Nature's Embrace: Unveiling the Psyche of Eco-Emotions and Pro-Environmental Behaviour

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Abstract

Background: Various studies show that feeling connected to nature can lead to more eco-friendly behaviour, which only sometimes translates into action. A recent study found that different eco-emotions can lead to varying types of climate action. Thus, this study investigated the relationship between connectedness to nature, pro-environmental behaviour and a possible mediation by different eco-emotions (eco-anxiety, eco-depression, eco-anger).

Method: A cross-sectional study was conducted with 93 participants (81.7% females, 34.4% between 18 and 25). Participants filled out a measure for pro-environmental behaviour, the Nature Relatedness Scale, the Hogg Eco-Anxiety Scale, and newly developed measures for eco-anger and eco-depression. Linear regression and mediation models were used to analyse the data.

Results: Connectedness to nature positively correlates with collective and personal pro-environmental behaviour. Eco-anxiety and eco-anger partially mediate the relationship between connectedness to nature and collective pro-environmental behaviour.

Discussion: Connectedness to nature is positively correlated with pro-environmental behaviours. Eco-anxiety and eco-anger are driving forces for collective environmental efforts. Future research should investigate nuanced relationships and gender influences and refine measurement tools.

Keywords: Connectedness to nature, eco-emotions, eco-anxiety, eco-anger, eco-depression, climate action, personal pro-environmental behaviour, collective pro-environmental behaviour

Nature's Embrace: Unveiling the Psyche of Eco-Emotions and Pro-Environmental Behaviour

Due to the global and longitudinal effects, climate change is one of the most remarkably complex social issues (Van Lange & Huckelba, 2021). The climate has changed many times, but this time, it is mainly caused by human activity and is happening faster. Cutting and burning down forests, burning fossil fuels like coal, oil, and gas, and today's agriculture have caused the earth's heat balance to be sufficiently affected so that the average global temperature has shifted outside of the temperature range that has defined the past 10,000 years of human history (Swim et al., 2011). The aforementioned human activities start a series of related phenomena: loss of polar sea ice, sea-level rise, melting of continental glaciers, acidification of the oceans, increased intensity and frequency of excessive rainfalls, and many more (Karl et al., 2009; Swim et al., 2011). In total, 315 natural disasters, mainly climate-related, occurred worldwide in 2018—with approximately 68.5 million afflicted individuals (Fawzy et al., 2020).

Climate change has various impacts on different aspects of human life. Indirect impacts on one's health due to climate change are giving rise to food—and water-borne diseases or water and food shortages. These consequences can also impact the overall economy; consequently, they will also affect consumer behaviour and welfare because certain products will no longer be available (Ciscar et al., 2011). Climate change also has direct impacts, such as temperature-related illness and death and impacts due to extreme weather occurrences. Besides physical health, climate change affects mental health by causing emotional distress (Fritze et al., 2008) and exacerbating feelings of loss, frustration, and grief in some individuals (Clayton et al., 2017).

People often struggle to take the recommended actions to mitigate the impacts of climate change because they feel disconnected from the consequences; this is known as psychological distance. There are various factors that contribute to the psychological distance to climate change. For one, climate change affects the entire planet over a long period, and individuals may have some uncertainties about its effects. Moreover, taking action usually involves the cooperation of various people, organisations, or institutions, making it difficult for individuals to act immediately. This psychological distance makes it harder for people to take prompt action to reduce climate change since the long-term consequences for the entire world are more abstract than the short-term ones for individuals (Van Lange & Huckelba, 2021). However, research suggests that a stronger connection to nature can help reduce this psychological distance. When people feel more connected to the environment, they are more likely to perceive environmental threats as severe and urgent, thus increasing the likelihood of taking action to reduce climate change (Schmitt et al., 2019). Nevertheless, a feeling of connectedness does not necessarily translate to climate action (Whitburn et al., 2019). Thus more research is needed to identify more contributing factors.

Given the far-reaching effects of climate change on society, the environment, and individuals, it is imperative to conduct empirical research to gain a deeper understanding of its consequences and devise ways to mitigate its impact. Additionally, it is equally essential to identify the personal factors that promote pro-environmental behaviour among individuals. This research will primarily examine the effect of connectedness to nature on an individual's climate actions and how climate change affects emotional responses.

Theoretical framework

Pro-environmental behaviour

Individuals may adopt various pro-environmental behaviours to mitigate environmental threats (Schmitt et al., 2018). Pro-environmental behaviour can be defined as behaviour "that is undertaken with the intention to change (normally, to benefit) the environment" (Stern, 2000, as cited in Vicente-Molina et al., 2018, para.10). These behaviours can include changes in diet, transportation, and housing (Kasser & Brown, 2005).

Two types of pro-environmental behaviour can be distinguished: personal and collective ones. Ando et al. (2010) defined personal pro-environmental behaviours as describing a person's actions, such as taking public transportation, conserving energy, and adhering to the 3Rs (reduce, recycle, reuse). Engaging in environmental group activities and attending local environmental events are examples of collective pro-environmental behaviours. These actions are intended to encourage environmental conservation through group efforts. While individual actions are crucial in creating ecologically sustainable societies, collective actions are vital in encouraging pro-environmental actions in other people and society (Ando et al., 2010). Previous research showed that individuals report, on average, less collective pro-environmental behaviours than personal pro-environmental behaviours (Ando et al., 2010; Oreg & Katz-Gerro, 2006).

Connectedness to nature

Several factors are found to influence an individual's pro-environmental behaviour. One factor frequently associated with pro-environmental behaviour is a connectedness to nature. Various studies show that feeling connected to nature is linked to pro-environmental behaviour (Davis et al., 2009; Davis et al., 2011; Dutcher, 2016; Mackay & Schmitt, 2019; Mayer & Frantz,

2004; Nisbet et al., 2009; Schultz & Tabanico, 2007). Thus, people connected to nature seem more inclined to take actions that benefit the environment (Barbaro & Pickett, 2016).

