



# Climate anxiety: What predicts it and how is it related to climate action?

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## ARTICLE INFO

Handling Editor: Mark Ferguson

### Keywords:

Climate anxiety

CCAS

Generalised anxiety

Pro-environmental behaviour

## ABSTRACT

As scientific evidence of the severity of climate change increases, there are indications that this represents a significant psychological burden in the form of climate anxiety on the public. So far very little research has explored the prevalence, predictors, or effects of climate anxiety amongst the public. This study aims to address this gap by exploring climate anxiety in the UK. It addresses the following questions: (a) How prevalent is climate anxiety amongst adults in the UK? (b) What are the predictors of climate anxiety? and (c) Does climate anxiety predict climate action? We report on findings from an online survey of the UK public ( $N = 1338$ ) undertaken in late 2020 (partially replicated in May 2022 with a sub-sample of 891 respondents) which found that while there are high levels of concern about climate change, there are low levels of climate anxiety (measured using the Climate Change Anxiety Scale). Climate anxiety was higher amongst younger age groups, those with higher climate concern, higher generalised anxiety, lower mindfulness, higher nature relatedness, and more climate change information seeking behaviour. In addition, climate anxiety predicted some (but not all) types of pro-environmental action. Consistent with other recent research, these findings indicate that climate anxiety may not necessarily be a negative impact of, or maladaptive response to, climate change; but rather, at least to some degree, be a motivating force for effective action.

## 1. Introduction

Climate change is increasingly being recognised as a major threat to human health (Watts et al., 2019). Whilst climate change-related physical health concerns and the impact of extreme weather events on mental health have been widely documented, the indirect association between climate change and mental health has not been equally considered in the literature. There is growing evidence that extreme weather events and natural disasters, such as floods and hurricanes, can have detrimental effects on mental wellbeing and adverse community health outcomes, for example, higher localised rates of post-traumatic stress disorder (PTSD), depression and anxiety, as well as increases in alcohol misuse, domestic violence, and suicide (Bourque & Cunsolo Willox, 2014; Palinkas & Wong, 2020; Cianconi et al., 2020; Doherty & Clayton, 2011; Morganstein & Ursano, 2020). Certain communities may be particularly at risk if their livelihoods or basic physical needs are threatened (Hayes & Poland, 2018; Morrissey & Reser, 2007; Usher

et al., 2019). However, there is less empirical evidence to suggest whether indirect exposure to climate change through increasing awareness of climate change risks (e.g., due to media coverage), but without direct experience of extreme weather events or other climate hazards, relates to psychological stress ('climate anxiety' or 'eco-anxiety'). While there are growing media and anecdotal reports of climate anxiety, little is known about how widespread or problematic it is.

One of few studies to date on climate anxiety (Clayton & Karazsia, 2020) found that 17–27% of their US sample reported a degree of climate anxiety (using a novel 'Climate Change Anxiety Scale' [CCAS]) which they reported affecting their ability to function. Clayton and Karazsia (2020) suggest that climate anxiety comprises two factors: cognitive-emotional impairment and functional impairment (means = 1.75 and 2.09, respectively, using a five-point scale, amongst an MTurk sample, of which half were 25–34). Cognitive-emotional impairment can be defined as the result of specific cognitions associated with feelings of anxiety or depression, and functional impairment is when an

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<https://doi.org/10.1016/j.jenvp.2022.101866>

Received 28 November 2021; Received in revised form 6 June 2022; Accepted 13 August 2022

Available online 28 August 2022

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individual's psychological state has detrimental consequences in living their day-to-day life (e.g., difficulty concentrating or sleeping). The same CCAS applied in a German sample found low levels of climate anxiety (mean 1.81 on a seven-point scale), although this correlated with generalised anxiety and depressiveness ( $r = 0.25, p < .01$ ) (Wullenkord et al., 2021). In a Filipino sample of 18–26-year-olds, Reyes et al. (2021) reported a mean of 2.38 on the CCAS; again, the scale correlated with psychological distress ( $r = 0.39, p < .001$ ). International research using a different measure with 10,000 young people in 10 different countries reported a high rate of climate anxiety amongst young people (aged 16–25), with 45% of the sample indicating their feelings about climate change negatively affected their daily lives (Hickman et al., 2021). This difference could be because this measure (unlike the CCAS) used a binary scale and did not assess frequency or severity of functional impairment.

UK-based research (Verplanken et al., 2020), using a measure of 'global warming worry' found that whilst this was associated with psychological distress (clinical worry), it also associated strongly with pro-environmental action, suggesting that it may be a constructive form of worry. Similarly, Pihkala (2020a, 2020b) found that individuals reported their climate anxiety had guided them in reflecting on their behaviour, information-seeking, and actively being more sustainable. Likewise, research conducted in Germany, Australia and New Zealand has found a positive relationship between eco-anxiety and pro-environmental behaviour (Hogg et al., 2021; Wullenkord et al., 2021). (Hogg et al. (2021), p.8) conclude that 'eco-anxiety and climate change anxiety are largely *rational* responses, given the enormity of the crisis'. It remains unclear whether climate anxiety is broadly a dysfunctional or adaptive response to the global climate crisis. Moreover, its antecedents and outcomes are little understood. The current study aims to address this research gap by exploring the prevalence, predictors, and behavioural correlates of climate anxiety within a representative adult UK sample.

## 2. Literature review

### 2.1. Is climate anxiety pathological or adaptive?

Climate anxiety has been defined as 'heightened emotional, mental or somatic distress in response to dangerous changes in the climate system', which can result in symptoms such as panic attacks, loss of appetite, and sleeplessness (Dodds, 2021). The broader literature on clinical levels of anxiety shows that they entail negative affect and chronic worry, often resulting in significant distress and impairment (Lawrence & Brown, 2008). Anxiety, when excessive, can impair an individual's ability to work, sleep and socialise. Clayton and Karazsia (2020) found a positive correlation between generalised anxiety and climate anxiety in their US sample. Others have questioned whether eco-anxiety can be distinguished from generalised anxiety or anxiety disorders (Helm, Pollitt, Barnett, Curran, & Craig, 2018; Swim et al., 2009; Wullenkord et al., 2021). On the other hand, Hogg and colleagues' (2021) study of climate anxiety within Australian and New Zealand samples found it was characterised by affective symptoms, rumination, behavioural symptoms, and anxiety about one's negative impact on the planet; but crucially that it was distinct from other mental health conditions, including generalised anxiety disorder. Indeed, some have argued that it might even be pathological to have *too little* climate anxiety, as well as *too much*, given that we urgently need to address the climate crisis (Dodds, 2021). However, there is currently limited research into whether climate anxiety is a form of more generalised anxiety or something distinct, and none that has been undertaken in the UK population. Identifying whether a correlation exists can assist psychologists in appropriate treatments, or conversely reconceptualising climate anxiety as something potentially adaptive (Pihkala, 2020a, 2020b; Verplanken et al., 2020).

