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Clayton, Susan D.

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Article

Psychological and Emotional Responses to Climate Change among Young People Worldwide: Differences Associated with Gender, Age, and Country

Susan D. Clayton ^{1,*} , Panu Pihkala ² , Britt Wray ³  and Elizabeth Marks ⁴¹ Psychology Department, College of Wooster, Wooster, OH 44691, USA² Faculty of Theology, Helsinki Institute of Sustainability Science, University of Helsinki, 00014 Helsinki, Finland³ Woods Institute for the Environment and Center for Innovation in Global Health, Stanford University School of Medicine, Stanford, CA 94305, USA⁴ Psychology Department, University of Bath, Bath BA2 7AY, UK

* Correspondence: sclayton@wooster.edu

Abstract: Recent research has described concern and anxiety about climate change, especially among young people, but limited data are available looking at the responses of adolescents. Based on further analysis of an existing dataset that obtained survey responses from young people aged 16–25 in 10 different countries, this paper examines differences associated with gender and age, which are important predictors of vulnerability to the impacts of climate change. Gender differences were small but consistent, with female respondents expressing greater levels of concern and negative emotions, while male respondents were more optimistic and expressed greater faith in the government. Within this narrow age group, there were small but significant positive correlations showing that concern and negative emotions about climate change were higher among older respondents. There were complex differences among countries; in general, respondents in the Philippines, India, and Nigeria reported a stronger psychological impact of climate change than respondents in the United States and Finland. These results help to describe the extent and patterns of climate anxiety in multiple locations around the world in an age range that is relatively understudied.

Keywords: climate anxiety; emotions; gender; youth; global survey



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1. Introduction

Emotions related to climate change are a fast-growing topic of research. They are important to examine in part because they suggest the level of concern that people are experiencing and how personally important they find the issue of climate change to be; this may predict support for policies designed to mitigate climate change and for behavioral adaptation measures. They may also be associated with mental health. As concern about climate change appears to be growing [1,2], describing demographic patterns in the emotional and attitudinal responses can help to understand the potential for adverse psychological impacts.

Climate anxiety, a constellation of emotions associated with awareness that climate change is occurring, has been observed around the world [3]. Recognizing that anxiety may serve an adaptive function by helping people to orient toward and respond to potential threats, climate anxiety should be considered to exist along a continuum, with only the higher levels of anxiety having the potential to affect mental health [4–6]. Although it is not itself a mental illness, climate anxiety is a stressor that increases the mental health burden and as such may lead to decreased mental health, particularly among those who are vulnerable, who have less intra- or inter-personal resilience or agency, and who are experiencing other stressors. In several studies, a measure of climate anxiety has been

found to be associated with self-assessed mental health threats as well as higher scores on established measures of anxiety and depression [7–10]. For example, initial studies validating the Climate Change Anxiety Scale [8] found that it was associated with an established measure of anxiety and depression; another study [9] found that climate anxiety was negatively associated with mental well-being in 31 out of 32 countries. A systematic review of published research [7] found that eco-anxiety was associated with depression, anxiety, stress, insomnia, PTSD, and lower self-rated mental health. Climate anxiety should be recognized as one of the ways in which climate change is having a detrimental impact on mental well-being.

Gender is associated with vulnerability to the effects of climate change. Women are considered to be at higher risk, due in part to factors related to gender roles and unequal access to power, information, and financial resources [11,12]. At a global and historical level, explicit and implicit bias as well as patriarchal cultural norms have meant that women and girls have often endured social vulnerability, exclusion from participation in the halls of power, and other inequities while being denied their agency and voice. The harmful impacts of climate change on women may be more pronounced in low- and middle-income countries, as poorer countries have fewer resources with which to mitigate the impacts of climate change.

Gender may also be associated with increased vulnerability to climate anxiety. A growing body of research demonstrates gender differences in environmental concern and concern about climate change [7,13–18], although this is not always the case [19]. For example, a systematic review of 12 studies using a variety of measures and covering multiple countries [7] found that women showed higher levels of concern in 11 of them; an analysis of more than 44,000 respondents from the European Social Survey [15] also found that women showed greater concern. Men also score higher on climate denial [20]. In a national survey of Finnish youth, women reported more climate emotions than men, although even young men reported high recognition of ecological sadness [21]. Higher levels of climate anxiety among women than men were found in a large sample of European and African Francophones [22]. The gendered characteristics of climate anxiety may relate to perceived differences in impacts as well as to broader patterns where the prevalence of anxiety and mood disorders is higher in women compared to men [23], a gender gap that is present in childhood and adolescence and present cross-culturally [24].

