Does Environmental Knowledge Relate to Eco-anxiety? The Moderating Role of Green Self-Efficacy and Coping

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Abstract

Theories suggest that increased public knowledge about the global environmental crisis can impact mental well-being, such as leading to eco-anxiety (Pihkala, 2022). However, from current research, it remains unclear whether increased environmental knowledge, indeed, is associated with higher levels of eco-anxiety and which psychological mechanisms help buffer this effect. Proposing a new approach, we argue that the established protective factors green self-efficacy as well as problem- and emotion-focused coping moderate the link between environmental knowledge and eco-anxiety. In a cross-sectional, correlational design with a sample of environmental science and psychology students ($N = 417$), we found that people with higher levels of environmental knowledge also reported higher levels of eco-anxiety. Contrary to our expectations, neither having high levels of green self-efficacy nor applying problem-focused coping moderated this relationship. Notably, higher levels of emotion-focused coping were even associated with an intensified relationship, such that people with higher levels of environmental knowledge experienced stronger eco-anxiety when actively engaging with their environmental distress. Taken together, our results suggest that the more the public knows about the global environmental crisis, the higher the level of eco-anxiety they report. Thereby, our findings advise caution when promoting emotional engagement as a coping strategy in environmental education, as it may even intensify the association.

Keywords: environmental crisis, eco-anxiety, environmental knowledge, green self-efficacy, coping

Does Environmental Knowledge Relate to Eco-anxiety? The Moderating Role of Green Self-Efficacy and Coping

Global warming, biodiversity loss, and environmental degradation pose an urgent threat not only to physical systems but also to mental well-being (IPCC, 2023). Importantly, these psychological reactions are not restricted to the people directly affected by environmental disasters. Rather, many experience emotional distress in response to the anticipated effects of the crisis (Jarrett et al., 2024; Thoma et al., 2021). Among these reactions, eco-anxiety is the most common form of distress (Calabria & Marks, 2024). It is referred to as a "chronic fear of environmental doom" (Clayton et al., 2017, p. 68). In recent decades, the prevalence of eco-anxiety in Western populations has grown (Heinzel et al., 2023). At the same time, people acquired increasingly more knowledge about the global environmental crisis (Meyer et al., 2022; Zacher & Rudolph, 2023). This trend suggests that environmental knowledge may contribute to an increase in eco-anxiety, which calls for further clarification. At the same time, the need arises to identify constructive ways of handling eco-anxiety and to develop strategies that raise environmental knowledge without eliciting distress (Pihkala, 2022). Such buffering mechanisms that could enhance resilience may be green self-efficacy as well as problem- and emotion-focused coping (Crandon et al., 2024a; Innocenti et al., 2023; Qin et al., 2024; Wullenkord et al., 2021). In sum, evidence on the relationship between environmental knowledge and eco-anxiety is needed, as well as an understanding of its protective factors.

This study aims to clarify whether increased knowledge about the global environmental crisis leads to higher levels of eco-anxiety (RQ1). Moreover, we seek to investigate whether green self-efficacy and coping buffer this relationship (RQ2). Primarily, our findings are vital for understanding what can prevent people's eco-anxiety from growing as they learn more about the global environmental crisis. To do so, we explore strategies for

effectively dealing with and protecting against eco-anxiety. Moreover, our study may inform policymakers and environmental communicators about how climate messaging and awareness-raising may relate to eco-anxiety (Whitmarsh et al., 2022). Lastly, our research contributes to the growing understanding of eco-emotions, which is likely to further increase in relevance in the years to come (Ágoston et al., 2022).

Eco-anxiety

Eco-anxiety, also referred to as climate anxiety, is characterised by persistent worry, distress, or fear in response to the global environmental crisis, which is primarily driven by the climate crisis (Verplanken et al., 2020). It can manifest in many different ways. Emotionally, eco-anxiety can show as nervousness, fear, or distress. Cognitively, it may involve difficulties with concentration or fatigue. Physiologically, it can elicit symptoms such as sweating and muscle tension, and behaviourally, it may lead to restlessness, sleep disturbances, and impaired daily functioning (van Valkengoed et al., 2023). Despite its severe impacts, eco-anxiety is considered a reasonable emotional response given the changing state of the planetary ecological system (Clayton & Karazsia, 2020).

The prevalence of eco-anxiety in Western population, such as Germany and the Netherlands, is relatively low; however, it is growing (Heinzel et al., 2023; Mania, 2024; Wrana, 2024). As more and more people experience eco-anxiety, it becomes increasingly vital to better understand what drives it and to identify protective factors that enhance resilience.

Environmental Knowledge

Environmental knowledge refers to what people know or believe they know about environmental problems and solutions, such as environmental pollution, resource exploitation, or species extinction (Asgarizadeh et al., 2023; Geiger et al., 2019; Pagiaslis & Krontalis, 2014). In Germany and the Netherlands, levels of environmental knowledge have increased in recent decades (Boermans et al., 2024; Meyer et al., 2022; Zacher & Rudolph, 2023). This

growth, together with the growth in eco-anxiety, makes it vital to understand what psychological effects environmental knowledge displays, particularly on eco-anxiety.