Differential responses to anxiety may be due to different forms of

coping. Emotion-focussed coping seeks to reduce negative affect rather than effectively dealing with a problem, while problem-focussed coping targets the cause of stress in more practical ways (Lazarus & Folkman, 1984). Studies show that children who cope through de-emphasizing the seriousness of climate change, using avoidance and denial as coping strategies, tend to be less engaged in pro-environmental behaviour and report lower levels of negative affect. In contrast, children who use problem-focused coping have been found to exhibit higher negative affect, whilst children who employ meaning-focused coping (developing trust in societal actors e.g. scientists to address climate change and create solutions) have less negative affect, and more positive affect and satisfaction (Ojala, 2012), with both problem-focused and meaning-focused coping associated with more pro-environmental behaviour (Ojala & Bengtsson, 2019). Hickman (2020) suggests that climate anxiety can arise in different forms, with severe forms being extremely debilitating, and that the existence of comorbid mental health problems have the potential to interact with and exacerbate climate anxiety. Together these studies indicate how climate anxiety may be both a psychological stressor, with a potential impact on mental health for some, whilst at the same time reflecting a rational response that can motivate pro-environmental behaviour. The current study explores this by examining whether climate anxiety can be seen as distinct from generalised anxiety, and whether it predicts positive beliefs and action on climate change. Given the need for the public to change their behaviour and adopt more pro-environmental habits to address climate change (IPCC, 2022) we examine whether climate anxiety predicts a range of green consumption behaviours.

### 2.2. What predicts climate anxiety?

Research shows *demographic factors* predict climate anxiety (Clayton & Karazsia, 2020; Wullenkord et al., 2021). Verplanken et al. (2020) found women to have significantly higher scores in pathological worry, and in a pro-ecological worldview, than men. Moreover, age had a significant negative correlation with trait pathological worry. Young people were found to have high levels of climate anxiety across ten countries (although this was not compared with older age groups; Hickman et al., 2021). Questionnaire data further suggests that young people are indeed more likely to report higher levels of climate-related distress, in both UK (Triodos Bank, 2019) and North American (Washington Post., 2019) samples. Earlier research similarly found females and young people were more anxious about climate change than men or older age groups, and that those with stronger pro-environmental values were also more anxious (Searle & Gow, 2010). Left-wing ideological values have also been found to predict climate anxiety (Wullenkord et al., 2021). It may be that lower income groups, who are typically more exposed to environmental risks (Downey & Hawkins, 2008), experience higher climate anxiety, but one study that examined this found no relationship (Wullenkord et al., 2021).

*Experiential factors* are also relevant, with evidence that first responders after extreme weather events and natural hazards may suffer more from severe climate anxiety (Alexander & Klein, 2009). It seems likely that those who directly experience such events may have higher climate anxiety (cf. Reser & Bradley, 2020). Similarly, we explore whether exposure to information about climate change risks from the media or other sources (i.e., indirect experience of climate change) may also cause climate anxiety, particularly since much media coverage is negative and (at least in the UK) tends to emphasise the most dramatic impacts (O'Neill, 2020). This might include passive exposure to information as well as actively seeing information about climate change, both of which we explore in this study.

*Mental health* might be another important factor: as noted, there is some evidence of an association between generalised anxiety and climate anxiety (Clayton & Karazsia, 2020), and it could be that those with existing mental health disorders could be vulnerable to experiencing more severe levels of climate anxiety as the stress of climate

anxiety could exacerbate pre-existing psychological distress. In this study we expect to find that generalised anxiety is associated with higher climate distress. In contrast, we predict that a key factor in resilience and positive mental health, mindfulness, would be associated with less climate and general anxiety. Mindfulness involves paying attention purposefully and non-judgmentally to the present moment (Kabat-Zinn, 2009) and people who exhibit higher levels of trait mindfulness may be better at accepting uncertainty and difficult feelings, including climate anxiety (cf. Carpenter et al., 2019; Hofmann et al., 2010).

*Environmental values* may also be associated with climate anxiety. Reporting climate anxiety in the first instance requires acknowledging the seriousness of climate change (Weintrobe, 2013). The New Ecological Paradigm was developed as a measure of environmental values, encompassing the belief that humans are having a negative influence on the environment and reflecting the view that humans should attempt to mitigate this impact (Dunlap et al., 2000). We investigate in this paper whether such an environmental worldview is associated with climate anxiety. Similarly, nature connectedness may be positively associated with climate anxiety, as Galway et al. (2021) reported that connectedness to nature was associated with higher levels of worry about the climate. It is possible that the implications of the climate crisis are more keenly felt by those who see themselves as part of nature, which may predict higher climate anxiety. Nature connectedness has also been found to be associated with worse mental health more generally (Dean et al., 2018), although some research has found it to be associated with increased happiness (Capaldi et al., 2014). In view of these mixed findings, we seek to clarify whether nature connectedness is associated with climate anxiety.

A confounding factor that might explain the mixed findings surrounding nature connectedness is the *frequency of nature visits*, which might be associated with higher connectedness to nature as well as being protective for mental health. Research has shown that interacting with natural environments promotes mental health, and therefore a better quality of life (Cianconi et al., 2020). Research shows nature engagement can alleviate symptoms of anxiety (Maund et al., 2019), reduce stress, and improve cognitive functioning (Barton & Rogerson, 2017; White et al., 2021). Tester-Jones et al. (2020) found higher rates of nature visits amongst those who reported having anxiety than those who did not, concluding that some may use nature as a way of managing their mental health. As such, we expect that more nature visits, as distinct from a sense of nature connectedness, is associated with climate anxiety.