Age is also relevant to considerations of vulnerability. Factors shaping young people's climate anxiety have received growing research attention [25]. Climate change is a particular concern among young people, whose lives extend further into the future and who thus are likely to experience more of the threats associated with climate change compared with older adults [26]. In previous research, younger adults have been found to be more worried about climate change than older adults [7,8,13,16,19,22]. This was found in a systematic review of research [7] as well as an analysis of the European Social Survey [15]. This may represent a cohort effect as almost 50% of the world's children are predicted to be at 'extremely high risk' of climate impacts [27], coupled with the fact that recent developments mean that young people will have been aware of climate change for a large proportion of (possibly for the entirety) their lives. Young people are facing a high level of vulnerability to the impacts of climate change as well as an onslaught of media coverage describing the threat [28]. Younger generations also have less power to effect change (e.g., through voting, finance, etc.), and, related to this, they may be particularly sensitive to feelings of betrayal by those in power [29,30].

The complex and forceful changes related to climate awareness, and to impacts on children and youth, have been evident in recent years. Climate awareness in children has grown alongside movements such as Fridays4Future, famous young activists such as Greta Thunberg, and media attention. These cultural shifts are necessary, but it is unclear whether such developments may have increased the concern and worry among younger people (aged 16–25) and how it may be affecting their plans for the future. It is often reported, for example, that some young adults are reluctant to have children due to their concerns about

climate change [28]. It is also not clear whether there are differences between the younger and older members of this age bracket [31]; there is some evidence that older adolescents are more worried than younger ones [32]. However, most of the research that has examined age differences has relied on adults [7,13], or has not compared the youngest respondents to those who were slightly older, only reporting overall associations with age [15]. A social-ecological perspective [25] discusses micro-, meso-, exo- and macro-level factors for climate anxiety. Whereas differences among adults are more likely due to different priorities or values, children and young people are affected more by individual differences including the stage of cognitive development, degree of exposure to climate information, the influence of family, peers, and media discussions, the (in)actions of governments, and complex cultural factors. Thus, it is important to further examine climate anxiety and other emotional responses among younger people, as well as how age relates to social interactions and perceptions of government.

Like the impacts of climate change, emotional and attitudinal responses to climate change vary across countries, for reasons partly related to exposure and partly to GDP but also to more abstract variables such as trust in others [13,33]. Risk perceptions may explain why climate change is generally perceived as a bigger threat in the developing world [17]. Risk can be associated with experience of the direct impacts of climate change; previous research has shown that there is a link between personal experience of climate change and risk perception, but that this also depends on socially-driven interpretations of that risk [17]. Several studies have shown that personal experience of climate change is associated with greater climate anxiety [8,22]. However, the relationship is complex. A high degree of inter-country variability was found in climate anxiety and other responses to climate change across 32 countries [9]. Exposure to flooding did not predict anxiety, but exposure to media information about climate anxiety did, as did a perception that other people were worried about climate change.

Risk perception is affected by demographic, cultural, and cognitive factors, but also includes an affective component [17]. While perceptions of risk and concern have been widely studied, emotional responses to climate change have only recently received substantial attention. Many different emotions can be related to risk perceptions and the various ways that people cope with them [5]. These emotions and coping methods are also shaped by social and cultural factors, such as emotional norms. For example, different cultures have different norms about which emotions are deemed suitable for persons in given situations [34]. Other cultural factors and individual differences relevant to eco-anxiety include one's connection with the natural world and 'environmental identity' [8,19]. This could interact with risk perception; for example, the strong cultural connection to the land in indigenous groups may affect the significance of climate-related changes, and such groups may also be living in areas where the risk is greater due to a greater geographic vulnerability [3].

Risk perceptions and the associated anxiety are also affected by perceptions of social interactions. Some young people have reported feeling unsupported when they express concern about climate change; some report frustration or anger about the responses of others, including governments [30,33]. However, to our knowledge, there has been no examination of how these social perceptions and experiences vary by gender or age.

