



Master's Thesis

Persistent and Momentary Forms of General and Specific Climate Anxiety: The Effect of Exposure to Climate Change-Related Media Coverage on Momentary General and Flood-Specific Climate Anxiety

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Are there deviations of the Master's thesis from the proposed plan?

No

Yes, please explain below the deviations

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Abstract

The media extensively covers global climate change (CC). Reading such reports likely triggers general climate anxiety (CA); so far, only one study confirmed the causal link between exposure to media coverage on global CC and general CA. The media reports increasingly more on specific and local CC consequences, which we postulated can evoke specific forms of CA. People strongly attached to a place might be more sensitive to reports about local and specific CC consequences as they care more about the place potentially being negatively affected. Thus, we hypothesized that different forms of CA exist and that individuals with stronger place attachment would react stronger to news about specific CC consequences, resulting in higher specific CA. We tested this with an online experimental study (N = 214) in the Netherlands. Results showed that reading global CC news increased general CA in the moment (i.e., momentary) while reading news about CC-caused floods increased momentary flood-specific CA; place attachment did not influence this relationship. Both news types increased both forms of momentary CA, suggesting a close relationship between the two concepts. However, as they were not perfectly related, they could be differentiated. Results showed that CA over a longer period (i.e., persistent) predicted momentary CA (for both forms) and were positively correlated, indicating reciprocity. These findings suggest a model where persistent and momentary CA mutually influence each other, with reading CC-related news reinforcing momentary CA. This scenario needs empirical testing, and more research on supporting individuals experiencing CA is urgently necessary.

Keywords: media coverage, climate anxiety, place attachment, flood, Netherlands

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Persistent and Momentary Forms of General and Specific Climate Anxiety: The Effect of Exposure to Climate Change-Related Media Coverage on Momentary General and Flood-Specific Climate Anxiety

Anthropogenic climate change is happening at a global scale with unprecedented consequences (IPCC 2022b, 2022c). The year 2023 was the warmest ever recorded (European Environment Agency, 2024); we experienced extreme heat, drought, and wildfires as well as extreme weather events with heavy rainfall across the globe (Climate Central, 2023). It is undeniable that climate change is a threat to people, animals and nature (IPCC, 2022b). This can cause individuals to be greatly concerned about climate change. For example, 72% of adults from various countries like the US, UK, France, Germany, Sweden, Japan, and Australia reported concern that global climate change would personally affect them at some point in their lives (Pew Research Center, 2021). Particularly young people from all over the world seem to be (very) worried about global climate change (Hickman et al., 2021), sometimes even more so than older adults (Pew Research Center, 2021).

Being aware of climate change and its consequences can lead to a variety of negative emotions, such as anxiety, fear, anger, sadness, and helplessness (Hickman et al., 2021). Anxiety specifically related to anthropogenic climate change has been termed *climate anxiety* (sometimes also *eco-anxiety*; Clayton, 2020). While there is no unanimous definition of what climate anxiety entails, it is generally understood as an experience characterized by heightened anxiety and other negative mental health impacts (e.g., distress) in response to threatening perceptions about climate change (Clayton, 2020). Additionally, it has been widely recognized that climate anxiety is a rational and justified experience (Clayton, 2020; Hogg et al., 2021; Pihkala, 2020) because climate change is a real threat.

Nevertheless, the experience of climate anxiety can be a significant burden to one's mental health and general well-being (IPCC, 2022a); it often occurs together with other conditions, like feelings of helplessness and frustration (Clayton et al., 2017), depression and

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general anxiety (Schwartz et al., 2023), and stress (Thomson & Roach, 2023). Hence, it is of great importance to understand the specific reasons why climate change is anxiety-inducing. It is often assumed that people experience anxiety about climate change because they are worried about being personally affected by its impacts (Fyke & Weaver, 2023; Pew Research Center, 2021). However, two recent studies found that personally experiencing a flood was not associated with higher levels of climate anxiety (Ogunbode et al., 2022; Whitmarsh et al., 2022). Instead, research suggests that people mostly experience anxiety about more large-scale climate change consequences, such as abstract threats to humanity or the planet (e.g., animal extinction, hunger and death; van Valkengoed & Steg, 2023), rather than personal experiences and risks.

While we do not mean to suggest that personal experiences of climate change are not at all relevant to the experience of climate anxiety, we highlight an alternative pathway, namely exposure to climate change-related media coverage. Nowadays, climate change news is everywhere; we are being informed about climate change via TV news, newspaper articles, social media, and even advertisements. That means climate change-related news coverage is currently an important way for people to become aware of and learn about climate change (e.g., Junsheng et al., 2019). Much of this media coverage of climate change is focused on the global consequences of climate change. For example, much attention was paid to the latest IPCC report that was published in 2022; multiple media outlets published articles about the report (e.g., *BBC*: McGrath, 2022; *The Guardian*: Harvey, 2023; *ZEIT Online*: Fischer & Erdmann, 2022). In recent years, several studies found that exposure to media coverage of global climate change is associated with experiencing higher climate anxiety (e.g., Maran & Begotti, 2021; Ogunbode et al., 2022; Whitmarsh et al., 2022). A potential explanation for this may be that the content reminds readers of the threat, unpredictability, and uncontrollability of climate change, which are assumed to be relevant elements of the experience of climate anxiety (Chan et al., 2024; see also van Valkengoed et al., 2023). Media reports also often

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point out that urgent action should be taken to combat climate change, but that the window of opportunity is closing because not enough action is currently being taken (e.g., McKie, 2022). The combination of this urgency to tackle the threat of climate change and this perceived lack of control to do something could be highly anxiety-inducing (Chan et al., 2024). However, most studies supporting this relationship between exposure to media coverage of global climate change and climate anxiety have examined this cross-sectionally with self-report measurements (e.g., Maran & Begotti, 2021; Ogunbode et al., 2022); only one experimental study has been conducted so far (Shao & Yu, 2023). Yet, as the causal link is often assumed (see Maran & Begotti, 2021) but not tested, the need for more experimental research investigating the effect of exposure to media coverage of global climate change on the experience of climate anxiety is high (see Gregersen et al., 2024).

In addition to media coverage of global climate change, we can also observe that media coverage of climate change is becoming more specific and place-focused as climate change consequences are starting to unfold in very specific ways and distinct places. For example, compared to reporting on global consequences of climate change (e.g., global temperature increase, melting ice and glaciers, sea level rise, etc.), *The Guardian* is covering more and more specific catastrophic climate change events in different places. For instance, news articles covered the extreme rainfalls and floods in Germany in 2021 (Tenz & Oltermann, 2021), the flood in Pakistan in 2022 (Meer Baloch, 2022), heatwaves across Europe during the summer of 2022 (Kirk et al., 2022), and wildfires in Canada in 2023 (Milman, 2023).

We propose that this more specific and place-focused media coverage of climate change consequences could cause more specific forms of climate anxiety, rather than this general climate anxiety about abstract threats to humanity and the planet (van Valkengoed & Steg, 2023). When reading news about a specific climate change consequence happening in a certain place, one might become more aware of specific climate change threats. And, when

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the person then perceives that this event is likely to happen in the region where one lives, this might increase the perceived risk attached to this climate change consequence. This might then lead to experiencing anxiety about this specific climate change consequence happening in a specific place. To illustrate, when reading an article about a flood caused by climate change happening in a specific place, one might develop a form of climate anxiety specifically related to floods: One might feel worried that a flood might also hit the place where a person lives, and damage houses, the environment, and potentially injure individuals close to oneself. Similarly, when reading news on heatwaves, one might be specifically worried about personally experiencing heatwaves and what it could mean for oneself, family, and friends. Thus, we suggest that media coverage of general climate change can trigger this more general climate anxiety, while media coverage of specific and local climate change consequences can trigger more specific forms of climate anxiety.

Ultimately, we theorize that climate anxiety can exist in general and specific forms. Global climate change is characterized by, for example, an increase in global surface temperature and an increasing frequency and intensity of weather extremes, such as heatwaves, heavy precipitation, droughts, and fires (e.g., IPCC, 2022b; United Nations, n.d.). Some consequences, like global warming, are experienced by people all around the world (i.e., globally), while others, like floods and heatwaves, occur in specific places (i.e., locally). Individuals may perceive these impacts as general threats to humanity (van Valkengoed & Steg, 2023) or as specific threats to themselves. Therefore, we propose that, in the context of climate change, people can be anxious about these global consequences (i.e., general climate anxiety) but also about specific and local consequences (i.e., specific climate anxiety) (see also Wullenkord & Ojala, 2023). Our idea is supported by previous findings that general climate anxiety was not predicted by experiencing a specific climate change-related event like a flood (Ogunbode et al., 2022; Whitmarsh et al., 2022). Instead, we suggest that experiencing or perceiving a high risk of a specific climate change consequence, such as a flood, in the

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place where one lives (see *Fyke & Weaver, 2023*) could lead to a specific form of climate anxiety, such as flood-related climate anxiety. However, any forms of specific climate anxiety have not yet been examined. Accordingly, we address this gap in this research by investigating climate anxiety on a general compared to a specific level.

This distinction between general and specific forms of climate anxiety is particularly relevant in the context of understanding the effect of climate change-related media coverage on climate anxiety. With climate change news being ubiquitous nowadays, people are exposed daily to potential triggers for different forms of climate anxiety but currently lack sufficient professional help to deal with these anxieties (e.g., *Baudon & Jachens, 2021; IPCC, 2022a*). However, the media could play a crucial role not only in causing but also in mitigating these anxiety experiences: By reporting on behaviours that people can engage in to reduce the perceived risks of climate change, the media can help decrease experiences of climate anxiety (see *Fyke & Weaver, 2023*). For example, when reporting on global climate change, the media could inform readers about effective actions that contribute to the slowing down of climate change, like living car-free or changing to a vegan diet (*Ivanova et al., 2020*). Similarly, when covering specific and local climate change consequences like floods or heatwaves, the media could advise people on how to prepare their homes for potential floods (e.g., building protection walls, storing important documents and sentimental objects on upper floors or moving them to higher shelves, getting insurance for flood-related damages) or heatwaves (e.g., installing window blinds to block out the sun, purchasing sunshades for shade, installing air conditioning systems). Thus, the media could not only report on climate change and its specific consequences but also on effective behavioural actions that help manage individual experiences of general and specific climate anxiety; encouragement to take action seems to be an adequate approach to decreasing climate anxiety (for a review, see *Baudon & Jachens, 2021*). But for these to be useful recommendations, we first need to assess whether general and specific climate change media coverage leads to general and specific climate anxiety.

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Considering this trend towards more specific and place-based media coverage of climate change consequences, it is important to highlight the role of place attachment, defined as the “cognitive-emotional bond that individuals develop towards places” (Scannell & Gifford, 2014, p. 274). Individuals who are strongly attached to a place value that place more (as it is highly meaningful to them personally; see Ilovan & Markuszewska, 2022) and have different perceptions of that place compared to non-attached individuals (Scannell & Gifford, 2014). For example, they tend to be more aware of certain environmental risks that potentially threaten this place, like certain climate change consequences (e.g., Bonaiuto et al., 2016). If they then read media reports on specific and local climate change consequences, they may perceive that certain climate change consequences are occurring now and nearby, which is associated with perceiving more risks related to these specific climate change consequences and experiencing more specific climate anxiety (see van Valkengoed et al., 2021). According to this reasoning, people with strong place attachment would be particularly sensitive to media coverage of specific climate change consequences in that place and would therefore show stronger emotional reactions in the form of very high experiences of specific climate anxiety. Thus, we propose that place attachment is a relevant moderator in the relationship between specific and place-based media coverage of climate change consequences and specific climate anxiety.

The Current Study

To investigate a specific form of climate anxiety and the influence of place attachment, we considered the context of the Netherlands as a case study. The country is characterized by several unique features that make it relevant to study the impact of climate change on people’s well-being. Geographically speaking, the average elevation of the Netherlands is only about 30 meters above sea level and about a quarter of the country even lies below sea level. Due to this, the country is particularly vulnerable to flooding events caused by climate change (e.g., heavy rainfalls, sea level rise). Indeed, the Netherlands has been hit by more and more high-

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profile flooding events over the last years: Limburg, a province in the south-east of the Netherlands, was strongly affected by a flood during the summer of 2021 (Kok et al., 2023; Sharma, 2021); and several rivers were measuring very high water levels leading to local floods during Christmas 2023 (Dutch News, 2023; NL Times, 2023a), with the city of Deventer being threatened to flood (NL Times, 2023b). Even more, with the changing climate, the frequency and intensity of such flooding events and other specific climate change consequences will likely increase (IPCC, 2022b). With that, the mental health problems in response to these specific consequences will also rise (IPCC, 2022a), specifically in low-lying areas, such as parts of the Netherlands, which are at risk of being severely impacted by flooding events. Therefore, the Netherlands was the “optimal place” to test if individuals experience specific climate anxiety related to floods caused by climate change (henceforth: flood-specific climate anxiety). Thus, regarding the influence of place attachment, we hypothesized that individuals who are strongly attached to the Netherlands would experience particularly high flood-specific climate anxiety after reading a news article about a flooding event in the Netherlands.

Based on the presented theoretical background and our newly developed assumption that general climate anxiety can be distinguished from specific forms of climate anxiety, we investigated whether exposure to climate change-related media coverage leads to general and flood-specific climate anxiety, and how place attachment moderates the latter relationship. Specifically, we examined the following three research questions with an online study featuring an experimental element (see Model 1 in Figure 1):

1. To what extent does reading a general climate change news article about global climate change trigger general climate anxiety?

Similar to Shao and Yu (2023)’s findings, we expected that reading this general climate change article about global climate change would lead to higher general climate anxiety, compared to reading an article unrelated to climate change.

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2. To what extent does reading a specific climate change impact news article about a recent flood in the Netherlands evoke flood-specific climate anxiety?

We hypothesized that reading this specific flood article would lead to higher flood-specific climate anxiety, compared to reading a climate change-unrelated article.

3. To what extent does place attachment to the Netherlands moderate the relationship between exposure to media coverage of flood-specific climate change consequences and flood-specific climate anxiety?

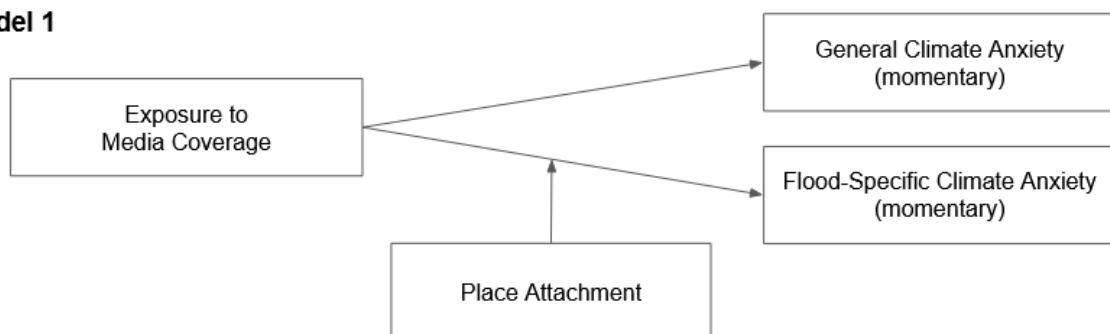
We hypothesized that higher place attachment to the Netherlands would strengthen the influence of reading the article about a flood in the Netherlands and flood-specific climate anxiety.

Moreover, we noticed that throughout the literature, climate anxiety has been conceptualized and assessed in two considerably different ways: Some researchers recognize

Figure 1

Research Framework for the Present Study

Model 1



Model 2



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it as a more persistent experience (e.g., Hogg et al., 2021), while others understand it as an emotional reaction in a given moment (i.e., momentary; e.g., Maran & Begotti, 2021; Ogunbode et al., 2022)¹. Therefore, we investigated the following additional research question (see Model 2 in Figure 1):

4. How are persistent experiences of general and flood-specific climate anxiety related to momentary experiences of general and flood-specific climate anxiety?

We hypothesized a positive relationship between persistent and momentary forms of climate anxiety, that is, we anticipated that individuals who experience higher persistent (general and/or flood-specific) climate anxiety would also experience higher momentary (general and/or flood-specific) climate anxiety.

