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RESEARCH ARTICLE

Communicating climate change as a generational issue: experimental effects on youth worry, motivation and belief in collective action

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ABSTRACT

Generations differ in their contribution to climate change and susceptibility to its effects. Contextualizing climate change as an intergenerational issue may therefore alter public engagement. We report a pre-registered, online experiment with a youth sample ($N = 500$, aged 16–24 years) in Ireland that tested whether highlighting generational differences in descriptions of climate change affects (i) worry about climate change, (ii) perception of others' worry, (iii) belief in collective action and (iv) pro-environmental intentions. We also tested the effect of correcting young people's misperceptions about how concerned older generations (aged 40+) are. The generational narrative amplified self-reported worry about climate change, from 5.42 ($SD = 1.45$) on a 7-point rating scale in the control group to 5.76 ($SD = 1.18$) among those who read the generational narrative ($d = 0.26$). Those who read the generational narrative also believed their close friends ($M = 5.14$, $SD = 1.32$) and other peers ($M = 5.28$, $SD = 1.19$) were more worried than those who read the control narrative ($M = 4.85$, $SD = 1.48$ and $M = 5.03$, $SD = 1.19$, respectively; $ds = 0.20$). There were no significant effects of contextualizing climate change as an intergenerational issue on perceived worry among older people, belief in collective action or pro-environmental intentions. Providing accurate information on older people's worry, however, boosted belief in collective action, particularly for the majority who initially underestimated it ($M = 4.22$ out of 7, $SD = 1.14$ vs. $M = 4.63$, $SD = 1.18$, $d = 0.36$). The results have implications for communications with young people about climate change. Correcting underestimations of concern about climate change between socio-demographic subgroups may help to foster engagement.

Policy highlights:

- Communications that highlight generational differences in the causes and effects of climate change may be unhelpful; they increase worry among young people without motivating them to act.
- Most young people underestimate how worried older people are about climate change and this misperception correlates with belief that people are less likely to work together to mitigate climate change.
- Providing accurate information on how worried older people are boosts belief in collective action, but only among the majority of young people who underestimate it.
- Communications about climate change likely benefit from avoiding highlighting differences between socio-demographic subgroups and correcting misperceptions where they exist.

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1. Introduction

> We live in a strange world where children must sacrifice their own education in order to protest against the destruction of their future. Where the people who have contributed the least to this crisis are the ones who are going to be affected the most.
> – Greta Thunberg

Climate change is an unavoidably intergenerational issue. Older generations have contributed the most to the climate crisis, but younger ones will face far more of the consequences (Thiery et al., 2021). In recent years, social movements such as Fridays for Future have highlighted this generational unfairness as a way to motivate young people to engage with environmental issues (Han & Ahn, 2020; Thew et al., 2020). This generational divide has features of a narrative, which can act as a persuasive form of communication (Shanahan et al., 2011). There is a clear plot. Years of actions (or inactions) taken by older generations changed the earth's climate. The main actors are those who have caused the damage (older generations) and those who will suffer the consequences (younger and future generations). This narrative of injustice seeks to influence policy and appeals to the media. The author of the above quote, Greta Thunberg, has received sufficient media coverage to become a household name in developed countries, including being named as Time Magazine's 'Person of the Year' in 2019. Her campaigning is openly youth-centric, and she explicitly holds older generations responsible for the climate crisis (Martiskainen et al., 2020; Murphy, 2021).

The underlying truth of this narrative is undeniable. The current cohort of young people cannot be held responsible for the failure to reduce global greenhouse gas emissions in recent decades, while the current cohort of older people can. Nevertheless, climate change is a global problem that requires joint effort from all generations. In developed countries, climate action foresees not only rapid changes in industrial processes and how land is used, but to aspects of everyday activity such as how we travel, what we eat and how we heat our homes. Individual willingness to embrace these changes is likely to depend on beliefs of whether others are willing to do the same, given the large proportion of people who behave as conditional co-operators in collective action problems (Fehr & Schurtenberger, 2018). Consequently, while highlighting between-group differences may provoke and motivate action to correct perceived injustice, it could also undermine the collective effort to address the problem, if people perceive other groups as less willing to act.

It is thus important to understand how generational narratives influence young people's perceptions of the effectiveness of collective action to mitigate climate change, given their role as climate stewards (see Barraclough et al., 2021; MacDonald et al., 2013). Our aim is to provide the first experimental test of whether contextualizing the climate change conversation along generational lines affects young people's climate motivations and perceptions of other generations. We also test whether cross-generational collaboration can be enhanced by highlighting similarities in concern about the environment.

The study was funded by the Environmental Protection Agency (EPA) in Ireland and was designed in collaboration with policy officers interested in communications with young people. Although Ireland is presently sheltered from the worst effects of climate change by its wealth and temperate oceanic climate, it is nonetheless experiencing hotter temperatures, rising rainfall levels and more frequent extreme weather events (EPA, 2020). The public overwhelmingly accepts that human activity is causing climate change (Leiserowitz et al., 2021). With respect to policy, the *Climate Action and Low Carbon Development (Amendment) Act 2021* sets a legally binding target of climate neutrality by 2050. However, Ireland has one of the highest per-capita emissions in the EU (Eurostat, 2022). The country remains heavily dependent on imported fossil fuels, has a large livestock-intensive agricultural sector and is projected to miss its medium-term targets for reducing emissions (EPA, 2023; SEAI, 2020). Thus, the study takes place in a wealthy country with little climate denialism but relatively poor performance on climate action metrics.

The remainder of this paper is organized as follows. Section 1.1 motivates our hypotheses by drawing on relevant literature on climate concern and collective action problems. Section 2 describes the design and procedure of the experiment. The results are presented in Section 3. Section 4 considers some implications of the findings.