In this paper, we utilize an existing dataset based on a survey of 10,000 young people around the world to investigate demographic differences in responses. An earlier paper reporting on the results of this survey [29] showed that a majority (59%) of young people surveyed were very or extremely worried; that 45% described their worries as affecting their daily functioning; that they were very pessimistic about the future; and that they evaluated governmental response to climate change very negatively. Almost 40% of respondents reported feeling dismissed by others when they tried to talk about climate change. Only 31% said that governments can be trusted to respond effectively to climate change. There were significant country differences in all of these responses, but these were not discussed at length in the earlier paper.

This large, international dataset provides a unique opportunity to explore responses to climate change, and associated gender differences, in a younger sample than most previous research has used. We were guided by three research questions:

RQ1: What are the differences in each variable associated with gender?

Based on previous research, we expected to find that women were more concerned and expressed more negative emotions than men. We did not have specific hypotheses about social perceptions and experiences associated with gender.

RQ2: What are the differences in each variable associated with age?

Previous research has mostly identified emotional responses as being stronger in younger respondents. However, there is little research investigating responses in youth younger than 18, so we did not have a directional hypothesis for the effects of age.

RQ3: What are the differences associated with the respondents' country?

The earlier paper [29] described a number of country differences but did not subject them to statistical analysis. We examine country differences in the experience of specific emotions in more detail.

2. Materials and Methods

We utilized an existing dataset that was collected under the guidance of Hickman and colleagues [29]. Data were collected from 10,000 young people via the participant recruitment platform Kantar between May and June 2021. Participants were eligible if aged 16–25 years and living in one of the ten countries selected (Australia, Brazil, Finland, France, India, Nigeria, Philippines, Portugal, the UK, and the USA; 1000 participants per country). These countries were chosen to reflect populations from the Global North and South, representing a range of cultures, incomes, climates, climate vulnerabilities, and exposure to differing intensities of climate-related events. Although the sample is large and diverse, it is still very small compared to the relevant global population. Participants were recruited from Kantar's LifePoints online research panel to represent the demographic characteristics of each country's population as well as possible, but participation in the research is opt-in and these respondents do not fully constitute a representative sample in each country. Participants were informed of the survey length but not the topic before accessing the survey.

Participants completed an online survey containing the following measures:

1. Climate-related worry (level of worry about climate change) (1–5 scale)
2. Climate-related functional impact (feelings about climate change negatively affecting functioning) (yes or no)
3. Climate-related emotions (presence of 14 positive and negative key emotions about climate change) (yes or no)
4. Climate-related thoughts (presence of seven key negative thoughts about climate change) (yes or no)
5. Experience of being ignored or dismissed when talking about climate change (yes, no, or "I haven't tried to talk to other people about climate change")
6. Beliefs about government response to climate change (presence of nine positive and negative key beliefs, each scored yes or no). Perceptions that government has failed to respond adequately were recorded and summed to create a variable 'Government Failure' (ranging from 9–18) with a higher score indicating more negative and less positive beliefs.
7. Emotional impact of government response to climate change (presence and intensity of feelings related to reassurance and betrayal). Emotional impacts of government response were split into two scales reflecting a positive or a negative emotional response. The Reassurance Scale was constructed from the mean of the four 'positive feelings' items scored on a 1–5 scale ("I am reassured by governments' action on climate change" and each of "When I think about how my government is or how other governments are responding to climate change I feel valued/protected/hopeful"). Cronbach's alpha was 0.82. The Betrayal Scale was constructed from the mean of

the six ‘negative feelings’ items scored on a 1–5 scale (“When I think about how my government is or how other governments are responding to climate change I feel anguished/abandoned/afraid/angry/ashamed/belittled”). Cronbach’s alpha was 0.89.

Further details on methods and the full survey can be found online [29].

Because we were primarily interested in describing group differences, ANOVAs and *t*-tests were utilized as appropriate statistics to evaluate group differences in quantitative variables, and chi-square analyses tested differences in categorical variables. Because of the large sample size and the large number of comparisons, only differences of $p < 0.001$ are reported. All analyses were conducted using SPSS version 28.