Method

Participants

The target population of the present study were inhabitants of the Netherlands, regardless of their age or nationality. However, participation was restricted to individuals who were not only residents of the Netherlands, but also over the age of 18, and fluent in English.

These potential participants were recruited through the participant pool of the University of Groningen (SONA; convenience sampling) and via social media (e.g., WhatsApp, Instagram, Facebook; snowball sampling). First-year bachelor psychology students from the University of Groningen who participated via SONA were awarded 0.4 SONA credits for participation; other participants were not offered any form of compensation. Based on an a-priori power analysis, we aimed to collect data from (at least) 159 participants to be able to detect a medium effect size (.25) with a power of .80 in a model with one factor that has three groups.

¹ As we studied how exposure to different types of news articles (i.e., general climate change news and specific flood news) leads to general and specific climate anxiety (see research questions 1 and 2), it was necessary to measure participants' immediate emotional reactions; we would not have been able to directly see a change in their persistent experiences after presenting the news articles.

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In total, 246 people filled in the online survey (SONA: $n = 183$; social media: $n = 63$). However, 32 participants had to be excluded due to either not giving consent to participate ($n = 1$), not giving consent to the processing of their SONA ID² ($n = 1$), not living in the Netherlands ($n = 2$), not completing ($n = 18$) or passing ($n = 9$) the manipulation check, or not completing the survey ($n = 1$). Thus, the final study sample consisted of 214 participants.

Overall, the vast majority of participants were students ($n = 198$; 92.52%), identified as female ($n = 154$; 71.96%), and were Dutch ($n = 141$; 65.89%). Most participants also lived in the Netherlands already for more than 10 years ($n = 135$; 63.98%). The average age was 21.7 ± 5.8 . An overview of the socio-demographic characteristics of the respondents can be found in Table 1.

Procedure

An online experimental study was conducted in Qualtrics. After having read the information letter and giving consent to take part in the study, participants were first asked whether they currently lived in the Netherlands at the moment of participation (inclusion criterion). Then, they had to provide demographic information about themselves (e.g., age, gender identification). Next, participants were randomly allocated to one of three experimental conditions in which they had to read one out of three online news article types: Non-climate change-related news, general climate change news, (i.e., global climate change) or specific climate change impact news (i.e., a recent flood in the Netherlands) (between-subjects design). After reading the article, participants were required to formulate a title for the article they read as a manipulation check. This was followed by two types of scales regarding climate anxiety. (1) The first scale assessed participants' momentary emotional experiences about a) global climate change and b) potential flooding events in the Netherlands after reading the news article. The two versions of this first scale were presented

² The SONA ID was collected for SONA participants solely for the purpose of assigning SONA credits after completing the survey; SONA IDs were deleted from the data.

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in a randomized order. (2) The second scale measured more persistent experiences of anxiety concerning a) global climate change and b) potential flooding events in the Netherlands.

Again, the order in which the two versions of this second scale were presented was randomised. Next, participants were asked whether they had previously experienced a flood, and if yes, how severe this flood experience was for them. Then, participants' attachment to the Netherlands was assessed. Lastly, participants were thanked for participating and debriefed about the study set-up. Completing the survey took about 10 to 15 minutes. The data were collected from early April to early May 2024. This study was approved by the ethics committee of the University of Groningen.

Table 1

Socio-demographic Characteristics of the Sample (N = 214)

Age (in years)	<i>M (SD)</i>	21.7 (5.8)
	Minimum	18
	Maximum	58
Gender (identification)	Female	154 (71.96%)
	Male	55 (25.70%)
	Non-binary	4 (1.87%)
	Neither	0 (0%)
	Wish not to say	1 (0.47%)
Dutch Nationality	Yes	141 (65.89%)
	No	73 (34.11%)
Student	Yes	198 (92.52%)
	No	16 (7.48%)
Duration of living in the Netherlands	Less than 1 year	48 (22.43%)
	1-2 years	8 (3.74%)
	2-5 years	19 (8.88%)
	5-10 years	4 (1.87%)
	10 years or more	135 (63.08%)
Flood experience	Yes	21 (9.81%)
	No	193 (90.19%)
Flood severity	<i>M (SD)</i>	2.5 (1.0)
	Minimum	1
	Maximum	5
Recruitment	SONA	174 (81.31%)
	Social media	40 (18.69%)

Note. Only participants who experienced a flood in the past were asked about the (perceived) severity of this flood ($n = 21$).

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The experimental element in this study was the manipulation of exposure to climate change-related media coverage. Participants were randomly assigned to read one out of three news articles. In the control condition ($n = 63$), an article about the Australian Open tennis tournament from 2024 was presented, describing the history and intense semi-final match between Alexander Zverev and Carlos Alcaraz. The article was carefully selected such that the event did not take place in the Netherlands, nor did the match include any Dutch athletes. When assigned to the general climate change news condition ($n = 65$), participants were presented with an article about the latest IPCC report from 2022. It stated that the climate crisis has already led to irreversible damage across the globe, but when international action is taken now, a liveable future is still possible. When assigned to the specific climate change impact news condition ($n = 86$), participants were instructed to read an article about the flood in Valkenburg in July 2021³. The devastating consequences of the flood for the region were described, and it was stated that with the changing climate, events like this will happen more often in the future.

Overall, the three articles were inspired by and partly copied from four previously published online news articles (i.e., Carayol, 2024; Harvey, 2023; NL Times, 2022; Sharma, 2021). The original articles were shortened and adapted for the manipulation; the flood article was adjusted in wording to match the tone of the IPCC article. Each of the presented articles was approximately 500 words long (tennis article: 499 words; IPCC article: 494 words; flood article: 510 words). The layout of all three articles was the same: The font type and size were the same, and no additional pictures or graphs were displayed in any of the three conditions.

Materials

Next to reading one of the articles and formulating a title, participants had to fill in other scales to assess the remaining variables. Climate anxiety (both general and flood-

³ Valkenburg is a municipality in Limburg, in the southeast of the Netherlands, and was strongly affected by the flood in July 2021.

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specific) was measured in two ways, namely as a more emotional momentary experience or as a more persistent symptomology of climate anxiety (e.g., emotions, cognitions, behavioural symptoms). The complete study survey, including the three articles used for the manipulation, can be found in Appendix A.

Momentary Climate Anxiety

Like Shao and Yu (2023), we used an adaptation of the *State-Trait Anxiety Inventory* (STAI; Maran & Begotti, 2021) to assess which emotions participants experienced right after reading the news article (i.e., momentary experiences). The scale included the following seven items: “Calm”, “tense”, “relaxed”, “anxious”, “peaceful”, “worried”, and “terrified”. Based on Stanley et al. (2021)’s finding that anger was also a relevant emotional experience in the context of climate change, we added the item “angry” to the list. Responses were measured on a 5-point Likert scale; the answer options ranged from 1 (*not at all*) to 5 (*extremely*). The items “calm”, “relaxed” and “peaceful” were reverse-coded for the analyses, and a sum score was calculated (range: 8-40).

Participants were required to fill in the STAI adoption twice. Specifically, they were asked to indicate how they currently felt (1) about global climate change (momentary general climate anxiety; $M = 24.8$, $SD = 6.7$, Cronbach’s $\alpha = .91$), and (2) about the possibility of floods caused by climate change happening in the Netherlands (momentary flood-specific climate anxiety; $M = 22.7$, $SD = 6.7$, Cronbach’s $\alpha = .91$).

Persistent Climate Anxiety

Persistent experiences of climate anxiety were measured with *the Hogg Eco-Anxiety Scale* for climate change (HEAS-13 (climate change); Hogg et al., 2021). It assessed to which extent participants experienced broader symptoms of anxiety regarding climate change over the last two weeks. The scale consisted of 13 items distributed over four dimensions, namely affective symptoms (e.g., “feeling afraid”), ruminative thoughts (e.g., “unable to stop thinking about future climate change”), behavioural symptoms (e.g., “difficulty sleeping”), and

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personal impact anxiety (e.g., “feeling anxious about the impact of your personal behaviours on climate change”). Responses were measured on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). For the analyses, a mean score of the complete scale was computed (range: 0-3).

Similar to the two versions of the STAI adoption, the HEAS-13 (climate change) was presented twice: 1) In the original HEAS-13 for climate change, participants were asked about their anxiety symptoms concerning global climate change (persistent general climate anxiety; $M = 0.4$, $SD = 0.5$, Cronbach's $\alpha = .93$). 2) In addition, this scale was slightly adapted to assess persistent flood-specific climate anxiety: Participants were asked how often they experienced symptoms of anxiety because of the possibility of floods caused by climate change happening in the Netherlands ($M = 0.2$, $SD = 0.4$, Cronbach's $\alpha = .93$). To this end, the wording of the items in the rumination and personal impact anxiety dimensions were adjusted to the context of flooding in the Netherlands (e.g., “unable to stop thinking about future floods caused by climate change happening in the Netherlands”, “feeling anxious about the impact of your personal behaviours on floods caused by climate change happening in the Netherlands”) (all items can be found in Appendix A).

Place Attachment

To measure participants' place attachment to the Netherlands, the *Abbreviated Place Attachment Scale* (APAS; Boley et al., 2021) was used. This scale consisted of six items, distributed over two dimensions, namely place identity (e.g., “I am very attached to the Netherlands”) and place dependence (e.g., “The Netherlands is the best place for what I like to do”). Responses were measured on a 5-point Likert scale; answer options ranged from 1 (*strongly disagree*) to 5 (*strongly agree*) ($M = 3.2$, $SD = 0.7$, Cronbach's $\alpha = .83$). A mean score for the scale was computed (range: 1-5).

Results

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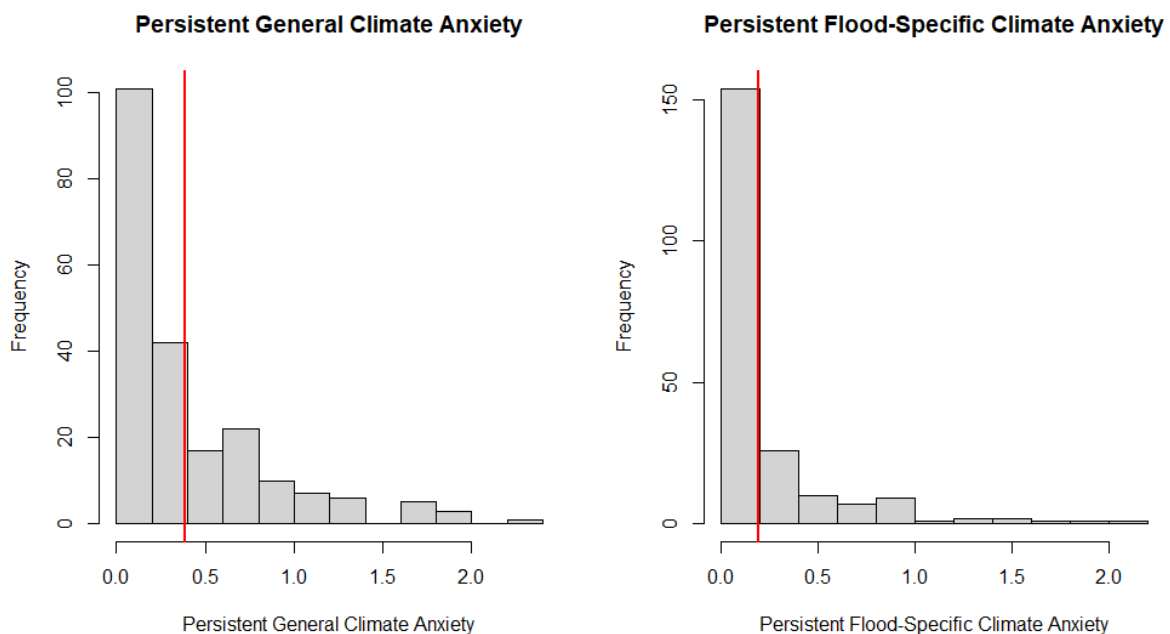
To test the present hypotheses, the data were prepared in SPSS version 28.0.1 (IBM Corp, 2021) and statistically analysed in R version 4.3.2 (R Core Team, 2023). The script for the analyses can be requested from the researcher.

Descriptives

Prior to testing the research hypotheses, the two persistent forms of climate anxiety were explored in terms of their means⁴. Overall, persistent general climate anxiety about global climate change was low, $M = 0.4$, $SD = 0.5$ (Figure 2), and persistent flood-specific climate anxiety about floods caused by climate change happening in the Netherlands was even lower, $M = 0.2$, $SD = 0.4$.

Figure 2

Graphical Representations of Distributions and Means of Persistent General and Flood-Specific Climate Anxiety



Note. Means are illustrated with red lines. HEAS CC = Persistent general climate anxiety; HEAS Flood = Persistent flood-specific climate anxiety.

⁴ Mean scores of each of the four subscales of the HEAS-13 for global climate change and HEAS-13 for flood can be found in Appendix B.

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Bivariate Correlations

Bivariate correlations among all study variables were computed⁵ (Table 2). The four climate anxiety variables were all highly positively and significantly correlated with each other. Specifically, the two momentary forms of climate anxiety were strongly associated with each other ($r(212) = .72, p < .001$) as were the two persistent forms of climate anxiety ($r(212) = .73, p < .001$). Similarly, both general forms of climate anxiety were moderately strong related to each other ($r(212) = .49, p < .001$) as were the two flood-specific forms of climate anxiety ($r(212) = .40, p < .001$). Place attachment was not or only very weakly and insignificantly related to the four climate anxiety variables.

Testing the Effect of Exposure to Climate Change-Related Media Coverage on Momentary Climate Anxiety

By conducting two Analyses of Variances (ANOVAs), we examined whether and to which extent reading a general climate change news article about global climate change (i.e., the article about the IPCC report) leads to momentary general climate anxiety (Hypothesis 1) and whether and to which extent reading a specific climate change impact news article about a flood caused by climate change happening in the Netherlands (i.e., the article about the flood in Valkenburg) leads to momentary flood-specific climate anxiety (Hypothesis 2)⁶. In addition, we tested whether place attachment to the Netherlands moderated the relationship between reading the flood article and momentary flood-specific climate anxiety (Hypothesis 3) by conducting a linear regression analysis. The corresponding assumption checks can be found in Appendix D.

⁵ Pearson's correlations were computed if both variables were numerical; point-biserial correlations were computed if one variable was numerical and the other was binary; and to compute the correlation between two dichotomous variables, first the phi coefficient was computed, and then a chi-square test was conducted to assess the level of significance.

⁶ The two outcome variables for research model 1 were momentary general and flood-specific climate anxiety (measured by the two versions of the STAI). Since these scales measured a broad range of negative emotions, we also assessed the anxiety items of both scales individually as additional outcome variables. The results can be found in Appendix C.

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Table 2*Means and Bivariate Correlations Between Variables*

Variable	M (SD)	1	2	3	4	5	6	7	8	9	10	11	12
1. Momentary General Climate Anxiety	3.1 (0.8)	-											
2. Momentary Flood-Specific Climate Anxiety	2.8 (0.8)	.72 ***	-										
3. Persistent General Climate Anxiety	0.4 (0.5)	.49 ***	.46 ***	-									
4. Persistent Flood-Specific Climate Anxiety	0.2 (0.4)	.25 ***	.40 ***	.73 ***	-								
5. Place Attachment	3.2 (0.7)	-.04	.01	-.06	.07	-							
6. Age	21.7 (5.8)	.09	.09	.09	.08	.09	-						
7. Gender Identification ^a	1.3 (0.4)	-.15 *	-.17 *	-.18 **	-.13	-.01	.24 ***	-					
8. Length of Residence ^b	3.8 (1.7)	-.20 **	-.20 **	-.20 **	-.16 *	.32 ***	.06	-.05	-				
9. Dutch Nationality ^c	0.7 (0.5)	-.28 ***	-.21 **	-.21 **	-.14 *	.37 ***	-.03	-.05	.89 ***	-			
10. Student ^d	0.9 (0.3)	.00	.02	-.06	-.04	-.10	-.63 ***	-.11	-.15 *	-.13	-		
11. Flood Experience ^e	0.1 (0.3)	.08	.08	.14 *	.03	-.16 *	-.04	.03	-.30 ***	-.23 **	.03	-	
12. Flood Severity ^f	2.5 (1.0)	-.08	.09	.30	.37	-.00	-.37	-.25	-.06	-.07	.12	-. ^g	-

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

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^a $n = 209$. These correlations were computed only with participants identifying as either female or male; 1 = female gender identification and 2 = male gender identification.

