# Psychological responses, mental health, and sense of agency for the dual challenges of climate change and the COVID-19 pandemic in young people in the UK: an online survey study

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## Summary

**Background** The COVID-19 pandemic and climate change are both significant and pressing global challenges, posing threats to public health and wellbeing. Young people are particularly vulnerable to the distress both crises can cause, but understanding of the varied psychological responses to both issues is poor. We aimed to investigate these responses and their links with mental health conditions and feelings of agency.

**Methods** We conducted an online survey between Aug 5 and Oct 26, 2020, targeting a diverse sample of young people (aged 16–24 years, n=530) in the UK. The survey was distributed using a combination of a survey panel (panel sample) and direct approaches to youth groups and schools who shared the survey with young people in their networks (community sample). We collected data on respondents' psychological responses to both climate change and the COVID-19 pandemic, their sense of agency to respond to each crisis, and the range of impacts on their lives. We also collected demographics data and screened for mental health and wellbeing indicators. We used non-parametric tests for most statistical comparisons. For paired samples, we used Wilcoxon's signed-rank test, and used Mann-Whitney U-tests or Kruskal-Wallis tests for two or more independent samples. Summed scale scores were considered as interval-level data and analysed with Student's *t* tests and ANOVAs. Effect sizes are reported as Cohen's d and partial eta-squared ($\eta^2_p$), respectively.

**Findings** After excluding 18 suspected bots and 94 incomplete responses, 530 responses were retained for analysis. Of the 518 respondents who provided demographic data, 63% were female, 71·4% were White, and the mean family affluence score was 8·22 (SD 2·29). Most participants (n=343; 70%) did not report a history of diagnosis or treatment for a mental health disorder, but mental health scores indicated a common experience of (relatively mild) symptoms of anxiety, depression, and stress. Although UK youth reported more life disruption and concern for their future due to the COVID-19 pandemic, climate change was associated with significantly greater distress overall, particularly for individuals with low levels of generalised anxiety. The COVID-19 pandemic was more associated with feelings of anxiety, isolation, disconnection, and frustration; distress around loss and grief; and effects on quality of life. Climate change was more likely to evoke emotions such as interest and engagement, guilt, shame, anger, and disgust. The greater distress attributed to climate change overall was due, in particular, to higher levels of guilt, sense of personal responsibility, and greater distress triggered by upsetting media coverage. Agency to address climate change was associated with greater climate distress, but pandemic-related distress and agency were unrelated.

**Interpretation** The COVID-19 pandemic and climate change are affecting the wellbeing of UK young people in distinct ways, with implications for health service, policy, and research responses. There is a need for mental health practitioners, policy makers, and other societal actors to account for the complex relationship between climate agency, distress, and mental wellbeing in young people.

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## Introduction

The COVID-19 pandemic constitutes a global crisis that has drastically affected almost every aspect of our societies, necessitating rapid and severe curtailing of previous ways of life, and with far-reaching consequences for health and economies.[1–5] Meanwhile, climate change continued almost unabated,[6] and 2020 saw further global climate-linked catastrophes, including bushfires, floods, and deadly heatwaves.[7] Both crises bring uncertainty, loss, and change, and induce grief, anxiety, and distress.[8] By contrast to the finite pool of worry hypothesis, as public worry about COVID-19 increased and the media paid less attention to climate change, people's concern over the climate did not appear to abate.[9] This situation raises questions regarding the implications of compound stressors on mental health and wellbeing. Psychologists have argued we should draw on how society has responded to the global pandemic to inform our

## Research in context

### Evidence before this study

The COVID-19 pandemic and the climate crisis are the two predominant global challenges of our time. Both crises encompass uncertainty, loss, and current and future threats that can generate distress and affect mental health and wellbeing. Young people appear to be a group experiencing worsened mental health and wellbeing as a result of the COVID-19 pandemic and are thought to also experience feelings of distress resulting from climate crisis awareness (eco-anxiety); however, robust data on the prevalence of climate-related distress is scarce. With rising rates of mental health issues in UK young people and insufficient societal response and available support—branded its own crisis—it is vital we understand the effect of these global challenges on young people, and the role of agency and active engagement in promoting resilience and reducing distress.

No formal literature review was done. Although a complete picture is still emerging, the COVID-19 pandemic has been associated with an increase in distress and mental health issues in people of all ages, but young people have been shown to be more commonly and severely affected. Research to date has not yet explored the relationships between specific pandemic-related distress and emotions, a sense of agency to respond to the pandemic, and general mental health. By contrast, research into climate change has shown its associations with a range of emotional experiences, worries, and distress in adults. The largest study to date in young people suggests that thoughts and feelings about climate change are affecting the daily lives of a substantial proportion of our global youth. The rapidly expanding literature, therefore, indicates that climate anxiety is a common experience, although there are mixed reports on its relationship with agency, psychological adaptation, climate action, interference in daily life, and symptoms of generalised anxiety. There are some suggestions that climate anxiety can be a constructive response to the climate emergency and might not impair general mental health for the majority of the population. However, there is also recent evidence (at time of writing in 2022) that the experience of negative emotions in response to climate change is associated with poorer mental health and insomnia. There have also been suggestions that climate action could reduce climate anxiety. Emerging global research suggests that young people are particularly susceptible to distress associated with both the COVID-19 pandemic and climate change. There have been recent calls to action to examine climate-related distress and anxiety in young people and the impacts on their mental health, with a growing body of research starting to support the initial anecdotal reports. We do not know how similar or different the psychological responses (thoughts and feelings) are across crises and how they contribute to distress. Overall, there is mixed evidence on the relationship between distress associated with these issues and mental health outcomes (eg, generalised anxiety), and less is known about how this distress interacts with the sense of agency young people feel to respond to these global challenges.

### Added value of this study

This study is the first to explore and compare, in young people, the range of psychological responses (thoughts and feelings), including distinct patterns of distress and different emotions, to the COVID-19 pandemic and climate change. This study adds to our collective understanding of the similarities and differences in how these crises are perceived by, and are affecting, young people in the UK. Further, for the first time, we examine the links with both general mental health (previous and current mental illness diagnoses and generalised anxiety) and sense of agency to contribute to change. We report that moderate levels of distress about both crises are widespread, with young people more distressed by the climate crisis than the pandemic, despite the pandemic having a greater impact on their daily life. Both crises are associated with distinct patterns of psychological responses, with different contributing sources of distress and emotions. Climate distress was associated with greater agency to contribute to addressing the crisis, with no such relationship for the COVID-19 pandemic.