3. Results

3.1. Sample Characteristics

Among the respondents, 51.4% were male and 48.6% were female. (Unfortunately, these were the only options for gender identity provided by the survey company.) Age ranged from 16 to 25, with a mean of 20.82 and a standard deviation of 2.54.

3.2. Gender Differences

Women were significantly higher than men in worry about climate change, negative thoughts about the future (women were significantly more likely to report each of the negative thoughts), the perception that governments had failed, and feelings of betrayal by governments. Men were higher in feelings of reassurance by governments. (See Table 1.) There were significant gender differences in all emotions except depression, with women more likely to report that they had felt sad, helpless, anxious, afraid, angry, guilty, ashamed, hurt, despair, grief, and powerless (also depressed, but not significantly), and men more likely to report feeling optimistic or indifferent. (See Figure 1.) Although slightly more male (48.4%) than female (45.4%) respondents reported impacts on functioning, the differences did not reach the predetermined level of significance. There were no gender differences in the experience of being dismissed or ignored by others. (See Table 2.)

Table 1. *t*-tests for gender differences.

Variable (Range)	Men	Women	<i>t</i>	df	Cohen’s <i>d</i>
	Mean (SD)	Mean (SD)			
Worry (1–5)	3.51 1.15	3.81 1.08	13.34	9848	0.27
Negative thoughts (0–7)	4.01 2.09	4.54 2.00	−12.26	8938	0.26
Government failure (9–18)	14.52 2.57	15.44 2.48	−16.68	8287	0.37
Betrayal (1–5)	2.63 0.99	2.77 1.01	−6.92	9084	0.14
Reassurance (1–5)	2.36 0.94	2.06 0.89	16.08	9242	0.34

Note: all differences are significant at $p < 0.001$.

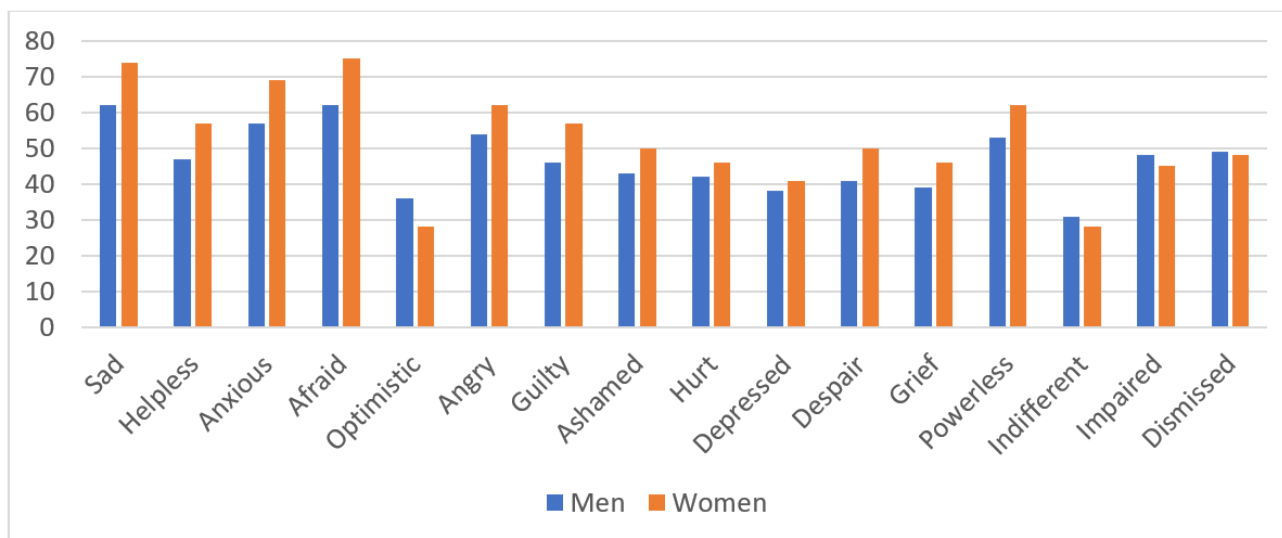


Figure 1. Proportion of men and women endorsing different responses to climate change.

Table 2. Chi-squares for gender differences.