An individual's emotional connection to the natural world can be measured as their trait of connection to nature (Kals et al., 1999; Mayer & Frantz, 2004), which means that connectedness to nature can be considered a personality trait that varies between groups and individuals and remains stable in different situations and over time (Mayer & Frantz, 2004; Nisbet, 2009). This trait significantly impacts people's physical, mental, and overall well-being due to the many benefits of being exposed to nature (Tauber, 2012). People who have more direct contact with natural environments tend to have a stronger emotional connection with nature, which can increase their interest in protecting the environment (Perkins, 2010). Based on this, connectedness to nature can be defined as an individual's enduring emotional attachment or affinity towards the natural world.

The theoretical framework for connectedness to nature is widely based on the biophilia hypothesis, which suggests that humans have an inherent connection with all life, strengthening health and survival (Wilson, 1984, as cited in Nisbet & Zelenski, 2013). However, a growing concern is that many individuals have lost their connection with nature, leading to a damaged relationship between humans and the environment (Nisbet & Zelenski, 2013). Scholars have suggested that people in the past were more attached to nature than people in industrialised countries today (Melson, 2001; Shepard, 1993; Shepard, 1996, as cited in Restall & Conrad, 2015), implying that modern society's pressures, technological advancements, and increased urbanisation may have caused a disconnection from nature. This disconnection can affect people's empathy towards other species and their interest in supporting conservation efforts (Louv, 2008; Kellert, 1997; Conn, 1998, as cited in Restall & Conrad, 2015). It also affects how

much individuals value the environment and their connection to nature across generations (Kahn, 2009).

Even though there might be a high connection to nature, this does not automatically translate into pro-environmental behaviours (Whitburn et al., 2019). Adding emotions elicited by the environment and climate change to the relationship between connectedness to nature and pro-environmental behaviour might narrow this gap.

The role of emotions

Emotions are responses that occur when something is seen as important to a person, leading to changes in behaviour, physical reactions, expressions, and subjective experience (Scherer, 2005). How emotions are experienced depends on how the situation is evaluated (Lazarus, 1991) (e.g. fear is triggered when there is a perceived threat, sadness is felt when there is a loss, and guilt is experienced when one has violated a moral standard). Emotions prompt behaviours that help people deal with the situation (Frijda et al., 1989), such as defensive actions (fight, flight, or freeze) when afraid, changing circumstances when sad, making reparations and reintegrating socially when feeling guilty. Emotions also affect how people think, evaluate, and judge situations by influencing risk and control appraisals (Lerner et al., 2015), significantly impacting future decision-making and behaviour (Brosch, 2021). Ekman et al. (1969) suggested six primary emotions: happiness, surprise, disgust, anger, fear, and sadness. Izard (2009) proposed classifying these emotions into two categories: "positive" and "negative." The "positive" group represents interest and joy, which includes happiness and surprise. The "negative" group includes anger, disgust, fear, and sadness.

Additionally, emotions are considered to have two dimensions. One dimension is the pleasantness of an emotion, also known as valence, which entails experiences characterised by pleasure. The second one is activation, or how much an emotion stimulates or restrains action (Barrett & Russell, 1999). All negative emotions are rather unpleasant; nevertheless, their extent of activation varies, which is important to note since less activating emotions result in disengagement from a perceived threat. In contrast, activating emotions predict behaviour to reduce the threat, such as approaching or fleeing the situation (Stanley et al., 2021). For example, depression is a deactivating feeling unlikely to encourage action. While anger is activating and linked to an approach propensity (fight), anxiety activates and causes avoidance of threat (flight) (Harmon-Jones, 2003; Stanley et al., 2021).

According to appraisal theory, emotions are evoked by evaluations (appraisals) of situations and events (Roseman & Smith, 2001). Thus, evaluating events and information related to climate change might cause emotional reactions in individuals, influencing environmental behaviour (Keller et al., 2012). Still, emotions have been widely neglected since most research on environmental behaviours focused on more cognitive factors (Russell et al., 2017), even though climate change has been generally associated with increased levels of anxiety and depression (Morganstein & Ursano, 2020). A recent study conducted in 10 different countries involving 10,000 adolescents and young adults found that 59% were "very or extremely" worried about climate change, as reported by Hickman et al. (2021). Furthermore, over 45% of respondents shared that their concerns regarding climate change were causing negative impacts on their daily lives, such as hindering their ability to concentrate in school or work. This was mainly due to their belief that their future was doomed and that governments were not doing

enough to address the problems faced by young people. This environmental worrying is positively related to pro-environmental behaviour (Verplanken et al., 2020).

Individuals may experience various emotions related to climate change, such as depression, anxiety, and anger. These emotions can affect their behaviour differently (Stanley et al., 2021). Emotions experienced in relation to climate change can be labelled as eco-emotions. The notion of eco-anxiety is the most prominent eco-emotion in scientific communities (Rozuel & Bellehumeur, 2022). Eco-anxiety refers to the feeling of concern and anxiety about the potential severity of climate change impacts, given the uncertainty surrounding their nature, timing, and location. These feelings can also be experienced by people who have not directly encountered the effects of climate change (Clayton, 2020; Clayton & Karazsia, 2020). Anxiety, in general, has been studied as a response that may be useful when faced with situations involving uncertainty about the future. This response can be beneficial when anticipating potential threats that are not currently present and preparing to deal with them if they arise (Heeren, 2020). Concerning eco-anxiety, several research studies have indicated that eco-anxiety is significantly linked to pro-environmental behaviours, showing moderate to strong associations between the two (Heeren et al., 2022; Sangervo et al., 2022; Verplanken et al., 2020). Additionally, previous research revealed that people who care more about environmental problems or feel more connected to nature are more likely to experience eco-anxiety (Clayton, 2020; Clayton & Karazsia, 2020).