### Implications of all the available evidence

Young people in the UK care about and are distressed by climate change even when it is not directly affecting their quality of life. This care for others and wider issues is a source of hope that can be leveraged to drive individual and societal change.
In particular, young people resident in the UK are distressed by the impact of these crises on public health and the environment. Governments are urged to listen to the voices of young people in policy responses to these two global challenges. Consideration should be given to the psychological responses to these crises—distress and strong emotions that can be provoked—in policy narratives and media reporting, and how these interplay with agency. For example, young people feel more guilty about climate change than the COVID-19 pandemic, but also reported significantly lower overall agency to address the climate crisis versus the COVID-19 crisis. Specifically, they feel less capable of taking action and less convinced their actions would be efficacious. Action by decision makers to include the voices of young people in driving change on both crises might increase their sense of control and reduce associated distress.

Some mental health professionals might require training and support to respond to the distress these crises evoke and to prevent pathologising, while distinguishing constructive and unhealthy levels of distress. Priority should be given to identifying and scaling up appropriate community support for healthy psychological processing of the distress and strong emotions associated with the crises in young people, to reduce the risk of increasing the mental health burden. More research is required to further untangle the interplay between psychological responses, psychological adaptation, agency, behavioural responses, and the impact on daily life and mental health and wellbeing in different subgroups.

understanding of individual and collective responses to the contemporaneous challenge of climate change.[10]

Despite the clear parallels between the two crises, there are also some important distinctions. Our work is focused on the UK, where the COVID-19 pandemic has been an acute threat directly impacting the lives and lifestyles of every resident. Conversely, for most UK residents, climate change represents a persistent but relatively slow-moving development, the effects of which have not yet been felt directly or can still be hard to distinguish from climate variability. Socially, spatially, or temporally removed events tend to be construed as more abstract,[11] which creates a perceived psychological distance that influences attitudes and behaviours in response to the object or event, including climate change. The COVID-19 and climate crises also differ notably in the scale, speed, and visibility of leaders' responses. Although society was dramatically reshaped in response to the COVID-19 pandemic, such transformational action has been slow for climate change. There is also less information available to guide individual action on climate change compared with the pandemic, raising questions about the relative agency and self-efficacy individuals might feel towards taking action on climate change. Understanding the similarities and differences in the psychological responses to an immediate crisis such as the COVID-19 pandemic, and the more distant effects of climate change, is crucial for guiding individual and community-based interventions to cope with, and act on, crisis situations.

Although the UK is not one of the countries most exposed to recent extreme weather events associated with climate change,[12] 81% of UK respondents to an international public opinion poll conducted in late 2020 believed in the existence of a climate emergency, the highest of any of the 50 countries included in the survey.[13] Anecdotal evidence that this knowledge might be generating significant distress for many can be found in terms such as eco-anxiety entering the popular lexicon.[14,15] The consensus among mental health professionals is that most of these feelings and experiences represent adaptive responses and do not constitute a mental illness in themselves, although they might constitute a stressor that worsens mental health, and evidence published in 2021 links negative climate emotions to worsened mental health.[16] Nevertheless, some anecdotal reports of maladaptive or severe reactions exist.[17,18]

Parents, teachers, mental health professionals, and charities have expressed growing concerns over some young people's mental wellbeing, even partly attributing self-harm to climate and pandemic distress.[19–22] A 2021 large global survey revealed widespread anxiety and dissatisfaction with government responses to climate change and highlighted that these feelings were impacting young people's daily functioning.[23] At the same time, evidence is mounting of potentially long-lasting consequences of the pandemic on mental health, with young people identified as particularly vulnerable—although the evidence is still not definitive.[2,21,24–27] A 2022 meta-analysis[28] showed that the proportion of individuals with onset of any mental disorders before the age of 25 was 62·5%, supporting the idea that adolescence and young adulthood might be a key period of vulnerability to psychological impacts. It also highlights an increased need to prevent mental ill-health in young people.[29] Characterising the specific challenges faced by young people could guide intervention design, policy change, and opportunities for collective action.

As it became apparent that the COVID-19 pandemic and climate change are contributing to the global mental health burden, research in this area has rapidly evolved through the development and validation of psychometric instruments to measure climate anxiety,[30–32] and some large-scale surveys.[23] Despite this progress, there is a need for more robust data on the range of psychological responses in young people, how these responses are linked to perceived agency to engage in mitigation and adaptation behaviours, and how these factors intersect with related mental health outcomes, such as symptoms of generalised anxiety and stress. Emerging evidence that participation in collective action can improve wellbeing suggests that encouraging action-taking and building a sense of agency amid a crisis can be protective and potentially improve resilience. To our knowledge, the link between agency and distress in the context of the pandemic and climate change remains unexplored.

Here, we aimed to examine and compare the positive and negative impacts of the climate and COVID-19 crises experienced by young people (aged 16–24 years) in the UK. We explored their psychological responses in association with self-reported mental health (particularly anxiety symptoms) and their sense of agency to effect change. Understanding how and why young people have responded to the concurrent public health and environmental threats will be a crucial step to designing appropriate interventions and policies that effectively account for the experiences of young people.

## Methods

### Survey sample and procedure

The survey—entitled Changing Worlds—was drafted in May–June, 2020 by the authors (covering expertise in environmental psychology, public health, mental health, neuroscience, climate and environmental science, and science communication), with additional input from mental health practitioners and clinicians. The survey was adapted based on a consultation process with the study's Young Persons' Advisory Group (YPAG) in June–July, 2020. The survey was distributed using Qualtrics between Aug 5 and Oct 26, 2020, using a combination of a survey panel (panel sample) accessed through Prolific and direct approaches to youth groups and schools who shared the survey with young people in their networks (community sample). Respondents in the panel sample received £4 in

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line with Prolific remuneration policies; respondents in the community sample entered a draw to win £100 of shopping vouchers.

All respondents were provided with a participant information sheet (as the first page of the online survey). Participants could exit the survey and skip questions throughout. Written informed consent was obtained from all respondents.

## Questions and scales

For the **Changing Worlds survey** see https://osf.io/9ewtn/

The full Changing Worlds survey is available online. We collected data on respondents' gender, age, ethnicity, sexual orientation, and individual experiences of the COVID-19 pandemic (eg, becoming ill or a loved one being affected). We used the six-item Family Affluence Scale-III,[33] which assesses common material assets or activities, to estimate the relative socioeconomic position of respondents in society (appendix p 5).

See **Online** for appendix

### *Mental health and wellbeing*

To screen for mental health and wellbeing indicators, we asked respondents to complete the Generalised Anxiety Disorder Assessment-7 (anxiety measure),[34] the Patient Health Questionnaire-9 (depression measure),[35] the four-item version of the Perceived Stress Scale (stress level measure),[36] and to rate their level of life satisfaction on a scale of 0–10 (0 being not at all satisfied and 10 being completely satisfied). We also asked respondents whether they had a current or historical diagnosis or were accessing treatment for a mental health condition (appendix p 2).

### *Positive and negative impacts*

We adapted the COVID-19 Adolescent Symptom & Psychological Experience Questionnaire,[37] based on YPAG feedback, to assess the nature and severity of various negative impacts (eg, feeling stressed about how many people are dying from COVID-19) and positive impacts (eg, spending more time at home to relax). Working with the YPAG, we created an equivalent questionnaire to reflect the personal impacts of climate change (eg, positive: feeling inspired by others; negative: reading worrying news coverage). Further details are given in the appendix (pp 2–3).