Theories suggest that, indeed, environmental knowledge is a driver of eco-anxiety (Pihkala, 2022). Several studies support this positive association, finding that people who reported higher levels of environmental knowledge also reported higher levels of eco-anxiety (Amin et al., 2024; Eren & Yıldız, 2024; İlaslan & Orak, 2024; Mat & Yilmaz, 2024; Ogunbode et al., 2022; Ramírez-López et al., 2023). In addition, groups with high levels of environmental knowledge, e.g., climate scientists (Calabria & Marks, 2024), environmental activists (Ediz & Yanik, 2023) and environmental science students (Daeninck et al., 2023; Kenstler & Shelley, 2024) showed higher levels of eco-anxiety compared to the general population. This trend may indicate that gaining more knowledge about the global environmental crisis can lead to increased levels of eco-anxiety.

However, some studies reported mixed evidence for the relationship between environmental knowledge and eco-anxiety, finding no association (Ágoston et al., 2024) or even a weak negative one (Asgarizadeh et al., 2023; Zacher & Rudolph, 2023). This suggests that a direct linear relationship may not sufficiently explain the link between environmental knowledge and eco-anxiety. We argue that these inconsistencies may be due to the omission of key moderating variables in existing research, such as green self-efficacy and coping. Moderation effects could help explain why some people with high environmental knowledge experience higher levels of eco-anxiety, while others experience lower levels. Thus, we assume that the association between environmental knowledge and eco-anxiety is positive, but its strength can vary.

H1: There is a positive relationship between environmental knowledge and eco-anxiety.

Green Self-Efficacy

Green self-efficacy refers to people's beliefs in their ability to plan, execute, and sustain behaviours that contribute to environmental protection and sustainability (Qin et al., 2024). Beneficial effects of green self-efficacy include improved regulation of negative emotions, responding positively to challenges, and reducing feelings of helplessness, such as in response to the global environmental crisis (Pihkala, 2022; Qin et al., 2024; Ruiter et al., 2014; Sangervo et al., 2022).

Prior findings have shown that people who believed in their ability to impact the global environmental crisis reported lower levels of eco-anxiety, whereas those with lower green self-efficacy reported higher levels of eco-anxiety (Innocenti et al., 2023; Qin et al., 2024; Wullenkord et al., 2021). Thus, green self-efficacy could serve as a protective factor against eco-anxiety and may also buffer the effect of environmental knowledge on eco-anxiety. Namely, people with a lot of environmental knowledge who simultaneously feel capable of making a difference due to heightened green self-efficacy may experience the global environmental crisis as an issue that can be addressed and reduced, which may buffer distress. In contrast, those with high environmental knowledge but low green self-efficacy may feel that addressing the crisis is beyond their agency, wherefore they might experience higher levels of eco-anxiety. Therefore, we assume that green self-efficacy can contribute to lower distress and buffer the impact of environmental knowledge on eco-anxiety.

H2: Green self-efficacy moderates the relationship between environmental knowledge and eco-anxiety, such that the relationship will be weaker for people with higher levels of green self-efficacy than those with lower levels of green self-efficacy.

Problem- and Emotion-focused Coping

Coping refers to people's behavioural and mental efforts to handle, tolerate, or reduce stressful and demanding situations (Lazarus & Folkman, 1984). The effectiveness of coping

depends on whether people approach or avoid a stressful situation (Addison et al., 2007; Lazarus & Folkman, 1984; Verplanken et al., 2020). The most common approach-oriented strategies are problem- and emotion-focused coping, which both promise high positive psychological outcomes, particularly in relation to ongoing stress, such as the global environmental crisis (Addison et al., 2007). Both involve distinct psychological mechanisms and serve different functions in addressing eco-anxiety (Crandon et al., 2024b; Jovarauskaite & Böhm, 2021; Ojala, 2013; Ojala & Bengtsson, 2019).

Problem-focused coping involves concrete actions aimed at directly altering a stressor, such as gathering information, developing solutions, or engaging in pro-environmental behaviour (Crandon et al., 2024b; Jovarauskaite & Böhm, 2021; Ojala, 2013; Ojala & Bengtsson, 2019). Research has underscored the beneficial effects of problem-focused coping, such that people who constructively engaged with an issue reported less distress and better mental well-being (Shermeyer et al., 2019; Weigold et al., 2024). Consequently, people who applied problem-focused coping also reported lower eco-anxiety than those who did not (Crandon et al., 2024a; Daeninck et al., 2023; Ojala, 2013; Parreira & Mouro, 2023). Therefore, we assume that when people address their distress by engaging in problem-focused coping, it can serve as a protective factor against eco-anxiety.

H3: Problem-focused coping moderates the relationship between environmental knowledge and eco-anxiety, such that the relationship will be weaker for people who apply more problem-focused coping than those who apply less problem-focused coping.

Emotion-focused coping encompasses strategies aimed at managing the emotional impact of a stressor, including cognitive reappraisal, emotional expression, or seeking social support (Crandon et al., 2024b; Jovarauskaite & Böhm, 2021; Ojala, 2013; Ojala & Bengtsson, 2019). While the strategy does not address the problem itself, it can help prevent eco-anxiety from becoming overwhelming and support people in maintaining emotional

stability (Crandon et al., 2024b). Prior findings showed that people who applied emotion-focused coping reported lower levels of eco-anxiety than those who did not. When compared to problem-focused coping, both strategies seemed to be equally effective in buffering eco-anxiety (Crandon et al., 2024a). Thus, we expect that when people with higher levels of environmental knowledge manage their negative emotions by applying emotion-focused coping, their levels of eco-anxiety will remain low.

