study, you must give your consent to continue, and agree to the following statements:

- I confirm that I have read the information sheet for the above study.
- I am satisfied that I fully understand the information provided and have had enough time to consider the information.
- I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my legal rights being affected.
- I agree and consent to take part in the above study.

I consent, proceed to survey (1)

I do not consent (2)

Demographics

What is your gender?

- Male (1)
- Female (2)
- Non-binary (3)
- Other, please indicate (4) _____

What is your age?

What is your political orientation?

- Very Liberal (1)
- Liberal (2)
- Somewhat Liberal (3)
- Moderate (4)
- Somewhat Conservative (5)
- Conservative (6)
- Very Conservative (7)

Are you vegan or vegetarian?

- Yes (1)
- No (2)

Perspective-Taking: Current Condition

Please read the following paragraphs carefully and imagine yourself in the following scenario. Use your own memories of familiar places or people, e.g., your bedroom, family, friends, whilst reading the passage.

The year is 2023. You have just woken up after a restless night's sleep due to a disruptive storm and warm overnight temperatures. You decide to check your phone for news updates and click on an article outlining climate change events of 2022. The article discusses how 2022 was the year with the hottest summer ever recorded in Europe, prolonged heatwaves, widespread drought conditions in Europe and Asia, and a storm causing devastating floods in Pakistan. The effects of climate change are now apparent, and life on earth is beginning to change due to these extreme weather events and their effects on society.

You move on to read that sea levels have risen approximately 21cm since 1900, which are threatening to submerge large coastal cities like Miami, Mumbai, and Jakarta. The severe weather events experienced worldwide have led to the displacement of 21.5 million climate change refugees every year, and the illness or deaths of countless others. Climate change is even predicted to bring about more pandemics like that of COVID-19, as increased deforestation and large-scale meat production increases the risk for spreading of disease, and subsequent pandemic outbreaks. As the current world population of 8 billion only continues to grow, these effects will worsen, unless significant, collective change is brought about.

The lack of urgent action placed on alleviating climate change so far has led to these devastating effects. Behavioural adjustment to climate change is still lacking, and we need to act fast to achieve a safe, happy, and sustainable society. Individual action today can secure a safe future, as reductions in personal carbon footprints, decreased dependence on polluting corporations, and sustainable "ripple" effects all rely on individual effort. If people today made simple, environmentally friendly behaviour changes, like reducing their consumption of meat, environmental damage can be significantly reduced, or in some cases, prevented altogether.

The proceed button will appear after 30 seconds.

Please read the paragraphs in entirety before proceeding.

Perspective-Taking: Future Condition

Please read the following paragraphs carefully and imagine yourself in the following scenario. Use your own memories of familiar places, people, or events, e.g., your bedroom, family/friends, and recent experiences whilst reading the passage.

The year is 2050. You have just woken up after a restless night's sleep due to the third disruptive storm of the week and warm overnight temperatures. There are predictions of a hurricane next

week, combined with relentless highs of 45 degrees Celsius, which will lead to further drought, infrastructural damage, and health concerns.

The effects of climate change are rampant, and life on earth has changed significantly, due to extreme weather events and their effects on society. Sea levels have now risen over 30cm since 1900, which has swamped big cities like Miami, Mumbai, and Jakarta. On top of this, the significant droughts, flooding, deforestation, and large-scale famine experienced in the last 30 years, has led to the forced migration of 1 billion climate change refugees, and the illness and deaths of countless others.

Many of your family and friends who previously lived abroad in hotter climates have now moved home, only to find that the government and healthcare system are crumbling with the increased demand of residents. Even seemingly fundamental aspects of society, including sports competitions such as the Olympics and World Cup have now been cancelled, as their emissions and heat risk prove too dangerous.

The lack of urgent action placed on alleviating climate change in the past, particularly since 2020, has caused these devastating effects. Although people in 2050 are now altering their lifestyle to stop further damage to our planet, we know it is too late to achieve a safe, happy, and sustainable society. Individual action in the past could have protected against these effects, as reductions in personal carbon footprints, decreased dependence on harmful, polluting companies, and sustainable "ripple" effects all rely on individual efforts. If people living in 2023 made simple, environmentally friendly behaviour changes, like reducing their consumption of meat, this damage could have been significantly reduced, or prevented altogether.

The proceed button will appear after 30 seconds.

Please read the paragraphs in entirety before proceeding.

Perspective-Taking: Control Condition

Please read the following paragraphs carefully and imagine yourself in the following scenario. Use your own memories of familiar places, people, or events, e.g., your bedroom, family/friends, and recent experiences whilst reading the passage.

The year is 2023. You have just woken up after a restless night's sleep. You decide to check your phone for news updates and click on an article focused on gender inequality. The article runs through a series of important events that occurred in 2022 and demonstrate the extent of gender inequality today. It begins by discussing the landmark decision made by the US Supreme Court to overturn *Roe v Wade*. This decision, made by six unelected justices, ended the right to abortion across the United States, thereby denying women and pregnant people of their bodily autonomy, and risking the livelihood of millions of people.