In addition to eco-anxiety, two other key eco-emotions have been introduced. One of them is eco-anger. Stanley et al. (2023) found that individuals experience anger towards various aspects of climate change and that this anger is associated with different emotional and behavioural reactions to climate change. The most common source of anger among participants

was the lack of action and indifference towards climate change, which varied in degrees. Based on this, eco-anger can be defined as a distinct emotional response characterised by feelings of frustration, resentment, or outrage directed towards various aspects of climate change, mainly rooted in the perceived lack of action and indifference towards environmental issues.

The other eco-emotion introduced is eco-depression. According to Kidner (2007), when environmental problems play a significant role in causing someone to experience forms of depression, the emotional response to the loss of nature seems to be too much to bear. The conflict between the natural world and industrialisation, which often portrays destruction as a positive thing regarding progress or development, can resurface as a psychological conflict. Nonetheless, feelings of sadness, grief, deep sorrow, tearfulness, and emotional pain are common, even if they do not result in a clinical impairment (Marczak et al., 2023; Schwaab et al., 2022). Following this, eco-depression can be defined as a psychological state marked by sadness, grief, and emotional pain stemming from the perceived loss or degradation of nature due to environmental problems.

The study by Stanley et al. (2021) examined all three eco-emotions: eco-depression, eco-anger and eco-anxiety. The study investigated how adverse eco-emotions impact the overall well-being of individuals and their involvement in efforts to address climate change. Their study showed that these different eco-emotions could have varying effects on pro-environmental behaviours. Their results highlighted that eco-anger is associated with more engagement in personal and collective pro-environmental behaviours. At the same time, they found that eco-anxiety predicted lower levels of collective actions and eco-depression related to greater engagement in collective actions. Nevertheless, more research is needed to investigate different

types of eco-emotions and their relationship to varying pro-environmental behaviours and draw comprehensive conclusions.

Present study

Previous research indicates that being in touch with nature can lead to more eco-friendly behaviour. Multiple studies have shown a strong correlation between feeling connected to nature and taking action to benefit the environment (Barbaro & Pickett, 2016; Davis et al., 2011; Mackay & Schmitt, 2019). However, simply feeling a connection to nature does not necessarily translate into eco-friendly behaviour (Whitburn et al., 2019), the influence of other factors on this relationship remains to be seen. In an attempt to bridge this gap, this research explores the relationship between connectedness to nature and different types of pro-environmental behaviour and the influence of eco-emotions on this relationship.

Stanley et al.'s study (2021) has shown that eco-emotions, including eco-anxiety, eco-anger, and eco-depression, are significant factors influencing pro-environmental behaviour. Additionally, research has shown that individuals with a deeper connection to nature experience higher levels of eco-anxiety (Clayton, 2020; Clayton & Karazsia, 2020). However, research has yet to investigate this connection for the other two eco-emotions.

Furthermore, while Stanley et al.'s study (2021) is the first to examine different eco-emotions and their impact on different types of pro-environmental behaviours, more research is needed to verify and confirm these findings. Their results have shown that eco-anxiety relates to lower levels of collective pro-environmental behaviour, while eco-depression relates to more engagement in collective actions. Eco-anger is linked to increased engagement in both personal and collective pro-environmental behaviours. Nevertheless, since the study by Stanley et al.

(2021) is the only available research on this relationship, the present study investigates other relationships as well. Generally, depression is seen as a deactivating emotion, anger as an activating one and anxiety as an activating one that causes avoidance (Harmon-Jones, 2003; Stanley et al., 2021).

Based on the existing literature, two research questions and corresponding hypotheses were formulated, and the research models are illustrated in Figures 1 and 2.

Research questions and hypotheses

RQ1: What is the relationship between connectedness to nature and pro-environmental behaviours?

Hypothesis 1a: Connectedness to nature is expected to predict personal pro-environmental behaviours positively.

Hypothesis 1b: Connectedness to nature is expected to predict collective pro-environmental behaviours positively.

RQ2: How do different eco-emotions affect the relationship between connectedness to nature and various pro-environmental behaviours?

Eco-anxiety is an activating emotion (Harmon-Jones, 2003; Stanley et al., 2021) that has been shown to be higher in people who feel more connected to nature (Clayton, 2020; Clayton & Karazsia, 2020); thus, it is expected that connectedness to nature positively relates to eco-anxiety. Additionally, research has shown that experiencing eco-anxiety is associated with more pro-environmental behaviour (Heeren et al., 2022; Sangervo et al., 2022; Verplanken et al.,

2020). In contrast to what Stanley et al. (2021) found earlier, we expect to find a positive relationship between eco-anxiety and both personal and collective pro-environmental behaviour, as we expect increasing anxiety will heighten a person's motivation to act.

Hypothesis 2a: Eco-anxiety is proposed to mediate the relationship between connectedness to nature and personal pro-environmental actions. Both paths of the mediation are expected to be positive.

Hypothesis 2b: Eco-anxiety is proposed to mediate the relationship between connectedness to nature and collective pro-environmental actions. Both paths of the mediation are expected to be positive.

No research has investigated the effect of connectedness to nature on eco-anger. However, since connectedness to nature is positively related to eco-anxiety, we expect that this relationship can also be found for eco-anger. Furthermore, the study of Stanley et al. (2021) has shown that eco-anger is positively related to both personal and collective pro-environmental behaviour; thus, we expect to find the same relationship since eco-anger is an activating emotion (Harmon-Jones, 2003; Stanley et al., 2021).

Hypothesis 3a: Eco-anger is expected to mediate the relationship between connectedness to nature and personal pro-environmental behaviours. Both paths of the mediation are expected to be positive.

Hypothesis 3b: Eco-anger is proposed to mediate the relationship between connectedness to nature and collective pro-environmental behaviours. Both paths of the mediation are expected to be positive.