Finally, engaging in *pro-environmental behaviour* could also predict climate anxiety: it is possible that engaging in pro-environmental behaviour would give a sense of control over climate change, but it is also possible that it would focus people in on climate change in a way that increases anxiety. Building on previous research showing climate anxiety is positively associated with pro-environmental behaviour (Wullenkord et al., 2021; Hogg et al., 2021; Verplanken et al., 2020; Pihkala, 2020a, 2020b), we examine how different pro-environmental actions are associated with climate anxiety.

### 2.3. Present study

Overall, little is known is about the predictors of climate anxiety, and its relationship to pro-environmental behaviours. The present study therefore aims to understand the unique contributions of several variables to climate anxiety, and explore if these variables predict overall, and different types of, pro-environmental behaviour.

Thirteen factors will be simultaneously investigated for their unique association with climate anxiety: demographic factors (age, gender, and household income), psychological factors (climate concern, environmental values, generalised anxiety, mindfulness, and nature connectedness), experiential factors (exposure to climate change information, seeking out information about climate change, and prior experience with the impacts of climate change [specifically, flooding]), and behaviours (pro-environmental behaviour, and frequency of visiting green

spaces).

## 3. Methods

We conducted an online survey of the UK public, using an online participant panel (Prolific). In total, 1338 useable responses were received.<sup>1</sup> Data was collected between 23rd October and November 28, 2020. Since this initial data was collected during the COVID-19 pandemic, potentially affecting climate anxiety levels, the sample was recontacted in late May 2022 to complete the climate anxiety and concern measures a second time; 891 respondents completed the measure. Ethical approval to conduct the study was obtained from Cardiff University's School of Psychology Research Ethics Committee (EC.20. October 03, 5991).

### 3.1. Participants

The sample was broadly representative of the UK population in terms of gender, age, and ethnicity, according to census data (ONS, 2011): 46.3% was male; 53% female; and 0.7% other; mean age was 47.1 years (median = 48.0; range 18–85); 82% were white and 14% were other ethnicities. One-third was not currently employed or on furlough; and 14.8% had a disability.<sup>2</sup> In total, 56.7% had visited a park or public green space in the last seven days; 3% had experienced flood damage to their home or garden in the last five years.

### 3.2. Measures

- *Climate change concern* was measured with an item used previously (Poortinga et al., 2018): 'How worried are you personally about the following issues at present: Climate change' (listed as one of 11 current issues, e.g., Coronavirus, Brexit, Terrorism, Plastic pollution) with responses on a five-point scale from 'not at all worried' (1) to 'extremely worried' (5).
- *Climate anxiety* was measured using Clayton and Karazsia's (2020) Climate Change Anxiety Scale (CCAS), comprising 13 statements such as 'Thinking about climate change makes it difficult for me to concentrate' (see Fig. 2 for all items) and a five-point frequency response scale from 'never' (1) to 'almost always' (5). The statements were preceded with 'Please rate how often the following statements are true of you'. The scale was highly reliable,  $\alpha[13] = 0.93$  at both timepoints.
- *Generalised anxiety* was measured by the GAD-7 (Spitzer et al., 2006), comprising seven statements (e.g., Feeling nervous, anxious, or on edge; trouble relaxing) preceded by the root 'Over the last two weeks, how often have you been bothered by the following problems?' and a four-point response scale from 'not at all' (0) to 'nearly every day' (3);  $\alpha[7] = 0.94$ .
- *Mindfulness* was measured using the FFMQ-18 (Medvedev et al., 2018) which captures the five dimensions of mindfulness (Acting with Awareness, Describing, Nonjudging, Nonreactivity, and Observing) and includes items such as 'I pay attention to sensations, such as the wind in my hair or sun on my face' and 'I'm good at finding words to describe my feelings' on a five-point frequency scale from 'Never or very rarely true' (1) to 'Very often or always true' (5).

<sup>1</sup> The survey was conducted in two waves. In May 2020, a representative sample of 1500 adults was obtained from Prolific and completed an unrelated questionnaire; in October 2020 we returned to the same sample for the current study. The sample of 1338 therefore represents an 89.2% response rate from our original sample.

<sup>2</sup> The sample in 2022 was very similar in composition: 45.1% were male, 54.1% female, and 0.8% other. Mean age was 52.0 years (range 18–84); and 31.4% were not currently employed. Ethnicity and disability were not recorded.

Items 3, 4, 8, 9, 11, 12, 16, and 18 were reverse scored, and total score calculated;  $\alpha[18] = 0.82$ .

- *Environmental values* were measured with a short version of the New Environmental Paradigm (NEP) scale (Dunlap et al., 2000), comprising statements such as ‘Humans have the right to modify the natural environment to suit their needs’ (reverse-scored) and ‘The balance of nature is very delicate and easily upset’, with a seven-point response scale from ‘strongly disagree’ (1) to ‘strongly agree’ (7);  $\alpha[5] = 0.73$ .
- *Nature relatedness* was measured using the NR-6 (Nisbet & Zelenski, 2013) which includes six statements, such as ‘My relationship to nature is an important part of who I am’ and ‘I feel very connected to all living things and the earth’ with a seven-point agreement scale (as above);  $\alpha[6] = 0.86$ .
- *Pro-environmental behaviour* (PEB) was measured by summing frequency of eight pro-environmental actions preceded by ‘At the moment, roughly how many times per month do you do each of the following?’: Eat organic, locally-grown or in season food; Encourage other people to save energy; Buy products with less packaging; Recycle household waste (e.g. glass); Avoid wasting food (e.g. by using leftovers); Buy second-hand items; Borrow or rent items (e.g. tools, toys); and Repurpose something for a different use, instead of throwing it away; and a response scale from ‘not at all’ (1) to ‘at least once a day’ (7);  $\alpha[8] = 0.67$ . Since most of these actions are relatively low environmental impact, we also include one high-impact environmental action, *red meat consumption* (Ivanova et al., 2020), with the question: ‘At the moment, how many days in a typical week do you eat red meat (e.g., beef, lamb)?’ with response options: ‘Never’ (0), ‘Less than once a week’ (1), ‘1–2 days per week’ (2), ‘3–4 days per week’ (3), ‘5–6 days per week’ (4), ‘Everyday’ (5).
- *Visits to green space* was measured with the item ‘In the past 7 days, have you visited a park or public green space?’ and response options yes (1) or no (0).
- *Experience of climate impacts* was measured by asking ‘In the last 5 years have you experienced any form of flood damage (including your home and garden)?’ with response options ‘Yes – once’ (1), ‘Yes – 2–3 times’ (2), ‘Yes – 4 or more times’ (3), and ‘No’ (0). Flooding was chosen to represent climate impacts, as it is one of the most common impacts of climate change in the UK and frequently linked to climate change in the media (Gavin et al., 2011).
- *Information exposure* was calculated by summing responses to ‘How often do you come across information about climate change ...’ from the following sources: ‘on TV’; ‘on streaming sources e.g. Netflix’; ‘on the radio’; ‘on social media e.g. Facebook, Twitter’; ‘in print newspapers’; ‘in online newspapers’; and ‘from colleagues; from friends or family’. The response scale went from ‘never’ (0) to ‘often’ (3),  $\alpha[8] = 0.76$ .
- *Information seeking* was measured with the item ‘How often, in a typical week, do you intentionally seek out information about climate change?’ using a four-point scale from ‘not at all’ (0) to ‘every day’ (4).