### *Psychological distress and daily life impacts*

We used the climate change distress scale, which was developed and validated by Reser and colleagues,[31] and adapted this scale to create an equivalent measure of pandemic distress. The final scales each had eight items for measuring climate or pandemic distress levels. We also asked the extent to which respondents' thoughts and feelings about the two crises were disruptive or interfered with daily life and wellbeing, ranging from 0 (not at all) to 4 (extremely). A single question was asked for each crisis, created by authors and the YPAG. Further details and internal consistency measures are given in the appendix (p 4).

### *Emotional responses*

Based on Climate Change in the American Mind,[38,39] a study by the Yale Program on Climate Change Communication, we asked respondents how strongly they felt a range of emotions when thinking about climate change and the COVID-19 pandemic; this included the original ten emotion items and eight items developed with the YPAG. Further details and internal consistency measures are given in the appendix (pp 3–4).

### *Sense of agency and engagement in activism*

We combined Reser and colleagues' self-efficacy and personal responsibility composite scales[31] to measure self-reported agency to respond to climate change, and we adapted this scale to measure self-reported agency regarding the COVID-19 pandemic. The dimensions of agency included respondents: being aware of actions they could take as an individual to combat the crisis (awareness); feeling capable of making behavioural changes (capability); believing their actions will make a difference (self-efficacy), positively affect their perspective on the crisis (change perspective), and encourage others to act (influence on others); feeling that people in general have control over the crisis (control); believing that the crisis is avoidable (avoidability); experiencing a sense of urgency to act (urgency); and feeling a sense of responsibility to act (responsibility). We also asked whether respondents were involved in activism or pro-environmental behaviour and whether this involvement had changed since the onset of the COVID-19 pandemic (single item measures, created by authors and the YPAG). To compute the total agency score, item ratings (range –2 to 2) were summed and the items "People have little control over forces of nature such as [COVID-19 or climate change]" and "I believe that [the spread of COVID-19 or climate change] is inevitable, no matter what we try and do to stop it" were reverse-coded. Further details are given in the appendix (pp 4–5).

## Statistical analysis

The analyses were guided by the a priori established research objectives, but the hypotheses and analyses were not formally preregistered. We examined the descriptive statistics for the measures representing respondents' psychological responses to the pandemic and climate change, and then statistically compared the scores of equivalent scales for the pandemic and climate change. We conducted further exploratory analyses examining associations between the psychological response measures to the pandemic and climate change on the one hand, and general mental health outcomes on the other. We used non-parametric tests for most statistical comparisons, given that the data were ordinal (ie, where analyses concerned Likert-scale items). We used Wilcoxon's signed-rank test for paired samples and Mann-Whitney U-tests or Kruskal-Wallis tests for two or more independent samples. We report *r* as the relevant effect size for Wilcoxon's signed-rank tests and

Mann-Whitney U-tests, calculated as $Z/\sqrt{N}$, and $\varepsilon^2$ for Kruskal-Wallis tests, which has a similar interpretation to eta-squared $\eta^2$. Summed scale scores (eg, total scores for climate distress) were considered as interval-level data and analysed using Student's *t* tests and ANOVAs; effect sizes are reported as Cohen's d and partial eta-squared ($\eta^2_p$), respectively. Bonferroni corrections for multiple comparisons were used when required. We excluded respondents with large amounts of missing data (>50%) from the dataset but retained those with missing data on a pairwise basis. If not evident from the test degrees of freedom, we explicitly report the sample size (n) for individual analyses.

The study protocol was reviewed and received approval from Imperial College London's science, engineering, and technology research ethics committee.


### Role of the funding source

This study was funded by an internal award from the Institute for Global Health Innovation, Imperial College London, to the first author. Funding was only used to cover the direct costs of participant incentives. The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.


## Results

After excluding 18 suspected bots and 94 incomplete responses, 530 responses were retained for analysis. The median time to complete the survey was 21 min (IQR 16–28). Respondents comprised a diverse sample of UK residents aged 16–24 years (mean 21·0, SD 2·53). Of those who responded to demographic questions (n=518), 63% identified as female, 34% as male, 2% as non-binary, <1% preferred to self-define, and <1% chose not to disclose. 16% of the sample identified as LGBTQ+. The sample was more ethnically diverse than the UK average, with 71·4% White, 5·6% mixed race, 16·6% Asian, 5·4% Black, and 1% Arab or any other ethnic group. The mean Family Affluence Score was 8·22 (SD 2·29, maximum scale score 13); 64% of participants lived with family, 11% with a partner, 17% with peers (eg, housemates), 6% alone, 1% other, and 2% did not want to disclose. The appendix contains full details on the exclusion criteria (p 6), consideration of missing values (p 7), and sample description (pp 7–8).

Mental health scores across the sample indicated a common experience of (relatively mild) symptoms of anxiety, depression, and stress—with high correlation between these symptoms and no gender-related differences (appendix pp 9–10). Of the 493 respondents who answered this question, most participants (n=343; 70%) did not report a history of diagnosis or treatment for a mental health disorder. Previous experience of a mental health disorder was reported by 57 (12%), whereas 80 (16%) were managing an ongoing mental health issue and 13 (3%) had recently been diagnosed or were receiving treatment for the first time.

Respondents reported various disruptions to their lives because of the COVID-19 pandemic, most commonly affecting their social lives, study, leisure activities, and holiday plans. Few respondents had been affected by job loss or had been furloughed, and financial problems were also relatively rare. A minority (19%) of respondents had direct exposure to COVID-19-related illness (appendix p 11).

Perhaps unsurprisingly, given the timing of the survey, the direct negative impact of the COVID-19 pandemic on respondents' lives was perceived to be greater than the impact of climate change. When asked to consider the overall negative impacts of the COVID-19 pandemic, 77% (n=404) of respondents indicated at least moderate severity, with a notable 49 (9%) experiencing it as extreme. For climate change, the negative effects on their personal lives were rated as less severe, with 64% (n=337) indicating "no" or "a little" negative impact, and