H4: Emotion-focused coping moderates the relationship between environmental knowledge and eco-anxiety, such that the relationship will be weaker for people who apply more emotion-focused coping than those who apply less emotion-focused coping.

Current Study

In summary, the relationship between environmental knowledge and eco-anxiety requires further understanding, and the role of common protective factors should be clarified. The present study, therefore, aims to examine the relationship between environmental knowledge and eco-anxiety, and whether green self-efficacy and coping buffer this relationship.

To test the above hypotheses, we included a sample of environmental science students. This group is likely to exhibit higher levels of environmental knowledge and eco-anxiety due to their academic focus on the global environmental crisis (Daeninck et al., 2023). Given their pronounced expression of both variables, this group could help identify a dynamic in the early stages, which may expand as public environmental knowledge further increases. Moreover, their heightened vulnerability to eco-anxiety makes them a relevant group for investigation (Kenstler & Shelley, 2024). To increase variability in environmental knowledge, we included a sample of psychology students who are less frequently confronted with environmental issues in their studies and are likely to differ in both environmental knowledge and eco-anxiety.

Method

Participants and Procedure

Our target populations were environmental science and psychology students from Germany and the Netherlands. They were recruited through faculty newsletters, personal recruitment, and the internal participant pool of the University of Groningen. People did not receive any compensation for their participation, except that those who participated via the participant pool received partial course credits. In total, we collected 565 responses. Of these, 135 people did not give their consent and were therefore excluded (24%). Additionally, 13 people were excluded due to missing values for the variables required for the analysis (2%). This resulted in a final sample of 417 people. To test for moderation, an a priori power analysis suggested a minimum sample size of 395 people to achieve 80% power for detecting a small effect, at a significance criterion of $\alpha = .05$ (Faul et al., 2007). As such, we had sufficient power to test all our hypotheses. The majority of the final sample were environmental science students (62%), followed by psychology students (26%).

The study followed a correlational, between-subjects design. It was part of a larger online questionnaire that included questions on values and status, which people answered before and after our items. People could withdraw from the questionnaire at any time without penalty. The questionnaire was translated into German by two native speakers who reached a mutual agreement (see Appendix A for an overview of the joint translation). The study's methods and procedures were exempt from a full ethics and privacy review as the research met all low-risk criteria. This decision was based on a checklist developed by the Ethics Committee of the Faculty of Behavioural and Social Science at the University of Groningen.

Materials

Eco-anxiety

The Climate Change Anxiety Scale-13 (CCAS-13; Clayton & Karazsia, 2020) was included as a measure of eco-anxiety that has been validated for use in German- and English-speaking populations (Whitmarsh et al., 2022; Wullenkord et al., 2021). The scale measures cognitive-emotional impairment and functional impairment in response to the global environmental crisis. Items include statements such as: "Climate change makes it hard for me to have fun with my family and friends." Answer options ranged from 1 (*Not applies at all*) to 7 (*Applies fully*). The reliability of the scale was very good (α = .87). Across the whole sample, people reported low levels of eco-anxiety (*M* = 2.1, *SD* = .61).

Environmental Knowledge

People responded to three items about their environmental knowledge (Vainio & Paloniemi, 2014). Two items asked about people's knowledge of the causes and solutions to environmental problems, including environmental destruction, resource exploitation, and species loss. These items were: "How much do you feel you know about the causes of these sorts of environmental problems?" and "How much do you feel you know about solutions to these sorts of environmental problems?" Answer options ranged from 1 (*Know nothing at all*) to 5 (*Know a great deal*). The third item asked about environmental knowledge in people's everyday life: "How much do you agree or disagree with…: I find it hard to know whether the way I live is helpful or harmful to the environment." Answer options ranged from 1 (*Strongly disagree*) to 5 (*Strongly agree*). In terms of internal consistency, we did not find an acceptable fit (α = .56). As previous studies found a low model fit for the last item (Saari et al., 2021), we excluded it from the final analysis. This improved the internal consistency to an acceptable fit (Spearman-Brown = .72). Across the whole sample, people reported moderate levels of environmental knowledge (*M* = 3.4, *SD* = .66).

Green Self-efficacy

Four items measuring green self-efficacy in the context of water conservation were adopted to measure green self-efficacy in the context of general environmental protection (Lauren et al., 2016). The original scale assessed people's confidence in protecting water quality. We replaced all mentions of water quality by asking about people's confidence in protecting the environment. Items include statements such as: "I feel confident that I can help protect the environment." Answer options ranged from 1 (*Strongly disagree*) to 7 (*Strongly agree*). The scale's internal consistency was very good (α = .85). Across the whole sample, people reported moderate levels of green self-efficacy (M = 4.7, SD = 1.11).

Coping

People responded to the problem- and emotion-focused subscales of the Climate Experts Coping Strategies Scale (Jovarauskaite & Böhm, 2021). The measure is based on the Multidimensional Coping Scale (Duhachek, 2005), from which we adopted the scale introduction. Namely, we asked people to imagine a troubling situation related to the global environmental crisis, such as extreme weather or inaction by others, and to indicate the strategies they would use in such a moment. Problem-focused items include statements such as: "Concentrate on the ways in which climate change can be solved." Emotion-focused items include statements such as: "Tell others how I feel." Answer options ranged from 1 (*Strongly disagree*) to 6 (*Strongly agree*). The scale's internal consistency was reasonably reliable for the short, three-item measure of problem-focused coping (α = .60) and very good for the four-item measure of emotion-focused coping (α = .81). Across the whole sample, people reported high problem-focused coping (M = 4.4, SD = .78) and moderate emotion-focused coping (M = 3.8, SD = 1.05).