### 3.3. Data analysis

For all analyses, we used the complete dataset collected in 2020, but used the additional data collected in 2022 to compare prevalence rates. For prevalence analysis, we examined frequencies, means and standard deviations for the CCAS and climate concern measures, and estimated total and stratified population prevalence of climate anxiety. Correlational and regression analyses then explored relationships between the various predictors and climate anxiety, and regression analysis examined the relative impact of climate anxiety on pro-environmental actions.

## 4. Results

### 4.1. Prevalence rates of climate concern and climate anxiety

Although 46.2% in 2020 (43.3% in 2022) stated they were extremely or very worried about climate change (Fig. 1), levels of climate anxiety on the 13-item CCAS were comparatively low (see Fig. 2). Since climate anxiety was measured on an ordinal Likert scale, prevalence was determined by categorising responses into ‘mild’ ( $1.00 \leq M \leq 2.33$ ), ‘moderate’ ( $2.34 \leq M \leq 3.66$ , and ‘severe’ ( $3.67 \leq M \leq 5.00$ ) levels of anxiety, in line with previous work using Likert scales in the absence of cut-off scores (De Vaus, 2002; Olsen et al., 2004). Prevalence rates were calculated as a percentage for each category, and stratified for gender and age (Table 1). Generally, climate anxiety was low, with an overall mean score of 1.25 ( $SD = 0.46$ ) in 2020 and 1.28 ( $SD = 0.48$ ) in 2022, and 96% in 2020 (95.4% in 2022) of participants reporting mild anxiety.

### 4.2. Correlational analyses

The means and variances were examined, and correlational analyses showed that several variables were related to climate anxiety (Table 2). Of the demographic factors, only younger age ( $r = -0.16, p < .001$ ) predicted increased climate anxiety. Several psychological factors, including increased climate concern ( $r = 0.26, p < .001$ ), higher generalised anxiety ( $r = 0.23, p < .001$ ), lower levels of mindfulness ( $r = -0.15, p < .001$ ) and increased nature relatedness ( $r = 0.21, p < .001$ ) were related to higher climate anxiety. Of the behavioural factors, increased green behaviours ( $r = 0.19, p < .001$ ) and having visited a green space in the last seven days ( $r = 0.08, p < .01$ ) were related to higher climate anxiety. Two experiential factors, higher levels of information exposure ( $r = 0.23, p < .001$ ) and higher information seeking ( $r = 0.39, p < .001$ ), were associated with increased climate anxiety.

### 4.3. Regression analysis: predicting climate anxiety

Given that many variables were correlated with climate anxiety, a multiple linear regression was conducted to understand the unique contributions of each predictor to climate anxiety. As observed in Table 3, younger age ( $\beta = -0.05, p = .004$ ), increased climate concern ( $\beta = 0.07, p < .001$ ), increased generalised anxiety ( $\beta = 0.01, p < .001$ ), lower mindfulness ( $\beta = -0.01, p < .001$ ), increased nature relatedness ( $\beta = 0.05, p < .001$ ), and increased information seeking ( $\beta = 0.19, p < .001$ ) uniquely predicted increased climate anxiety. Surprisingly, lower environmental values predicted increased climate anxiety once other variables had been controlled for ( $\beta = -0.12, p < .001$ ). Green behaviour, visits to green spaces, and information exposure no longer predicted increased anxiety.

In line with Clayton and Karaszia’s (2020) conceptualisation of climate anxiety as a two-dimensional construct, we also independently explored the predictors of cognitive-emotional and functional climate anxiety. The predictors of both the cognitive-emotional and functional dimensions were the same as overall climate anxiety (see Tables S1–2), perhaps suggesting that these variables predict both emotional ‘ruminative’ anxiety responses, as well as more functional impairments.

### 4.4. Regression analysis: predicting pro-environmental behaviours

As observed in Table 2, increased climate anxiety appeared to be related to more engagement with pro-environmental actions ( $r = 0.19, p < .01$ ). To understand if climate anxiety uniquely predicted pro-environmental action, we conducted a multiple linear regression, controlling for all other variables. As observed in Table 4, when controlling for all other variables, climate anxiety was not a unique predictor of overall pro-environmental behaviour.

However, since a variety of different pro-environmental behaviours were included in the overall index, it is possible that whilst climate

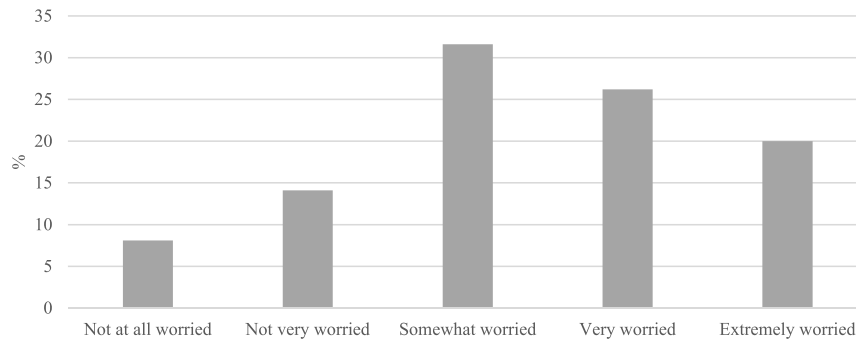


Fig. 1. Concern about climate change, 2020 data (%).