1.1. Literature review

An important matter to establish is whether there is, in fact, a generational divide in concern about climate change and the desire for stronger action to address it. This section summarizes relevant survey evidence. Our focus is unavoidably on evidence from the US and other WEIRD (Western, Educated, Industrial, Rich, Democratic, Henrich et al., 2010) countries, given the lack of evidence from non-WEIRD countries on climate communications and associated social psychology (Badullovich et al., 2020; Sabherwal & Kácha, 2021; Tam et al., 2021). It then describes what is known about the relationship between climate concern and climate action, including evidence for a direct, positive influence of worry on climate action but also the potential for some negative effects. We then discuss the implications of using generational narratives to motivate climate action through the lens of inter-group behaviour. Drawing on each of these bodies of evidence, we specify our study hypotheses.

1.1.1. Age and climate change concern

Perhaps activists and the media highlight generational differences in concern about climate change simply because younger people are more worried. The rise in younger people's engagement with climate issues in recent years indeed suggests that, as a generation, they hold stronger environmental views than their predecessors (Neas et al., 2022; Swim et al., 2022). According to the 2018 Gallup World Poll, 70% of Americans aged 18–34 report being very worried about climate change, compared to 56% of those aged 55 and over (Reinhart, 2018). Hence, although these figures indicate an age difference in climate concern, they also show that a majority of the older generation are very worried about climate change. Nevertheless, other studies similarly report that younger Americans care more about climate change and agree more with climate scientists (Hamilton et al., 2019; Ross et al., 2019). More recent Gallup data from 2021 suggest that these generational differences have sustained (Saad, 2021; see also YPCC & Mason 4C, 2022; Ballew et al., 2019a).

However, there is evidence that the generational divide in the US is confined to the political right, with differences recorded between younger and older Republicans but not between younger and older Democrats (Ballew et al., 2019b). Moreover, in other WEIRD countries, evidence of a substantive generation gap is less convincing. In Europe, 83% of 15–24 year olds agree that climate change is a 'very serious problem' compared with 77% of those aged 40 and over. Younger people are somewhat more likely than those aged 40 and over to say that climate change is the single most serious problem facing the world as a whole, but the difference is just 6 percentage points (22% vs. 16%) (European Commission, 2021, p. 25). Cross-national analyses of survey data raise further questions of the reliability of the generation gap. Some studies even find higher levels of concern about climate change among older people (Arıkan & Günay, 2021), while others show a curvilinear relationship, with concern peaking among 30–60 year olds (Kvaløy et al., 2012). Others still suggest that the relationship is country-dependent (Lewis et al., 2019). In Ireland, where the current study was undertaken, concern is particularly high across generations, with over 80% of all age groups reporting they are at least somewhat worried (Leiserowitz et al., 2022; Timmons & Lunn, 2022). Given these data, we focus on how a youth sample (aged 16–24) views the generations above them (aged 40+).

Although international evidence implies only modest age differences in climate concern, the intergenerational narrative has become prominent. Speeches at global events draw heavily on it. Greta Thunberg, Time Magazine's 2019 'standard bearer in a generational battle,' told the United Nations' Conferences of the Parties (COP) 24 that the 'burden of acting is left to children because adults are not mature enough.' The following year, Ugandan activist Hilda Flavia Nakabuye asked COP attendees how she would explain to future generations the failures of previous ones. Irish activist Theo Cullen-Mouze spoke of how 'adults are acting like children.' US activist Kallan Benson told attendees at a UN Champions of the Earth event that 'children's lives and the lives of future generations' are in jeopardy because of the inaction of older people. Singer-songwriter Billie Eilish has expressed hope that 'adults and the old people start listening to us so that we don't all die' (Trendel, 2019).

These statements are not unreasonable, because power over political and corporate decisions resides overwhelmingly among members of older generations, who therefore bear the most responsibility for inaction on lowering emissions. However, the narrative that older generations, in general, lack concern about climate

change appears not to be grounded in evidence (for most countries) and, importantly, could turn out to be unhelpful. Narratives not only reflect society but also shape and influence perceptions and preferences (Shanahan et al., 2014). Although we could locate no published studies that explore direct effects of generational divide narratives on public opinion, experimental research shows that narratives covered by media can influence public opinion of policy (Shanahan et al., 2011). Speeches such as those cited above generate substantial media coverage (Marris, 2019; Pickard, 2019).

Language and communications experts have thus called for experimental tests of how dominant climate change narratives influence public opinion (Fløttum & Gjerstad, 2017). For example, generational narratives could risk alienating older generations from engaging with climate change initiatives (Haq, 2021). Younger people, the focus of our study, may begin to believe that older generations are, as a whole, less concerned about climate change. This in turn may be worrying for young people and add to the toll of climate anxiety (e.g. Hickman et al., 2021). It may also undermine their motivation to act in ways that require co-operation across generations.

1.1.2. Is worry helpful?

Feeling worried is a reasonable response to awareness of the real effects of climate change if action is not taken (Hagedorn et al., 2019) and climate activists and proponents often call attention to the emerging threat of climate change as a way to promote urgent action (Han & Ahn, 2020). Climate worry can be a motivator for mitigation (Goldberg et al., 2021; Van der Linden, 2015; Verplanken et al., 2020), including for young people (Ojala et al., 2021). However, the evidence for a relationship between worry and action is not entirely consistent and is mostly correlational (Bouman et al., 2020; Brosch, 2021).