	Proportion of Males Describing	Proportion of Females Describing	X ² (1)	p	Cramer’s V
Sad	62.4	73.7	143.71	<0.001	0.12
Helpless	46.8	57.3	108.11	<0.001	0.10
Anxious	57.2	69.0	147.55	<0.001	0.12
Afraid	62.4	74.7	173.89	<0.001	0.13
Optimistic	35.6	27.5	72.47	<0.001	0.09
Angry	53.8	62.4	74.14	<0.001	0.09
Guilty	45.5	57.1	130.33	<0.001	0.12
Ashamed	43.3	49.8	42.36	<0.001	0.07
Hurt	41.6	46.1	19.72	<0.001	0.04
Depressed	38.1	40.8	7.94	0.005	0.03
Despair	40.8	49.9	81.01	<0.001	0.09
Grief	39.3	45.7	40.11	<0.001	0.06
Powerless	52.6	61.8	83.17	<0.001	0.09
Indifferent	31.4	28.2	11.63	<0.001	0.04
Impaired functioning	48.4	45.4	8.80	0.003	0.03
Dismissed/ignored	49.2	47.5	2.16	0.14	0.02

3.3. Age Differences

Age showed small but significant positive correlations with worry about climate change ($r = 0.053$), negative thoughts about climate change ($r = 0.058$), and perceptions of betrayal ($r = 0.088$): older respondents expressed higher levels of these variables. Age correlations with feelings of reassurance ($r = 0.027$) and government failure ($r = 0.005$) did not reach the target level of significance.

A series of chi-square analyses (looking at each of the ages as a separate category) found significant differences in emotions, such that the older groups were more likely to report being sad, hurt, depressed, grief, and powerless compared with those in the

youngest groups. (See Figure 2.) When the ages were grouped into 16–20 and 21–25, differences remained significant in endorsement of feeling depressed (chi-square = 13.6, $df = 1$, $p < 0.001$), grief (chi-square = 15.25, $df = 1$, $p < 0.001$), and powerless (chi-square = 10.5, $df = 1$, $p = 0.001$). People in the younger groups were less likely to report being ignored or dismissed by others, but more likely to say they did not talk about climate change with others, compared to those 21 and up (chi-square = 48.62, $df = 2$, $p < 0.001$). Age differences in reported functioning did not reach the target level of significance.