^b Categories: 1 = less than one year, 2 = between 1 and 2 years, 3 = between 2 and 5 years, 4 = between 5 and 10 years, 5 = more than 10 years. As the categories were ordered such that the higher the category was, the longer the length of residence in the Netherlands, this variable was used in its numerical version to compute the correlations.

^c 0 = non-Dutch participants and 1 = Dutch participants.

^d 0 = non-students and 1 = students.

^e 0 = no prior flood experience and 1 = prior flood experience.

^f $n = 21$.

^g The correlation between flood severity and flood experience was not computed as only those who experienced a flood in the past were asked about the perceived severity of this flood.

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The experimental manipulation had a significant effect on momentary general climate anxiety, $F(2, 211) = 7.35, p < .001$. The post-hoc Tukey test revealed that participants in the control group ($M = 22.2, SD = 7.0$) scored significantly lower on momentary general climate anxiety compared to participants in the climate change group ($M = 25.8, SD = 6.6$) ($p = .006, 95\% CI [0.87, 6.29]$) and also compared to participants in the flood group ($M = 26.0, SD = 6.0$) ($p = .001, 95\% CI [1.30, 6.38]$). The climate change group and the flood group did not significantly differ from each other ($p = .968, 95\% CI [-2.26, 2.78]$).

In addition, the experimental manipulation also had a significant effect on momentary flood-specific climate anxiety, $F(2, 211) = 16.38, p < .001$. The post-hoc Tukey test showed that participants in the control group ($M = 19.0, SD = 5.7$) scored significantly lower on momentary flood-specific climate anxiety compared to participants in the climate change group ($M = 23.9, SD = 6.4$) ($p < .001, 95\% CI [2.28, 7.48]$) and also compared to participants in the flood group ($M = 24.6, SD = 6.4$) ($p < .001, 95\% CI [3.19, 8.07]$). The climate change group and the flood group did again not significantly differ from each other ($p = .744, 95\% CI [-1.67, 3.17]$).

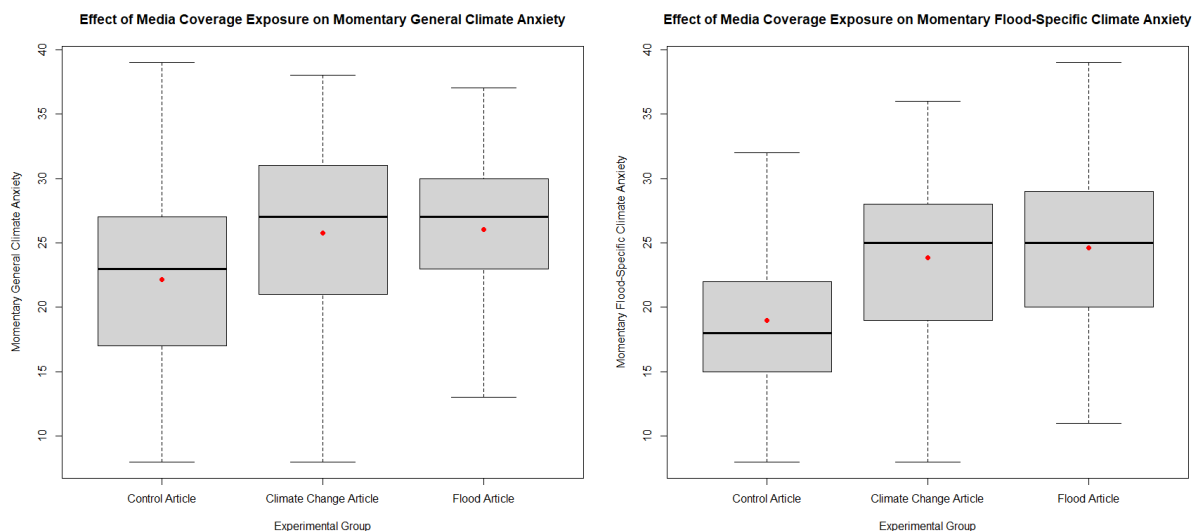
Thus, overall, the results demonstrated that Hypotheses 1 and 2 were both confirmed. As expected, reading the article about global climate change led to significantly more momentary general climate anxiety compared to reading the control article, and reading the article about floods in the Netherlands led to significantly more momentary flood-specific climate anxiety compared to reading the control article (Figure 3). However, in both cases, participants in the climate change group and the flood group did not significantly differ from each other: Reading the flood article also led to a significant increase in momentary general climate anxiety, and reading the global climate change article also significantly increased momentary flood-specific climate anxiety. Thus, reading either of the two news articles (i.e., the global climate change or the flood article) led to an increase in momentary experiences of both, general and flood-specific climate anxiety.

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Finally, the interaction effect of the experimental manipulation and place attachment on momentary flood-specific climate anxiety was tested. To do this, we centered the place attachment variable first. The regression model was significant, $F(5, 208) = 7.34, p < .001$, and explained 13% of the variance ($Adj. R^2 = .13$) (Table 3). The results showed that the difference between the control group and the climate change group ($b = 4.87, p < .001, 95\% CI [2.70, 7.04]$) and the difference between the control group and the flood group ($b = 5.61, p < .001, 95\% CI [3.58, 7.64]$) both had a significant effect on momentary flood-specific climate anxiety. However, the effect of place attachment on momentary flood-specific climate anxiety was insignificant ($b = -0.10, p = .919, 95\% CI [-1.96, 1.77]$); this was expected based on the insignificant weak correlation⁷. Similarly, the difference between the interaction of the

Figure 3

Boxplots Representing the Effect of Exposure to General and Specific Media Coverage on Momentary and Flood-Specific Climate Anxiety



Note. The means of the categories are displayed by red circles.

⁷ We double-checked the correlation between momentary flood-specific climate anxiety and the centered place attachment; the results were the same: The correlation was still very weak and insignificant, $r(212) = .01, p = .884$.

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control group and place attachment and the interaction of the climate change group and place attachment was insignificant ($b = 1.98, p = .176, 95\% \text{ CI } [-0.90, 4.85]$), as was the difference between the interaction of the control group and place attachment and the interaction of the flood group and place attachment ($b = -0.85, p = .533, 95\% \text{ CI } [-3.54, 1.83]$).

Thus, in contrast to Hypothesis 3, the findings showed that place attachment did not moderate the relationship between the experimental manipulation and momentary flood-specific climate anxiety: Participants who were strongly attached to the Netherlands did not experience even higher flood-specific climate anxiety after reading the flood article.

Testing the Relationship Between Persistent and Momentary Climate Anxiety

Based on the strong correlations between persistent general and momentary general, and persistent flood-specific and momentary flood-specific climate anxiety, we conducted two linear regression analyses to further examine the relationship between persistent and

Table 3

Regression Results Predicting Momentary Flood-Specific Climate Anxiety

	Momentary Flood-Specific Climate Anxiety		
	<i>B (SE)</i>	95% CI	<i>p</i>
Intercepts	19.00 (0.78)	[17.46, 20.55]	< .001
<i>Experimental Manipulation^a</i>			
Climate Change Group	4.87 (1.10)	[2.70, 7.04]	< .001
Flood Group	5.61 (1.03)	[3.58, 7.64]	< .001
Place Attachment	-0.10 (0.94)	[-1.96, 1.77]	.919
<i>Interactions^b</i>			
Climate Change Group x Place Attachment	1.98 (1.46)	[-0.90, 4.85]	.176
Flood Group x Place Attachment	-0.85 (1.36)	[-3.54, 1.83]	.533
	<i>F</i>	7.34	
	df1, df2	5, 208	
	<i>Adjusted R²</i>	.13	
	<i>p</i>	< .001	

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

^a The experimental manipulation groups were compared to the control group.

^b The interactions were compared to the interaction of the control group and place attachment.

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momentary forms of climate anxiety (research model 2)⁸. The corresponding assumption checks can be found in Appendix E.

General Climate Anxiety

We first assessed the relationship between persistent general climate anxiety and momentary general climate anxiety (Table 4). The regression model (Model 1) was significant, $F(1, 212) = 67.96, p < .001$, and explained 24% of the variance ($Adj. R^2 = .24$). The results showed a significant effect of persistent general climate anxiety on momentary general climate anxiety ($b = 7.02, p < .001, 95\% \text{ CI } [5.34, 8.70]$): The more persistent general climate anxiety was experienced, the stronger one's momentary experiences of general climate anxiety.

This finding confirmed Hypothesis 4 regarding the general form of climate anxiety as it clearly indicated that persistent general climate anxiety positively predicted momentary general climate anxiety: The more persistent climate anxiety about general climate change was experienced, the more momentary climate anxiety about general climate change one experienced.

Flood-Specific Climate Anxiety

We then examined the relationship between persistent flood-specific climate anxiety and momentary flood-specific climate anxiety. This regression model was significant as well (Model 2), $F(1, 212) = 40.25, p < .001$, and explained 16% of the variance ($Adj. R^2 = .16$). The results revealed a significant effect of persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 7.24, p < .001, 95\% \text{ CI } [4.99, 9.48]$): The more persistent flood-specific climate anxiety was experienced, the stronger one's momentary experiences of flood-specific climate anxiety.

By demonstrating that persistent flood-specific climate anxiety positively predicted

⁸ Regression analyses with each of the four subscales of the HEAS-13 for climate change and HEAS-13 for flood can be found in Appendix B.

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Table 4*Regression Results Predicting Momentary General and Flood-Specific Climate Anxiety*

	Momentary General Climate Anxiety (Model 1)			Momentary Flood-Specific Climate Anxiety (Model 2)		
	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>
Intercepts	22.11 (0.52)	[21.09, 23.12]	< .001	21.37 (0.47)	[20.44, 22.30]	< .001
Persistent General Climate Anxiety	7.02 (0.85)	[5.34, 8.70]	< .001	-	-	-
Persistent Flood-Specific Climate Anxiety	-	-	-	7.24 (1.14)	[4.99, 9.48]	< .001
<i>F</i>		67.96			40.25	
df1, df2		1, 212			1, 212	
<i>Adjusted R</i> ²		.24			.16	
<i>p</i>		< .001			< .001	

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

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momentary flood-specific climate anxiety, this finding also confirmed Hypothesis 4 regarding flood-specific climate anxiety: The stronger persistent climate anxiety about floods caused by climate change happening in the Netherlands was experienced, the higher momentary flood-specific climate anxiety.

Exploratory Analyses

In two exploratory analyses, we tested whether participants who experienced either or both forms of persistent climate anxiety experienced even higher momentary climate anxiety (either or both forms) after reading either the climate change article or the flood article. To do this, we first centered the two predictor variables persistent general and flood-specific climate anxiety and then conducted two additional linear regression analyses (Table 5).

The first additional regression model assessed the interaction effect of persistent general climate anxiety and the experimental manipulation on momentary general climate anxiety (Model 3). The model was significant, $F(5, 208) = 18.90, p < .001$, and explained 30% of the variance ($Adj. R^2 = .30$). Similar to above, persistent general climate anxiety had a significant effect on momentary general climate anxiety ($b = 8.48, p < .001, 95\% \text{ CI } [5.18, 11.77]$). Additionally, the difference between the control group and the climate change group ($b = 3.36, p < .001, 95\% \text{ CI } [1.41, 5.32]$) as well as the difference between the control group and the flood group ($b = 3.69, p < .001, 95\% \text{ CI } [1.86, 5.53]$) both had a significant effect on momentary general climate anxiety (just as in Hypothesis 1). However, the difference between the interaction of persistent general climate anxiety and the control group and the interaction of the persistent general climate anxiety and the climate change group was insignificant ($b = -3.19, p = .131, 95\% \text{ CI } [-7.34, 0.95]$), as was the difference between the interaction of persistent general climate anxiety and the control group and the interaction of persistent general climate anxiety and the flood group ($b = -0.62, p = .776, 95\% \text{ CI } [-4.90, 3.67]$). Thus, participants with strong persistent climate anxiety about general climate change did not experience higher momentary general climate anxiety after having read the global

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Table 5*Additional Exploratory Regression Results Predicting Momentary General and Flood-Specific Climate Anxiety*

	Momentary General Climate Anxiety (Model 3)			Momentary Flood-Specific Climate Anxiety (Model 4)		
	<i>B</i> (<i>SE</i>)	95% CI	<i>p</i>	<i>B</i> (<i>SE</i>)	95% CI	<i>p</i>
Intercepts	22.31 (0.71)	[20.92, 23.71]	< .001	19.33 (0.72)	[17.91, 20.75]	< .001
Persistent General Climate Anxiety	8.48 (1.67)	[5.18, 11.77]	< .001	-	-	-
<i>Experimental Manipulation^a</i>						
Climate Change Group	3.36 (0.99)	[1.41, 5.32]	< .001	-	-	-
Flood Group	3.69 (0.93)	[1.86, 5.53]	< .001	-	-	-
<i>Interactions^b</i>						
Persistent General Climate Anxiety x Climate Change Group	-3.19 (2.10)	[-7.34, 0.95]	.131	-	-	-
Persistent General Climate Anxiety x Flood Group	-0.62 (2.17)	[-4.90, 3.67]	.776	-	-	-
Persistent Flood-Specific Climate Anxiety	-	-	-	9.49 (2.39)	[4.79, 14.20]	< .001
<i>Experimental Manipulation^a</i>						
Climate Change Group	-	-	-	4.23 (1.01)	[2.24, 6.22]	< .001
Flood Group	-	-	-	5.49 (0.94)	[3.62, 7.35]	< .001
<i>Interactions^c</i>						
Persistent Flood-Specific Climate Anxiety x Climate Change Group	-	-	-	-4.41 (2.81)	[-9.95, 1.13]	.118
Persistent Flood-Specific Climate Anxiety x	-	-	-	-0.78 (3.10)	[-6.89, 5.33]	.802

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Flood Group			
	<i>F</i>	18.90	17.32
	df1, df2	5, 208	5, 208
	<i>Adjusted R²</i>	.30	.28
	<i>p</i>	< .001	< .001

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

^a The experimental manipulation groups were compared to the control group.

^b The interactions were compared to the interaction of persistent general climate anxiety and the control group.

^c The interactions were compared to the interaction of persistent flood-specific climate anxiety and the control group.

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climate change or the flood article.

In a similar vein, the second additional regression model tested the interaction effect of persistent flood-specific climate anxiety and the experimental manipulation on momentary flood-specific climate anxiety (Model 4). The model was significant, $F(5, 208) = 17.32, p < .001$, and explained 28% of the variance ($Adj. R^2 = .28$). Again, persistent flood-specific climate anxiety had a significant effect on momentary flood-specific climate anxiety ($b = 9.49, p < .001, 95\% CI [4.79, 14.20]$). In addition, the difference between the control group and the climate change group ($b = 4.23, p < .001, 95\% CI [2.24, 6.22]$) and the difference between the control group and the flood group ($b = 5.49, p < .001, 95\% CI [3.62, 7.35]$) both had significant effects on momentary flood-specific climate anxiety (like in Hypothesis 2). Yet, the difference between the interaction of persistent flood-specific climate anxiety and the control group and the interaction of the persistent flood-specific climate anxiety and the climate change group was again insignificant ($b = -4.41, p = .118, 95\% CI [-9.95, 1.13]$), as was the difference between the interaction of persistent flood-specific climate anxiety and the control group and the interaction of persistent flood-specific climate anxiety and the flood group ($b = -0.78, p = .802, 95\% CI [-6.89, 5.33]$). Therefore, participants with strong persistent climate anxiety about floods caused by climate change happening in the Netherlands did not experience higher momentary flood-specific climate anxiety after reading the global climate change or the flood article.

Discussion

The main purpose of the present study was to examine the role of exposure to climate change-related media coverage in triggering general and specific forms of climate anxiety in a given moment. Specifically, we assessed whether reading general climate change news about global climate change evokes momentary general climate anxiety and whether reading specific climate change impact news about a flood in the Netherlands leads to momentary flood-specific climate anxiety. Thus, assuming that general and specific forms of climate

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anxiety can be differentiated, we tested whether people experience not only general climate anxiety about global climate change but also specific climate anxiety about specific climate change consequences, such as about floods caused by climate change. In addition, we assessed whether place attachment influenced the relationship between media coverage of specific climate change consequences and specific climate anxiety, specifically, whether individuals who are strongly attached to the Netherlands would experience even higher flood-specific climate anxiety after reading news about floods in the Netherlands. Finally, we investigated how persistent experiences of general and flood-specific climate anxiety were related to momentary experiences of general and flood-specific climate anxiety.