Psychologists and medics are becoming increasingly concerned about 'climate-anxiety' among young people (Hickman et al., 2021), with recent medical papers calling for urgent research on improving understanding of it (Wu et al., 2020). Climate anxiety is a multifaceted concept that is generally understood to entail feelings of worry for the climate accompanied by climate-related negative thoughts and emotions that impair function (Clayton & Karazsia, 2020; Hickman et al., 2021; Ojala et al., 2021). For example, a large-scale survey from 25 countries found negative climate related emotions to be associated with sleep and mental health issues (Ogunbode et al., 2021). In addition, recent international research on climate anxiety and young people shows that around 50% of 16–25 year olds report negative emotions due to climate change (e.g. sadness, fear, helplessness). Over 45% report that these feelings negatively affect their day-to day lives and around 56% say climate change makes them think that 'humanity is doomed'. These feelings have been associated with perceptions of betrayal and insufficient government response (Hickman et al., 2021).

It is not yet well understood when climate change communications induce worry as a constructive response, and when they generate anxiety that is detrimental for mental health and wellbeing (for a review and discussion, see Ojala et al., 2021). Our first aim was to investigate young people's worry about climate change and their perception of how worried others (both their age and older) in society are. Narratives that highlight generational differences could plausibly bias perceptions of how worried other generations are, with potential implications for belief in the possibility of effective collective action.

1.1.3. Collective action and climate change

Tackling climate change requires a coordinated and collective response from governments, industry and individuals (Ostrom, 2010). Each day, individuals and organizations make decisions that have consequences for greenhouse gas emissions. Although there are co-benefits to climate action (Bain et al., 2016), such as better air quality, these decisions often involve trade-offs between environmental impact and making additional effort or incurring extra cost, such as when purchasing greener products, separating waste, choosing alternatives to travelling by car, and so on. Similarly, support for climate mitigation policies requires people to consider the trade-off between willingness to incur costs and the reduction of emissions, where the former is experienced individually, locally or nationally, while the latter is a collective global benefit. In other words, pro-climate actions are behaviours that take place within a complex collective action framework. Everyone gets the benefit of joint effort, albeit to varying degrees, yet individuals and organizations might be better off if instead they choose to freeride on others. Success requires all individuals – young and old – to be willing to

make sacrifices to their lifestyle and to support systemic change (Hurlstone et al., 2020). Action goes beyond isolated individual choice and needs to be understood as a collective response enacted by all (Fritsche et al., 2018).

One factor that boosts cooperation in collective action problems is the expectation that others will cooperate (e.g. Fehr & Schurtenberger, 2018; Lindman et al., 2013; Runge, 1984). Expectations about how others will behave are largely determined by perceptions of their internal state, and people are rarely accurate when judging how others feel (Klein, 2019). Thus, if exposure to a generational narrative leads young people to think that most older people are not worried and will not play their part, such narratives may reduce their own pro-climate motivations (Masson & Fritsche, 2021). Hence, in addition to measuring the effects of generational narratives on worry, we aimed to test how generational narratives affect perceptions that others will play their part mitigating climate change.

We were further interested in whether such potential effects can be attenuated. Recently, researchers have stressed the necessity of overcoming 'us vs. them' thinking and instead creating a superordinate identity between all of humanity in facing climate change, for example by highlighting shared norms and goals (Fritsche et al., 2018; Mackay et al., 2021; Reese, 2016; Sarrasin et al., 2022). Since, as above, in many countries older people report high levels of worry about climate change, providing young people with accurate information about older generations' sense of climate worry may be a useful way to promote pro-environmental behaviour (Andre et al., 2021). We also sought to test whether providing them with accurate information about older people's worry affects not only their pro-environmental intentions but also their belief in cross-generational collective climate action.

1.1.4. The current study: generational narratives and cross-generational collective action

The literature reviewed above implies that generational narratives on climate change could have positive and/or negative effects on young people's motivations to act. Given this, our aim was to test how generational narratives influence young people's worry about climate change, their perception of how worried other people are, their belief in collection action to tackle climate change and their own pro-environmental intentions. We also aimed to test whether providing young people with accurate information on how worried older people are influences their belief in collective climate action and their intentions. We expected effects to be stronger among those who underestimate how worried older people are. Our specific hypotheses were pre-registered in line with best scientific practice (Nosek et al., 2018).

Contextualizing climate change as a generational issue will lead young people to …

H1: … report higher levels of worry.

H2[1]: … perceive other young people (their friends and other peers) to be more worried.

H3: … perceive older people to be less worried.

Regarding belief in collective climate action, we hypothesized that:

H4: Perceptions of how worried older people are will positively correlate with belief in collective action.

H5: Reading the generational narrative will lower belief in the likelihood of collective climate action.

H6a: Young people presented with accurate information about how worried older generations are will report higher belief in collective action, H6b: particularly among those who initially underestimated older generations' worry.

Turning to pro-environmental intentions, we hypothesized that:

H7: Reading the generational narrative will lead to stronger pro-environmental behaviour intentions.

[1]This hypothesis was mistakenly not included in our list of pre-registered hypotheses. Other hypotheses have been re-worded from the pre-registration for clarity, but the predicted directionality of effects and dependent variables remain the same. We also included in the study, but not the pre-registration, measures of policy support and a question on why young people judge it to be important to protect nature. Details on these questions and the findings are presented in the Supplementary Material.

H8a: Young people presented with accurate information about how worried older generations are will report stronger pro-environmental intentions, H8b: particularly among those who initially underestimated older generations' worry.

2. Method

The online study was programmed in Gorilla Experiment Builder (Anwyl-Irvine et al., 2020) and proceeded over multiple stages. Here we report findings from the first stages, which contained the study's primary experimental manipulations and measured worry about climate change, belief in collective action and pro-environmental intentions. Results from other states are reported in Andersson et al. (2022). The study received approval from the institutional Research Ethics Committee on 15th March 2022 and was pre-registered (https://osf.io/kmeh3). Data collection took place between 15th of March and 3rd of April 2022.