Results

We hypothesised that people who know more about the global environmental crisis also report higher levels of environmental knowledge. To test our reasoning, we conducted a two-sided Pearson correlation. In line with our prediction, we found that higher levels of environmental knowledge have a small positive association with higher levels of eco-anxiety ($r(415) = .17$, $p < .001$, 95% CI [.08, .26]). Thus, the more people know about the causes and solutions to the global environmental crisis, the more likely they are to report higher levels of eco-anxiety. This supports H1. In Table 1, correlations for all study variables are presented.

Table 1

Correlations for Study Variables

Variable	1	2	3	4	5
1. Eco-anxiety	—				
2. Environmental Knowledge	.17**	—			
3. Green Self-efficacy	.06	.14**	—		
4. Problem-focused Coping	.17**	.16**	.26**	—	
5. Emotion-focused Coping	.34**	.15**	.15**	.49**	—

Note. $^{**}p < .01$.

To test for indirect effects, we performed three moderation analyses using PROCESS 4.3 (Model 1) for R (Hayes, 2022). To assess the significance of the indirect effects, we calculated 95% bootstrapped confidence intervals based on 10000 resamples. Firstly, we hypothesised that green self-efficacy moderates the relationship between environmental knowledge and eco-anxiety. The first moderation model, therefore, consists of green self-efficacy as a moderator, with eco-anxiety as the dependent variable, environmental knowledge as the independent variable, and both forms of coping as control variables. As

shown in Table 2, we found the overall model to be significant. Of the control variables, only emotion-focused coping showed a positive significant effect with a small to medium effect size, whereas problem-focused coping was not significant. The positive direct effect of environmental knowledge on eco-anxiety was small but significant, whereas no significant direct effect of green self-efficacy on eco-anxiety was found. We also found no significant interaction effect between green self-efficacy and environmental knowledge for eco-anxiety. This suggests that when people reported high green self-efficacy, this did not moderate the relationship between their environmental knowledge and their eco-anxiety. Therefore, we did not find support for H2.

Table 2

Moderation Analysis with Green Self-efficacy as Moderator

DV: Eco-anxiety	*β*	*p*	95% CI	
			LL	*UL*
Intercept	.011	.830	-.078	.099
Environmental Knowledge	.122	.009	.026	.219
Green Self-Efficacy	.003	.937	-.101	.094
Environmental Knowledge × Green self-efficacy	-.069	.118	-.173	.026
Problem-focused Coping	-.006	.909	-.114	.098
Emotion-focused Coping	.320	>.001	.219	.423
Model Fit: $R^2 = .13$, $p < .001$				

Note. 95% bootstrapped confidence intervals (95% CI) with 10000 resamples are reported.

Next, we hypothesised that problem-focused coping moderates the relation between environmental knowledge and eco-anxiety. In the second moderation model, problem-focused coping served as a moderator, with eco-anxiety as the dependent variable, environmental knowledge as the independent variable, and green self-efficacy and emotion-focused coping as control variables. As shown in Table 3, we found that the overall model was significant. Of

the control variables, only emotion-focused coping showed a positive significant effect with a small to medium effect size, whereas green self-efficacy was not significant. The positive direct effect of environmental knowledge on eco-anxiety was small but significant, whereas no significant direct effect of problem-focused coping on eco-anxiety was found. We also found no significant interaction effect between problem-focused coping and environmental knowledge for eco-anxiety. This suggests that when people engaged more in problem-focused coping, this did not moderate the relationship between their environmental knowledge and their eco-anxiety. Hence, we did not find support for H3.

Table 3

Moderation Analysis with Problem-focused Coping as Moderator

DV: Eco-anxiety	*β*	*p*	95% CI	
			LL	*UL*
Intercept	.001	.985	-.086	.090
Environmental Knowledge	.124	.011	.027	.222
Problem-focused Coping	-.006	.912	-.116	.100
Environmental Knowledge × Problem-focused Coping	-.005	.900	-.103	.094
Green Self-efficacy	-.007	.872	-.108	.091
Emotion-focused Coping	.327	>.001	.236	.429
Model Fit: $R^2 = .13$, $p < .001$.				

Note. 95% bootstrapped confidence intervals (95% CI) with 10000 resamples are reported.

Lastly, we hypothesised that emotion-focused coping moderates the relation between environmental knowledge and eco-anxiety. The third moderation model, therefore, consists of emotion-focused coping as the moderator, with eco-anxiety as the dependent variable, environmental knowledge as the independent variable, and green self-efficacy and problem-focused coping as control variables. Again, the overall model was significant and explained more variance in eco-anxiety than the previous moderation models. As shown in Table 4, neither of the two control variables, green self-efficacy and problem-focused coping, was

significant. In terms of significant direct effects, environmental knowledge showed a weak positive effect on eco-anxiety, and emotion-focused coping showed a moderately strong positive effect on eco-anxiety. Moreover, we found the interaction effect of emotion-focused coping to be significant, such that for people who applied more emotion-focused coping, the effect of environmental knowledge on eco-anxiety increased. However, as the positive direction of the effect contradicts our initial reasoning, we did not find support for H4.