Replicating the findings of Shao and Yu (2023)'s study, the present results showed that exposure to media coverage of global climate change was causally related to an increase in momentary general climate anxiety: When reading a general climate change news article about global climate change (i.e., an article about the IPCC report from 2022), participants experienced higher general climate anxiety immediately after reading this article, compared to reading a news article unrelated to climate change (i.e., an article about a tennis match). This finding verified the causal relationship between exposure to climate change-related media coverage and momentary general climate anxiety, and confirms other literature suggesting that media exposure is a key predictor for the experience of climate anxiety and other negative emotions related to climate change (e.g., Ogunbode et al., 2022; Whitmarsh et al., 2022) and may be a key factor in the development of more persistent climate anxiety.

Additionally, we further expanded on our and Shao and Yu (2023)'s finding, demonstrating that exposure to media coverage showcasing specific and localized climate change consequences was causally related to an increase in momentary flood-specific climate anxiety: Reading a news article about a flood caused by climate change happening in the Netherlands triggered higher experiences of flood-specific climate anxiety immediately after reading this article, compared to reading a climate change-unrelated news article (i.e., the

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above-mentioned tennis article). This finding supported our hypothesis that reporting on more specific and place-focused impacts of climate change can lead to a different form of momentary climate anxiety, namely climate anxiety focused on more specific climate change-related risks (i.e., floods) and that is place-focused (i.e., on the Netherlands). Yet, unexpectedly, our results showed that place attachment to the Netherlands was not related to this momentary form of flood-specific climate anxiety and also did not influence the relationship between exposure to specific climate change-related media coverage and momentary flood-specific climate anxiety, indicating that having a strong attachment to the Netherlands did not strengthen the effect of reading the news article about floods caused by climate change happening in the Netherlands on momentary climate anxiety about floods.

In contrast to our hypotheses, we also found that exposure to both types of climate change-related news articles increased both forms of momentary climate anxiety. That is, reading the global climate change article also triggered higher momentary flood-specific climate anxiety, and reading the flood article also evoked higher momentary general climate anxiety. Even more so, reading any of the two articles led to similarly high experiences of momentary general and flood-specific climate anxiety. Thus, our experimental manipulation yielded similar effects for both forms of momentary climate anxiety.

This finding calls into question whether general and flood-specific climate anxiety can actually be practically disentangled as proposed. Indeed, our results showed that momentary general and momentary flood-specific climate anxiety were highly correlated, as were persistent general and persistent flood-specific climate anxiety⁹, suggesting that the two concepts were closely related in practice and may not be as fundamentally different as initially hypothesized, and potentially overlap. However, the relationships were not perfect,

⁹ Our findings were similar to those of Wullenkord and Ojala (2023), who also reported a high correlation between micro- and macro-climate worries, which is a comparable concept to our proposed concept of general and specific climate anxiety.

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suggesting that the concepts were not identical; there seemed to be some distinct differences between general and flood-specific climate anxiety, regardless of their timeframe (i.e., persistent or momentary experiences of the two forms of climate anxiety). Indeed, the results also indicated that people who experienced higher flood-specific climate anxiety usually also experienced higher general climate anxiety, but those who experienced higher general climate anxiety did not automatically also experience higher flood-specific climate anxiety, suggesting that experiencing anxiety about global climate change was a prerequisite to experiencing anxiety about floods caused by climate change, but not vice versa.

Consequently, this finding implied that general and more specific forms of climate anxiety can indeed be distinguished from each other, at least to some degree, thereby supporting our theory. Thus, in contrast to previous research suggesting that people commonly experience anxiety about large-scale consequences and more abstract climate change risks like animal extinction or human death (e.g., van Valkengoed & Steg, 2023), our findings demonstrated that people can also experience anxiety about very explicit and specific climate change risks. Therefore, when studying climate anxiety, it is important to take the context of this anxiety into account (i.e., general and global or specific and place-focused). Future research should also investigate whether other specific forms of climate anxiety exist. For example, it could be tested whether people experience heat-specific climate anxiety, that is, whether they experience anxiety about climate change-caused heatwaves and their potential outcomes, particularly in those areas that are frequently hit by heatwaves (e.g., Greece, or Spain).

Furthermore, our results showed that persistent experiences of general and flood-specific climate anxiety positively predicted momentary experiences of general and flood-specific climate anxiety: Participants who experienced higher climate change-related anxiety over a longer time, also reported stronger climate anxiety in a given moment. However, as this was studied cross-sectionally, a causal link could not be established.

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Nevertheless, given the significant and moderately strong correlations between persistent and momentary forms of climate anxiety, it seems possible that momentary climate anxiety also predicts persistent climate anxiety, suggesting a reciprocal relationship between these climate anxiety constructs. Taking the experimental findings into account that reading either of the climate change-related news articles caused higher momentary general and flood-specific climate anxiety, this suggests that reading any news article that reports about anything related to global climate change and its impacts has the potential to trigger momentary climate anxiety, in its general and more specific form(s). As climate news is ubiquitous nowadays, this means that individuals are constantly confronted with triggers for momentary forms of general and specific climate anxiety. At some point, this experience could translate into more persistent forms of general and specific climate anxiety; for instance, when individuals have difficulties regulating their momentary climate change-related emotions, they may employ maladaptive or ineffective strategies for managing these emotions, like trying to avoid experiencing these climate change-related emotions or ruminating about climate change, which can lead to an accumulation of negative climate change-related emotions, resulting in a persistent experience of negative climate change-related emotions like climate anxiety (Salters-Pedneault et al., 2006; see also van Valkengoed et al., 2023). Thus, this assumption would point to a model in which momentary and persistent climate anxiety (in both forms) mutually influence each other, and exposure to climate change-related media coverage acts as a third variable that reinforces momentary climate anxiety. It would be worthwhile to investigate this scenario in an experimental longitudinal study, testing whether reading news on global climate change and its more specific impacts daily over a longer period, which each triggers momentary forms of climate anxiety, would lead to developing persistent forms of climate anxiety. If the results were to confirm our assumption, this could be a first starting point for developing a theory that can actually account for how climate anxiety starts, as called for by van Valkengoed and colleagues (2023).

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Even more, in combination with our (experimental) findings, such results would suggest that research on coping with momentary climate anxiety and its omnipresent media-related triggers is urgently needed to stop this effect. Our model indicates two possible intervention moments: The first moment is between the exposure to climate change-related media coverage and the momentary experience of climate anxiety (in the general and specific forms). Developing strategies that help people avoid the negative emotional response to climate change-related news, like building resilience (Shao & Yu, 2023), is essential here. The second moment is between the momentary and the persistent experience of climate anxiety. Action plans are needed to equip people with appropriate skills, such as mindfulness (Whitmarsh et al., 2022; see also van Valkengoed et al., 2023), to prevent their momentary emotional experiences from turning into constant rumination and worry. People need to know and learn how they can best deal with their momentary experiences of climate anxiety and the constant exposure to media reporting on climate change. Indeed, previous research found that those who experienced higher climate anxiety were also likely to suffer from other mental health issues potentially detrimental to their well-being, like higher depression and general anxiety symptoms (e.g., Schwartz et al., 2023) and increased stress (Thomson & Roach, 2023). Thus, more research is crucial to not only comprehend how to support individuals experiencing (general and specific) climate anxiety (regardless of its timeframe) (van Valkengoed & Steg, 2023), but also to train mental health professionals to provide this support (Baudon & Jachens, 2021; IPCC, 2022a).

Overall, these findings demonstrate that exposure to climate change-related media coverage increases climate anxiety, in a general and flood-specific form. However, it would be misleading to conclude that reporting on climate change is the main cause of experiencing climate anxiety. Rather the changing climate itself is the reason for the experience of climate anxiety. Thus, to face climate anxiety, global climate change itself needs to be addressed.

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Factually accurate reporting on climate change is therefore essential, even non-negotiable, to ensure that climate goals are met and that governments and companies are held accountable.

Measurement of Climate Anxiety Matters

Furthermore, our findings clearly indicated that the choice of measurement used to assess climate anxiety significantly impacts the results. Specifically, it is important to highlight that our participants experienced persistent general and flood-specific climate anxiety only to a very limited extent. This is surprising given that the present sample consisted predominantly of young adults, who are often reported to be (very) concerned about climate change and its impacts, sometimes even more so than older adults (e.g., Hickman et al., 2021; Pew Research Center, 2021; Rocchi et al., 2023). Younger individuals have also been found to be more likely to experience climate anxiety (Whitmarsh et al., 2022).

These low scores might be explained by one of the measurements utilized in our study, namely the HEAS-13 (Hogg et al., 2021). When using the same scale, several other studies also reported low scores for persistent climate anxiety (e.g., Hogg et al., 2021; Hogg et al., 2023; Rocchi et al., 2023; Sampaio et al., 2023; Türkarslan et al., 2023). Although it is widely recognized that the experience of climate anxiety is not pathological (e.g., Clayton, 2020; Pihkala, 2020), the HEAS-13 was (partly) developed based on existing clinical scales (Hogg et al., 2021) and focuses on broader anxiety symptoms, like behaviours and cognitions. Another popular measure of persistent climate anxiety is the Climate Change Anxiety Scale (CCAS; Clayton & Karazsia, 2020) which was also developed based on clinical measurements for impairment and rumination (Ogunbode et al., 2022). Unsurprisingly, studies utilizing the CCAS also reported lower scores for persistent general climate anxiety (e.g., Innocenti et al., 2021; Schwartz et al., 2023; Thomson & Roach, 2023; Whitmarsh et al., 2022). Thus, it appears that these more clinical and symptom-focused measures of persistent climate anxiety more often find this floor effect.

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In contrast, our participants scored considerably higher on momentary climate anxiety (both, general and flood-specific), compared to persistent climate anxiety. The measure used to assess this momentary experience of climate anxiety (i.e., the STAI adaptation; Maran & Begotti, 2021) focused more on the emotional experience of anxiety in a given moment, rather than broader anxiety symptoms. Indeed, other studies using the STAI adaptation also reported higher scores of momentary climate anxiety (e.g., Maran & Begotti, 2021; Ogunbode et al., 2022). This difference in scores with different measurements suggests that people commonly experience climate anxiety as a more emotional experience in a given moment rather than a persistent experience characterized by certain behaviours and cognitions (and potentially impairments). Thus, individuals can experience climate anxiety as an emotional response without being impaired in daily functioning (see also Chan et al., 2024). This is an important finding as this response (emotions versus behaviours and cognitions) is a crucial criterion in defining climate anxiety (van Valkengoed et al., 2023).

Therefore, whether researchers measure climate anxiety as a more symptom-focused or emotion-focused experience matters and has important implications for the conclusions drawn from studies. Our findings demonstrated that depending on the utilized measurement of climate anxiety, prevalence rates vary substantially (see also Chan et al., 2024). Indeed, some studies find that climate anxiety is highly prevalent among participants (e.g., Hickman et al., 2021), while others find relatively low prevalence rates (e.g., Whitmarsh et al., 2022). Notably, researchers often do not explicitly specify what type of climate anxiety they assess, using the same label for symptom-focused and emotion-focused climate anxiety. This practice obfuscates important differences and leads to confusion within the scientific literature. Our findings clarify this issue by showing that these differences in prevalence rates are related to the utilized measurement instruments. It is thus essential for researchers to specify whether climate anxiety is assessed as an ongoing symptomatic experience or as a purely emotional experience in a given moment.

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The Role of Place Attachment

In addition, previous research suggests that individuals who are strongly attached to a place attribute high personal meaning to it (Ilovan & Markuszewska, 2022) and are more aware of environmental risks specific to that place, like specific climate change consequences (Bonaiuto et al., 2016). When exposed to media coverage reporting on local climate change impacts, these individuals may perceive greater immediate climate change-related risks and negative emotions, like specific climate anxiety (see van Valkengoed et al., 2021). Based on this, we hypothesized that individuals with a stronger attachment to the Netherlands would be particularly sensitive to media coverage of floods caused by climate change happening in the Netherlands, leading to higher flood-specific climate anxiety. However, we found no relationship between place attachment and this momentary flood-specific climate anxiety, nor did place attachment influence the effect of flood-specific media coverage on this flood-specific climate anxiety. This implied that, despite participants having, on average, a moderately strong attachment to the Netherlands, this did not impact their momentary climate anxiety about floods after reading the flood article.

A potential explanation for this may be the varying risk levels in different areas. Bonaiuto and colleagues (2011) found that, compared to living in an area with lower flood risk, living in a high-flood-risk area increased perceived flood risk and concern about floods, which logically should lead to increased flood-specific climate anxiety. The utilized flood-specific news article reported on the flood in Valkenburg, a city in Limburg with a relatively high flood risk, while most participants lived in Groningen where the flood risk is relatively low (Klimaateffectatlas, n.d.). Thus, the flood article focused on a region with a different flood risk than most of the participants lived in, which might have led them to perceive the risk of experiencing a flood in Groningen as low (Bonaiuto et al., 2016) and therefore be less worried about floods, resulting in lower flood-specific climate anxiety. Yet, Bonaiuto et al. (2011) also found that higher place attachment increased the perceived flood risk and concern

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about floods. Our participants showed moderately strong attachment to the Netherlands, which should have been associated with higher flood-specific climate anxiety, but was not. It is possible that these two effects cancelled each other out, such that the combination of higher place attachment to the Netherlands but mostly living in a low-flood-risk area (i.e., Groningen) resulted in no relationship between place attachment and flood-specific climate anxiety. Thus, the choice of the area reported on in the flood article might have influenced our results in terms of the perceived risk of floods and the resulting experience of flood-specific climate anxiety. It may have been better for the flood article to report on previous floods in the province of Groningen.

Additionally, Bonaiuto et al. (2011) also found that higher place attachment and living in a low-risk area was related to more preventive behaviours prior to a flood, like collecting valuable and necessary items (e.g., documents, medicine). Thus, it could also be that most of our participants felt more prepared to handle a flood, which might also explain why place attachment did not influence the effect of reading news about floods in the Netherlands on flood-specific climate anxiety. These possible explanations imply that the relationship between place attachment and climate anxiety is more complex than we initially thought.

Furthermore, it is necessary to comment on our measure of place attachment: We assessed national place attachment to the Netherlands (e.g., with the item “I am very attached to the Netherlands”). And although place attachment can be measured on a national level (Wullenkord et al., 2020), this national attachment was not related to flood-specific climate anxiety, potentially because this scale level was too abstract. Indeed, the flood risk greatly varies across the Netherlands (Klimaat-effectatlas, n.d.); most participants lived in Groningen where the flood risk is relatively low (Klimaat-effectatlas, n.d.). This geographical context might have obscured the relationship between place attachment and momentary flood-specific climate anxiety. So, there might have been a mismatch in the focus of the place attachment measurement and the flood-specific news article. Acknowledging this limitation, it might

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have been more appropriate to measure place attachment on a local level (e.g., Groningen), and then also present the above-suggested article reporting on floods in the area of Groningen to be able to properly assess the relationship between exposure to flood-specific media coverage, local place attachment, and flood-specific climate anxiety.

Limitations

Several other limitations regarding the experimental manipulation should be considered when interpreting the present findings. Given that the sample consisted of predominantly students, news articles might have not been the best choice for the manipulation. Young people often consume news in formats other than news articles, such as videos (e.g., YouTube), or posts on social media (e.g., Instagram, TikTok, X, etc.) (Newman et al., 2023). Thus, using articles to present news about global climate change and its specific impacts might not have accurately reflected how young people actually encounter news about climate change and its impacts. As a result, reading one of our news articles might not have elicited the same (strength of) emotions as other formats potentially might have done, thereby potentially biasing our results and conclusions.

Additionally, the presented news articles were about 500 words each. Some participants might have perceived this as too long and not completely engaged with the content of the article. Indeed, some of the provided titles consisted of only one word. Yet, when the word matched the overall content of the article, the survey answers of the participants were kept for the analyses. This might have slightly confounded the results.