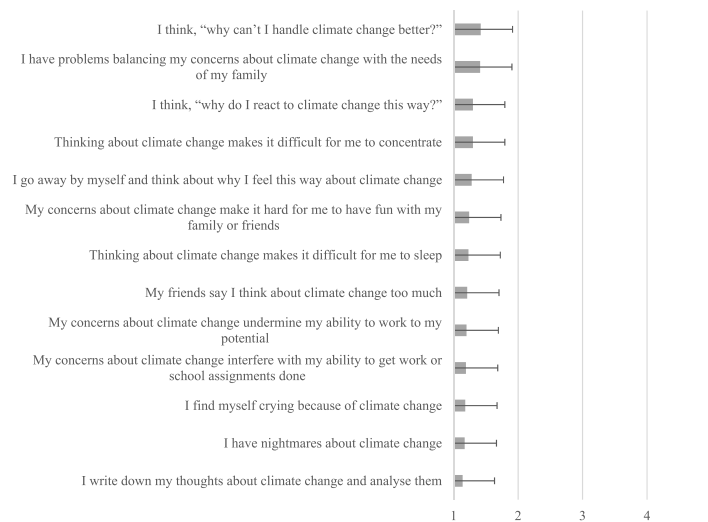


Fig. 2. Mean scores on climate anxiety scale items (2020 data). Error bars show  $\pm 1$  SD.

Table 1  
Prevalence rates of climate anxiety (2020).

	Mean Climate Anxiety [SD]	Prevalence rates (%) [95% Confidence Intervals]		
		Mild	Moderate	Severe
All (N = 1332)	1.25 [0.46]	96.0 [94.8, 97.0]	3.6 [2.7, 4.7]	0.4 [0.1, 0.9]
Female (N = 706)	1.24 [0.44]	96.6 [95.0, 97.8]	3.0 [1.9, 4.5]	0.4 [0.1, 1.2]
Male (N = 616)	1.27 [0.47]	95.5 [93.5, 97.0]	4.2 [2.8, 6.1]	0.3 [0.0, 1.2]
Age <30 (N = 220)	1.40 [0.61]	90.9 [86.3, 94.4]	9.1 [5.6, 13.7]	0.0 [0.0, 0.2]
Age 30–59 (N = 725)	1.25 [0.45]	96.3 [94.6, 97.5]	3.2 [2.0, 4.7]	0.6 [0.2, 1.4]
Age >60 (N = 386)	1.17 [0.33]	98.4 [96.6, 99.4]	1.3 [0.4, 3.0]	0.3 [0.0, 1.4]

anxiety is not related to overall pro-environmental action, individual pro-environmental actions may be.

To understand whether climate anxiety differentially predicts varying types of pro-environmental behaviours, we conducted eight further exploratory regression analyses (see Tables S3–10). Five of the pro-environmental actions were uniquely predicted by climate anxiety. Climate anxiety predicted an increased tendency to encourage others to save energy; buy second-hand items; borrow or rent items; and repurpose items, yet a decreased tendency to recycle. Climate anxiety did not

predict eating organic, local or seasonal food; buying products with less packaging; or avoiding wasting food. Observing the lack of correlation between climate anxiety and eating red meat (see Table 2), multivariate analyses were not required to determine that climate anxiety did not predict the higher impact pro-environmental behaviour of reducing red meat consumption. These results give a more nuanced understanding, and suggest that climate anxiety is related to many, but not all, pro-environmental behaviours.

## 5. Discussion

### 5.1. Summary of findings

The purpose of this study was to deepen understanding of the prevalence and nature of climate anxiety, and to investigate its relation to a range of individual, psychological, and behavioural variables. Despite widespread levels of worry about climate change in the UK, we find climate anxiety, as measured by the Clayton and Karazsia scale, is much less common. Almost half (46.2%) of participants reported being very or extremely worried about climate change. However, overall scores of climate anxiety were far lower (1.25 on a 1–5 scale). These rates changed very little between 2020 and 2022, when we replicated the CCAS and climate concern measures with a sub-sample of respondents, reinforcing previous work showing the pandemic did not suppress public worry about climate change (cf. Evensen et al., 2021). This disparity between climate concern and anxiety may reflect Clayton

**Table 2**  
Descriptive statistics and correlations.

Variable	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Income	4.27 (2.01)	–													
2. Gender	1.53 (0.50)	-.07*	–												
3. Age	2.13 (0.66)	-.09**	-.01	–											
4. Climate Concern	3.36 (1.18)	.01	.03	-.06*	–										
5. Generalised Anxiety	5.39 (5.39)	-.12***	.15***	-.20***	.14***	–									
6. Mindfulness	59.25 (9.35)	.11***	-.03	.22***	-.04	-.51***	–								
7. Environmental Values	5.45 (0.95)	-.05	.11***	.02	.51***	.11***	.02	–							
8. Nature Relatedness	4.63 (1.26)	-.02	.04	.09**	.36***	.10***	.19***	.41***	–						
9. Green Behaviours	3.15 (0.85)	.08**	.16***	.06*	.29***	.05	.13***	.18***	.39***	–					
10. Eat Red Meat	1.70 (1.00)	.08	-.14**	.01	-.15**	-.04	-.03	-.17**	-.12***	-.04	–				
11. Green Space	0.57 (0.50)	.13***	.01	.03	.04	-.08**	.06*	.02	.12***	.02	.02	–			
12. Flood Experience	0.03 (0.17)	.03	.03	-.06*	.01	.05	-.05	-.03	.03	.01	-.02	-.02	–		
13. Info Exposure	11.19 (4.62)	.15***	-.09***	-.07*	.25***	.04	.04	.10***	.28***	.02	.16***	.12***	.02	–	
14. Info Seeking	0.40 (0.66)	.03	-.10***	-.12***	.37***	.09**	.06*	.18***	.31***	.27***	-.08**	.12***	.00	.30***	–
15. Climate Anxiety	1.25 (0.46)	.04	-.03	-.16***	.26***	.23***	-.15***	-.02	.21***	.19***	-.03	.08**	.05	.23***	.39***