Table 4

Moderation Analysis with Emotion-focused Coping as Moderator

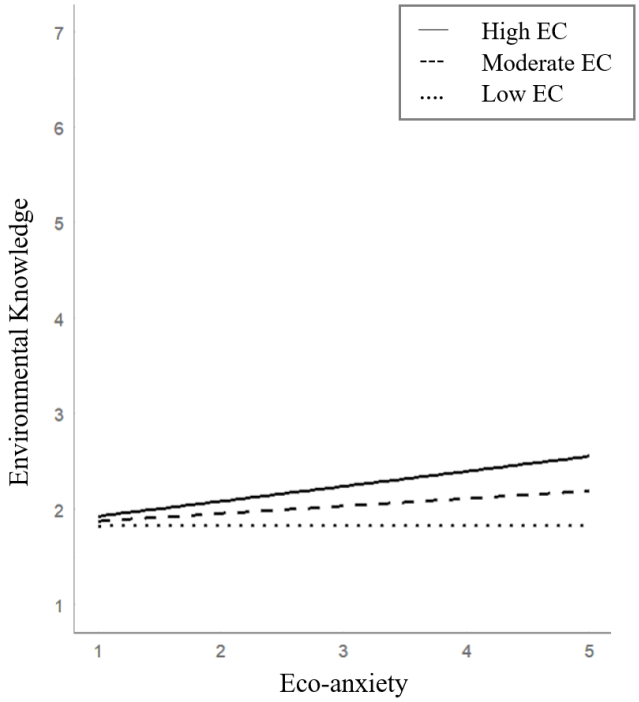
DV: Eco-anxiety	*β*	*p*	95% CI	
			LL	*UL*
Intercept	-.019	.676	-.103	.068
Environmental Knowledge	.128	.006	.030	.223
Emotion-focused Coping	.335	>.001	.236	.433
Environmental Knowledge × Emotion-focused Coping	.128	.003	.041	.235
Green Self-efficacy	-.0002	.996	-.098	.096
Problem-focused Coping	.006	.904	-.096	.110
Model Fit: $R^2 = .15$, $p < .001$				

Note. 95% bootstrapped confidence intervals (95% CI) with 10000 resamples are reported.

A simple slopes analysis showed that the relationship between environmental knowledge and eco-anxiety was weakly positive and significant among people who applied levels of emotion-focused coping around the mean ($b = .13$, p .006) and higher, namely one standard deviation above the mean ($b = .26$, $p < .001$). However, there was no effect for people who applied low levels of emotion-focused coping, one standard deviation below the mean ($b = .00$, $p = .99$). This suggests that the relationship between environmental knowledge and eco-anxiety is stronger the more people engage in emotion-focused coping (see Figure 1 for the visualisation of the slopes).

Figure 1

Interaction Effects of Emotion-focused Coping and Environmental Knowledge on Eco-Anxiety



Note. EC used to represent emotion-focused coping.

Discussion

The global environmental crisis poses a substantial physical and societal threat, which can elicit eco-anxiety (Whitmarsh et al., 2022; Wullenkord et al., 2021). Although eco-anxiety is becoming more recognised, we still know little about what contributes to or protects against it. One possibility is that greater environmental knowledge may relate to higher levels of eco-anxiety, especially if people feel powerless to act or do not apply coping strategies. By investigating these relationships, our findings contribute to the growing body of research on the drivers and mechanisms of eco-anxiety.

Environmental Knowledge and Eco-anxiety

In line with our predictions, we found that people who had higher levels of environmental knowledge also reported higher levels of eco-anxiety. This result contributes to the growing body of evidence indicating a positive association between the two variables (Amin et al., 2024; Eren & Yıldız, 2024; İlaslan & Orak, 2024; Mat & Yilmaz, 2024; Ramírez-López et al., 2023). Moreover, it provides important support for theoretical models, which suggest that higher levels of environmental knowledge are an essential driver of eco-anxiety (Pihkala, 2022). That is, when people become more aware of the global environmental crisis, they are likely to experience eco-anxiety as a result of their growing understanding of the crisis's seriousness and gravity (Mat & Yilmaz, 2024; Pihkala, 2022).

Due to our unique sample, who tend to report elevated levels of environmental knowledge (Daeninck et al., 2023; Filho et al., 2023; Kenstler & Shelley, 2024), the found association may serve as an early indicator of what could follow if environmental knowledge of the general public increases. Namely, a rise in eco-anxiety. We already see such an effect, as we identified higher levels of eco-anxiety than in previous studies (Heinzel et al., 2023; Wullenkord et al., 2021). In addition, this finding highlights the vulnerability of environmental science students to eco-anxiety.

The result challenges a core assumption in environmental education and messaging, which suggests that increasing environmental knowledge will foster engagement in sustainable actions by making people understand what needs to be done (Kaiser et al., 2008; van de Wetering et al., 2022). This optimistic reasoning is questioned, as increased environmental knowledge is associated with eco-anxiety, which can have negative impacts (van Valkengoed et al., 2023) and hinder environmental action (Chapman & Peters, 2024; Schwartz et al., 2022). Through longitudinal or experimental studies, future research may aim

to clarify the direction of the link between environmental knowledge and eco-anxiety, as well as whether eco-anxiety becomes reinforced through environmental education and messaging.