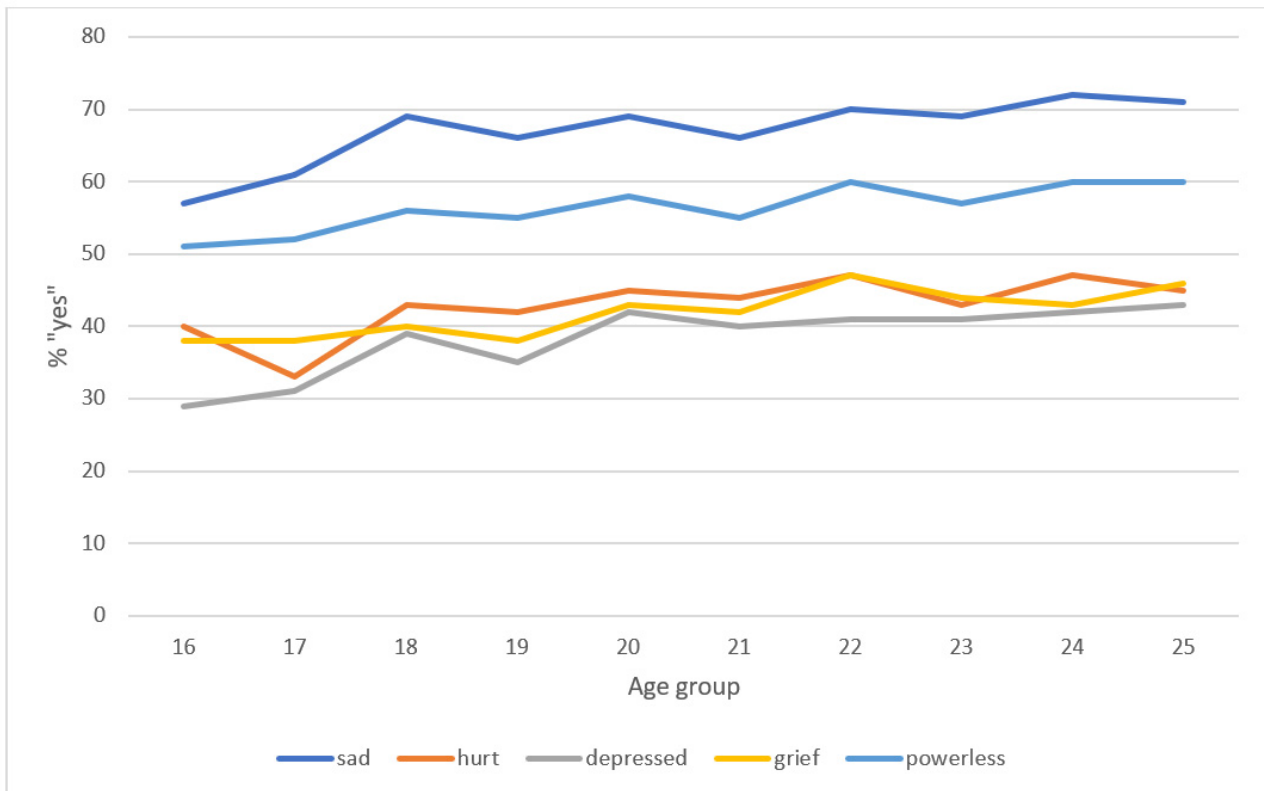


Figure 2. Significant age trends in endorsement of emotions.

3.4. Country Differences

There were significant differences among countries in the extent to which respondents reported that climate change affected functioning (chi-square = 1289.9, $df = 9$, $p < 0.001$), in all emotion reports, and in the experience of being ignored or dismissed (chi-square = 311.8, $df = 9$, $p < 0.001$). In line with previous findings, proximity to climate change impacts was associated with perceived impairment; the countries where more respondents reported impaired functioning were those threatened by some of the strongest climate impacts. In India, the Philippines, and Nigeria, more than two-thirds reported functional impact; by contrast, US, UK, and Finland reported the least functional impact. (See Figure 3.) Emotional responses corresponded to these ratings to some extent but not always consistently. For example, the Philippines had among the largest percentages of respondents reporting sad, helpless, anxious, afraid, angry, guilty, ashamed, hurt, and despair, but also indifferent and optimistic. Nigeria had among the lowest percentages of people reporting angry, guilty, ashamed, despair, and powerless.

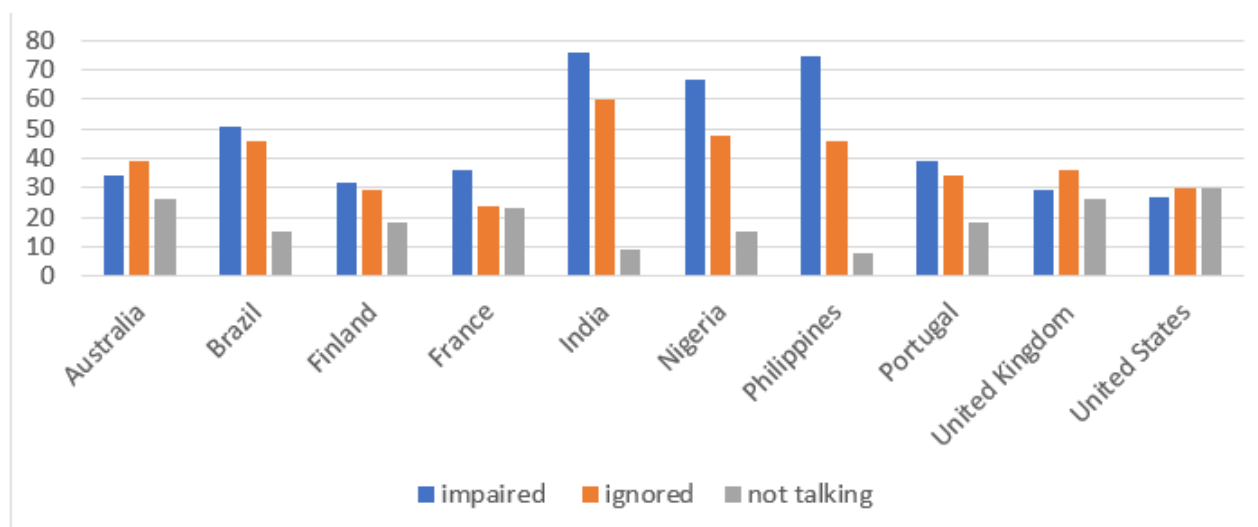


Figure 3. Proportion reporting different responses in each country.