2.1. Participants

The sample consisted of 500 young people, aged 16–24 years (i.e. a 'youth' sample), who were recruited by two market research and polling agencies.[2] Unlike most research on youth perceptions of environmental issues, there was no reliance on participant (or their school's) engagement in climate-rated activities to provide a convenience sample (see Lee et al., 2020). Our sample frame was the existing participants in two online survey panels designed to be representative of Ireland's general population. The agencies sent an email containing a link to the study to 18–24 year olds and parents of 16 and 17 – year olds[3] on these panels. After clicking the link, respondents were informed on the first page that the study was about their views on the environment. Attrition rates at this point were very low ($n = 5$ exited the study once informed of the topic, with $n = 7$ exiting after this point). Participants were paid €3 for completing the study, which took 13 minutes on average.

Given the above approach to sampling, the study is unlikely to be biased towards highly engaged youth. That said, comparing the socio-demographic characteristics of the sample against population data from Ireland's Central Statistics Office reveals that, in the end, women and people in education and training were overrepresented (Table A1 in Supplementary Materials, hereafter 'SM'). The results we report control for socio-demographic characteristics and exploratory analyses found no interactions between gender or working status and our experimental manipulations.

2.2. Design and procedure

In the stages of the study relevant for this paper, participants were first asked questions about their own environment-related behaviour (e.g. diet, use of transport). Responses were used to personalize intention-based questions later in the study. Participants were then informed that the focus of the study was climate change. Figure 1 shows the experimental design for the main stages. All participants read a vignette describing climate change, where half the sample ($n = 250$) were randomly assigned by the computer software to read this information written in a way to highlight generational differences (detailed below). The control condition ($n = 250$) read the same information but without reference to different generations.

All participants were then asked how worried they themselves are about climate change and how worried they think (1) older generations (aged 40 and over), (2) other people their own age in general, and (3) their close friends are. Hence this part of the design was between-groups, with just two groups.

After making their guess, approximately half of participants ($n = 257$) were randomly assigned by the computer software to receive feedback on the actual level of worry among older generations. To encourage participants to reflect on the information, they were asked how surprised they were by the findings before

[2]RED-C Research (www.redcresearch.ie) and Behaviour & Attitudes (www.banda.ie)

[3]Parents/guardians of 16- and 17-year olds were first required to consent to their child's participation in the study, before assent and participation was sought from the young person.

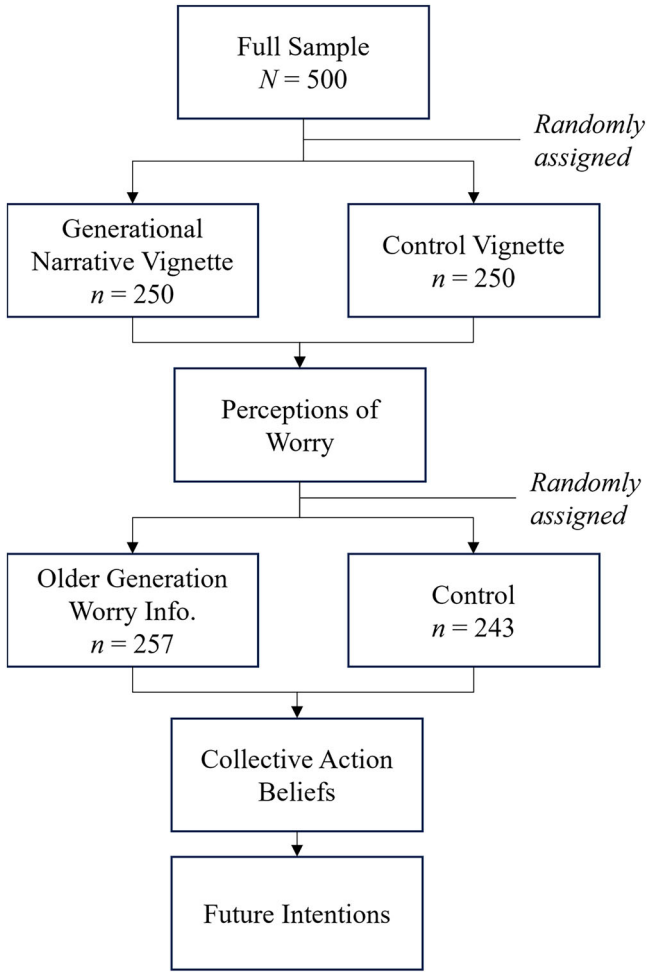

Figure 1. Experimental design and procedure.

proceeding with the study. The control condition ($n = 243$) proceeded with the study without seeing this information. Hence the design for subsequent measures was a 2 (generational narrative, neutral) x 2 (older generation ('OG') worry information, no information) between-groups design and there was a minimum of 116 participants per cell.

Participants were then informed that they were starting a new stage of the study which was about ways to tackle climate change. They were asked three questions about their belief in collective action to mitigate climate change and reported their future pro-environmental intentions before answering socio-demographic questions. Full details on responses are available in SM.

2.3. Experimental manipulations

Generational Narrative: All participants read a vignette that included the same definition of climate change and equivalent information about the scientific consensus that climate change is happening and that the effects include extreme weather events such as storms, droughts and flooding. However, half the sample ($n = 250$) were randomly assigned to read information that highlighted generational differences. The narrative included on this text was inspired by speeches given by youth activists, such as those described in the Introduction section, to reflect the kinds of narratives that young people are exposed to during media coverage (Marris,

2019).[4] For example, participants were told that scientists have agreed for more than 30 years that climate change is happening but 'older generations did not do enough to stop it.' They also read that 'future generations are more likely to experience the worst effects' of climate change and that 'young people around the world have started to criticize older people and governments for not taking climate change seriously enough.' Because participants completed the experiment online via their mobile phone or computer rather than in a laboratory setting, the task mimicked the way in which such narratives are often consumed online. The control condition ($n = 250$) read the same information but without reference to different generations. The generational emphasis continued throughout parts of the survey for participants in the generational condition. For example, some questions were pre-empted with 'As a young person … '. SM contains the full text.