Currently, no research has investigated the effect of connectedness to nature on eco-depression. Nonetheless, since connectedness to nature is positively related to eco-anxiety, we expect to find the same relationship for eco-depression. Contrasting to what Stanley et al. (2021) previously found, we expect to find a negative relationship between eco-depression and both personal and collective pro-environmental behaviour, as we expect a higher depression score will reduce a person's motivation to act since depression is seen as a deactivating emotion (Harmon-Jones, 2003; Stanley et al., 2021).

Hypothesis 4a: Eco-depression is expected to mediate the relationship between connectedness to nature and personal pro-environmental actions. The path between connectedness to nature and eco-depression is expected to be positive, while the path between eco-depression and personal pro-environmental behaviour is expected to be negative.

Hypothesis 4b: Eco-depression is expected to mediate the relationship between connectedness to nature and collective pro-environmental actions. The path between connectedness to nature and eco-depression is expected to be positive, while the path between eco-depression and collective pro-environmental behaviour is expected to be negative.

Research models

Figure 1

The expected effect of connectedness to nature on personal pro-environmental behaviour (H1a) and the expected mediation effect of eco-anxiety (H2a), eco-anger (H3a), and eco-depression (H4a)

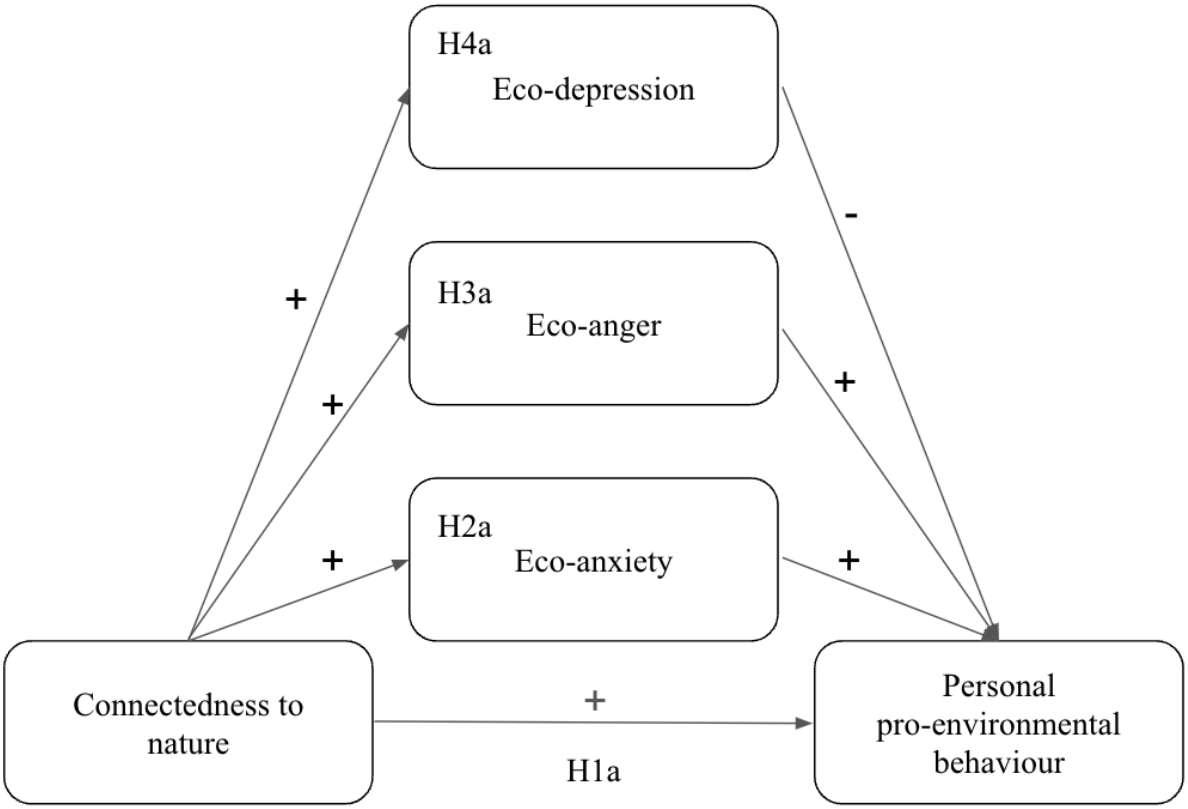
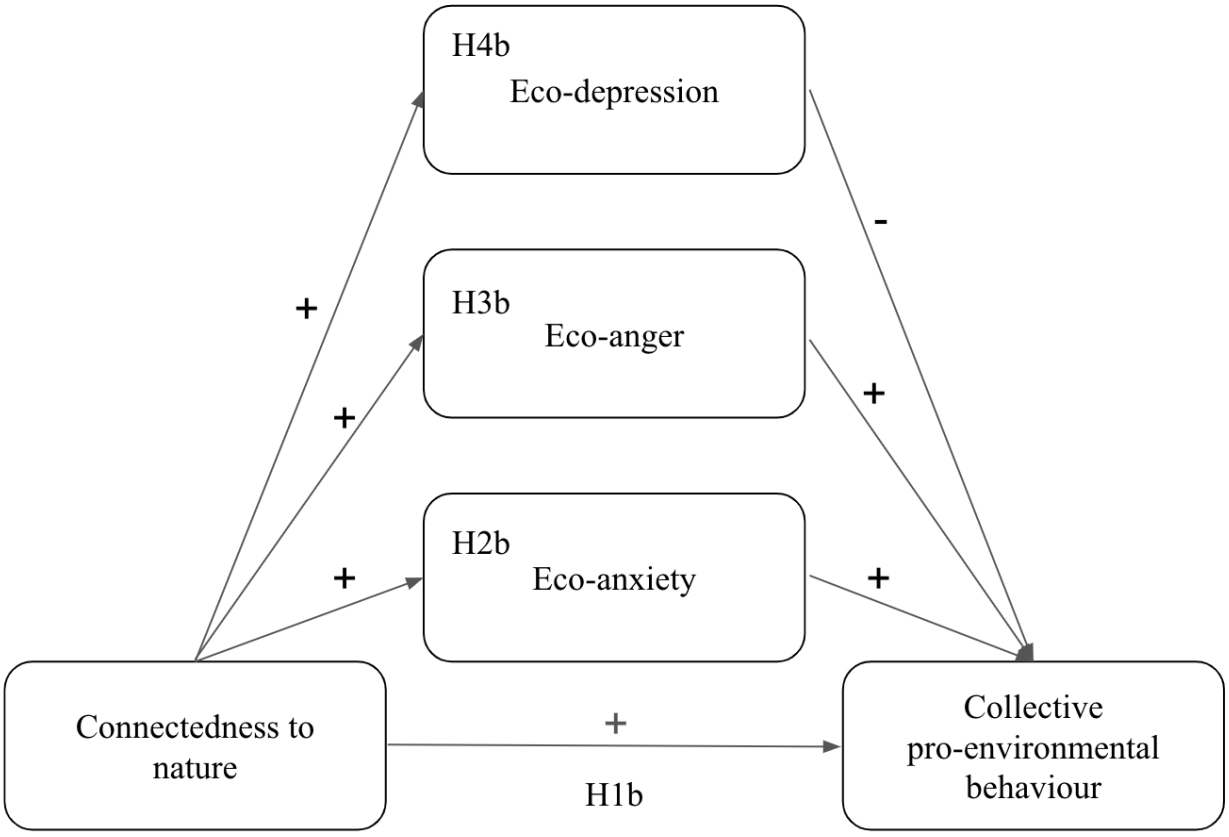