You move on to read about the increase in extreme oppression and persecution of women in Afghanistan and Iran, including the banning of Afghan women in higher education, and the death in custody of 22-year-old Mahsa Amini, who was imprisoned after alleged violation of Islamic dress code. These events have led to significant widescale protests in both countries, leading to further unlawful arrests, violence, and civil disorder. These devastating social events also combine with global economic inequality, as predictions suggest that it will take 132 years to achieve full gender equality, and political inequality, as women hold only a quarter of seats in national parliaments around the world today.

The lack of urgent action placed on improving gender equality so far has led to these unjust developments and events. Individual and collective action for increased gender equality is still lacking, so we need to act fast to achieve a safe, happy, and equal society. If people today made simple motivated acts, such as standing up against stereotyping and harassment, donating to gender equality charities, and supporting female authority figures or leaders, gender equality could be improved, or in some cases fully achieved, across the globe.

The proceed button will appear after 30 seconds.

Please read the paragraphs in entirety before proceeding.


What memories/ideas/thoughts popped into your head whilst reading the above passage?

Hopefulness

Please rate your hopefulness on the scale below.

(0 = not hopeful at all - 100 = extremely hopeful)

0 10 20 30 40 50 60 70 80 90 100

After reading the perspective-taking scenario, how hopeful do you feel? ()	
--	--

Temporal Distance

Please rate your belief regarding when we will start to feel the effects of climate change on the scale below.

0 = "We Are Already Feeling the Effects"

20 = "In the next 10 years"

40 = "In the next 25 years"


60 = "In the next 50 years"

Temporal Framing, Perspective Taking, and Sustainable Intentions

80 = "In the next 100 years"

100 = "Beyond 100 years/Never"




0 20 40 60 80 100

When, if at all, do you think we will start feeling the effects of climate change? ()	
---	--

Concerns about climate change

Please answer the following questions on a scale from 0 (Not at all concerned) - 100 (Extremely Concerned)

0 10 20 30 40 50 60 70 80 90 100

How concerned, if at all, are you about climate change, sometimes referred to as global warming? ()	
How concerned are you about the effects that climate change may have on you personally? ()	
How concerned are you about the effects that climate change may have on society as a whole? ()	

General sustainable motivation

To what extent do you feel motivated to take action to mitigate climate change?

(0 = Not at all motivated - 100 = Extremely motivated)

0 10 20 30 40 50 60 70 80 90 100

How motivated do you feel? ()	
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Intentions to reduce meat-eating.

Reducing your meat-eating is considered a simple, yet effective, method of mitigating climate change. This is because livestock farming and meat production accounts for 15% of all greenhouse gas emissions, making it a greater pollutant than the global transportation sector.

In the upcoming week, how many meals do you plan to contain NO MEAT, i.e., how many vegetarian/vegan meals will you eat this week?

(0 = no vegetarian meals, 10 = approximately half, 21 = all vegetarian meals).

Debriefing Letter

Thank you for participating in this study! Your participation is greatly appreciated. To learn the real purpose of the study, read below and confirm consent at the bottom of this page.

Purpose of the Study

Initially, you were informed that this research aimed to investigate individuals' perspective-taking abilities and climate change attitudes. In reality, the research has a specific focus on how the emphasis of time in climate change communication may influence attitudes towards climate change and sustainable intentions. This is because temporal distance, or how much imagined future events differ from the present reality, is considered a major barrier to pro-environmental behaviour change and engagement.

Participants were assigned to one of three manipulated perspective-taking conditions: current (set in 2023), future (set in 2050), or control (paragraphs about gender inequality). Psychological perspective-taking, which involves perceiving a topic or situation from a certain viewpoint, has been cited as a powerful tool to enhance understanding of others, increase empathy, and reduce biases. This study was organised to assess whether perspective-taking methods may also help to overcome temporal distance regarding climate change, generate more favourable attitudes towards climate change, and promote sustainable intentions. Additionally, the study was organised to investigate whether a presently set or future-imagined scenario proves more effective in promoting pro-environmental attitudes and behavioural intentions.

Unfortunately, we could not provide you with all the details of our investigation prior to your participation, as we needed to ensure all reactions and responses were unbiased and instinctive. If all details were revealed at the start of the study, responses may have been influenced or shaped according to our instructions, which reduces the reliability and authenticity of the study. We regret not providing entirely transparent information but hope that participants understand this is a necessary step to guarantee the reliability and meaningfulness of this research.

Confidentiality

We wish to emphasise that although the purpose of the study differs slightly from the originally stated purpose, all other information provided in the consent form and survey is correct. This includes all information regarding anonymity, data storage, and confidentiality.

Now that you are made aware of the true purpose of the study and our manipulation of perspective-taking methods, you are free to decide that you no longer wish for your data to be used in our research. If you would like your responses not to be included, simply close this tab on your browser or click “I do not consent” at the end of this page. If you want your answers to be included, please click “I consent, collect my responses” at the end of this page.

Reconfirmation of consent

After learning the true purpose of the study, do you consent to your responses being collected?

- I consent, collect my responses (1)
- I do not consent (2)