Older People's Worry: After participants had responded to how worried they believed people over 40 in Ireland were, approximately half of them ($n = 257$) were randomly assigned to receive feedback on the actual level of worry among older generations. They were informed that data collected in 2021 showed that people aged over 40 in Ireland on average gave a response of 5.01 out of 7 on the same scale they had just rated, where 1 indicated 'not at all worried' and 7 indicated 'extremely worried'.[5] The page with the text included a scale where they could see their own guess compared with this 'correct' answer (see Figure C1 in SM).

2.4. Measures

Full instrumentation can be found in SM. The following measures were used in the present study.

Climate Worry: We asked how worried participants themselves were about climate change and how worried they thought (1) older generations (aged 40 and over), (2) other people their own age in general, and (3) their close friends were. Responses were elicited on slider scales that ranged from 1 (not at all worried) to 7 (extremely worried) and allowed responses up to two decimal points.

Surprise About Older Worry: Those who were given feedback on accurate worry levels of those aged 40 and over were asked how surprised they were by the findings on rating scales from 1 (not at all) to 7 (very).

Collective Action Beliefs: We asked three questions relating to belief in collective action to mitigate climate change. The first asked to what extent participants agreed with the statement that 'it's likely that most people in Ireland will play their part in the joint effort to address climate change.' The other two questions specifically asked if they thought it was likely that (i) young people and (ii) older people would play their part. All responses were recorded on 1 (completely disagree) to 7 (completely agree) rating scales.

Future Intentions: Participants were asked how likely it was that they would engage in different pro-environmental behaviours in the future. These questions were tailored to the participant (e.g. only those who reported eating meat were asked about their willingness to reduce their meat consumption) based on questions asked at the beginning of the study. Example items read: 'Eat less meat', 'Buy fewer new things (e.g. buy second hand or re-use old things, such as clothes)', 'Walk, cycle or use public transport for most journeys instead of getting a lift/going by car', 'Take fewer flights (or try to convince those you live with to)'. All responses were recorded on rating scales from 1 (not at all likely) to 7 (extremely likely). We created an index of future intentions by calculating the average score for each participant ($\alpha = .81$).

3. Results

This section presents the effect of the generational narrative on self-reported worry and estimates of others' worry, followed by the effects of the generational narrative and seeing OG worry estimates on belief in collective action and pro-environmental intentions. As specified in the pre-registration, all

[4]For example, https://fridaysforfuture.org/what-we-do/activist-speeches/

[5]We initially considered separating older generations into those aged 40–59 and those aged 60+, but data from Timmons and Lunn (2022) showed no differences in the level of worry between these generations in Ireland.

Table 1. OLS Regression Models Predicting Worry Estimates.

	Model 1 Self		Model 2 Close Friends		Model 3 Other Young People		Model 4 Older People	
	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value
Constant	6.10*** [5.66, 6.54]	<.001	5.22*** [4.74, 5.70]	<.001	5.36*** [4.92, 5.80]	<.001	3.84*** [3.32, 4.36]	<.001
Generational Narrative *(Ref: Control)*	0.30** [0.07, 0.53]	.005[a]	0.26*[b] [0.01, 0.51]	.040	0.24*[b] [0.01, 0.46]	.041	0.22 [−0.04, 0.49]	.949[a]
Socio-demographic Controls	Yes		Yes		Yes		Yes	
Participants[c]	500		492		493		494	

*$p < .05$; **$p < .01$; ***$p < .001$. [a]One-tailed, given directional hypothesis. [b]Coefficient not significant in reduced sample models than exclude participants within the 5% to complete survey and those that failed attention check but in the same direction and of similar magnitude. [c]Participants are excluded from models where values are missing for the dependent variable.

models[6] included a limited set of socio-demographic controls for gender, age, degree, mother's educational attainment (as a proxy for socio-economic status) and living area.[7] We did not record data on participant ethnicity or place of birth. Models report unstandardized coefficients. Full models including the effects of these controls on dependent variables can be found in SM. The data that support the findings of this study are openly available at https://osf.io/kmeh3.

3.1. Worry

Participants reported that they themselves were very worried about climate change, with responses showing a strong negative skew ($M = 5.59$, $SD = 1.33$; Figure A2 in SM). Model 1 in Table 1 shows that participants in the generational narrative condition reported being more worried about climate change than those in the control condition ($M = 5.76$, $SD = 1.18$ vs. $M = 5.42$, $SD = 1.45$, respectively, $d = 0.26$), providing support for H1.

Wilcoxon Signed Rank tests showed that participants rated themselves as more worried about climate change than their close friends ($M = 4.99$, $SD = 1.41$; $Z = 10.36$, $p < .001$, $r = .46$) and other young people ($M = 5.17$, $SD = 1.28$; $Z = 7.21$, $p < .001$, $r = .32$). They rated other young people to be more worried than their close friends ($Z = 3.35$, $p = .001$, $r = .15$). Models 2 and 3 in Table 1 show that participants in the generational narrative condition estimated their close friends and other young people to be more worried than those in the control condition (friends: $M = 5.14$, $SD = 1.32$ vs. $M = 4.85$, $SD = 1.48$, respectively, $d = 0.20$; peers: $M = 5.28$, $SD = 1.19$ vs. $M = 5.03$, $SD = 1.19$, respectively, $d = 0.20$), supporting H2.