Figure 2

The expected effect of connectedness to nature on collective pro-environmental behaviour (H1b) and the expected mediation effect of eco-anxiety (H2b), eco-anger (H3b), and eco-depression (H4b)



Methodology

Design

This study used a quantitative cross-sectional study design. Thus, the variables were measured once. The questionnaire included five scales: one pro-environmental behaviour scale, one connectedness to nature scale, and three eco-emotions scales. The data collection began on 11.09.2023 and lasted 77 days. The research obtained ethical approval by the ethics committee of the University of Groningen.

Participants

The participants were recruited via convenience sampling through the researchers' network. Additionally, social media was used to recruit participants. Participants met the inclusion criteria if they were at least 18 and could understand English or German since the questionnaire was only available in these languages. Participation was voluntary, and withdrawal could be made at any time without justification.

The final sample consisted of 93 participants, which exceeded the proposed sample size by the G*power analysis of n= 77 for all analyses. A power estimate of 0.8 was used since it has been established that this is the ideal power of a study (Serdar et al., 2021). The majority of the final sample identified as female (81.7%). The sample's age range was quite broad; nevertheless, around ⅓ were between 18 and 25 (34.4%). Nationality-wise, there was much variety in the sample. Most participants had a different nationality than German or Dutch. Further information can be found in Appendix A.

Procedure

The questionnaire was created using Qualtrics (Qualtrics, 2015). Participants received an anonymous link with which they obtained access to the survey. This way, it could not be traced back to who participated in the study. Participants could freely decide whether to access the survey by clicking the link. First, the topic and purpose of the study were explained. Next, participants were informed about the anonymity and confidentiality of their answers and their right to withdraw from the study at any point (Appendix B).

After participants gave informed consent, they were directed to the first items concerning demographic information, such as age, gender, and nationality. Afterwards, the remaining concepts were measured: pro-environmental behaviour, connectedness to nature, eco-anger, eco-anxiety, and eco-depression. The scales about eco-emotions were presented in a random order to avoid order bias. At the end of the survey, participants received more information about the study, and the researchers thanked them for participating (Appendix C). Participants needed, on average, 15 minutes to complete the questionnaire. Beforehand, it was estimated that it would take them around 10 minutes to complete it.

Measures

Demographic information

The demographic variables collected were age (18-25, 26-30, 31-40,41-50, 51 or older), gender (male, female, non-binary/third gender, prefer not to say), and nationality (German, Dutch, Other).

Pro-environmental behaviour

The same measure that Stanley et al. (2021) used in their study was adopted to measure personal and collective pro-environmental behaviours. They formulated 16 items, eight for both personal and collective pro-environmental behaviours. Participants needed to indicate: "In the past year, how often have you done the following behaviours? Please give your response from 0 (never) to 100 (at every opportunity)". "Switched lights off around the house whenever possible" is an example of a personal pro-environmental behaviour item. "Joined a protest march" is an example of a collective pro-environmental behaviour item. Both scales were reliable in this research (personal actions: $\alpha = .78$; collective actions: $\alpha = .86$).

Connectedness to nature

The nature-relatedness scale (NR-6) (Nisbet & Zelenski, 2013) was used to measure participants' connectedness to nature. Participants were given the following instructions: "For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think "most people" feel". The scale consisted of six items. Example items are "My ideal vacation spot would be a remote, wilderness area" or "I feel very connected to all living things and the earth". Items were rated on a 5-point Likert-type scale where "Disagree strongly" (1) and "Agree strongly" (5). The scale was shown to be reliable ($\alpha = .84$).

Eco-emotions

The measures for the eco-emotions in this research differed from the study by Stanley et al. (2021) since their study used short measures to assess them. The Hogg Eco-Anxiety Scale

(HEAS-13) was used to measure eco-anxiety (Hogg et al., 2021). The participants had the following instructions: “Over the last two weeks, how often have you been bothered by the following problems when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)?” The scale contains 13 items. Example items are “Feeling anxious about the impact of your personal behaviours on the earth” or “Feeling nervous, anxious or on edge”. Items were rated on a 4-point Likert-type scale where “Not at all” (0) and “Nearly every day” (3). The HEAS-13 was reliable ($\alpha = .9$).