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

and Karazsia’s (2020) point about the distinction between “worry” about climate change and the impact that climate anxiety may have on someone’s life. The CCAS measures cognitive, emotional, and behavioural impacts of climate anxiety. Since these were reported less commonly than climate worry, we can infer people may be highly concerned about the climate crisis, but not (yet) to the extent that this concern usually affects their daily lives. This builds on the findings of Verplanken et al. (2020) that habitual climate change worry is significantly associated with pathological worry. Therefore, it may be that individuals express worry regarding climate change when asked, though do not engage with it habitually or to the degree that it constitutes a form of disabling anxiety. Moreover, the experience of climate anxiety has been connected to many other emotions including fear, anger, grief, despair, guilt and shame (Pihkala, 2020a, 2020b), none of which are assessed by the current scale. It is possible neither climate anxiety nor climate worry as measured in our survey captured the full experience of climate emotions in this population (cf. Davis et al., 2021).

Our results do suggest that climate anxiety is higher amongst certain groups. As expected, those with higher generalised anxiety were found also to have higher climate anxiety, echoing previous research indicating an association between these two forms of anxiety (Clayton & Karazsia, 2020; Reyes et al., 2021; Wullenkord et al., 2021). By substantiating previous research conducted in the US, Germany and the Philippines, this result may suggest that those with generalised anxiety are at particular risk of experiencing climate anxiety. It is also possible that climate anxiety may lead to anxiety about an array of topics; a longitudinal study design would be needed to test these causal pathways. Being younger was also uniquely predictive of higher climate anxiety, which is in line with the assertion that these feelings are being felt more fiercely among younger populations (Hickman et al., 2021). Hickman et al. (2021) suggest that powerlessness coupled with a lack of trust in, and accountability from, governments is impacting climate anxiety in young people. Lower levels of climate anxiety reported here as compared to previous studies may be because our sample included a broad range of ages. We found that gender and income did not predict climate anxiety, mirroring recent research showing fear about climate change are at similar levels across gender, location and class in the UK (Davis et al., 2021, cf. Wullenkord et al., 2021). This may indicate that eco-anxiety transcends social status, class, or wealth, being felt equally among differing groups. However, it is important to recognise that earnings are not the only indicator of wealth or privilege. Further research into how climate anxiety presents among varying populations is essential in our ability to understand this phenomenon.

Extending previous research on the links between mental health and climate anxiety (e.g., Reyes et al., 2021), we included a measure of trait mindfulness. Ours is the first study to demonstrate a negative association between mindfulness and climate anxiety, which is in keeping with evidence that trait mindfulness is negatively correlated with anxiety in general (Carpenter et al., 2019). This finding also echoes research showing mindfulness to be negatively predictive of distress relating to COVID-19 – another global emergency (Conversano et al., 2020). Furthermore, a recent review has shown that mindfulness interventions can reduce stress, anxiety and depression and increase well-being across a range of non-clinical populations (Galante et al., 2021). Climate anxiety can entail cognitive and emotional impairment, including ruminative and repetitive thinking about climate anxiety itself (Clayton & Karazsia, 2020). Clayton (2020) noted that individuals who engage in high levels of rumination about their climate anxiety could benefit from ways of developing some distance from the topic: as mindfulness entails an attitude of non-judgemental observation toward one’s experiences (Kabat-Zinn, 2009), it could guard against these repetitive thinking patterns that exacerbate climate anxiety. Indeed, mindfulness may represent a particularly helpful stance toward climate anxiety, as it fosters a new relationship to experience (i.e., acceptance as opposed to avoidance) and may provide an alternative or supplement to problem- and meaning-focussed coping strategies (Ojala & Bengtsson, 2019). This

**Table 3**  
Multiple regression showing the predictors of climate anxiety.

Variable	B	SE <sub>B</sub>	$\beta$	t	p	sr <sup>2</sup>	95% BCa CI	
							Lower	Upper
Income	0.00	0.01	0.02	0.76	.450	0.000	-0.007	0.015
Gender	-0.01	0.02	-0.01	-0.51	.609	0.000	-0.058	0.035
Age	-0.05	0.02	-0.07	-2.90	.004	0.005	-0.086	-0.016
Climate Concern	0.07	0.01	0.19	6.24	<.001	0.022	0.043	0.098
Generalised Anxiety	0.01	0.00	0.11	3.93	<.001	0.009	0.004	0.016
Mindfulness	-0.01	0.00	-0.12	-4.05	<.001	0.009	-0.008	-0.003
Environmental Values	-0.12	0.01	-0.25	-8.44	<.001	0.040	-0.150	-0.083
Nature Relatedness	0.05	0.01	0.14	4.61	<.001	0.012	0.030	0.070
Green Behaviours	0.02	0.01	0.03	1.25	.213	0.001	-0.011	0.050
Visits to Green Spaces	0.03	0.02	0.03	1.29	.197	0.001	-0.016	0.070
Flood Experience	0.06	0.06	0.02	0.90	.369	0.000	-0.092	0.248
Information Exposure	0.01	0.00	0.06	2.31	.021	0.003	0.000	0.012
Information Seeking	0.19	0.02	0.28	10.38	<.001	0.060	0.143	0.252

Model Fit:  $F(13,1300) = 38.34, p < .001, R^2 = 0.28, R^2_{adj} = 0.27$

Note. 95% bootstrapped bias-corrected and accelerated confidence intervals (95% BCa CI) with 1000 resamples are reported.