Estimates of how worried older people are showed a slight positive skew (Figure A2 in SM) and were much lower than the other worry estimates ($M = 3.9$, $SD = 1.50$). A Wilcoxon Signed-Rank test against the next lowest group (close friends) was highly significant, $Z = 12.01$, $p < .001$, as were comparisons against peers, $Z = 13.43$, $p < .001$, and self-rated worry, $Z = 16.21$, $p < .001$. A majority (75%) gave a response below the 'correct' estimate of 5.01 and hence could be considered 'underestimators.' Model 4 in Table 1 shows no evidence for H3 that the generational narrative would elicit lower estimates of older generations' worry. In fact, the difference, although non-significant, is in the opposite direction to our prediction and shows a pattern similar to the effect on self-worry (Figure A3 in SM).

3.2. Belief in collective action

Belief in collective action was concentrated slightly above the midpoint of the scale ($M = 4.61$, $SD = 1.23$) and, in support of H4, was significantly correlated with perceptions of how worried older generations are, $r = .32$, $p < .001$. Model 1 in Table 2 shows that there was no overall effect of being in the generational narrative condition

[6]We pre-registered use of OLS or ordinal logistic regression models depending on the nature of the dependent variable, as the response distributions allowed OLS models to be run without violating assumptions and as OLS models are generally more straightforward to interpret, we opted to use OLS models for all hypotheses. All findings are the same if ordinal logistic regressions are conducted.

[7]Further robustness checks excluding respondents who failed an attention check or were within the fastest 5% to complete the study showed similar results.

Table 2. OLS Regression Models Predicting Belief in Collective Action.

	Model 1		Model 2	
	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value
Constant	4.69*** [4.27, 5.12]	<.001	5.39*** [4.91, 5.87]	<.001
Generational Narrative (*Ref: Control*)	0.05 [−0.17, 0.26]	.341[a]	0.05 [−0.16, 0.26]	.689[a]
Shown OG Worry (*Ref: Not Shown*)	0.15[b] [−0.07, 0.36]	.090[a]	0.40** [0.16, 0.64]	.002
Overestimated OG Worry (*Ref: Underestimated*)			1.03*** [0.70, 1.37]	<.001
Overestimated + Shown OG Worry			−0.77** [−1.25, − 0.29]	.002
Socio-Demographic Controls	Yes		Yes	
Participants[c]	499		493	

*$p < .05$; **$p < .01$; ***$p < .001$. [a]One-tailed, given pre-registered directional hypothesis. [b]Coefficient not significant in reduced sample models than exclude participants within the 5% to complete survey and those that failed attention check. [c]Participants are excluded from models where values are missing for the dependent variable or any independent variable.

on belief in collective action, in contrast to H5. The lack of effect of generational narrative is supported by an equivalence test showing that the difference between the groups is not statistically different from zero, t (498) = 0.52, $p = .300$. This result is consistent with the lack of support for H3, since the condition did not lead to perceptions of lower worry among older people. There was a marginal effect of seeing accurate OG worry information, providing weak support for H6a. Model 2 includes an interaction term between whether the participant saw the OG worry information and had underestimated OG worry when asked. The model shows that seeing information on OG worry amplified beliefs in collective action among those who underestimated it, supporting H6b. Figure 2a shows that the OG worry information increased collective action beliefs for underestimators ($M = 4.22$, $SD = 1.14$ vs. $M = 4.63$, $SD = 1.18$, $d = 0.36$, $p < .001$) whereas it marginally diminished beliefs for non-underestimators ($M = 5.29$, $SD = 1.21$ vs. $M = 4.89$, SD = 1.26, $d = 0.33$, $p = .07$).

Looking at perceptions of expected contributions to climate action from different generations, participants believed young people are more likely to play their part than older people ($M = 5.37$, $SD = 1.23$ vs. $M = 4.17$, $SD = 1.40$; Wilcoxon Signed Rank, $Z = 12.67$, $p < .001$, $r = .57$). Model 1 in Table 3 shows that there was no effect of the generational narrative or seeing OG Worry information on perceptions of younger people, but seeing the OG Worry information boosted beliefs that older people would play their part, in support of H6a (Model 2a, Table 3). There was no interaction effect between narrative condition and seeing OG Worry. Testing for an interaction between seeing accurate worry information and previously underestimating worry showed that the

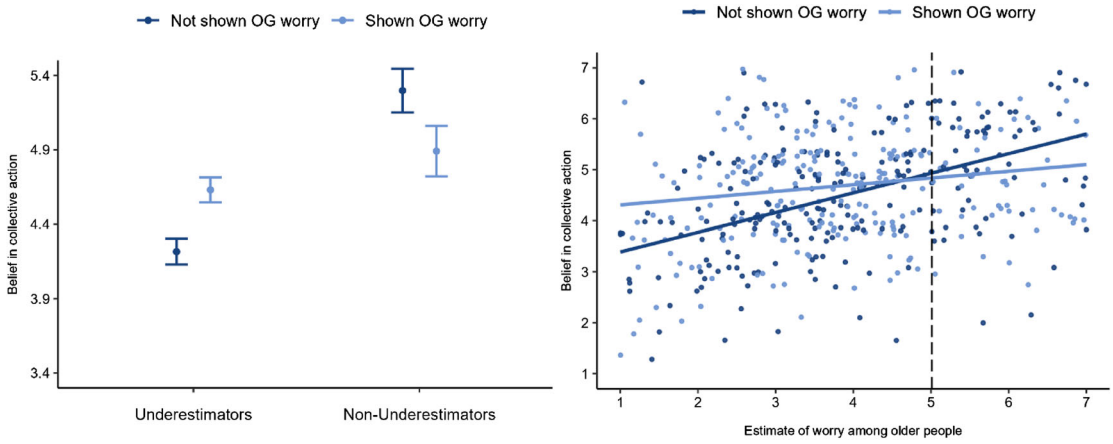

Figure 2. a and b. Average collective action beliefs between underestimators and non-underestimators (left) and simple slope regression lines (right). Error bars represent standard error of the mean.