Since there are no validated measures to assess eco-anger and eco-depression, the HEAS-13 was adapted to test for these emotions (Appendix D). To adopt the HEAS-13 for the other two eco-emotions, the original items were investigated, and items that seemed adoptable were adjusted. For example, items like “Feeling anxious that your personal behaviours will do little to help fix the problem” were easily adjusted to measure eco-depression and eco-anger.

Additionally, for the eco-depression scale, the subscale for depression of the Depression Anxiety Stress Scale (DASS-21) (Lovibond, S. H., 1995, as cited in Stanley et al., 2021) was partly adopted and fitted to the environmental context. For example, “I felt down-hearted and blue” was changed to “I felt down-hearted and blue when thinking about future climate change and other global environmental problems”. This way, the final eco-depression scale contained nine items, and the overall scale was reliable ($\alpha = .81$).

For the eco-anger scale, no fitting anger scale could be found as a basis. Thus, the wording of HEAS-13 was simply adjusted to fit a different emotion. For example, “Feeling nervous, anxious or on edge” was changed to “Feeling angry or frustrated”. Additionally, items that seemed fitting for eco-angers, like “Angry or hostile feelings towards individuals/groups that

damage the environment or significantly contribute to climate change", were included. In the end, the scale contained eight items. This scale was also reliable ($\alpha = .89$). The instruction and rating scale from the HEAS-13 was used for the developed eco-depression and eco-anger scales.

Method of analysis

Data was analysed using SPSS (version 27). Before starting the analysis, the gathered data was prepared. In total, 105 individuals filled out the survey. Respondents who did not fill out at least one whole scale or only answered the demographic items were excluded from the data set; thus, 93 participants remained in the sample. Multiple assumptions were tested before the following analyses were conducted. Frequency distributions were created for the demographic variables and descriptive statistics for the other variables. The reliability of the scales was examined by using Cronbach's alpha analysis.

H1a and *H1b* were examined using simple linear regression analyses with connectedness to nature as the independent variable. For *H1a,* the dependent variable is personal pro-environmental behaviour. Furthermore, for *H1b,* the dependent variable is collective pro-environmental behaviour. The SPSS macro-PROCESS (Hayes, 2023) was used to test the remaining hypotheses about the effects of mediation. Running this macro will give the indirect effect of the independent variable on the mediator and the effect of the mediator on the dependent variable while controlling for the independent variable. Additionally, one will see the direct effect of the independent variable on the dependent variable while controlling for the mediator. A significance level of $p < .05$ was used for all analyses.

Results

Descriptive statistics

Multiple assumptions were tested before the hypothesis testing. Firstly, the variables were examined regarding their distribution. The Shapiro-Wilk test was used to test for normal distribution. For the personal pro-environmental behaviour scale, the test showed no significant departure from normality ($W(93) = 0.98$, $p = .102$). The test did show significant deviation from normality for the other variables, namely collective pro-environmental behaviour ($W(93) = 0.94$, $p < .001$), connectedness to nature ($W(91) = 0.96$, $p = .003$), eco-anxiety ($W(86) = 0.9$, $p < .001$), eco-anger ($W(86) = 0.92$, $p < .001$), and eco-depression ($W(86) = 0.91$, $p < .001$). However, the normal P-P plots did indicate normality for all these variables; therefore, it can be concluded that all variables met the normality assumption. The Q-Q and residual plots indicated linearity and homoscedasticity for all variables; thus, these assumptions are met. All six variables showed an absence of multicollinearity (Tolerance = 1, VIF = 1); therefore, this assumption was also met. Thus, all variables met the required assumptions for normal distribution, linearity, homoscedasticity, and multicollinearity.

The descriptive statistics of the personal pro-environmental behaviour, collective pro-environmental behaviour, connectedness to nature, eco-anxiety, eco-anger and eco-depression variables can be seen in Table 2. On average, participants indicated much higher scores for personal actions ($M = 61.32$; $SD = 18.31$) than collective ones ($M = 31.76$; $SD = 23.02$).

Table 2

Descriptive statistics of the variables personal pro-environmental behaviour (Pers-PEB), collective pro-environmental behaviour (Coll-PEB), connectedness to nature (CN), eco-anxiety, eco-anger and eco-depression

Variable	*n*	*M*	*SD*	*Min*	*Max*
Pers-PEB (Scale 0-100)	93	61.32	18.31	12.75	100
Coll-PEB (Scale 0-100)	93	31.76	23.02	0	85
CN (Scale 1-5)	91	3.59	0.9	1.67	5
Eco-anxiety (Scale 0-3)	86	0.55	0.5	0	2.15
Eco-anger (Scale 0-3)	86	0.87	0.69	0	2.5
Eco-depression (Scale 0-3)	86	0.59	0.5	0	2

Hypotheses testing

Linear regression analysis

Two linear regression analyses were conducted to test the hypotheses related to the first research question (*What is the relationship between connectedness to nature and pro-environmental behaviours?)*. For *H1a* (*Connectedness to nature is expected to predict personal pro-environmental behaviours positively*), connectedness to nature was set as the predictor and personal pro-environmental behaviour as the outcome variable. The overall regression was statistically significant ($R^2 = .38$, $F(1,89) = 53.9$, $p < .001$). For every point someone went up on the connectedness to nature scale, their personal pro-environmental behaviour increased by 12.11 points. In other words, the more connected people felt to nature, the more likely they were to act in environmentally friendly ways in the personal domain. So, feeling connected to nature positively predicted the personal pro-environmental behaviour of participants. Therefore, *H1a* can be accepted.