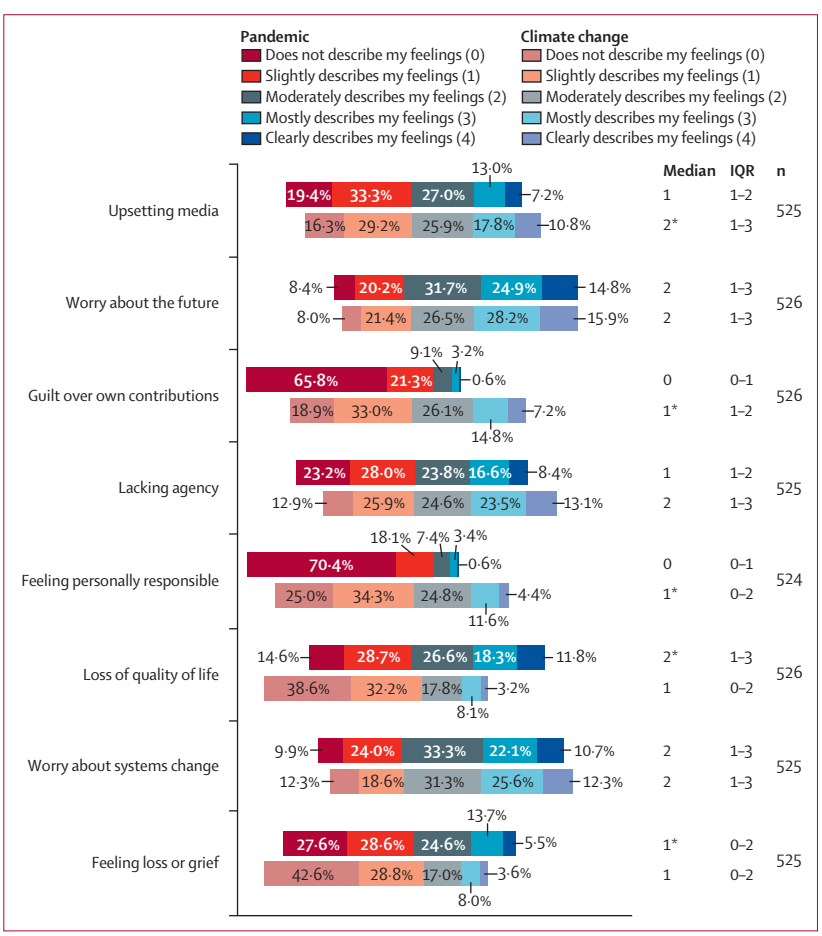



***Figure 1:*** **Self-rated extent of distress in response to the COVID-19 pandemic and climate change across different contributing sources**

Responses were measured on a Likert scale of 0 (does not describe my feelings) to 4 (clearly describes my feelings). The coloured bars represent the percentage of respondents who selected a particular response and are centred around the middle point of the Likert scale. Wilcoxon's signed-rank test was used to compare item ratings for the COVID-19 pandemic and climate change as a source of distress. *A statistically significant difference on that distress dimension, after Bonferroni correction for multiple comparisons, with the asterisk position indicating the crisis associated with greater distress.

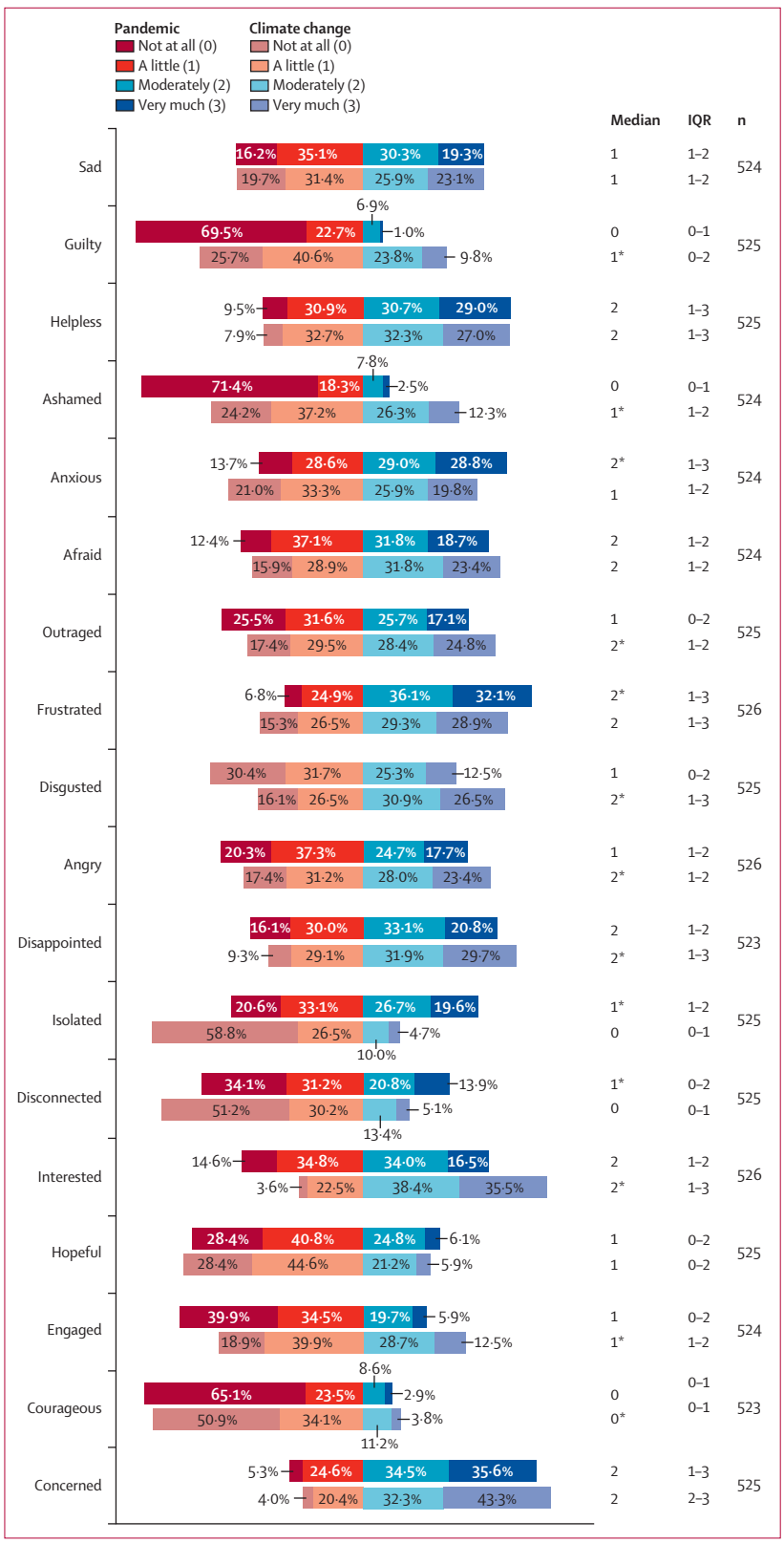



***Figure 2:*** **Self-rated strength of emotions felt in response to thinking about the COVID-19 pandemic and climate change**

Responses were measured on a Likert scale of 0 (not at all) to 3 (very much). The coloured bars represent the percentage of respondents who selected a particular response and are centred around the middle point of the Likert scale. Wilcoxon's signed-rank test was used to compare emotion ratings for the COVID-19 pandemic and climate change. Additional descriptive statistics are provided in the appendix (p 17). *A statistically significant difference on self-rated strength of emotion, after Bonferroni correction for multiple comparisons, with the asterisk position indicating the crisis engendering the stronger emotional response.

experiences of extreme negative impacts were reported by nine respondents (2%). The overall extent of perceived negative impact was greater for the COVID-19 pandemic than for climate change (Z –13·821, p<0·0001, *r*=0·60, n=526, Wilcoxon's signed-rank test). To avoid biasing respondents towards negative impacts, we also asked them to consider various potentially positive changes. 33% (n=171) of respondents reported at least a moderate positive effect associated with the COVID-19 pandemic, whereas only 107 (20%) of respondents felt this way about climate change. The overall extent of perceived positive impact was greater for the COVID-19 pandemic than for climate change (Z –8·350, p<0·0001, r=0·36, n=526, Wilcoxon's signed-rank test). Greater negative pandemic-related impacts were associated with a reduced experience of positive impacts (*r*=–0·287, p<0·0001, n=526). By contrast, the experience of positive and negative impacts of climate change was weakly but positively correlated (*r*=0·160, p<0·0001, n=529).