Table 3. OLS Regression Models Predicting Specific Collective Action Beliefs.

	Model 1 Younger People		Model 2a Older People		Model 2b Older People	
	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value
Constant	5.82*** [5.40, 6.25]	<.001	4.04*** [3.55, 4.53]	<.001	3.51*** [3.05, 3.97]	<.001
Generational Narrative (*Ref: Control*)	−0.04 [−0.26, 0.17]	.657[a]	−0.01 [−0.26, 0.23]	.460[a]	−0.01 [−0.24, 0.21]	.451[a]
Shown OG Worry (*Ref: Not Shown*)	−0.06 [−0.28, 0.15]	.575	0.39** [0.15, 0.64]	.001[a]	0.78 [0.52, 1.04]	<.001
Overestimated OG Worry (*Ref: Underestimated*)					1.75*** [1.39, 2.11]	<.001
Overestimated + Shown OG Worry					−1.18*** [−1.70, − 0.65]	<.001
Socio-Demographic Controls	Yes		Yes		Yes	
Participants[c]	499		498		492	

*$p < .05$; **$p < .01$; ***$p < .001$. [a]One-tailed, given pre-registered directional hypothesis. [c]Participants are excluded from models where values are missing for the dependent variable or any independent variable.

effect on perceptions that older people would play their part was driven by those who had previously underestimated worry, whereas the minority who had not underestimated expressed marginally weaker beliefs in collective action after seeing the correct information, again supporting H6b (Model 2b, Table 3).

3.3. Pro-Environmental intentions

To test for effects on pro-environmental intentions, we created a willingness index by averaging responses across all behaviours ($M = 5.12$, $SD = 0.94$, $\alpha = .81$). Model 1 in Table 4 shows there was no effect of being in the generational narrative condition (generational narrative: $M = 5.14$, $SD = 0.96$ vs. control: $M = 5.10$, $SD = 0.93$) or seeing OG worry information (shown worry: $M = 5.09$, $SD = 0.95$ vs. not shown: $M = 5.15$, $SD = 0.93$), contra H7 and H8a. Model 2 presents an analysis testing for an interaction between underestimating older generations' worry and seeing the OG worry estimate on future intentions. The coefficients suggests that the OG worry information diminished intentions to act pro-environmentally among the minority of those who overestimated how worried older generations are (shown worry: $M = 5.22$, $SD = 0.84$ vs. not shown: $M = 5.56$, $SD = 0.87$) but, against H8b, generated no countervailing effect among those who underestimated how worried older people are (shown worry: $M = 5.06$, $SD = 0.98$ vs. not shown: $M = 4.99$, $SD = 0.91$).

Table 4. OLS Regression Models Predicting Pro-Environmental Intentions

	Pro-Environmental Intentions			
	Model 1		Model 2	
	Coefficient [95% CI]	*p*-value	Coefficient [95% CI]	*p*-value
Constant	5.48*** [5.16, 5.81]	< .001	5.30*** [4.97, 5.63]	< .001
Generational Narrative (*Ref: Control*)	0.02 [−0.15, 0.18]	.428[a]	0.01 [−0.16, 0.17]	.467[a]
Shown OG Worry (*Ref: Not Shown*)	−0.03 [−0.19, 0.14]	.738	0.08 [−0.11, 0.27]	.386
Overestimated OG Worry (*Ref: Underestimated*)			0.54*** [0.28, 0.80]	< .001
Overestimated + Shown OG Worry			−0.38*[b] [−0.76, − 0.01]	.048
Socio-Demographic Controls	Yes		Yes	
Participants[c]	500		494	

*$p < .05$; **$p < .01$; ***$p < .001$. [a]One-tailed, given pre-registered directional hypothesis. [b]Coefficient not significant in reduced sample models that exclude participants within the fastest 5% to complete survey and those that failed attention check. [c]Participants are excluded from models where values are missing for the dependent variable or any independent variable.

4. Discussion

Our study presents the first experimental test of contextualizing the conversation about climate in generational terms. The results show that highlighting generational differences in the causes and effects of climate change leads to higher levels of worry among young people, compared to standard information on climate change (supporting H1 and H2). However, this generational narrative does not enhance intentions to act more pro-environmentally in the future (H7).

The results also show that a generational narrative does *not* lead to belief that older people are less worried (contra H3). Unsurprisingly, given that it does not lead to lower perceived worry among older people, a generational narrative does not diminish belief in collective action (contra H5). However, a large majority (three in four) of young people in Ireland underestimate the level of worry older people report, and this belief is linked to lower belief in collective action (supporting H4). This is important, as the misperception undermines belief in collective climate action. Furthermore, confronting young people with this misperception boosts belief in collective action and, specifically, that older people are likely to play their part to tackle climate change (supporting H6). However, those who overestimate how worried older people are may be demotivated after seeing the correct information: they have lower intentions to act pro-environmentally in the future compared to other young people who overestimate worry but do not learn what older people report when asked (contra H8).

4.1. Policy implications

The implications of these findings are not straightforward and depend on policy aims. First and foremost, however, our results confirm that contextualizing climate change communications in generational terms, as many speeches and media reports do, is likely to have impacts on how young people think about climate change. Note that the current experiment obtained effects from a simple, once-off written description. Sustained, repeated communication in generational terms could amplify what we observed here. Further research investigating the long-term effects of different narratives used to communicate climate change with the public is necessary.