There were also significant differences in the likelihood that people talked to others about climate change (chi-square = 654.4, $df = 18$, $p < 0.001$). People in the US were most likely to report that they did not talk to other people about climate change (30%), while those in the Philippines and India were the least likely to report this (8% and 9%). (See Table 3.)

Table 3. Country descriptions.

Country	% Poor Functioning	% Ignored	% Not Talking	Top Three Emotions
Australia	33.9	39.2	26.2	Anxious, afraid, sad
Brazil	51.2	46.5	15.0	Afraid, sad, angry
Finland	32.2	29.4	18.2	Grief, helpless, afraid/sad (tied)
France	36.4	23.8	22.9	Powerless, afraid, sad
India	75.6	59.7	8.7	Afraid, sad, anxious
Nigeria	67.4	47.6	14.6	Anxious, afraid, sad
Philippines	74.8	46.5	8.0	Sad, afraid, anxious
Portugal	39.2	34.2	18.3	Afraid, sad, anxious
United Kingdom	29.4	35.5	26.2	Sad, afraid, anxious
United States	27.0	30.4	30.3	Anxious, sad, afraid

4. Discussion

This close look at a worldwide sample of young adults found some consistent patterns in the data. Informing our first research question, we found significant differences associated with gender in most of the variables. Many of these results confirm existing research about gender differences in concern and in vulnerability. Women are often found to express greater concern about climate change, and that was reflected here in the higher ratings of negative emotions and of negative thoughts about the future. This is also in line with existing research on gender and psychological distress (particularly anxiety and mood disorders). Given their lower level of concern compared to the female respondents, it is unsurprising that the male respondents expressed greater confidence in the governmental response to climate change. Notably, there were no significant differences in willingness to

discuss climate change or in reported impact on functioning. This suggests that social interactions around the topic of climate change may not be gendered, although the experience of climate change impacts is.

Since women and men may live, on average, very different lives, future research should look in more depth at the specific ways in which people's daily activities are affected by climate changes, and the extent to which this predicts differences linked to age and gender. It should also consider the role of broader psychosocial factors, including cultural, religious, and family beliefs, which often have gendered aspects. In Nigeria, for example, where concern was comparatively high, there was comparatively little hesitation about having children (23% in Nigeria, 42% in Finland, for example). Scholars have linked the high fertility rates in Nigeria to strong patriarchal power structures [35] and a strong cultural stigma toward infertility [36], among other factors. Thus, the example of Nigeria shows how a complex set of factors affects the manifestations/impacts of climate anxiety. Future research might also help clarify whether the gender differences in relation to negative emotions actually reflect differences in experience, or simply differences in self-awareness and emotional recognition.

In response to our second research question, we found associations with age that contrast with those reported by much of the previous research. Within this group of young people aged 16–25, concern about climate change, and endorsement of negative emotions, was lower among the younger respondents. Although the effects were small, the pattern was consistent. The fact that younger respondents were less likely to report talking to other people about climate change supports the conclusion that it may be less salient for them in comparison to other concerns. Younger adolescents may be more focused on social factors such as peer acceptance, so that climate change worries, though still significant, share emotional space with social conflicts [37]. Older adolescents and young adults are beginning to contemplate life decisions, such as whether or not to have children, that may be strongly affected by climate change [28,38]. However, these results should be interpreted with caution given the small size of the effect, the restricted age sample, and the possibility of different access to the internet at different ages. Further research is necessary to confirm this result, and since the social context for climate change is continually changing, the pattern may be different in future studies.