We asked respondents to select up to three of each positive and negative impacts that affected them the most. The most commonly cited positive impact of the pandemic was being able to spend more time with family (37%). For climate change, 54% of respondents experienced improved wellbeing through eco-friendly practices. Worry about the future in general was a commonly cited negative impact of the pandemic (37%), whereas 52% noted worry about the lack of action on climate change. Full results are provided in the appendix (pp 14–15).

Although respondents perceived the direct impact of climate change on their personal lives as less severe, their overall distress (based on the total score for the distress scales; ranging 0–32) was slightly, but significantly, more pronounced for climate change (mean score 13·08, SD 6·60) than for the COVID-19 pandemic (mean score 11·55, SD 5·85; t(523)=–6·27, p<0·0001, d=0·27). Women reported greater distress than men (mean score: women 12·44 [SD 5·72] *vs* men 9·63 [5·60]; appendix p 17). Comparing the different contributions to distress assessed by the scale (figure 1) shows that loss or grief and concern over effects on quality of life were greater for the COVID-19 pandemic than for climate change; whereas guilt, a sense of responsibility, and low agency were greater for climate change than for the COVID-19 pandemic. Even amid the pandemic, respondents reported

slightly more distress from exposure to media reports about the effects of climate change. Respondents equally reported distress arising from worries about the future and concern about wider impacts of the crises on public health (ie, COVID-19) or the environment (ie, climate change). Notably, even the most widely shared concerns among respondents were experienced as moderately distressing (on average).

Moreover, we asked respondents to indicate on a 5-point scale the extent to which their thoughts or feelings ever interfered with their wellbeing or cause problems for them in any way (eg, trouble falling asleep or feeling distracted by the crisis in daily life). The median scores indicated that interference was typically perceived as moderate for the pandemic, and mild for climate change. There was a statistically significant difference between perceived interference due to the pandemic (median 2, IQR 1–3) and due to climate change (median 1, IQR 1–2), with interference due to the pandemic being reported as interfering more with day-to-day wellbeing than climate change (Z –10·95, p<0·0001, n=448, r=0·52, Wilcoxon's signed-rank test).

When respondents were asked to identify the degree to which they experienced a wide range of emotions when they thought about the COVID-19 pandemic and climate change, feelings of anger, outrage, concern, disgust, shame, guilt, and disappointment were all significantly more prominent in response to climate change than to the pandemic (figure 2). Interest in, and engagement with, climate change was also higher than for COVID-19. The COVID-19 pandemic predictably evoked significantly stronger feelings of isolation, anxiety, disconnection, and frustration. Overall, the breadth of emotions that respondents reported, although at a moderate level, suggest interest and emotional engagement with both crises is relatively strong. Frustration, helplessness, disappointment, concern, and anxiety were among the most strongly experienced emotions across crises. Full statistical comparisons are given in the appendix (p 17).

Next, we wanted to understand whether the experiences of distress about the COVID-19 pandemic and climate change were linked to more general indicators of mental health and wellbeing. We focused on anxiety symptoms because of the stronger conceptual link between (and current evidence for) climate and pandemic-related concerns and anxiety,[19,40–42] and to eliminate redundancy because of the very high correlations among anxiety, depression, and stress symptom scores (appendix p 9). We conducted analyses on two outcome variables: (1) the level of distress experienced and (2) the extent to which thoughts and feelings about the crises interfered with their daily life and functioning. As distress scale scores could be treated as interval-level data, we used a two-factor mixed model (factor 1: source or topic of distress, with the COVID-19 pandemic and climate change as categories; factor 2: level of anxiety, with four categories ranging from no symptoms to severe symptoms) to test

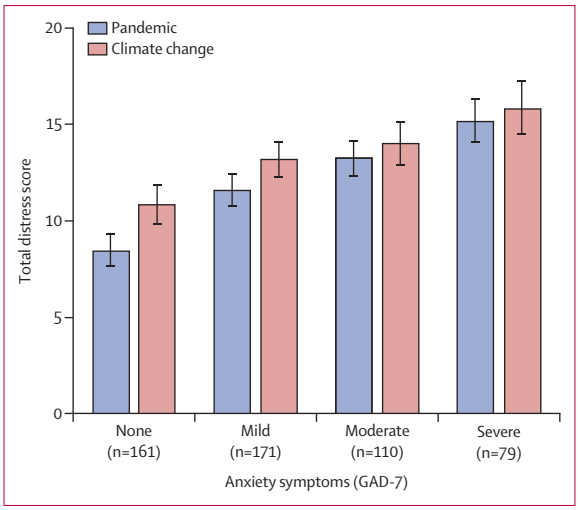



***Figure 3:*** **Degree of distress associated with thoughts about climate change and the COVID-19 pandemic, by generalised anxiety symptoms**
Total distress scores ranged between 0 and 32. Error bars indicate 95% CIs. Anxiety symptoms were determined by total GAD-7 scores. GAD-7=Generalised Anxiety Disorder Assessment-7.

for main effects and interactions. The ANOVA was assumed to be robust against violations of normality and uneven sample sizes (which were n=161, n=171, n=110, n=79, for no, low, moderate, and severe anxiety symptoms, respectively). As already noted, climate change was perceived to be slightly, but significantly, more distressing than the COVID-19 pandemic (main effect of "source", F[1,520]=28·28, p<0·0001, $\eta^2_p$=0·052), but distress also varied depending on an individual's anxiety level (F[3,520]=26·29, p<0·0001, $\eta^2_p$=0·132). Notably, a trend-level interaction effect was observed (F[3,520]=2·61, p=0·051, $\eta^2_p$=0·015). Respondents with no or low general anxiety were more distressed by climate change than by the COVID-19 pandemic, whereas respondents with moderate or severe anxiety tended to be equally (and more strongly) concerned with both (figure 3; pairwise). Full results are given in the appendix (p 19). To examine the effect of anxiety on the degree of interference in daily life and wellbeing, we conducted separate Kruskal-Wallis tests on pandemic-related interference and climate change-related interference scores. The outcome variable was a single item with a restricted range and these ordinal-level data were not suitable for a mixed model. A significant effect was seen between anxiety level and interference experienced due to the COVID-19 pandemic (H[3]=88·41, p<0·0001, n=501, $\varepsilon^2$=0·17). Although the effect size was smaller, anxiety level also had a significant effect on climate-related interference in daily life (H[3]=22·51, p<0·0001, n=470, $\varepsilon^2$=0·05). The appendix (p 20) lists pairwise comparisons between anxiety levels. Due to missing values (appendix p 7), and the restricted observed range of the interference scores, results from this analysis should be interpreted with caution.