If communicators wish to increase worry among young people, emphasizing the generational context is likely to be effective. Our findings suggest that doing so is also unlikely to affect beliefs that different generations will contribute more or less to tackling climate change. However, we find no evidence that a generational narrative motivates action among young people. This disconnect between worry and motivation to act supports recent research critiquing the focus on finding ways to engender worry (Bouman et al., 2020; Brosch, 2021) and other research showing the shift in some narratives towards intragenerational injustices (Thew et al., 2020). If communicators instead wish to reduce worry among young people, for example to attempt to address eco-anxiety (Ojala et al., 2021; Wu et al., 2020), speaking about climate change in neutral, non-generational terms is likely to help, without undermining young people's belief in collective action or existing intentions to act pro-environmentally.

Given our findings, a perhaps more important implication concerns the usefulness of correcting misperceptions about older people's level of worry. In countries such as Ireland, where concern for the climate is high, many young people are likely to underestimate older people's concern. While doing so is associated with lower belief in collective action, providing accurate information increases that belief. The finding suggests that the call for recognition of humanity's superordinate identity in climate communications could be supported by supplying the public with accurate information on shared concern (e.g. Fritsche et al., 2018; Mackay et al., 2021; Sarrasin et al., 2022). However, if precise statistical information is shared – as in our experiment – the minority of overestimators who see this information are likely to reduce their intentions to act in pro-environmental ways. Hence a sensible approach for policymakers may be to communicate the level of concern in general terms. For example, stressing that most older adults are very worried about climate change may correct misperceptions among majority 'underestimators' while remaining congruent with beliefs among the remaining minority.

Is it possible these implications are specific to Ireland? Our study was motivated by narratives prevalent at global events, such as the UN's COPs, where the expectation of a generational divide in climate concern appears

widespread. Ireland has low levels of climate denialism and an apparent appetite among the public for climate action, but a poor track record of performance. In this regard, many other countries are similar. Data from almost 70 countries (including non-WEIRD countries) suggests that global belief in climate change is very high (Vlasceanu et al., 2024). The Climate Change Performance Index notes that no country has enacted sufficient climate policy to warrant overall high ratings; severe climate change would not be avoided even if all countries matched the current top performers. Our findings are perhaps less likely to generalize where there is, in fact, a gap in generational concern about climate change, such as among the political right in the US. However, extensions and replications of this study are needed to confirm the degree of generalisability.

4.2. Limitations

Our aim was to test the effects of generational narratives on youth views on climate change and the likelihood of climate action. One limitation of this approach is that we do not test how describing climate change as a generational issue affects older generations. It is not clear whether the current narrative is motivating older generations to 'do better' or if it leads them to perceive heightened intergenerational differences and to disengage from taking climate action (Masson & Fritsche, 2021). These possibilities have important implications. Older generations are particularly susceptible to the health effects of climate change in many WEIRD countries (Paavola, 2017) and their role in mitigating climate change is often overlooked (Smyer, 2017). Thus, successfully adapting to and mitigating climate change requires engagement with older people and avoidance of narratives that encourage division (Haq, 2021; Latter, 2022). Further research is needed to allow for a broader evaluation of this common climate change narrative on different audiences.

Our study measured the immediate effects of once-off exposure to narrative embedded in text about climate change. The cumulative effects of repeated exposure to this narrative in different forms (e.g. through emotive speeches delivered via video) may be stronger. It is thus unlikely that we overestimate the 'real world' effects of such narratives on how worried young people feel about climate change. The long-term effects of correcting misperceptions about worry among older generations, however, are more difficult to estimate. We could locate no other studies that have tested such informational interventions. While our findings point towards a promising effect on boosting belief in collective action, further research is needed.

More generally, this study emphasizes the need for experimental tests of communications about climate change. The results show that while some effects align with reasonable expectations – for example that a generational narrative leads to higher levels of worry among young people – there are potential knock-on effects on other important psychological variables and for different subgroups of the population. This experiment presents a first step in assessing the potential effects of a common media narrative. From an eco-anxiety perspective, it's not clear that this narrative, overall, is the most helpful – particularly given the lack of effects on motivating climate action.

This paper began with a characteristically incisive quote from Greta Thunberg, who has repeatedly highlighted the ironies embedded in the intergenerational politics of climate change (Martiskainen et al., 2020). Yet our results might question how much the intergenerational narrative of the crisis contributes to the 'Greta Thunberg Effect' (i.e. whereby familiarity with Greta Thunberg predicts climate activism intentions; Hayes & O'Neill, 2021; Sabherwal et al., 2021). Perhaps, regardless of age or generation, it is how her contributions personalize and impose a narrative on an often abstract and technical subject that gives them force.

5. Conclusion

Communicating with the public about climate change is necessary to ensure appropriate understanding of the policy challenge and acceptance of effective solutions. Rhetorical devices and narrative tools are appealing to ensure communications draw attention and are engaging and memorable. However, some approaches may have unintended, perhaps negative, consequences. Here, we show that highlighting generational differences in the causes and effects of climate change – differences that are difficult to deny – increases worry among young people but does not motivate them to act. In fact, many young people already underestimate how worried older generations are about climate change and this misperception is linked to greater belief that

others will not come together to tackle climate change. Communications that correct this misperception may have greater benefit. We find that confronting those who underestimate how worried others are with accurate information boosts belief in collective action. Successful policy communications about climate change might be those that highlight, not differences, but similarities in concern about climate change between socio-demographic subgroups. Belief that others will act too is vital for motivating the kind of cooperation necessary to mitigate and adapt to climate change.

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