Green Self-efficacy

As we found that people with greater knowledge of the global environmental crisis reported higher levels of eco-anxiety, we extended previous research by proposing and testing what may buffer this relationship. Firstly, we hypothesised that when people report higher levels of green self-efficacy, this would moderate the link, as feeling capable of making a difference can reduce distress (Innocenti et al., 2023; Qin et al., 2024; Wullenkord et al., 2021). Importantly, we did not find a buffering effect of green self-efficacy on the relationship between environmental knowledge and eco-anxiety. Hence, feeling capable of impacting the global environmental crisis does not reduce the association of environmental knowledge and eco-anxiety. This challenges theoretical models that suggest green self-efficacy protects against eco-anxiety (Pihkala, 2022). Furthermore, we also found no direct negative effect of green self-efficacy on eco-anxiety, such that people who reported higher levels of green self-efficacy did not report lower levels of eco-anxiety. This contradicts prior research (Innocenti et al., 2023; Qin et al., 2024).

A possible reason why we did not find support for the theoretically suggested buffering effect may be due to an overestimation of the protective role of green self-efficacy in the context of the global environmental crisis. While experiencing high green self-efficacy should reduce distress, this assumption may not hold when the perceived scale of the crisis exceeds what people believe they can realistically influence (Gifford, 2011; Swim et al., 2009). In other words, even when people feel capable of contributing to environmental protection, they may still experience eco-anxiety because they perceive their potential contribution as too small in light of the global environmental crisis.

We were unable to replicate the buffering effect observed in previous research, which could be due to earlier research linking green self-efficacy only in a very limited way, or not at all, to the global environmental crisis. Namely, they measured green self-efficacy only in the narrow context of sustainable consumption (Qin et al., 2024), which may buffer eco-anxiety due to an increased sense of control resulting from tangible and repeatable actions (Becht et al., 2024). Alternatively, they measured general self-efficacy outside the environmental domain (Innocenti et al., 2023), which may reduce eco-anxiety due to the general belief that one can handle difficulties even if they lie outside one's direct control (Jerusalem & Schwarzer, 1995). As we measured green self-efficacy as people's confidence to contribute to environmental protection in general, which better reflects the actual scope of the crisis, we observed its direct and indirect protective effect on eco-anxiety diminishing. Future research should, therefore, investigate whether certain forms of green self-efficacy better buffer eco-anxiety and whether these effects are more substantial among people who perceive the global environmental crisis in general as solvable.

Problem-focused Coping

We did not find that when people applied more problem-focused coping, it significantly moderated the relationship between their environmental knowledge and their eco-anxiety, which contradicts our initial hypothesis about a protective effect (Crandon et al., 2024a; Daeninck et al., 2023; Ojala, 2013; Parreira & Mouro, 2023). Moreover, we did not find a direct buffering effect of problem-focused coping on eco-anxiety either, such that people who reported more problem-focused coping did not report lower eco-anxiety. Hence, we have no evidence to suggest that applying problem-focused coping functions as a protective mechanism against eco-anxiety.

A possible explanation for this finding may lie in the nature of the stressor itself, as the perceived controllability of a stressor is crucial for problem-focused coping to be effective

(Lazarus & Folkman, 1984; van Valkengoed & Steg, 2024). When people perceive a problem as beyond their control, attempts to solve it may lead to heightened distress. The global environmental crisis represents such a stressor, as it is a complex, large-scale issue that cannot be resolved through immediate problem-solving (Renn et al., 2022). Thus, while problem-focused coping can be effective in dealing with well-defined and manageable challenges, it may fall short of addressing the overwhelming nature of the global environmental crisis.

Our findings deviate from previous research that emphasised the constructive role of problem-focused coping in managing eco-anxiety (Crandon et al., 2024a; Daeninck et al., 2023; Ojala, 2013; Parreira & Mouro, 2023). Notably, these studies found that applying problem-focused coping was primarily associated with lower functional impairment, one of the two central dimensions of eco-anxiety, rather than having an impact on overall eco-anxiety. When people engaged in problem-focused coping, they showed improved functioning in forms of an increased motivation to act sustainably and greater social connectedness (Crandon et al., 2024a; Ojala et al., 2012; Daeninck et al., 2023). All of which may reduce eco-anxiety by reinforcing a sense of agency and control in the face of an overwhelming crisis (van Valkengoed & Steg, 2024). As this study focused on overall eco-anxiety rather than specifically testing for functional outcomes, this may explain why we did not replicate the previously observed protective findings. Thus, our results question the assumption that engaging in problem-solving is overall an adaptive response to eco-anxiety (Kenstler & Shelley, 2024; Kurth & Pihkala, 2022).

Emotion-focused Coping

Contradicting our reasoning on the protective effect of emotion-focused coping, we even found that the association between environmental knowledge and eco-anxiety strengthened as people engaged more with their environmental distress (Crandon et al., 2024a). In other words, there was a stronger link between environmental knowledge and eco-

anxiety for people who actively expressed and engaged with their distress rather than avoiding it. In addition, we found a positive direct effect, such that people who engaged more in emotion-focused coping reported lower levels of eco-anxiety. This finding challenges existing theories that propose emotion-focused coping as a buffer against eco-anxiety (Pihkala, 2022; van Valkengoed & Steg, 2024). Instead, people who had high levels of environmental knowledge and actively expressed their environmental distress or sought social support reported higher levels of eco-anxiety. Conversely, people who also had high levels of environmental knowledge but did not engage with their environmental distress reported lower levels of eco-anxiety.