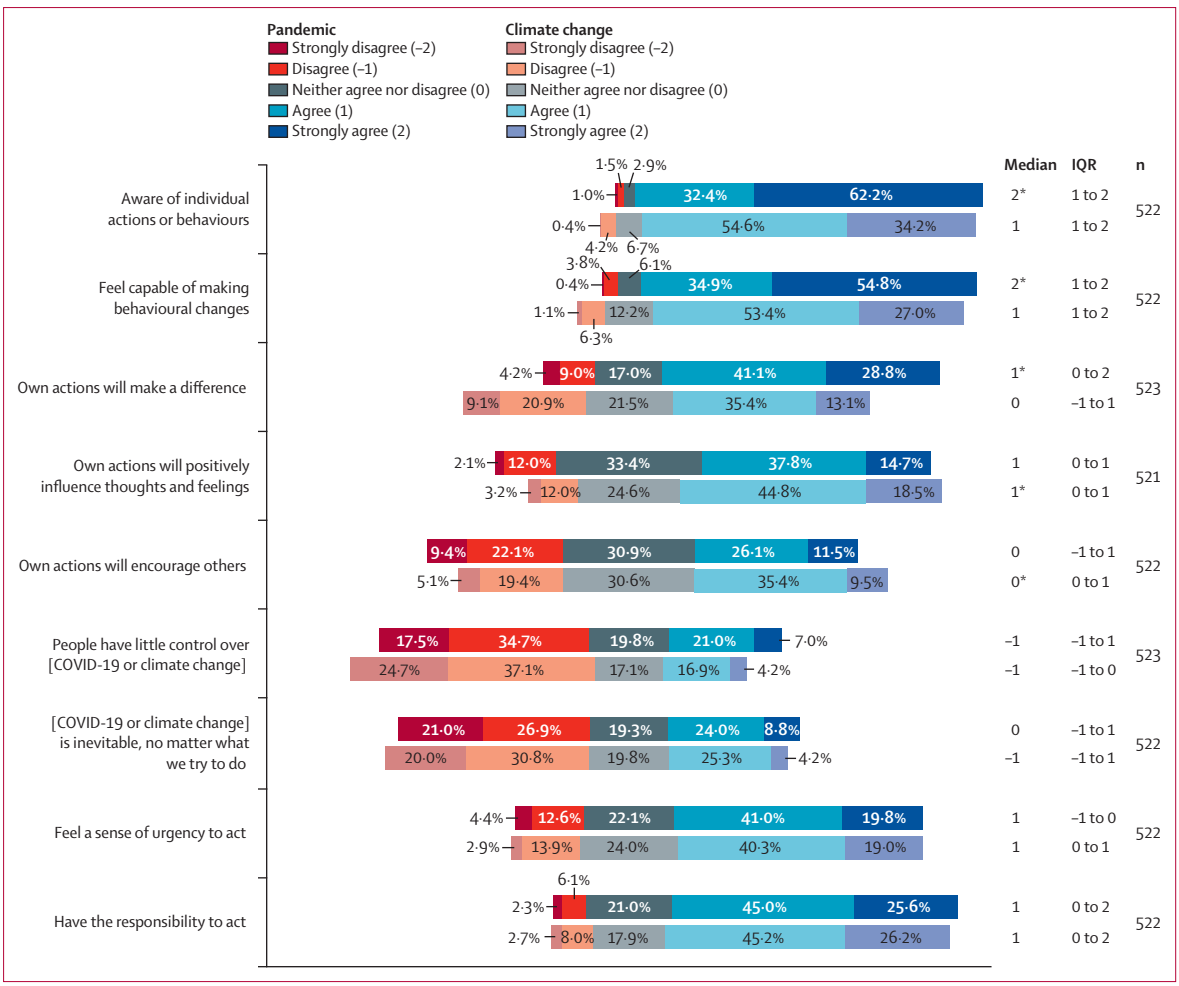



***Figure 4:*** **Self-reported agency to act against the COVID-19 pandemic and climate change**
Responses were measured on a Likert scale of –2 (strongly disagree) to 2 (strongly agree). The coloured bars represent the percentage of respondents who selected a particular response and are centred around the middle point of the Likert scale. Wilcoxon's signed-rank test was used to compare item ratings for the COVID-19 pandemic and climate change as a source of distress. Additional descriptive statistics are provided in the appendix (p 21). *A statistically significant difference on that agency dimension, after Bonferroni correction for multiple comparisons, with the asterisk position indicating the crisis associated with greater agency.

Although respondents' reported sense of agency was significantly lower for climate change (mean 5·75, SD 5·37) than for the COVID-19 pandemic (mean 6·39, SD 5·38; t[520]=2·682, p=0·008, d=0·12), the small difference in total agency score masks more interesting patterns that are revealed by examining the subscales. Respondents most strongly reported that they had awareness of and capability to respond to both crises, although at significantly higher levels for the COVID-19 pandemic than for climate change (figure 4). Full statistical comparisons are given in the appendix (p 22). The reported sense of avoidability of the crisis, control over forces of nature, and influence over others' behaviour were all low for both crises, although lack of control was less pronounced for the COVID-19 pandemic than for climate change. The sense of urgency and responsibility to do something was similar and moderately strong for both crises.