Finally, it is noteworthy that both climate change-related news articles were negative in valence, while the control article was neutral. However, it may be the case that reading negative news in general is already sufficient to trigger negative emotions (see Huff, 2022). Thus, it might have been useful to include an additional control article unrelated to climate change but still negative in valence, like news about the war in Ukraine. This could have helped to determine whether the negative emotional response (i.e., climate anxiety) was

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specific to the climate change content or a general reaction to any negative news.

Understanding this distinction would be crucial for accurately interpreting the emotional impact of climate change-related news.

Despite these limitations, the present findings clearly demonstrated that exposure to climate change-related media coverage leads to experiencing a variety of negative emotions (e.g., anger, worry, tension, being terrified), which can further feed into the experience of general and flood-specific climate anxiety.

Conclusion

Taken together, the present study further validated previous findings that exposure to media coverage of global climate change leads to momentary general climate anxiety.

Additionally, we provided first empirical evidence that exposure to media coverage of specific climate change impacts in specific places (i.e., floods in the Netherlands) leads to a specific form of momentary climate anxiety (i.e., momentary flood-specific climate anxiety).

Unexpectedly, place attachment to the Netherlands was not associated with this flood-specific climate anxiety, nor did it influence the relationship between exposure to specific climate change impacts media coverage and momentary flood-specific climate anxiety. Interestingly, both news articles had the same effect on momentary general and flood-specific climate anxiety, raising questions about whether the two forms of climate anxiety can be distinguished from each other. However, as the two constructs were highly yet not perfectly correlated, there seemed to be some distinct differences that allowed for their differentiation. These findings imply that people not only experience anxiety about global climate change and abstract threats related to it but also about very explicit and specific climate change consequences in specific places. The present findings also showed that persistent climate anxiety predicted momentary climate anxiety, indicating that individuals who experience climate anxiety over a longer period were more likely to also experience this climate anxiety in a given moment. The correlation between persistent and momentary climate anxiety

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suggests a potential reciprocal relationship between these two concepts. This points to a model in which persistent and momentary climate anxiety mutually influence each other, with reading climate change-related news reinforcing momentary climate anxiety. Given the ubiquity of climate change news, these findings imply that individuals experiencing climate anxiety should receive professional support. Moreover, the study findings highlight that the measurement of climate anxiety matters for prevalence distributions and study conclusions. Future research is essential to understand how to safeguard factually accurate reporting on the climate crisis while protecting people's mental health and well-being.

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Appendix A**Qualtrics Survey (Including News Articles Used for Experimental Manipulation)**

First, please answer the following questions about yourself.

Are you currently living in the Netherlands?

- Yes
- No

For how long have you already been living in the Netherlands?

- less than 1 year
- 1-2 years
- 2-5 years
- 5-10 years
- 10 years or more

How old are you?

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I identify as ...

- a woman.
- a man.
- non-binary.
- neither.
- I wish not to say.

Do you have a Dutch nationality?

- Yes
- No

Are you currently a student? ¹⁰

- Yes
- No

Now, please carefully read the following excerpts from an online news article: ¹¹

In these first few years of his young tennis career, Carlos Alcaraz has relished making the near impossible seem	Scientists have delivered a “final warning” on the climate crisis, as rising greenhouse gas emissions	The flood that struck Limburg, the southernmost province of the Netherlands, in July 2021 was a
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¹⁰ This question was only asked in the social media version of the questionnaire; all SONA participants were students.

¹¹ This item was randomized: Participants randomly received one of the three options to read.

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<p>routine. He has performed at such a high level so consistently, learned from his mistakes at warp speed and, even when he has struggled badly, so often he has somehow found a way through.</p> <p>This time, he could not. Despite a spirited comeback at the death, a pitiful start from the second seed left him with far too much to do against Alexander Zverev, who maintained a high level across four sets and held on in a tough fourth set to win 6-1, 6-3, 6-7 (2), 6-4 and reach the semi-final of the Australian Open.</p> <p>As a result, Zverev, the sixth seed, and the third seed Daniil Medvedev will duel</p>	<p>push the world to the brink of irrevocable damage that only swift and drastic action can avert.</p> <p>The Intergovernmental Panel on Climate Change (IPCC), made up of the world's leading climate scientists, set out the final part of its mammoth sixth assessment report. The comprehensive review of human knowledge of the climate crisis took hundreds of scientists eight years to compile and runs to thousands of pages, but boiled down to one message: Act now, or it will be too late.</p> <p>The UN secretary general, António Guterres, said: "This report is a clarion call to massively fast-track</p>	<p>catastrophic event that surpassed even the worst-case scenarios. It was triggered by heavy rainfall in the neighboring hilly regions of Germany, the Ardennes in Belgium, and Belgian Limburg, causing the Maas (Meuse) River to rapidly overflow, leading to severe flooding in Limburg.</p> <p>Despite existing protective measures, the Maas struggled to hold the massive influx of water within a short number of days. Thousands of residents in towns and villages along the Maas, including parts of Maastricht, Roermond, Roerdalen, Venlo, and Valkenburg were forced to evacuate at short notice, abandoning their homes and</p>
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<p>for a spot in the final on Sunday. Earlier in the day, Medvedev maintained his composure in the uncomfortable heat, holding on against a resurgent Hubert Hurkacz to return to the semi-finals in Melbourne with a 7-6 (4), 2-6, 6-3, 5-7, 6-4 win.</p> <p>Alcaraz entered Rod Laver Arena on Wednesday night favoured to crush his lower-ranked opponent, but their history underlined the potential danger ahead.</p> <p>Zverev held a narrow 4-3 record against Alcaraz, which included one of the best matches of his career to defeat the Spaniard at the 2022 French Open.</p> <p>It quickly became clear that</p>	<p>climate efforts by every country and every sector and on every timeframe. Our world needs climate action on all fronts: Everything, everywhere, all at once”.</p> <p>In sober language, the IPCC set out the devastation that has already been inflicted on swathes of the world.</p> <p>Extreme weather caused by climate breakdown has led to increased deaths from intensifying heatwaves in all regions, millions of lives and homes destroyed in droughts and floods, millions of people facing hunger, and “increasingly irreversible losses” in vital ecosystems.</p> <p>Kaisa Kosonen, a climate expert at Greenpeace International, said: “This</p>	<p>belongings.</p> <p>Prime Minister Mark Rutte characterized the situation as “extremely serious”, and the affected areas of Limburg were declared disaster zones.</p> <p>This disastrous event underscored the vulnerability of the Netherlands to extreme weather events exacerbated by the climate crisis: We will be heavily affected by not only floods but also snowfall, drought, and hail much more often in the near future.</p> <p>On July 16, 2021, the Maas recorded its highest flow since the 17th century, reaching a flux of 3168 cubic meters per second, which was 20 times greater</p>
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<p>Zverev was in a similar mood, swinging freely, while Alcaraz was shaky from the beginning. He set the tone by immediately handing over the first break to love with a dire, error-strewn opening service game.</p>	<p>report is definitely a final warning on 1.5C. If governments just stay on their current policies, the remaining carbon budget will be used up before the next IPCC report [due in 2030]”.</p>	<p>than the average. The water levels soared to a record 5 meters above NAP (Normaal Amsterdams Peil, the standard Amsterdam water level used for measurement across Europe), described as “just below the doom scenario”.</p>
<p>Throughout the first two sets, Zverev served well, scrambled from behind the baseline, drawing errors with his defence and picked his moments well to move inside the baseline and attack. Alcaraz simply could not keep his error count down and finished the first set with two winners and 10 unforced errors. After seemingly starting to find his feet early in the second, the set fell away with haste, his unforced errors piling up</p>	<p>More than 3bn people already live in areas that are “highly vulnerable” to climate breakdown, the IPCC found, and half of the global population now experiences severe water scarcity for at least part of the year. In many areas, the report warned, we are already reaching the limit to which we can adapt to such severe changes, and weather extremes are “increasingly driving displacement” of people in Africa, Asia,</p>	<p>“What we are experiencing now has never happened before in the history of our province”, says dijkgraaf Patrick van der Broek of the Limburg water authority, emphasizing the unprecedented nature of the situation, attributing it to an extreme accumulation of rainfall in the region combined with a substantial influx of water from the neighboring Belgian Ardennes, Germany, and</p>

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<p>again.</p> <p>It was not until his last stand, with Zverev serving for the match at 5-3, that Alcaraz found a brief moment of inspiration. He played a brilliant return game, closing down the net to seal the break as the crowd erupted and then his attacking all-court game flowed through an irresistible tiebreak as he forced a fourth set.</p> <p>The momentum had flipped and Alcaraz spent much of the fourth set pushing Zverev back. Under immense pressure from the beginning, Zverev continued to serve extremely well, he hung with Alcaraz in the frantic cat-and-mouse rallies</p>	<p>North, Central and South America, and the south Pacific.</p> <p>The world heats up in response to the accumulation of carbon dioxide and other greenhouse gases in the atmosphere, so every year in which emissions continue to rise eats up the available “carbon budget” and means much more drastic cuts will be needed in future years.</p> <p>Yet there is still hope of staying within 1.5C, according to the report.</p> <p>Hoesung Lee, the chair of the IPCC, said: “This synthesis report underscores the urgency of taking more ambitious action and shows that, if we act now, we can still secure a livable</p>	<p>France.</p> <p>“The situation is very unique not only because the water level and discharge have become extremely high in a short time, but also because this happened in the summer”, a Rijkswaterstaat spokesperson said in an interview with nu.nl.</p> <p>Valkenburg was hit the hardest and suffered significant damage, including the destruction of a bridge and the Eurlings weather station, along with two decades’ worth of weather data. The army intervened to construct an emergency bridge over the River Geul after the original bridge was swept away. The Geul transformed into a</p>
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<p>that the Spaniard initiated and held on there long enough for Alcaraz’s level to fall as he closed a dramatic win.</p> <p>“With the level that I was playing before, coming into this match with a lot of confidence, knowing that I’m playing good tennis, it’s a shame that I started the match like the way that I did and ending the way that I did. But it’s tennis”, Alcaraz said.¹²</p>	<p>sustainable future for all”.</p> <p>Guterres called on governments to take drastic action to reduce emissions by investing in renewable energy and low-carbon technology. He said rich countries must try to reach net zero greenhouse gas emissions “as close as possible to 2040”, rather than waiting for the 2050 deadline most have signed up to.</p> <p>He said: “The climate timebomb is ticking. But today’s report is a how-to guide to defuse the climate timebomb. It is a survival guide for humanity. As it</p>	<p>wide, turbulent muddy river, flooding low-lying parts of the town. The total damage in Valkenburg was estimated at 400 million euros.</p> <p>Fortunately, no one died and the existing flood prevention measures in Limburg were effective – the damages were much worse in western Germany and Belgium.</p> <p>However, this event underscored the increasing frequency of unpredictable extreme weather events in the Netherlands due to climate change. If this much rain fell in the Randstad, neither Rotterdam nor Delft would have been able to handle it, leaving the cities totally flooded.</p>
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¹² Control condition: The presented tennis article was slightly shortened and adjusted from the original news article published by Carayol (2024) in *The Guardian*: The title, the two sub-headers, the last three paragraphs as well as the photographs of the players that were displayed in the original article were not presented in the survey.

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	<p>shows, the 1.5C limit is achievable".¹³</p>	<p>Can we safely assume that this disastrous July flood was a rare anomaly? We better not. The flood timebomb is ticking. With the intensifying climate crisis, we urgently need to take measures before the next flood strikes and leaves behind irreversible damage.</p> <p>14</p>
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Imagine you are the editor for the newspaper that is publishing this text as a news article.

What title would you give this article?

¹³ General climate change news condition: The presented climate change article about the IPCC report was shortened and adjusted from the original publication by Harvey (2023) in *The Guardian*: The title and sub-headers, multiple paragraphs, and the video, photographs and graphs shown in the original article were not presented to participants.

¹⁴ Specific climate change impact news condition: The presented flood article about the flood in Valkenburg was composed of two different news articles, published by the NL Times (2022) and by Sharma (2021) in *The Holland Times*. Several parts of each article were used for the presented text in the survey; the wording was adjusted to match the tone of the IPCC text.

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After reading the article, how do you *currently* feel about **climate change**? ¹⁵

	Not at all	Somewhat	Moderately	Very much	Extremely
Calm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peaceful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worried	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Terrified	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹⁵ Immediately after reading the text, we assessed present emotional experiences concerning a) climate change and b) potential flooding events caused by climate change happening in the Netherlands. The order of these two questions was randomized: All participants had to answer both questions, however, the order in which these two questions were presented was random.

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After reading the article, how do you *currently* feel about the possibility of **floods caused by climate change happening in the Netherlands?**

	Not at all	Somewhat	Moderately	Very much	Extremely
Calm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tense	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Relaxed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peaceful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worried	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Terrified	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

MEDIA AND GENERAL AND FLOOD-SPECIFIC CLIMATE ANXIETY

Over the last 2 weeks, how often have you experienced the following because of **climate change**?¹⁶

	Not at all	Several days	Over half of the days	Nearly every day
Feeling nervous, anxious or on edge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not being able to stop or control worrying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unable to stop thinking about future climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹⁶ After the two questions regarding participants' present emotional experiences, we assessed their more persistent anxiety experiences regarding a) climate change and b) potential flooding events caused by climate change happening in the Netherlands. Here too, the order of the two questions was randomized: All participants had to answer both questions, however, the order in which these two questions were presented was random.

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Unable to stop thinking about past events related to climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unable to stop thinking about climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty sleeping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty enjoying social situations with family and friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty working and/or studying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling anxious about the impact of your personal behaviours on climate change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Feeling anxious
about your
personal
responsibility to
help address
climate change



Feeling anxious
that your personal
behaviours will
do little to help
fix climate
change



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Over the last 2 weeks, how often have you experienced the following because of the possibility of **floods caused by climate change happening in the Netherlands**?

	Not at all	Several days	Over half of the days	Nearly every day
Feeling nervous, anxious or on edge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not being able to stop or control worrying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Unable to stop
thinking about
future floods
caused by climate
change happening
in the
Netherlands



Unable to stop
thinking about
past events
related to floods
caused by climate
change happening
in the
Netherlands



Unable to stop
thinking about
floods caused by
climate change
happening in the
Netherlands



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Difficulty sleeping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty enjoying social situations with family and friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Difficulty working and/or studying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling anxious about the impact of your personal behaviours on floods caused by climate change happening in the Netherlands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

MEDIA AND GENERAL AND FLOOD-SPECIFIC CLIMATE ANXIETY

Feeling anxious
about your
personal
responsibility to
help address
floods caused by
climate change
happening in the
Netherlands



Feeling anxious
that your personal
behaviours will
do little to help
fix floods caused
by climate change
happening in the
Netherlands



Have you ever experienced a flood?

- Yes
- No

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How severe was the flood you experienced? ¹⁷

- Not severe at all
- Somewhat severe
- Moderately severe
- Very severe
- Extremely severe

The following section is about how you perceive yourself in relation to your environment.

Please think of the Netherlands (as the place in which you currently live) and indicate how much you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
I am very attached to the Netherlands.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Netherlands is very special to me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

¹⁷ This question was only displayed if the answer to the previous question was “yes”.

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I identify strongly

with the

Netherlands.

The Netherlands

is the best place

for what I like to

do.

No other place

can compare to

the Netherlands.

I wouldn't

substitute any

other place for

doing the types of

things I do in the

Netherlands.