There are two possible explanations for this finding, depending on the interpretation of the direction of the association. On the one hand, it is reasonable that people who feel more anxious have a stronger tendency to emotionally engage with a threat such as the global environmental crisis (Cisler & Koster, 2010). Namely, the more people know about environmental issues, the more eco-anxiety they may experience, and the more they have feelings to express and engage with. In contrast, people who know less about the global environmental crisis may have no eco-anxiety to handle and, therefore, report low emotion-focused coping. Thus, emotion-focused coping may not buffer eco-anxiety, but eco-anxiety may elicit emotion-focused coping.

On the other hand, the association might be vice versa, such that the more people engage in emotion-focused coping, the higher their eco-anxiety. This reasoning is supported by the positive direct effect of emotion-focused coping on eco-anxiety and could be explained by rumination-based forms of emotional engagement. Generally, actively engaging with one's emotions, such as expressing feelings of eco-anxiety, is considered a constructive and helpful strategy (Crandon et al., 2024b; Jovarauskaite & Böhm, 2021; Ojala, 2013; Ojala & Bengtsson, 2019). However, emotional engagement can become counterproductive when it

turns into an excessive focus on negative emotions. In such cases, emotional engagement may shift into rumination or co-rumination, which is a repetitive and unproductive dwelling on distressing thoughts, either alone or with others (Rose, 2002, 2021). This shift into (co-)rumination is especially likely in contexts of uncontrollable problems, such as the global environmental crisis, and is strongly associated with general anxiety and eco-anxiety (Aldao et al., 2010; Clayton & Karazsia, 2020; Ortner et al., 2025; Rose, 2021; Spendelow et al., 2017; Starr et al., 2021; Tompkins et al., 2011; Verplanken & Roy, 2013, 2013). Thus, while emotional engagement can be beneficial in specific contexts, it may not be so in the uncontrollable face of the global environmental crisis.

Practical Implications

Despite the non-causal nature of our study, educators and communicators should be careful of how environmental education and messaging may relate to eco-anxiety (Crandon et al., 2024b). Our findings suggest that increasing public environmental knowledge may have unintended emotional consequences, such as amplifying eco-anxiety. Therefore, the role and content of educational programmes and information campaigns should be cautiously designed to ensure that knowledge sharing is paired with a sensitivity to eco-anxiety.

At the same time, our findings highlight the importance of avoiding untested, generalised mental health approaches when addressing eco-anxiety. In particular, emotional engagement should be facilitated with caution, as our results suggest that people who engaged more in emotion-focused coping experienced a stronger association between environmental knowledge and eco-anxiety. Hence, encouraging people to engage with or express their environmental distress may not reduce eco-anxiety and, in the worst case, can make people feel even more anxious. This finding is particularly relevant for global initiatives such as climate cafés, which provide spaces for people to share their eco-emotions. In such contexts, it is possible that emotional engagement may further intensify eco-anxiety.

Limitations and Future Research

We cannot make causal claims about whether environmental knowledge drives eco-anxiety. This is especially relevant when considering that eco-anxiety can manifest in many different ways, such as in forms of practical eco-anxiety (Kurth & Pihkala, 2022). Practical eco-anxiety can serve as a motivator for engagement, leading to information gathering and knowledge seeking (Bonello & Lauri, 2024; Kurth & Pihkala, 2022; Parreira & Mouro, 2023). Hence, eco-anxiety could also drive environmental knowledge, rather than vice versa, which could suggest a constructive effect of eco-anxiety. Further research, such as experimental or intervention studies, is needed to clarify the causal nature of the relationship.

Secondly, our sample might have identified strongly as environmental actors, which could have obscured the protective effect of green self-efficacy. Previous studies found that environmental science students, who are the majority of our sample, identified more strongly as environmental actors compared to other students (Daeninck et al., 2023). According to the environmental identity model (Kempton & Holland, 2003) and prior research (Chen & Hsieh, 2023; Lauren et al., 2016; van der Werff et al., 2014), people who identify as environmental actors are particularly anxious about the global environmental crisis, but also feel more self-efficacious in addressing it. This may explain why we did not find a protective effect of green self-efficacy on eco-anxiety, as people in our sample identified as environmental actors, but at the same time experienced eco-anxiety. Future research should clarify the role of identifying as an environmental actor in the relationship between green self-efficacy and eco-anxiety, and explore protective mechanisms such as green self-efficacy across different populations.

Conclusion

Overall, our findings suggest that people who report greater environmental knowledge about the global environmental crisis also report higher levels of eco-anxiety. At the same time, our results challenge the assumption that when people have or use established protective strategies, such as green self-efficacy and coping, their eco-anxiety is buffered. Surprisingly, we even found that engaging with one's environmental distress could intensify the link between eco-anxiety and environmental knowledge, rather than reducing it. As such, our findings highlight the complex interplay between the uncontrollable nature of the global environmental crisis and its adverse effects on common protective strategies. Moreover, they emphasise the importance of clarifying how environmental knowledge relates to eco-anxiety, to identify how public environmental knowledge can be increased without eliciting distress.