Our third research question regarded country differences. Countries differ in many ways, including the level of economic development, impacts and threatened impact of climate change, political system, and even representativeness of the sample in the present study (samples from countries where a smaller proportion of the population is connected to the internet will have been less representative). There are also more abstract differences in culture such as the degree of individualism or collectivism, trust in others, environmental identity and connectedness to nature, and sociopolitical framings of climate change [39,40]. This makes it difficult to draw clear conclusions about the emotional and cognitive differences discerned in this study; further research is necessary to disentangle the effects of cultural, economic, and geographic differences. Still, it is worth recognizing a broad pattern where respondents from countries that have already experienced significant negative impacts of climate change (floods, fires, or heatwaves) and that have limited economic resources to help them adapt or mitigate the effects (India, the Philippines, and Nigeria) report more negative emotions and attitudes about climate change. By contrast, those from richer countries that are not yet experiencing such devastating and repeated climate-related events (such as Finland, the UK, and the USA) feel less vulnerable. Although unsurprising, this offers important validation that expressed concern about climate change reflects real vulnerabilities and is not simply a problem for the 'worried well'.

Beyond this, country-specific aspects of attitudes toward governments and social attitudes about climate change were likely important. As reported earlier [29], distress about climate change in this sample was associated with a perception that governments were failing to do their job. At the time of the survey, the Finnish government had an ambitious climate plan, in contrast to other countries where attitudes toward the climate

and protection of the natural world were low on the political agenda, which may have affected the responses. Meanwhile, climate change is politically contested in the US, which may explain the proportion who did not talk to others about climate change in that country. A recent analysis of 15 million tweets [20] found that the US contained a higher proportion of climate change deniers among its population of Twitter users than did Europe, India, or Central Africa. Interestingly, participants in the present study were most likely to report being ignored or dismissed in India, Nigeria, Brazil, and the Philippines, countries where people were relatively unlikely to keep quiet about climate change. Although climate change was important to our respondents, other problems related to economics or social justice may have been seen as more important by some citizens in those countries, leading to pushback against people who voice concerns about climate change. This study provides some data about the social climate around climate change in each country, contributing to a more detailed understanding of possible causes of the obtained differences in concern and impacts on functioning.

One reason for investigating the emotional impacts of climate change is to inform strategies for promoting resilience in the face of those impacts. An important finding from this dataset is that many young people—over one-third—feel that others are ignoring their distress. As youth activists have reported [28], validating their emotional experiences rather than ignoring them or attempting to “correct” them can help young people to cope with those responses. Strengthened mental health support is also important [28,41]. At a more practical level, believing that governmental officials are attending to the issue and will implement effective policies is also associated with emotional resilience. Although activism may be empowering for young activists, and even help them to cope with anxiety and distress [42–44], systemic change is necessary to support both individual and collective resilience. We hope that findings such as these that indicate the depth and range of psychological impacts of climate change will lead those in power to be more attentive to this problem and take action to more effectively respond to the looming crisis.

5. Conclusions

This study explored demographic and national differences in emotional responses to climate change. Overall, these results confirm that gender is relevant, with women reporting more worry and negative emotions as well as more negative beliefs about the impacts of climate change. They also show a small effect of age, suggesting that younger adolescents may be less involved in thinking about climate change than those who have reached adulthood, but further research, particularly longitudinal research, should examine this finding further. Finally, these data indicate country-level differences in responses, probably linked to differential vulnerability, but possibly also to the political climate surrounding climate change.

Perhaps the most important, and striking, conclusion of this study is not the differences but the similarities. As described in an earlier paper [29], samples from each country reported high levels of concern, pessimism about the future, and negative emotions. Substantial proportions of respondents reported being affected by their concerns about climate change. Even in countries like Finland that have not yet experienced major physical impacts of climate change, for example, the indirect impacts are so strong that many young people reported some hesitation to have children. Given this evidence of a strong emotional response to climate change, research needs to further examine the impacts on young people and on their plans for the future, and ways to reduce the distress that young people are feeling.

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Informed Consent Statement: Data were collected by Kantar, which allows participants to actively opt in to participate in online surveys and to choose whether or not their data will be included.

Data Availability Statement: Marks, E., Hickman, C., Pihkala, P., 2022. *Dataset for “Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey”*. Bath: University of Bath Research Data Archive. Available from: <https://doi.org/10.15125/BATH-01124> (accessed on 20 December 2022).

Conflicts of Interest: The authors declare no conflict of interest.

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