When we compared individuals with high climate agency (n=436; a positive total agency score) with those with low climate agency (n=89; neutral or negative total agency score), we found that those reporting high climate agency had higher levels of climate distress (mean score 13·79, SD 6·29) than those with low agency (mean score 9·43, SD 6·97), a medium-sized mean difference (t[523]=–5·854, p<0·0001, d=0·68). Pandemic-related distress did not differ between the 458 respondents reporting high agency in matters relating to the pandemic (mean score 11·59, SD 5·70) and the 65 respondents with low pandemic-related agency (mean score 11·11, SD 6·72; t[77·64]=–0·551, p=0·534, d=0·08; figure 5). Generalised anxiety levels did not differ between respondents with low (mean score 8·65, SD 6·31) versus high (mean score 7·93, SD 5·36) pandemic-related agency (t[77·61]=0·871, p=0·387, d=0·13) or between those with low (mean score 9·01, SD 5·75) versus high (mean

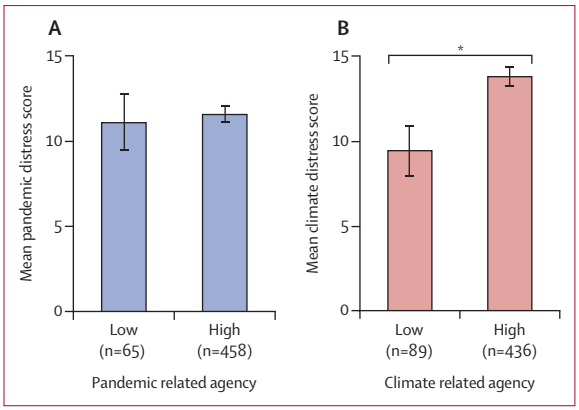



***Figure 5:*** **Difference in mean distress scores for participants with low or high agency related to the COVID-19 pandemic (A) or climate change (B)**
The total distress score ranged between 0 and 32. Error bars indicate 95% CIs. *A statistically significant difference (p<0·05) in distress scores for participants with low versus high agency.

score 7·90, SD 5·43) climate change-related agency (t[523]=1·735, p=0·083, d=0·20), although the latter showed a marginal trend towards higher anxiety levels being associated with low agency. The appendix (p 22) contains a graphical representation of these findings, as well as a comparison between agency groups on respective scores for the Patient Health Questionnaire-9 and Perceived Stress Scale.

The propensity towards pro-environmental behaviour—ie, doing things a certain way for environmental reasons—particularly to mitigate climate change, was unaffected by the pandemic for most respondents (n=326; 62%). Although 260 respondents (36%) felt less concerned by climate change since the pandemic began and 123 (23%) felt more concerned (n=217 [41%] were unchanged), only 52 respondents (10%) reportedly reduced their pro-environmental behaviour, and 123 (23%) reported an increase in their personal engagement in pro-environmental behaviour. Full results are given in the appendix (p 23).

## Discussion

In this survey study, we investigated the psychological responses to the COVID-19 pandemic and climate change in young people aged 16–24 years in the UK. In particular, we explored and compared positive and negative impacts of both global challenges, experiences of distress and different emotions in response, and interactions with both their mental health and wellbeing and their sense of agency to address each crisis. Young people expressed moderate feelings of distress about both crises, particularly with respect to the (collective) future and the impacts on public health and the environment. Yet, even during the COVID-19 pandemic, climate change was a source of significantly greater distress, whereas the pandemic had a larger impact on daily life.

Each crisis elicited distinct patterns of sources of distress and emotional responses, with the COVID-19 pandemic giving rise to feelings of anxiety, isolation, disconnection, and frustration. Pandemic-related distress was linked to loss and grief, and diminished quality of life. Climate change was more likely to evoke interest and engagement, but also difficult emotions such as guilt, shame, anger, and disgust. Climate change was perceived as more distressing than the COVID-19 pandemic, and this distress was particularly linked to feeling guilty, responsible, and upset by media coverage. Feelings of helplessness, sadness, and fear were notable and similar for both crises. Relatively low levels of hope and courage were reported for both crises, although courage was slightly higher for climate change than for the pandemic. Overall, respondents felt less agency to address the crisis of climate change than the pandemic, although the following agency sub-dimensions were higher for climate change: (1) the ability of humanity to control the crisis, and the perceived ability of one's behaviour to (2) change one's perspective and (3) influence others' behaviour. Young people see potential for change but are perhaps lacking the tools to effect it. By comparison, the respondents felt more aware, more capable, and more effective in their actions against the spread of COVID-19.

The finding of higher levels of distress for climate change aligns with previous observations that, contrary to the finite pool of worry hypothesis, concern about the pandemic does not necessarily diminish climate concern.[9] It also highlights the degree to which awareness of the climate crisis and its wider impacts, as opposed to direct experience, can elicit emotional and mental distress. One interpretation is that climate change represents a more enduring existential threat. For those stepping into adulthood, the weight of that realisation can be substantial, even as they face other challenges in their daily lives. The distress reported for the climate crisis, which is not currently and directly affecting the respondents' lives, highlights a care for the environment and those beyond themselves, which is a source of hope that can be leveraged to foster stronger bonds with nature and others—which is conducive to mental wellbeing. Such worries, if appropriately managed, could drive engagement with political and collective action to protect the environment.[39,43]

Distress about the COVID-19 pandemic and climate change was higher for individuals experiencing generalised anxiety, but even those with low generalised anxiety expressed some feelings of distress about climate change. Although there is conflicting evidence on the association between depression, anxiety, and climate-related anxiety and functional impairment,[30,44–46] distress triggered by big individual or collective threats, losses, and traumas should not be pathologised.[47] Strong emotional and psychological responses to climate change or the pandemic can be a rational response to the threats posed. Overall, in this sample of young people in the UK, we found no compelling evidence that climate distress

has the characteristics of a clinical mental health issue, as interference on daily activities was minimal. We do note that a single question was used to probe the extent to which climate or pandemic-related distress interfered with daily life. Future research should include multidimensional assessments (eg, social functioning, family relationships, sleep, and overall health). Individuals with high levels of generalised anxiety reported higher levels of distress for both crises than respondents with no (or low levels of) anxiety. Compound sources of stress could potentially exacerbate symptoms of poor mental health and wellbeing. There must be adequate provision of support that allows processing of psychological responses to both crises, takes the concerns of young people seriously, and helps to minimise the risk of mental health impacts.

Interestingly, young people who were more distressed about climate change were also more likely to report a sense of agency, whereas pandemic-related distress showed no associations with self-reported agency. This finding suggests that distress responses do not necessarily signal defeat, and some level of worry might facilitate engagement[39] and be salutary rather than debilitating.[31] Climate distress was previously found to be strongly and positively correlated with self-efficacy and responsibility—the two metrics we compiled to form our agency scale[31]—and observations available in Feb, 2022 (preprint) from young people in 28 countries suggest that engagement with climate issues and negative beliefs about the global future might be related to both climate distress and higher self-efficacy.[48] On the other hand, a 2020 study in US adults found that climate anxiety was not correlated with behavioural engagement.[30] Further research is needed to explore the potentially non-linear relationship between emotional and behavioural engagement with climate change.

The pathways, directions of influence, and mediating factors between patterns of psychological responses, agency, and mental health outcomes remain largely unexplored. More work is needed to examine the possible spectrum of strategies for adaptation and constructive coping, especially in those at increased risk. For example, it is important to examine the multifaceted construct of agency and not only examine actions; many young people appear to feel responsibility to act on climate change, but are less likely to believe in the value of their actions than for the pandemic. Their motivation might be better translated into action with appropriate opportunities, and their mental health could be protected by particular coping strategies that relate to particular emotional signatures (eg, hopefulness). Previous work has identified meaning-focused coping—relating to trust in societal actors, acting in line with values, and focusing on hopeful framings—as a strategy that protects mental health and wellbeing in children and young people, while encouraging pro-environmental behaviour.[49] This strategy highlights the importance of perceived controllability of a crisis, opportunities to act, and the power of hope in facilitating constructive behaviour and adaptive coping. In this light, the low levels of hope and perceived avoidability in relation to both crises we observed is particularly concerning, and should encourage urgent translational research and intervention in this area.