**Table 4**  
Multiple regression showing predictors of pro-environmental behaviour.

Variable	B	SE <sub>B</sub>	$\beta$	t	p	sr <sup>2</sup>	95% BCa CI	
							Lower	Upper
Income	0.03	0.01	0.07	2.70	.007	0.004	0.008	0.051
Gender	0.30	0.04	0.18	7.02	<.001	0.029	0.217	0.376
Age	0.09	0.03	0.07	2.73	.006	0.004	0.028	0.146
Climate Concern	0.10	0.02	0.15	4.69	<.001	0.013	0.063	0.145
Generalised Anxiety	0.00	0.01	0.02	0.66	.507	0.000	-0.007	0.013
Mindfulness	0.01	0.00	0.08	2.69	.007	0.004	0.001	0.013
Environmental Values	-0.04	0.03	-0.05	-1.57	.116	0.001	-0.099	0.017
Nature Relatedness	0.17	0.02	0.26	8.64	<.001	0.043	0.134	0.215
Visits to Green Spaces	0.08	0.04	0.05	1.80	.072	0.002	-0.002	0.160
Flood Experience	0.11	0.12	0.02	0.88	.378	0.000	-0.097	0.306
Information Exposure	0.01	0.01	0.08	2.89	.004	0.005	0.004	0.025
Information Seeking	0.15	0.04	0.12	4.07	<.001	0.010	0.080	0.222
Climate Anxiety	0.07	0.05	0.04	1.25	.213	0.001	-0.044	0.193

Model Fit:  $F(13,1300) = 32.26, p < .001, R^2 = 0.24, R^2_{adj} = 0.24$

Note. 95% bootstrapped bias-corrected and accelerated confidence intervals (95% BCa CI) with 1000 resamples are reported.

could potentially be of use to practitioners helping individuals to manage high levels of climate anxiety; however, as levels of climate anxiety were comparatively low in our sample, this would need to be replicated in a sample of those with higher levels of anxiety about climate change.

Interestingly, while nature relatedness positively predicted climate anxiety, environmental values were a negative predictor in the regression analysis. This is in line with recent findings that nature relatedness is a stronger predictor of pro-environmental behaviours than measures of environmental concern (Mackay & Schmitt, 2019), suggesting the NR-6 may be a more diagnostic measure of strong pro-environmental responses than the NEP which is more widely endorsed. It may also be possible that individuals with high environmental values are less anxious about climate change, since they tend to engage in more pro-environmental behaviours (see Table 2), which has been shown to attenuate climate anxiety (Schwartz et al., 2022). If this finding was replicated, future work may seek to disentangle the relationship between environmental values, pro-environmental behaviour, and climate anxiety.

Another interesting finding was that visits to green spaces were not predictive of lower climate anxiety, despite the correlational analysis showing it predicted lower generalised anxiety as expected (e.g., Cianconi et al., 2020). This might be because for those with high nature relatedness, visiting natural spaces activated climate anxiety by reminding them of the threat to something they value, while for others the effect of spending time in natural environments served to reduce anxiety. Further work would be needed to clarify the association

between nature visits, nature connectedness, and climate anxiety, and provide a more granular assessment of nature visits than we used here (see Limitations section). Given the differential effects of nature visits on generalised anxiety and climate anxiety in our sample, these findings highlight an important distinction between these two types of anxiety, and how they manifest. This is of particular importance for those studying the effects of nature engagement and relatedness on mental wellbeing. It also indicates the care that should be taken when advising people with climate anxiety on how best to manage their distress, as for some the common advice to spend time in nature may not always be the most supportive action they can take.

## 5.2. Direct and indirect information exposure

We examined the roles of direct and indirect climate change experience. One explanation for the dissonance between climate change worry and climate anxiety scores may be that direct experiences of climate change are not (yet) triggering climate anxiety to a measurable degree. Experiencing extreme weather events, like floods, are known to predict PTSD, depression, violence, and substance abuse (e.g., Cianconi et al., 2020). However, our finding of a non-significant difference in climate anxiety between those who had, and had not, experienced flooding may indicate that this relationship needs to be explored in more depth. This relationship may not be indicative of general populations as just 3% of participants within this study had experienced a flood within the past five years. Further, data was not collected on the attribution of flooding to climate change or on individuals' coping capacity, which

may influence whether these direct experiences contribute to climate anxiety scores (Ogunbode et al., 2019; Reser & Bradley, 2020). Other impacts of climate change, such as heat stress and sea-level rise, were also not explored here, but could be examined in future climate anxiety research.

Indirect experience of climate change was explored through both passive exposure to climate change information and active information-seeking about the issue. Exposure to information about climate change continued to predict climate anxiety after controlling for other variables. This suggests that the media have an important role to play in climate anxiety, which fits with previous research showing much media coverage is negative and focusses on the most dramatic impacts (O'Neill, 2020). Clarifying what sorts of media content and channels trigger or exacerbate climate anxiety would be a helpful step for future research. We also found that climate anxiety was particularly high amongst those who actively sought out climate change information; indeed, this was the strongest predictor of climate anxiety in our multivariate analysis. This is consistent with previous research on environmental risks showing information-seeking behaviour is associated with anxiety (Hmielowski et al., 2019; Williams, 2020). Future experimental work may extend these correlational findings by establishing directionality; i. e., whether climate anxiety leads individuals to seek out climate-related information or vice versa (Williams, 2020). Engaging with information reflecting the realities of climate change is likely to engender some stress and anxiety, as there is a very real threat. However, it is likely that there will be a balance to be struck in terms of seeking out reliable information at an appropriate frequency to inform one's decisions and understanding, in a way that may lead to adaptive climate anxiety, but without engaging in repetitive checking behaviours at an unhelpful frequency, as these are known to exacerbate anxiety and could lead to less helpful forms of climate anxiety.

### 5.3. Relationship between climate anxiety and pro-environmental action

A series of exploratory regressions indicated that higher climate anxiety is predictive of higher frequency of some pro-environmental behaviours: encouraging others to save energy, buying second-hand items, borrowing or renting items, and repurposing items. It is interesting that these behaviours entail a degree of effort, whereas behaviours that were not predicted by climate anxiety were those that could be carried out with more ease, such as making slightly different consumer choices (e.g. buying products with less packaging) or avoiding wasting food. In fact, climate anxiety was negatively predictive of recycling, which is a behaviour that is carried out by many and made quite convenient by local councils. On the other hand, we found no relationship between climate anxiety and avoiding red meat consumption, one of the most effective PEBs, although this could be because there is relatively low awareness of the impact on the climate of dietary choices (Steentjes et al., 2021). Moreover, our regression analysis of the PEB index found PEBs were most strongly predicted by nature relatedness, gender, and climate concern, while climate anxiety did not predict them.