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Appendix

Appendix A – Translations of Scales

Appendix A1. Environmental Knowledge (Vainio & Paloniemi, 2014; Saari et al., 2021)

	Original English Version	Translation by First Author	Translation by Native Speaker	Final German Version
1	How much do you feel you know about the causes of these sorts of environmental problems?	Was glaubst Du, wie viel Du über die Ursachen dieser Umweltprobleme weißt?	Was glaubst Du, wie viel Du über die Ursachen dieser Umweltprobleme weißt?	Was glaubst Du, wie viel Du über die Ursachen dieser Umweltprobleme weißt?
2	How much do you feel you know about solutions to these sorts of environmental problems?	Was glaubst Du, wie viel Du über Lösungen für diese Art von Umweltproblemen weißt?	Was glaubst Du, wie viel Du über Lösungen für diese Art von Umweltproblemen weißt?	Was glaubst Du, wie viel Du über Lösungen für diese Art von Umweltproblemen weißt?
3	How much do you agree or disagree with…: I find it hard to know whether the way I live is helpful or harmful to the environment.	Wie sehr stimmst Du zu oder widersprichst Du...: Ich finde es schwierig zu wissen, ob meine Lebensweise nützlich oder schädlich für die Umwelt ist.	Wie sehr stimmst Du zu oder widersprichst Du...: Ich finde es schwierig zu wissen, ob meine Lebensweise nützlich oder schädlich für die Umwelt ist.	Wie sehr stimmst Du zu oder widersprichst Du...: Ich finde es schwierig zu wissen, ob meine Lebensweise nützlich oder schädlich für die Umwelt ist.

Appendix A2. Green Self-efficacy (Lauren et al., 2016)

	Original English Version	Translation by First Author	Translation by Native Speaker	Final German Version
1	I feel confident that I can help protect [the environment].	Ich bin zuversichtlich, dass ich zum Schutz [der Umwelt] beitragen kann.	Ich bin zuversichtlich, dass ich zum Schutz [der Umwelt] beitragen kann.	Ich bin zuversichtlich, dass ich zum Schutz [der Umwelt] beitragen kann.
2	I feel capable of protecting [the environment].	Ich fühle mich in der Lage, [die Umwelt] zu schützen.	Ich fühle mich in der Lage, [die Umwelt] zu schützen.	Ich fühle mich in der Lage, [die Umwelt] zu schützen.
3	I feel confident that I can help conserve [the environment].	Ich bin zuversichtlich, dass ich zur Erhaltung [der Umwelt] beitragen kann.	Ich bin zuversichtlich, dass ich dazu beitragen kann, [die Umwelt] zu erhalten.	Ich bin zuversichtlich, dass ich dazu beitragen kann, [die Umwelt] zu erhalten.
4	I feel capable of conserving [the environment].	Ich fühle mich in der Lage, [die Umwelt] zu erhalten.	Ich fühle mich in der Lage, [die Umwelt] zu schonen.	Ich fühle mich in der Lage, [die Umwelt] zu erhalten.

Appendix A3. Climate Experts Coping strategies (Jovarauskaite & Böhm, 2021)

	Original English Version	Translation by First Author	Translation by Native Speaker	Final German Version
[Problem-focused coping]				
1	Concentrate on the ways in which climate change can be solved	Konzentration auf die Möglichkeiten zur Lösung des Klimawandels	Ich konzentriere mich auf die Möglichkeiten, wie der Klimawandel gelöst werden kann	Ich konzentriere mich auf Möglichkeiten zur Lösung des Klimawandels
2	Seek out others to talk about climate change	Andere Menschen aufsuchen, um über den Klimawandel zu sprechen	Ich suche andere auf, um über den Klimawandel zu sprechen	Ich suche andere auf, um über den Klimawandel zu sprechen
3	Think about the best way to handle climate change	Überlegen, wie man am besten mit dem Klimawandel umgehen kann.	Ich überlege, wie ich am besten mit dem Klimawandel umgehen kann.	Ich überlege, wie ich am besten mit dem Klimawandel umgehen kann
[Emotion-focused coping]				
4	Delve into my climate-change-related feelings to understand them	Mich mit meinen Emotionen im Zusammenhang mit dem Klimawandel auseinandersetzen, um sie zu verstehen	Ich beschäftige mich mit meinen Gefühlen in Bezug auf den Klimawandel, um sie zu verstehen.	Ich setze mich mit meinen Gefühlen in Bezug auf den Klimawandel auseinander, um sie zu verstehen
5	Ask colleagues how they control their climate-change-related emotions	Andere fragen, wie sie mit Emotionen im Bezug auf dem Klimawandel umgehen	Ich frage Bekannte, wie sie ihre mit dem Klimawandel verbundenen Gefühle kontrollieren	Ich frage andere, wie sie mit Emotionen in Bezug auf dem Klimawandel umgehen
6	Tell others how I feel	Mit anderen darüber reden, wie ich mich fühle	Ich teile mit anderen, wie ich mich fühle	Ich teile mit anderen, wie ich mich fühle
7	Try to get advice from someone about what to do with climate-change-related emotions	Versuchen, Rat von anderen zu bekommen, wie man mit Emotionen im Bezug auf dem Klimawandel umgeht	Ich versuche, von jemandem einen Rat zu bekommen, was hilft mit klimawandelbedingten Emotionen umzugehen	Ich versuche, Rat von anderen zu bekommen, wie man mit Emotionen in Bezug auf dem Klimawandel umgehen kann