Appendix B

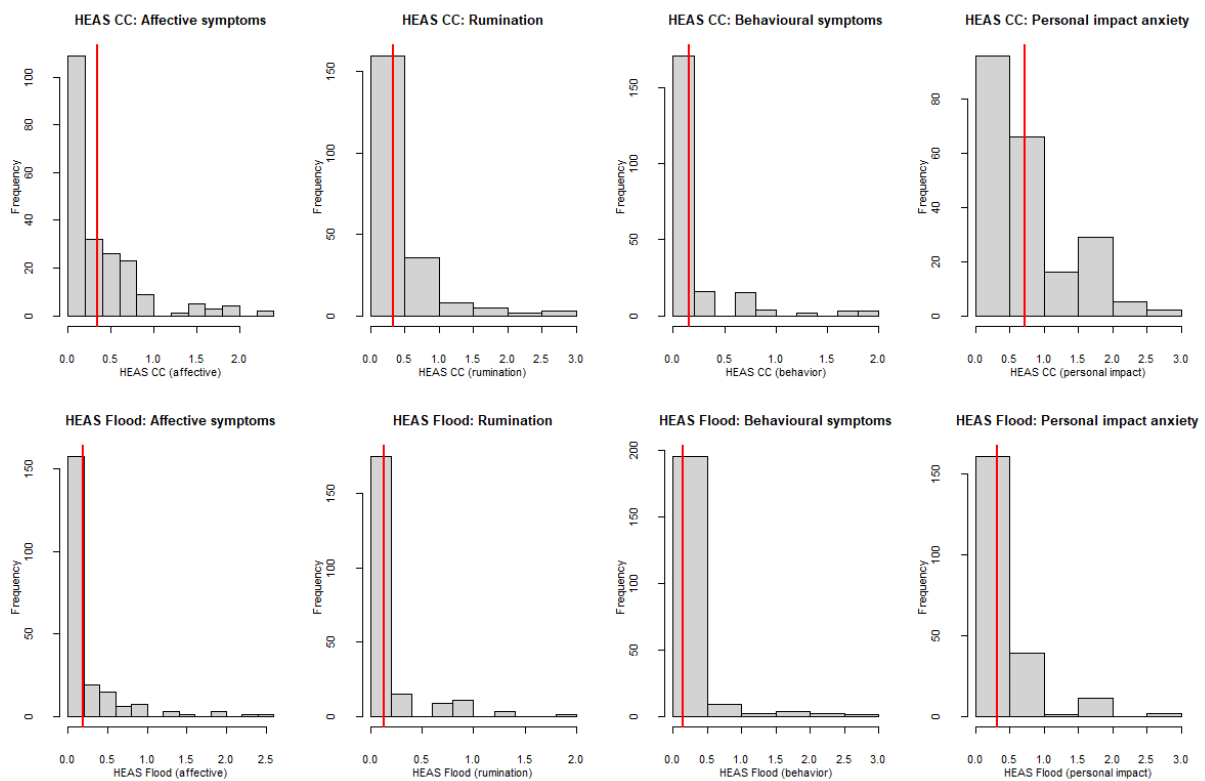
The Relationship Between Each of the Four Subscales of Persistent General and Flood-Specific Climate Anxiety and Momentary General and Flood-Specific Climate Anxiety

Descriptives

Concerning persistent general climate anxiety, the means of all four subscales were low (Figure B1), with the behavioural symptoms subscale having the lowest mean and the personal impact anxiety subscale the highest mean (affective symptoms: $M = 0.3$, $SD = 0.5$; rumination: $M = 0.3$, $SD = 0.6$; behavioural symptoms: $M = 0.2$, $SD = 0.4$; personal impact

Figure B1

Graphical Representations of Distributions and Means of the Four Subscales of Persistent General and Flood-Specific Climate Anxiety



Note. Means are illustrated with red lines. HEAS CC = Persistent general climate anxiety; HEAS Flood = Persistent flood-specific climate anxiety.

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anxiety: $M = 0.7$, $SD = 0.7$). Likewise, the means of all four subscales of persistent flood-specific climate anxiety were also low, with the personal impact anxiety subscale having the highest mean, while the other three subscales were similarly low (affective symptoms: $M = 0.2$, $SD = 0.4$; rumination: $M = 0.1$, $SD = 0.3$; behavioural symptoms: $M = 0.1$, $SD = 0.4$; personal impact anxiety: $M = 0.3$, $SD = 0.6$).

Bivariate Correlations

We computed the bivariate correlations between the two momentary forms of climate anxiety, each of the four subscales of the two persistent forms of climate anxiety, and place attachment (Table B1). Momentary general and flood-specific climate anxiety were again highly and significantly correlated, $r(212) = .72$, $p < .001$. Momentary general climate anxiety was significantly and moderately to highly related to all subscales of the two forms of persistent climate anxiety, except for the behavioural symptoms subscale of persistent flood-specific climate anxiety, $r(212) = .06$, $p = .335$. In contrast, momentary flood-specific climate anxiety was significantly moderately associated with all subscales of persistent general and flood-specific climate anxiety. All subscales of persistent general and flood-specific climate anxiety were moderately to highly and significantly associated with each other. Place attachment was (very) weakly related to momentary climate anxiety (both, general and flood-specific) and all four subscales of persistent general and flood-specific climate anxiety.

Linear Regression Analyses

General Climate Anxiety

We conducted four linear regression analyses to examine the relationship between each of the four subscales of persistent general climate anxiety and momentary general climate anxiety: Each model included one of the four subscales as the predictor and momentary general climate anxiety as the outcome variable (Table B2).

The first regression model was significant (Model A), $F(1, 212) = 50.72$, $p < .001$, and explained 19% of the variance ($Adj. R^2 = .19$). The results demonstrated that there was a

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Table B1

Pearson's Correlations between Momentary General and Flood-Specific Climate Anxiety, The Four Subscales of Persistent General and Flood-Specific Climate Anxiety, and Place Attachment

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Momentary General CA	-										
2. Momentary Flood-Specific CA	.72 ***	-									
3. Persistent General CA: Affective symptoms	.44 ***	.45 ***	-								
4. Persistent General CA: Rumination	.37 ***	.37 ***	.83 ***	-							
5. Persistent General CA: Behavioural symptoms	.20 **	.27 ***	.62 ***	.59 ***	-						
6. Persistent General CA: Personal impact anxiety	.56 ***	.43 ***	.68 ***	.61 ***	.42 ***	-					
7. Persistent Flood-Specific CA: Affective symptoms	.20 **	.38 ***	.72 ***	.64 ***	.65 ***	.43 ***	-				
8. Persistent Flood-Specific CA: Rumination	.19 **	.31 ***	.52 ***	.51 ***	.54 ***	.35 ***	.68 ***	-			
9. Persistent Flood-Specific CA: Behavioural symptoms	.06	.23 ***	.50 ***	.50 ***	.78 ***	.29 ***	.70 ***	.54 ***	-		
10. Persistent Flood-Specific CA: Personal impact anxiety	.33 ***	.40 ***	.56 ***	.52 ***	.53 ***	.55 ***	.64 ***	.65 ***	.50 ***	-	
11. Place attachment	-.04	.01	-.05	-.10	.03	-.05	.11	.12	.00	.02	-

Note. *** $p < .001$, ** $p < .01$, * $p < .05$. CA = Climate anxiety.

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significant effect of affective symptoms related to persistent general climate anxiety on momentary general climate anxiety ($b = 5.88, p < .001, 95\% \text{ CI } [4.25, 7.51]$): The stronger one's affective symptoms (e.g., feeling anxious or worrying) regarding the persistent experience of general climate anxiety were, the stronger the momentary experiences of general climate anxiety.

The second model was also significant (Model B), $F(1, 212) = 33.82, p < .001$, and explained 13% of the variance ($Adj. R^2 = .13$). The findings showed a significant effect of rumination related to persistent general climate anxiety on momentary general climate anxiety ($b = 4.20, p < .001, 95\% \text{ CI } [2.78, 5.63]$): The stronger one's ruminative thoughts (e.g., not being able to stop thinking about climate change) related to the persistent experience of general climate anxiety were, the stronger one's momentary feelings of general climate anxiety.

Similarly, the third model was significant (Model C), $F(1, 212) = 9.19, p = .003$, but explained only 4% of the variance ($Adj. R^2 = .04$). The results indicated a significant effect of behavioural symptoms related to persistent general climate anxiety on momentary general climate anxiety ($b = 3.56, p = .003, 95\% \text{ CI } [1.24, 5.87]$): The more behavioural symptoms (e.g., difficulties sleeping or working) related to persistent general climate anxiety were experienced, the stronger one's momentary experiences of general climate anxiety.

Likewise, the fourth model was also significant (Model D), $F(1, 212) = 98.44, p < .001$, and explained 31% of the variance ($Adj. R^2 = .31$). The findings showed a significant effect of anxiety about one's personal impact related to persistent general climate anxiety on momentary general climate anxiety ($b = 5.15, p < .001, 95\% \text{ CI } [4.12, 6.17]$): The more anxiety one experienced about one's personal impact (e.g., feeling anxious about the impact of one's personal behaviours on climate change) related to persistent general climate anxiety, the stronger one's momentary feelings of general climate anxiety.

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Table B2

Regression Results Predicting Momentary General Climate Anxiety

	Momentary General Climate Anxiety (Model A)			Momentary General Climate Anxiety (Model B)			Momentary General Climate Anxiety (Model C)			Momentary General Climate Anxiety (Model D)		
	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>
Intercepts	22.78 (0.50)	[21.79, 23.76]	< .001	23.41 (0.49)	[22.46, 24.38]	< .001	24.26 (0.48)	[23.30, 25.21]	< .001	21.09 (0.53)	[20.04, 22.14]	< .001
Persistent General Climate Anxiety: Affective symptoms	5.88 (0.83)	[4.25, 7.51]	< .001	-	-	-	-	-	-	-	-	-
Persistent General Climate Anxiety: Rumination	-	-	-	4.20 (0.72)	[2.78, 5.63]	< .001	-	-	-	-	-	-
Persistent General Climate Anxiety: Behavioural symptoms	-	-	-	-	-	-	3.56 (1.17)	[1.24, 5.87]	.003	-	-	-
Persistent General Climate Anxiety: Personal impact anxiety	-	-	-	-	-	-	-	-	-	5.15 (0.52)	[4.12, 6.17]	< .001
	<i>F</i>	50.72		33.82			9.19			98.44		
	df1, df2	1, 212		1, 212			1, 212			1, 212		
	<i>Adjusted R</i> ²	.19		.13			.04			.31		
	<i>p</i>	< .001		< .001			.003			< .001		

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

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Overall, the results of these additional regression analyses were in line with the above-mentioned finding and further confirmed Hypothesis 4 regarding the general form of climate anxiety. It showed that also the four subscales of persistent general climate anxiety positively predicted momentary general climate anxiety: The more affective symptoms, ruminative thoughts, behavioural symptoms, and anxiety about one's personal impact regarding persistent climate anxiety about general climate change was experienced, the more momentary climate anxiety about general climate change one experienced.

Flood-Specific Climate Anxiety

We conducted four linear regression analyses to examine the relationship between each of the four subscales of persistent flood-specific climate anxiety and momentary flood-specific climate anxiety: Again, each model included one of the four subscales as the predictor and momentary flood-specific climate anxiety as the outcome variable (Table B3).

The first model was significant (Model E), $F(1, 212) = 34.80, p < .001$. It explained 14% of the variance ($Adj. R^2 = .14$). The findings indicated a significant effect of affective symptoms related to persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 5.91, p < .001, 95\% \text{ CI } [3.94, 7.89]$): The stronger one's affective symptoms (e.g., feeling anxious or worrying) regarding the persistent experience of flood-specific climate anxiety were, the stronger the momentary experiences of flood-specific climate anxiety.

Also the second model was significant (Model F), $F(1, 212) = 22.08, p < .001$, and explained 9% of the variance ($Adj. R^2 = .09$). The results showed that there was a significant effect of rumination related to persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 6.32, p < .001, 95\% \text{ CI } [3.67, 8.97]$): The stronger one's ruminative thoughts (e.g., not being able to stop thinking about floods caused by climate change happening in the Netherlands) related to the persistent experience of flood-specific climate anxiety were, the stronger one's momentary feelings of flood-specific climate anxiety.

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Table B3

Regression Results Predicting Momentary Flood-Specific Climate Anxiety

	Momentary Flood-Specific Climate Anxiety (Model E)			Momentary Flood-Specific Climate Anxiety (Model F)			Momentary Flood-Specific Climate Anxiety (Model G)			Momentary Flood-Specific Climate Anxiety (Model H)		
	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>	<i>B (SE)</i>	95% CI	<i>p</i>
Intercepts	21.64 (0.46)	[20.73, 22.56]	< .001	21.92 (0.47)	[20.99, 22.84]	< .001	22.25 (0.47)	[21.33, 23.17]	< .001	21.28 (0.48)	[20.34, 22.22]	< .001
Persistent Flood-Specific Climate Anxiety: Affective symptoms	5.91 (1.00)	[3.94, 7.89]	< .001	-	-	-	-	-	-	-	-	-
Persistent Flood-Specific Climate Anxiety: Rumination	-	-	-	6.32 (1.35)	[3.67, 8.97]	< .001	-	-	-	-	-	-
Persistent Flood-Specific Climate Anxiety: Behavioural symptoms	-	-	-	-	-	-	3.65 (1.05)	[1.58, 5.72]	< .001	-	-	-
Persistent Flood-Specific Climate Anxiety: Personal impact anxiety	-	-	-	-	-	-	-	-	-	4.76 (0.74)	[3.29, 6.23]	< .001
	<i>F</i>	34.80		22.08			12.11			40.97		
	df1, df2	1, 212		1, 212			1, 212			1, 212		
	<i>Adjusted R</i> ²	.14		.09			.05			.16		
	<i>p</i>	< .001		< .001			< .001			< .001		

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

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Additionally, the third model was significant (Model G), $F(1, 212) = 12.11, p < .001$, but explained only 5% of the variance ($Adj. R^2 = .05$). The findings demonstrated a significant effect of behavioural symptoms related to persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 3.65, p < .001, 95\% CI [1.58, 5.72]$): The more behavioural symptoms (e.g., difficulties sleeping or working) related to persistent flood-specific climate anxiety were experienced, the stronger one's momentary experiences of flood-specific climate anxiety.

Similarly, the fourth model was significant (Model H), $F(1, 212) = 40.97, p < .001$, and explained 16% of the variance ($Adj. R^2 = .16$). The results indicated a significant effect of anxiety about one's personal impact related to persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 4.76, p < .001, 95\% CI [3.29, 6.23]$): The stronger anxiety one experienced about one's personal impact (e.g., feeling anxious about the impact of one's personal behaviours on floods caused by climate change happening in the Netherlands) related to persistent flood-specific climate anxiety, the stronger one's momentary feelings of flood-specific climate anxiety.

In general, and similar to above, the results of these additional regression analyses were again in line with the initial finding and further confirmed Hypothesis 4 regarding the flood-specific form of climate anxiety. It indicated that also the four subscales of persistent flood-specific climate anxiety positively predicted momentary flood-specific climate anxiety: The more affective symptoms, ruminative thoughts, behavioural symptoms, and personal impact anxiety regarding persistent climate anxiety about floods caused by climate change happening in the Netherlands was experienced, the more momentary flood-specific climate anxiety one experienced.

Appendix C

The Effect of Climate Change-Related Media Coverage on the Anxiety Items of the Scales for Momentary General and Flood-Specific Climate Anxiety

We repeated the analyses for research model 1 with the only difference being that the outcome variables were now only the anxiety items of the scales for momentary general and momentary flood-specific climate anxiety.

Bivariate Correlations

First, we computed the bivariate correlations between the anxiety items of the two forms of momentary climate anxiety and place attachment (Table C1). The anxiety items were strongly and significantly correlated, while neither of the two anxiety items was associated with place attachment.

Main Analyses with Anxiety Items

We conducted two additional ANOVAs to assess 1) whether reading the article about global climate change also had an influence on the anxiety item of momentary general climate anxiety and 2) whether reading the article about floods in the Netherlands also influenced the anxiety item of momentary flood-specific climate anxiety. With an additional linear regression, we assessed 3) the influence of place attachment on the latter relationship.

Just as for the initial analysis for Hypothesis 1, the results also yielded a significant effect of the experimental manipulation on the anxiety item of momentary general climate

Table C1

Bivariate Correlations Between the Anxiety Items of Momentary General and Flood-Specific Climate Anxiety, and Place Attachment

Variable	1.	2.	3.
1. Anxiety Item of Momentary General CA	-		
2. Anxiety Item of Momentary Flood-Specific CA	.60 ***	-	
3. Place Attachment	.01	.00	-

Note. *** $p < .001$. CA = Climate anxiety.

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anxiety, $F(2, 211) = 3.86, p = .023$. A post-hoc Tukey test showed that the control group ($M = 2.4, SD = 1.0$) scored significantly lower on the anxiety item of momentary general climate anxiety compared to the climate change group ($M = 2.9, SD = 1.0$) ($p < .046, 95\% CI [0.01, 0.86]$), and also compared to the flood group ($M = 2.8, SD = 1.0$) ($p < .037, 95\% CI [0.02, 0.82]$). The climate change group and the flood group did again not significantly differ from each other ($p = .997, 95\% CI [-0.41, 0.38]$).