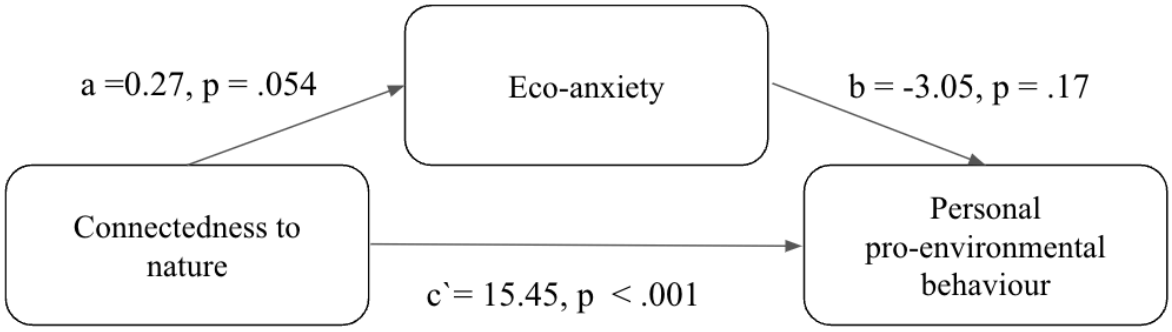
For *H1b* (*Connectedness to nature is expected to predict collective pro-environmental behaviours positively*), connectedness to nature was again set as the predictor and collective pro-environmental behaviour as the outcome. The overall regression was statistically significant ($R^2 = .24$, $F(1,89) = 27.43$, $p < .001$). Participants' collective pro-environmental behaviour increased by 12.31 points, for every point, they went up the connectedness to nature scale. Thus, the more connected participants felt to nature, the more collective pro-environmental behaviour they exhibited. Therefore, connectedness to nature positively predicted collective pro-environmental behaviour. Consequently, *H1b* can be accepted.

Mediation analysis

A series of regression analyses were conducted using the Process-macro in SPSS to test the remaining hypotheses related to the second research question (*How do different eco-emotions affect the relationship between connectedness to nature and various pro-environmental behaviours?*). For *H2a* (*Eco-anxiety is proposed to mediate the relationship between connectedness to nature and personal pro-environmental actions. Both paths of the mediation are expected to be positive*), the mediating role of eco-anxiety on the relationship between connectedness to nature and personal pro-environmental behaviour was assessed. The results showed an insignificant indirect effect of the impact of connectedness to nature on personal pro-environmental behaviour (b = -0.81, t = -1.29), thus, not supporting *H2a*. However, the direct effect of connectedness to nature on personal pro-environmental behaviour in the mediator's presence was significant ($b_{c'}$ = 15.45, $p < 0.001$). The complete direct effects can be seen in Figure 3. Thus, eco-anxiety did not mediate the relationship between connectedness to nature and personal pro-environmental behaviour. This suggests that feeling anxious about environmental issues does not seem to be why connectedness to nature affects personal climate behaviour. The mediation analysis summary is presented in Table 3.

Figure 3

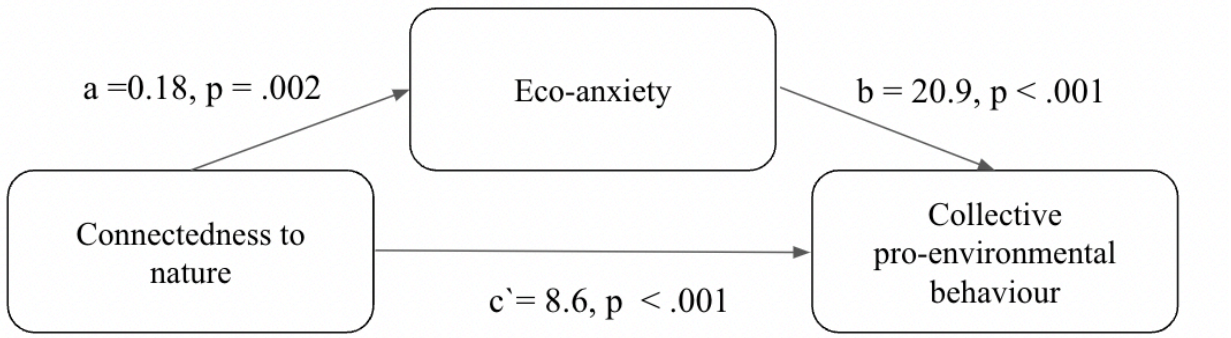
Research model of hypothesis 2a, including the direct effects of paths a, b and c`



For *H2b* (*Eco-anxiety is proposed to mediate the relationship between connectedness to nature and collective pro-environmental actions. Both paths of the mediation are expected to be positive*), the mediating role of eco-anxiety on the relationship between connectedness to nature and collective pro-environmental behaviour was assessed. The results revealed a significant indirect effect of the impact of connectedness to nature on collective pro-environmental behaviour (b = 3.8, t = 3.1), supporting *H2b*. Furthermore, the direct effect of connectedness to nature on collective pro-environmental behaviour in the mediator's presence was also significant ($b_{c'}$ = 8.6, $p < 0.001$). The complete direct effects can be seen in Figure 4. Hence, eco-anxiety partially mediated the relationship between connectedness to nature and collective pro-environmental behaviour. Eco-anxiety partially explains why being connected to nature affects how much people engage in collective climate action. This suggests that emotions, specifically eco-anxiety, are part of why a connection to nature influences collective environmental behaviour. The mediation analysis summary is presented in Table 3.