These findings are broadly consistent with recent research indicating that climate anxiety could be an adaptive, motivating response to climate change that encourages effective action (Verplanken et al., 2020) although other psychological and socio-demographic factors may be stronger predictors of pro-environmental behaviours (cf. Whitmarsh et al., 2021). For the first time, we disaggregated PEBs into a range of green consumption and dietary actions and found climate anxiety predicted some but not other actions. This might explain the mixed findings from previous research exploring links between climate anxiety and PEBs. Specifically, Clayton and Karazsia (2020) found no relationship between climate anxiety and PEB. However, they reported much higher levels of climate anxiety than we did; it might therefore also be possible that the level of impairment is associated with one's ability to engage with their climate anxiety in an adaptive manner so as to allow it to motivate action. Taken together, these studies may suggest that a

threshold for adaptive, motivating climate anxiety exists, though future research will need to explore this among samples with varying degrees of climate anxiety.

### 5.4. Limitations

This study is not without limitations. The regression analysis indicated a low level of variance for climate anxiety was explained by the model used, highlighting that there may be more influential factors which have not been accounted for in this study. Incorporating data such as ethnicity (which was not directly measured, but rather used by the panel provider to derive a representative sample) may have led to some useful insights, particularly in light of consistent findings in the environmental justice literature of increased exposure to environmental risks amongst minority ethnic groups (e.g., Downey & Hawkins, 2008).

A recent review also indicates the lack of conceptual clarity regarding eco-anxiety, which involves a far broader range of emotions than simply anxiety (Coffey et al., 2021). Thus, the use of a scale focused on the anxiety-based responses to climate change may have failed to capture the range of emotions and distress reported by people concerned about climate change, but this does reflect the availability of appropriate measures within the literature at this time. It is also noteworthy that the two sub-scales of the CCAS were predicted by the same factors, suggesting at least that social-cognitive (ruminative) and functional impairments are closely related.

Of course, it may be that social desirability encourages people to say that they are worried about the climate when they indeed are not, so other forms of measure (e.g., physiological, observational) would be helpful to triangulate self-reports of climate anxiety. We also need to move beyond correlational analysis to explore how climate anxiety is evolving over time, and what may cause or mitigate it. Many useful suggestions have been made for how climate anxiety might be managed or 'treated' (e.g., Baudon & Jachens, 2021), but there has so far been no experimental evidence of intervention efficacy. As we have shown here, we should also firmly establish at what levels or in what forms climate anxiety may need 'treatment' and when it may in fact be a healthy and adaptive response to the climate crisis.

We did not measure levels of neighbourhood green in our study. Van den Berg et al. (2016) noted that the literature has tended to investigate the role of green space less in terms of nature visits and more in terms of neighbourhood green spaces; these authors found a positive association between visits to a green space and mental health. Some research indicates that the benefit of neighbourhood green spaces on mental health may be partly, but not wholly, mediated by a higher frequency of nature visits (Van den Berg et al., 2017). Measuring levels of neighbourhood green could have provided a more nuanced understanding of the role that nature plays in climate anxiety aside from its association with formal nature visits. Our measure of visits to nature also did not allow for a full assessment of its association with climate anxiety, such as the amount of time spent in green space; a recent review indicated that as little as 10 min spent in nature can have a positive impact on mental health (Meredith et al., 2020), but there may be a dose-response effect of nature visits that could have been explored with a more detailed measure. Assessing the quality of time spent in nature, such as specific activities undertaken, or the interactive effect between nature activities and levels of mindful awareness, could also have been illuminating. Finally, the lack of association between direct experience of climate change and climate anxiety may have been due to only a small minority having had a personal experience of flooding, reducing the variability in this measure. More comprehensive measures of direct experience of climate impacts would help in investigating its relationship with climate anxiety.

### 5.4. 5.5 Future research

This study points toward some important questions for further



research. Firstly, it will be important to identify a clear distinction between climate anxiety and climate concern or worry, to gain a clearer insight into what constitutes climate anxiety that is significant enough to impact on an individual's health and functioning. For researchers understanding the impact of nature on mental wellbeing, it will be important to distinguish whether for some people climate anxiety may be exacerbated by visits to a green space, and what role nature relatedness might play in this relationship. Although climate anxiety was associated with higher pro-environmental behaviour in our study, it would be helpful to determine the association between these constructs when there are higher levels of climate anxiety. It might also be helpful to examine other ways in which people are taking action on climate change that were not assessed with the current scale, for example collective or social action through activism, influencing others such as in schools and workplaces, lobbying MPs and those in power, and choosing finance options that avoid fossil fuels.

More generally, longitudinal research is essential to show whether climate anxiety is increasing over time. We found little change within a two-year timeframe (2020–2022), but longer-term analysis is now needed. In order to gain more insight into the direct versus indirect effects of climate change on mental wellness, it would be beneficial to study climate anxiety levels cross-culturally, beyond the limited samples so far studied in the US, Germany, and the Philippines.

Ultimately, the utility of this research translates to our ability to design effective ways of supporting people, individually and collectively, to manage climate change-related psychological distress, in such a way as to promote wellbeing and pro-environmental behavior. Due to the infancy of our understanding of the intersection between psychological health and the climate emergency, studies such as this are essential in developing our understanding of climate anxiety, and informing evidence-based psychological approaches for clinicians, and at a community health level (see [Baudon & Jachens, 2021](#)). Furthering our understanding of the psychological impacts of climate change, therefore, remains a high priority.

## Author statement

**Lorraine Whitmarsh:** Conceptualization, Methodology, Investigation, Formal Analysis, Visualization, Writing - Original Draft, Writing - Review & Editing. **Lois Player:** Formal Analysis, Visualization, Writing - Review & Editing. **Angela Jiongco:** Formal Analysis, Writing - Original Draft. **Melissa James:** Formal Analysis, Writing - Original Draft. **Marc Williams:** Methodology, Writing - Review & Editing. **Elizabeth Marks:** Methodology, Writing - Review & Editing. **Patrick Kennedy-Williams:** Methodology, Writing - Review & Editing.

## Funding

This work was supported by funding from the European Research Council (ERC) as part of the MOCHA Consolidator Grant (grant no: 820235).

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2022.101866>.

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