A 2020 systematic review has identified an urgent need for approaches that are more participatory, interdisciplinary, creative, and affect-driven, to involve young people actively in climate solutions.[50] Young people in our study reported positive impacts of climate change that centred around personal growth (eg, finding inspiration and seeking wellbeing through eco-friendly practices), which might suggest that the period of identity formation in early adulthood provides an opportunity for positive psychological adaptation, but more work is needed to explore the role of both developmental trajectories and psychological adaptation in climate (or pandemic) distress responses. This research could also help to reveal where the tipping points might lie that could lead to overwhelm or helplessness that can worsen mental wellbeing. Future research should also explore how individual experiences of climate change and climate action depend on what communities the young person is a part of and examine the hypothesis that social connection and collective action can be protective. Furthermore, our study focused on young people in the UK, and research indicates that climate-related distress is very much a global issue.[23] It will, therefore, be important to understand how geographical and sociocultural factors affect the collective and individual experiences and psychological responses. It will be particularly insightful to compare findings from the UK to regions that have experienced more direct climate impacts (eg, the USA and the Caribbean *vs* the UK), and those that have experienced less direct impacts of the pandemic (eg, New Zealand).

There are many actors who can support young people's mental health and resilience in the face of global crises. Mental health practitioners, teachers, and parents should be supported to learn about the patterns and mechanisms associated with climate-related and pandemic-related distress. Psychological expertise should be included in development of supportive interventions[49] and in communication about the crises. Given that media reports of climate change were a particular source of distress for respondents, media outlets can play a key role in constructing narratives that highlight opportunities for constructive and hope-giving action, improve self-efficacy, and reduce individual guilt.[13,50] The most common negative impact of climate change, cited by 52% of respondents, was increased worry over inaction to mitigate climate change, which echoes findings from the largest global survey of climate anxiety in young people to date.[23] Opportunities for young people to take action in their communities, particularly with others, might also act as a mental health intervention, supporting wellbeing by

increasing hope, agency, and control.[51,52] Decision makers need to consider youth voices and ensure that young people have opportunities to direct their concern into actions that demonstrably contribute to climate change mitigation. Arguably even more importantly, governments themselves need to take decisive action at national and international scales. Youth mental health should be on the agenda at climate policy meetings. There are win–win opportunities to reduce inequality, improve mental health, and mitigate climate change in the pandemic recovery,[53] including the promotion of active transport options, support for localised economies that build community cohesion, and nature-based interventions that provide equitable access to green space.[54]

Our study has a few limitations. First, our study delivers a snapshot insight of the situation in one specific country (the UK). Given that this study was conducted in the early stages of the COVID-19 pandemic (between Aug 5 and Oct 26, 2020) and in the context of a rapidly changing policy landscape, it is likely that psychological responses vary with the severity and duration of the pandemic and government-imposed restrictions. Today, 2 years into the pandemic, the mental health toll might be greater. However, it is also possible that, as attention starts to shift away from the pandemic, climate anxiety might become even more prominent. Only future longitudinal research will be able to capture the true dynamics. Furthermore, due to the single-country focus, these results might not generalise outside of the UK. Second, our sample was modest in size, and in part recruited through convenience sampling. It is possible that the greater interest of study respondents in climate change than the COVID-19 pandemic observed in our sample is driven by self-selection. We aimed to mitigate this bias to some extent by recruiting a diverse sample via a variety of community groups and mental health charities, and complemented this with additional responses from a paid survey panel. Further, although we observed some gender differences with respect to self-reported distress levels, a larger representative study would be required to describe and differentiate psychological responses in different demographic groups and to identify intersecting vulnerabilities to the impacts of climate change and the pandemic. In particular, it is important to note that developmental stages, even within the 16–24-year age range, will be associated with unique challenges and opportunities. In addition, individual vulnerability results from the dynamic interplay of physiological, genetic, cognitive, emotional, social, and environmental factors. Developmental life-course perspectives on climate impacts in particular will benefit from an integrative and interdisciplinary framework to identify causal pathways, and to monitor and mitigate age-specific risks.[55]

In summary, our findings highlight the distress many young people feel about climate change, even in the context of a global pandemic. Young people's emotional responses and their sense of agency with respect to the two crises differed, potentially reflecting realistic considerations of the greatest threat to their future lives (climate change), even while their current lives are directly impacted (the pandemic). The observation that climate distress and agency were positively related suggests an interesting dynamic between emotional engagement and the potential for positive coping that requires further investigation. The pandemic recovery period offers unprecedented opportunity for decision makers to effect radical change. Young people have the most to gain or lose from these decisions, so it is vital that we consider their voices and desires, which have received relatively little attention thus far. Increasing their participation and sense of agency might promote mental resilience. Our work provides a basis for further standardised and representative research, and is a call to action for policy makers and practitioners to take these concerns seriously.

#### Contributors

This manuscript was authored by members of Imperial College London's Institute of Global Health Innovation–Grantham Institute programme, Climate Cares. Climate Cares is led by an interdisciplinary team of researchers, designers, policy professionals, and educators aiming to understand and support mental health in the current climate and ecological crises. The author team has expertise across multiple domains informing planetary health: behavioural science (AV and ELL), psychology and neuroscience (ELL and AV), mental health (ELL), climate science (NJ), psychological measurement and survey design (AV), quantitative modelling (ELL and AV), sustainable development (VK and JD), sustainability education (VK), science communication (ELL and NJ), climate policy (NJ), psychological interventions (ELL, RT, and JD), and environmental health (RT). ELL conceptualised and project managed the study. AV and NJ accessed and verified the underlying survey data, and conducted the statistical analyses. AV produced the final figures. ELL and AV drafted the paper and finalised the manuscript. All authors developed the survey and supported data collection (in consultation with the YPAG), contributed to discussions about analysis methods and interpretation of findings, had access to all of the underlying data, contributed to manuscript edits, and approved the submitted version.

For more on **Climate Cares** see https://www.imperial.ac.uk/global-health-innovation/what-we-do/research/mental-health/climate-cares

#### Declaration of interests

We declare no competing interests.

#### Data sharing

The data collected for the study, including individual respondent data and a data dictionary defining each field in the set, will be made available to others either (1) upon request to the corresponding author (at e.lawrance@imperial.ac.uk) or (2) on the permanent project page, hosted by OSF at https://osf.io/bf5wp/. In accordance with consent and data protection legislation, we will only make available deidentified respondent data. The data will be accompanied by relevant meta-data outlining the characteristics of the dataset, and a description of the variables contained therein. The data will be available with publication of the manuscript. No other restrictions to access will apply.

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