Similar to the analysis findings of Hypothesis 2, the results showed the experimental manipulation also had a significant effect on the anxiety item of momentary flood-specific climate anxiety, $F(2, 212) = 9.22, p < .001$. The post-hoc Tukey test demonstrated that the control group ($M = 2.1, SD = 0.9$) also scored significantly lower on the anxiety item compared to the climate change group ($M = 2.7, SD = 1.0$) ($p = .001, 95\% CI [0.20, 0.99]$), and also compared to the flood group ($M = 2.7, SD = 1.0$) ($p < .001, 95\% CI [0.25, 0.99]$). Again, the climate change group and the flood group did not significantly differ from each other ($p = .987, 95\% CI [-0.34, 0.39]$).

Generally, these findings are in line with the conclusions for Hypotheses 1 and 2. With just the anxiety items of momentary general and flood-specific climate anxiety as outcome variables, we also found that reading the global climate change article led to significantly higher scores on the anxiety item of momentary general climate anxiety compared to reading the control article, and reading the flood article led to significantly higher scores on the anxiety item of momentary flood-specific climate anxiety compared to reading the control article (Figure C1). Yet, in both cases, participants in the climate change group and the flood group did again not significantly differ from each other: Reading the flood article also caused significantly higher scores on the anxiety item of momentary general climate anxiety, and reading the global climate change article also caused significantly higher scores on the anxiety item of momentary flood-specific climate anxiety. Thus, both types of

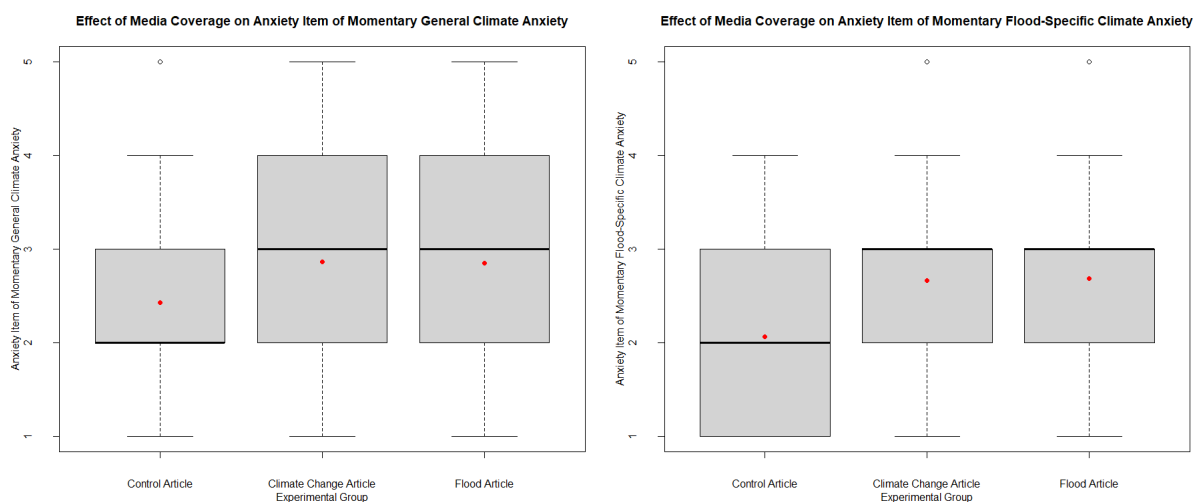
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news articles led to an increase in the score on the anxiety items of momentary general and flood-specific climate anxiety.

Subsequently, we tested the interaction effect of the experimental manipulation and place attachment on only the anxiety item of momentary flood-specific climate anxiety (Table C2). The place attachment variable was again centered. This regression model was also significant, $F(5, 208) = 4.54, p < .001$, but explained only 8% of the variance ($Adj. R^2 = .08$). The results showed again that the difference between the control group and the climate change group ($b = 0.60, p < .001, 95\% \text{ CI } [0.27, 0.93]$), as well as the difference between the control group and the flood group ($b = 0.62, p < .001, 95\% \text{ CI } [0.31, 0.93]$), had a significant effect on the anxiety item of momentary flood-specific climate anxiety. However, the effect of place attachment on the anxiety item of momentary flood-specific climate anxiety was insignificant ($b = 0.03, p = .837, 95\% \text{ CI } [-0.25, 0.31]$); this was again expected based on the

Figure C1

Boxplots Representing the Effect of Exposure to Media Coverage on the Anxiety Items of Momentary and Flood-Specific Climate Anxiety



Note. Means are illustrated with red points.

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insignificant very weak correlation¹⁸. Similarly, the difference between the interaction of the control group and place attachment and the interaction of the climate change group and place attachment was insignificant ($b = 0.23, p = .302, 95\% \text{ CI } [-0.21, 0.67]$), as was the difference between the interaction of the control group and place attachment and the interaction of the flood group and place attachment ($b = -0.23, p = .272, 95\% \text{ CI } [-0.64, 0.18]$). Thus, the findings showed that place attachment did again not moderate the relationship between the experimental manipulation and the anxiety item of momentary flood-specific climate anxiety, implying that participants with strong attachment to the Netherlands did not experience higher anxiety about floods caused by climate change happening in the Netherlands after reading the flood article.

Table C2

Regression Results Predicting the Anxiety Item of Momentary Flood-Specific Climate Anxiety

	Anxiety Item of Momentary Flood-Specific Climate Anxiety		
	<i>B</i> (<i>SE</i>)	95% CI	<i>p</i>
Intercepts	2.06 (0.12)	[1.83, 2.30]	< .001
<i>Experimental Manipulation</i> ^a			
Climate Change Group	0.60 (0.17)	[0.27, 0.93]	< .001
Flood Group	0.62 (0.16)	[0.31, 0.93]	< .001
Place Attachment	0.03 (0.14)	[-0.25, 0.31]	.837
<i>Interactions</i> ^b			
Climate Change Group x Place Attachment	0.23 (0.22)	[-0.21, 0.67]	.302
Flood Group x Place Attachment	-0.23 (0.21)	[-0.64, 0.18]	.272
	<i>F</i>	4.54	
	df1, df2	5, 208	
	<i>Adjusted R</i> ²	.08	
	<i>p</i>	< .001	

Note. B = unstandardized coefficient; SE = standard error; CI = confidence interval.

^a The experimental manipulation groups were compared to the control group.

^b The interactions were compared to the interaction of place attachment and the control group.

¹⁸ We again double-checked the correlation between the anxiety item of flood-specific climate anxiety and the centered place attachment variable; the correlation was still very weak and insignificant, $r(212) = .00, p = .944$.

Appendix D

Assumption Checks of Analyses for Research Model 1: The Effect of Exposure to Climate Change-Related Media Coverage on Momentary General and Flood-Specific Climate Anxiety

We checked whether the assumptions of the two ANOVAS utilized to test Hypotheses 1 and 2 and the regression model used to assess Hypothesis 3 were met.

Analyses of Variance

As we implemented an experimental design with randomized group allocation for testing research model 1, the assumption that observations in each group were independent was deemed satisfactory. Additionally, both ANOVA models were visually inspected for normality of residuals and homogeneity of variances (Figure D1). The plots in the upper row showed that the residuals were approximately normally distributed with some deviations at the tails (plot 1), potentially indicating minor departures from normality; and although variance was somewhat smaller in the flood group compared to the control and climate change groups, the spread of the residuals seemed reasonably consistent across the three groups (plot 2), indicating homogeneity assumption was likely satisfied. Additionally, the plots in the lower row demonstrated that the residuals were again approximately normally distributed with minor deviations at the tails (plot 3), and although the variance of the control group was slightly smaller in the control group compared to the climate change and flood groups, the variances were approximately homogeneous across the three groups (plot 4). Therefore, based on these plots, we concluded that the assumptions of both ANOVAs were satisfied, despite minor issues existing, and the models were deemed reasonably robust.

Linear Regression Model

As the model included more than one predictor variable, multicollinearity between the three predictors was tested using the variance inflation factor (VIF). Multicollinearity was not

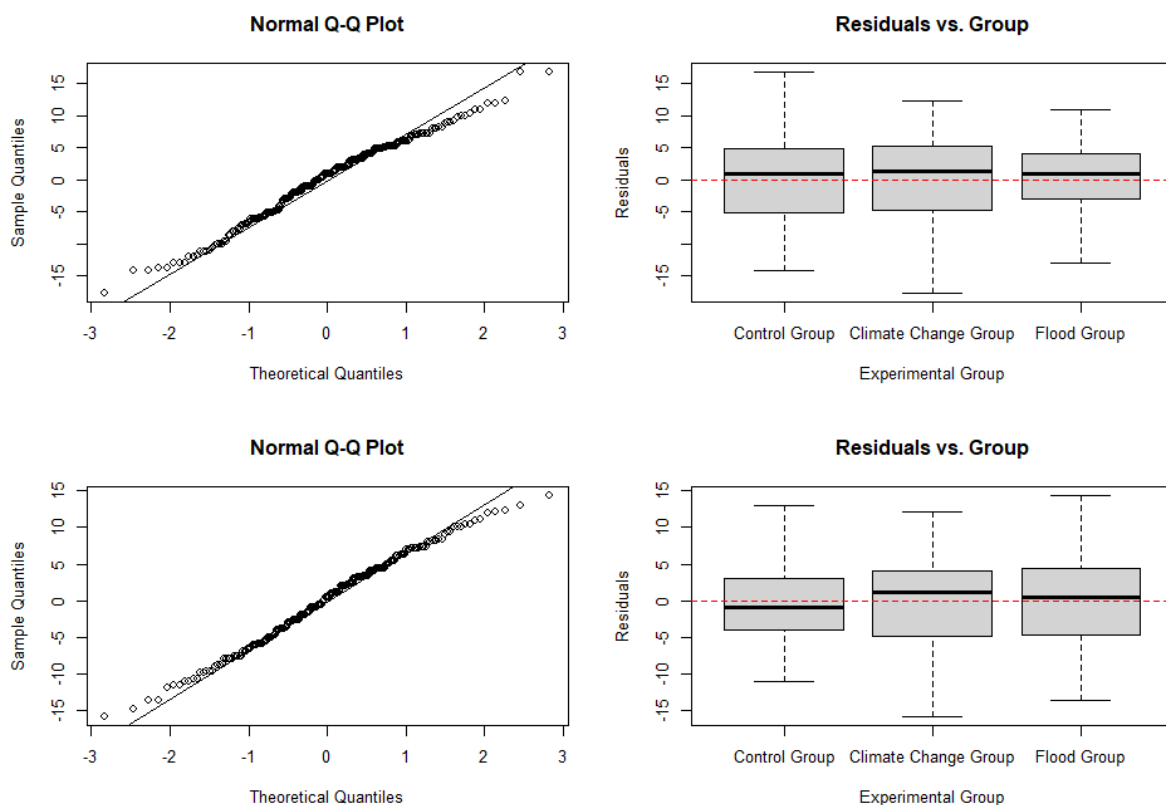
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violated as none of the variance inflation factors exceeded 10 (Myers, 1990, as cited in Field, 2009), $VIF_{\text{Group}} = 1.00$, $VIF_{\text{Place attachment}} = 2.65$, $VIF_{\text{Group} \times \text{Place Attachment}} = 2.65$.

Then, the model was graphically inspected for linearity of the data, normal distribution of the residuals, homoscedasticity, and potential influential observations (Figure D2). The plots showed that there was no clear pattern of the residuals while their variance was

Figure D1

Visual Assumption Checks of Both ANOVA Models



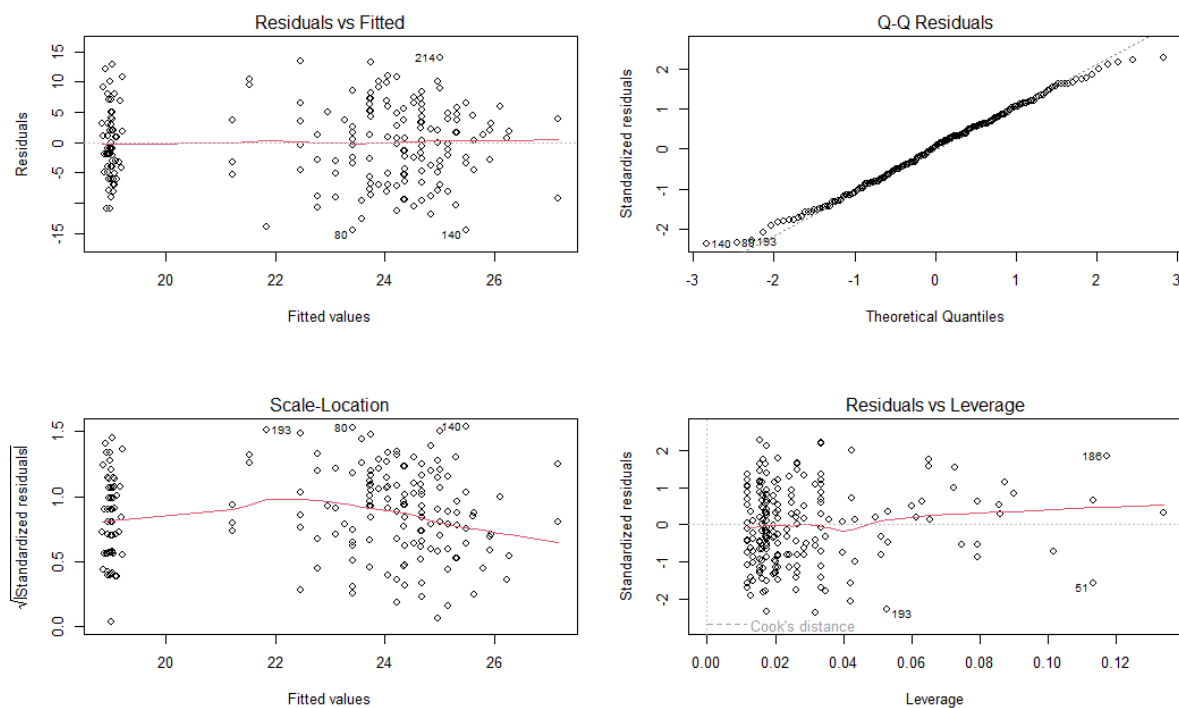
Note. Visual assumption checks for the ANOVA testing the effect of exposure to media coverage on momentary general climate anxiety are displayed in the upper row; plot 1: Normality of residuals; plot 2: Homogeneity of variances. Visual assumption checks for the ANOVA testing the effect of exposure to media coverage on momentary flood-specific climate anxiety are presented in the lower row; plot 3: Normality of residuals; plot 4: Homogeneity of variances.

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relatively constant (plot 1), suggesting that the linearity assumption was likely met and that no strong evidence for heteroscedasticity was found; the residuals were approximately normally distributed although some deviations were observed at the tails (plot 2); the supposedly horizontal line was not perfectly horizontal but the residuals scattered around this line without a clear pattern (plot 3), indicating that the homoscedasticity assumption was likely met; and some points with higher leverage were detected, yet no points were beyond the Cook's distance lines, although several points being near the line (plot 4), suggesting that there were no highly influential observations affecting the model. Based on these inspections, we concluded that the assumptions for the linear regression model were reasonably met and the model appeared to be robust.

Figure D2

Visual Assumption Checks of Regression Model Testing Hypothesis 3



Note. Plot 1: Linearity of the data; plot 2: Normal distribution of residuals; plot 3: Homoscedasticity; plot 4: Influential observations.

Appendix E

Assumption Checks for Linear Regressions Testing Research Model 2: The Relationship Between Persistent and General Climate Anxiety

We checked the assumptions for the linear regression analyses used to test the relationship between persistent general and momentary general climate anxiety as well as between persistent flood-specific and momentary flood-specific climate anxiety. As these models only included one outcome variable, multicollinearity was not assessed.

General Climate Anxiety

First, we checked the assumptions for the model testing the relationship between persistent general climate anxiety and momentary general climate anxiety (Model 1). The model was visually inspected (Figure E1). The plots suggested several issues: The residuals were clearly patterned and followed a downward trend (plot 1), indicating potential non-linearity; the residuals were approximately normally distributed although there were some deviations at the tails (plot 2); the spread of the residuals increased with increasing fitted values and the supposedly horizontal line followed an upwards trend (plot 3), indicating heteroscedasticity; and no points were detected that lie outside of the Cook's distance lines (plot 4), suggesting that there were likely no influential observations affecting the model. In addition, several outliers were observed. Given these plots, it was concluded that not all assumptions were met.

To handle these violations, the outcome variable momentary general climate anxiety was log-transformed, and analysis was repeated (Model 1b). The model was still significant, $F(1, 212) = 54.63, p < .001$, but explained only 20% of the variance ($Adj. R^2 = .20$). The results still demonstrated a significant effect of persistent general climate anxiety on momentary general climate anxiety ($b = 0.30, p < .001, 95\% \text{ CI } [0.22, 0.38]$). The more persistent general climate anxiety was experienced, the stronger one's momentary experiences of general climate anxiety. Thus, the conclusions of the regression analysis with the updated

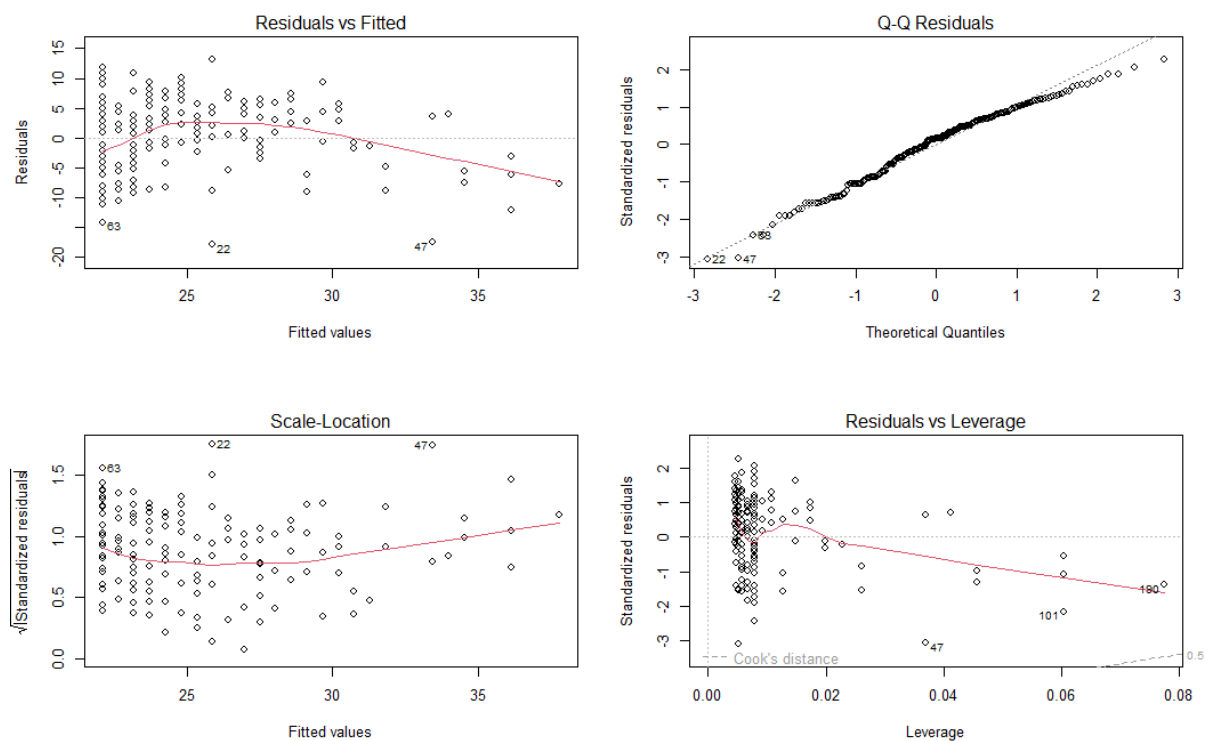
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model were the exact same as the original Model 1; the only difference was that Model 1b explained considerably less variance.

The assumptions of Model 1b were visually inspected again (Figure E2). The plots indicated that the residuals were still clearly patterned and followed a downward trend, although less so than before (plot 1), still indicating some issues with linearity; the residuals were approximately normally distributed although deviations at the tails were more extreme than before (plot 2); the spread of the residuals increased with increasing fitted values and the supposedly horizontal line followed an upwards trend although less so than before (plot 3), indicating some heteroscedasticity; and no points were detected outside of the Cook's distance

Figure E1

Visual Assumption Checks of Model 1



Note. Plot 1: Linearity of the data; plot 2: Normal distribution of residuals; plot 3:

Homoscedasticity; plot 4: Influential observations.

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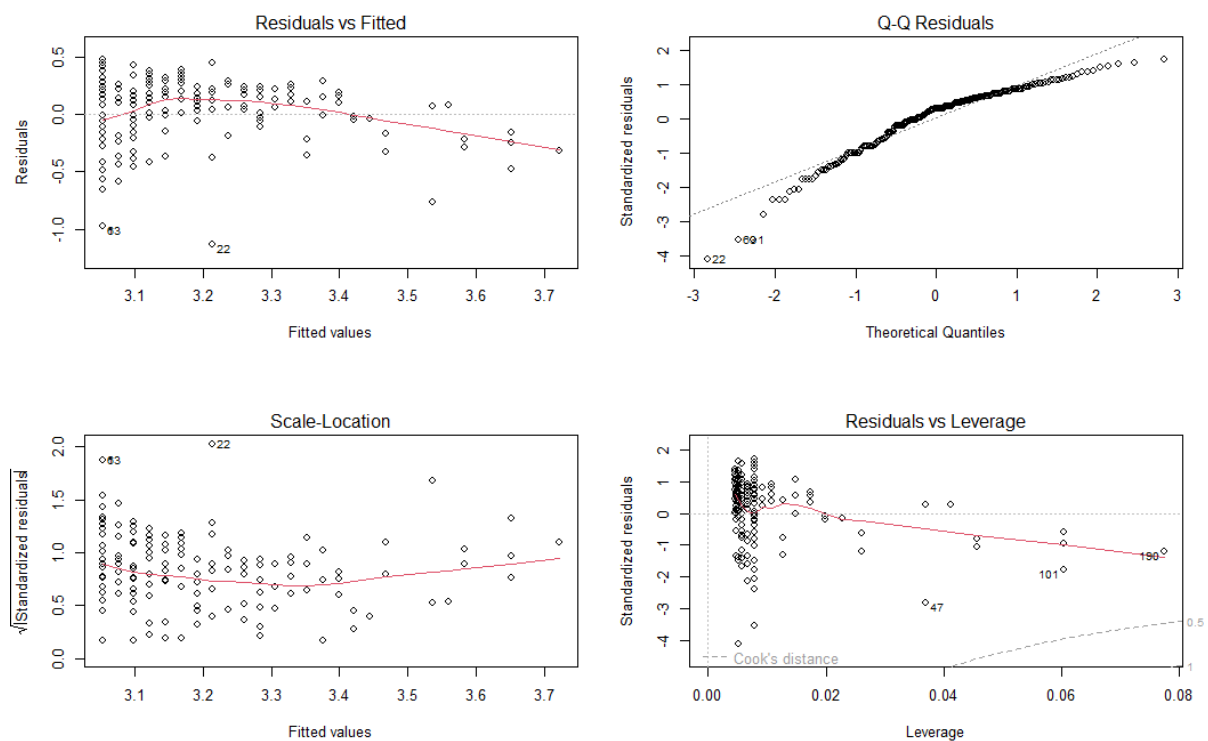
lines (plot 4), suggesting no potentially influential observations. However, several outliers were again detected. Thus, log-transforming the outcome variable improved the assumptions only to some degree. Although the two models had the exact same conclusions, Model 1 was considered to be the superior one as it explained considerably more variance.

Flood-Specific Climate Anxiety

Second, we checked the assumptions of Model 2, testing the relationship between persistent flood-specific climate anxiety and momentary flood-specific climate anxiety by visually inspecting the model (Figure E3). These plots also suggested several issues: The residuals were again clearly patterned and following a downward trend (plot 1), indicating

Figure E2

Visual Assumption Checks of Model 1b



Note. Plot 1: Linearity of the data; plot 2: Normal distribution of residuals; plot 3:

Homoscedasticity; plot 4: Influential observations.

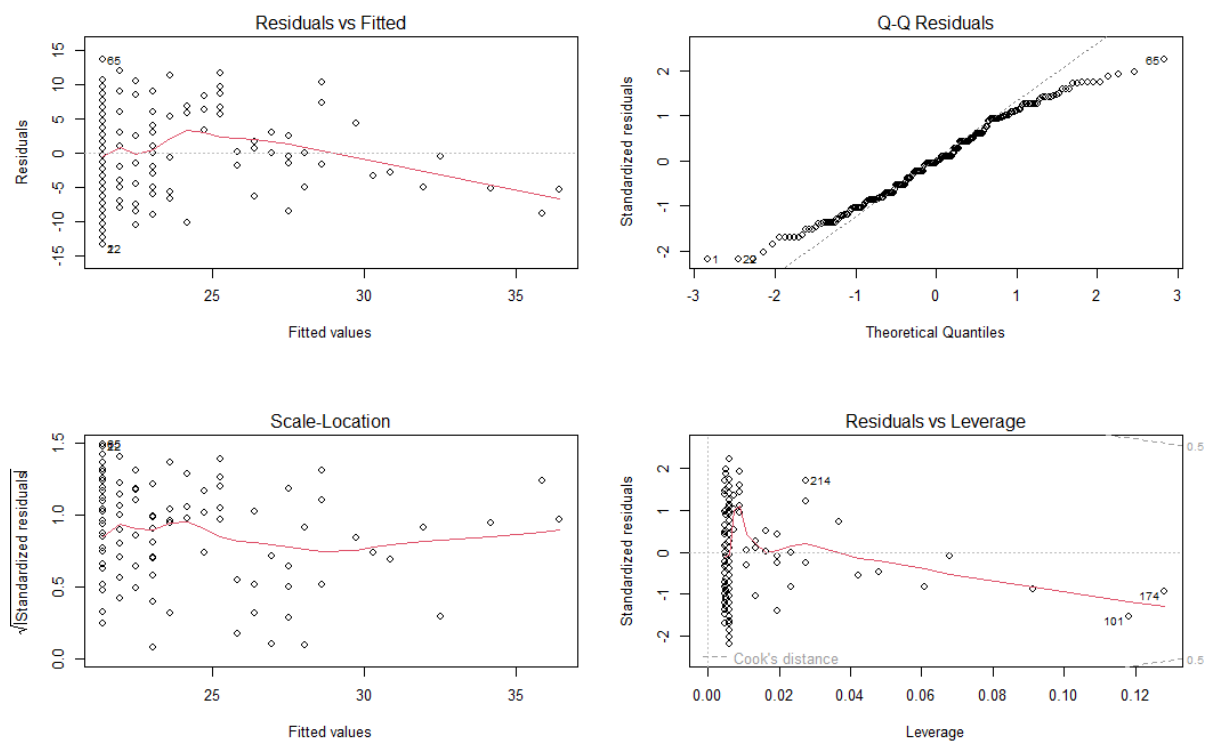
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non-linearity of the data; the residuals were approximately normally distributed but deviated at the tails (plot 2); the spread of the residuals slightly increased with increasing fitted values although the line was approximately horizontal (plot 3), indicating some heteroscedasticity; and no points were detected that lie outside of the Cook's distance lines although some points being near the line (plot 4), suggesting that there were potentially influential observations that might have affected the model. In addition, several outliers were observed. Based on these plots, it was again concluded that several assumptions were violated.

To deal with these violations, the outcome variable momentary flood-specific climate anxiety was log-transformed, and the model was tested again (Model 2b). It was still

Figure E3

Visual Assumption Checks of Model 2



Note. Plot 1: Linearity of the data; plot 2: Normal distribution of residuals; plot 3: Homoscedasticity; plot 4: Influential observations.

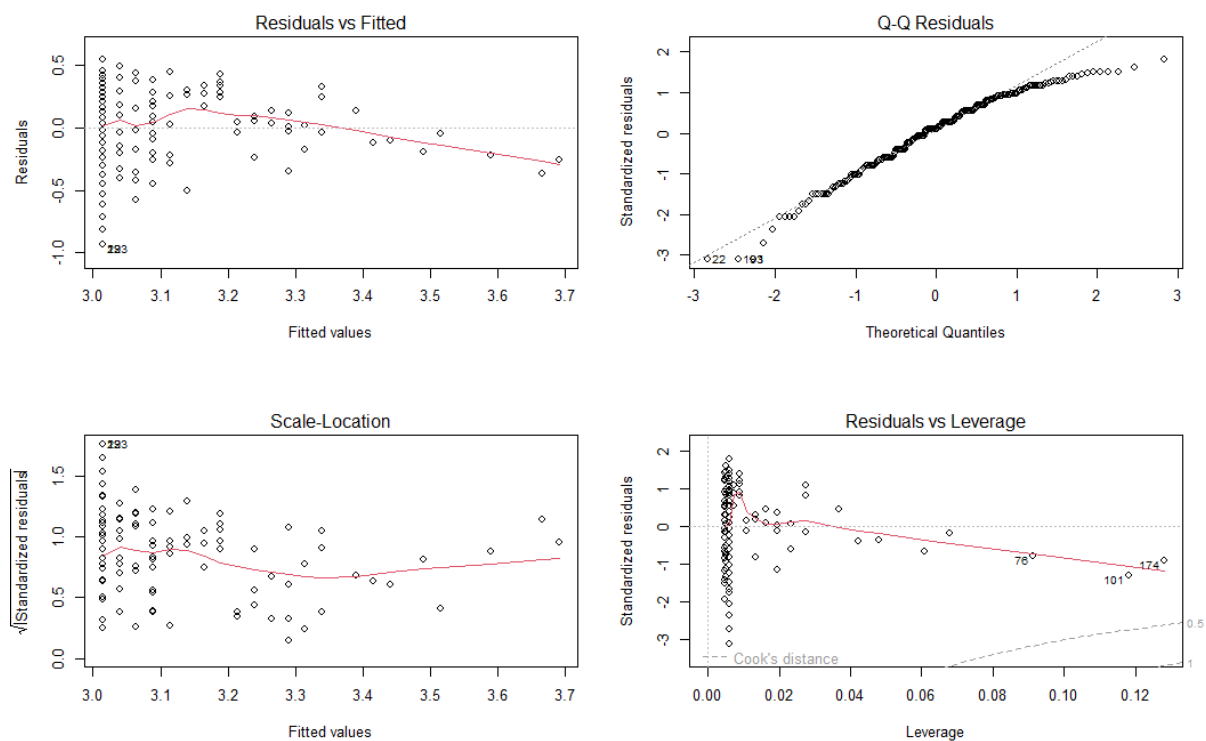
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significant, $F(1, 212) = 33.48, p < .001$, but only explained 13% of the variance ($Adj. R^2 = .13$). The results still demonstrated a significant effect of persistent flood-specific climate anxiety on momentary flood-specific climate anxiety ($b = 0.33, p < .001, 95\% \text{ CI } [0.21, 0.44]$): The more persistent flood-specific climate anxiety was experienced, the stronger one's experiences of momentary flood-specific climate anxiety. Thus, the conclusions of the linear regression analysis with Model 2b were exactly the same conclusions as the original Model 2; the only difference was that Model 2b explained considerably less variance.

The linear regression assumptions of this newer model were visually inspected again (Figure E4). The plots indicated that the residuals still were not randomly scattered and

Figure E4

Visual Assumption Checks of Model 2b



Note. Plot 1: Linearity of the data; plot 2: Normal distribution of residuals; plot 3: Homoscedasticity; plot 4: Influential observations.

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followed a downward trend (plot 1), still indicating potential non-linearity; the residuals were approximately normally distributed although deviations at the tails were still present (plot 2); the residuals were not equally spread along the approximately horizontal line (plot 3), indicating some heteroscedasticity; and no points were detected beyond the Cook's distance lines (plot 4), indicating no potentially influential observations. Yet, several outliers were again detected. Thus, log-transforming the outcome variable improved the assumptions only slightly. And although the two models had the exact same conclusions, the original Model 2 was considered to be the superior one as it explained considerably more variance.