Figure 4

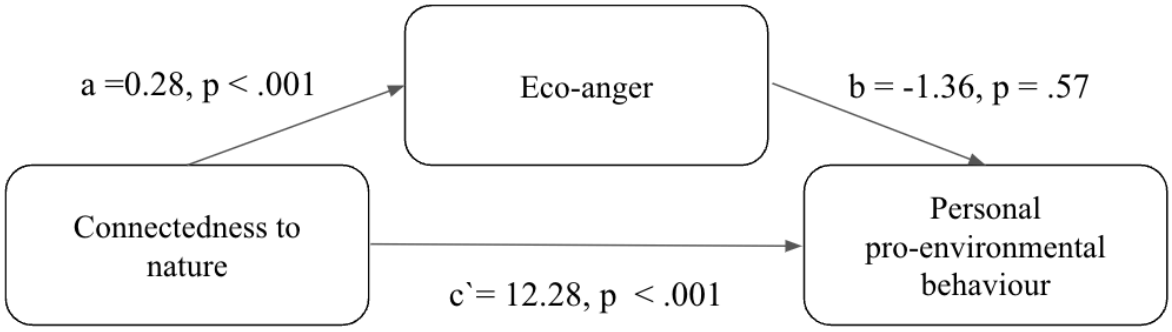
Research model of hypothesis 2b, including the direct effects of paths a, b and c`



For *H3a* (*Eco-anger is expected to mediate the relationship between connectedness to nature and personal pro-environmental behaviours. Both paths of the mediation are expected to be positive*), the mediating role of eco-anger on the relationship between connectedness to nature and personal pro-environmental behaviour was assessed. The results revealed an insignificant indirect effect of the impact of connectedness to nature on personal pro-environmental behaviour (b = -0.39, t = -0.61), thus not supporting *H3a*. However, the direct effect of connectedness to nature on personal pro-environmental behaviour in the mediator's presence was significant ($b_{c`}$ = 12.28, $p < 0.001$). The complete direct effects can be seen in Figure 5. Still, being angry about environmental issues does not seem to be why this connection to nature affects personal behaviour. The mediation analysis summary is presented in Table 3.

Figure 5

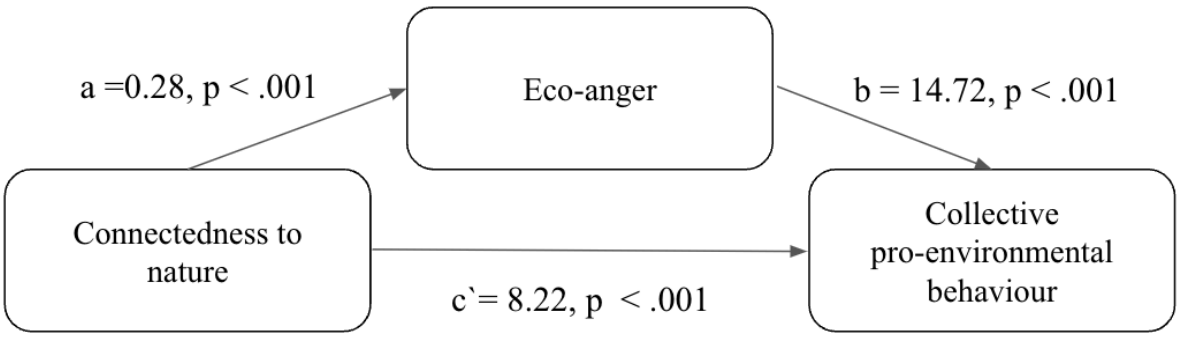
Research model of hypothesis 3a, including the direct effects of paths a, b and c`



For *H3b* (*Eco-anger is proposed to mediate the relationship between connectedness to nature and collective pro-environmental behaviours. Both paths of the mediation are expected to be positive*), the mediating role of eco-anger on the relationship between connectedness to nature and collective pro-environmental behaviour was assessed. The results revealed a significant indirect effect of the impact of connectedness to nature on collective pro-environmental behaviour (b = 4.16, t = 2.82), supporting *H3b*. Furthermore, the direct effect of connectedness to nature on collective pro-environmental behaviour in the mediator's presence was also significant ($b_{c`}$ = 8.22, $p < 0.001$). The complete direct effects can be seen in Figure 6. Hence, eco-anger partially mediated the relationship between connectedness to nature and collective pro-environmental behaviour. Eco-anger partially explains why being connected to nature affects how much people engage in collective climate action. This suggests that emotions, specifically eco-anger, are part of why a connection to nature influences collective environmental behaviour. The mediation analysis summary is presented in Table 3.

Figure 6

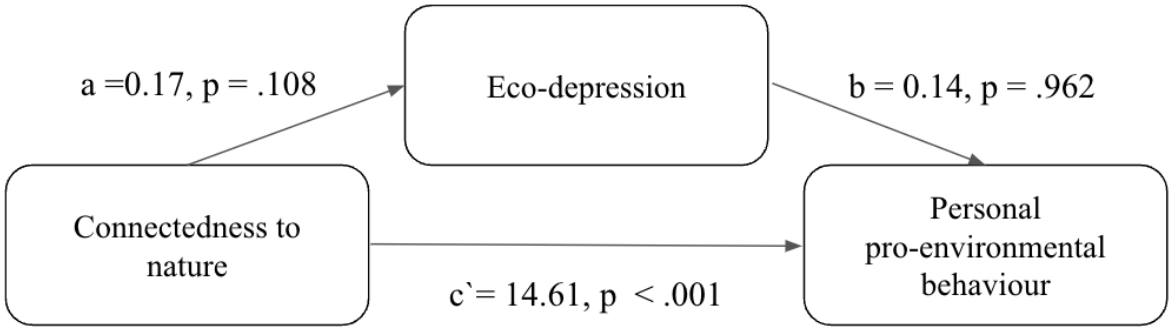
Research model of hypothesis 3b, including the direct effects



For *H4a* (*Eco-depression is expected to mediate the relationship between connectedness to nature and personal pro-environmental actions. The path between connectedness to nature and eco-depression is expected to be positive, while the path between eco-depression and personal pro-environmental behaviour is expected to be negative*); the mediating role of eco-depression on the relationship between connectedness to nature and personal pro-environmental behaviour was assessed. The results revealed an insignificant indirect effect of the impact of connectedness to nature on personal pro-environmental behaviour (b =0.02, t = 0.04), thus not supporting *H4a*. Still, the direct effect of connectedness to nature on collective pro-environmental behaviour in the mediator's presence was significant ($b_{c'}$ = 14.64, $p < 0.001$). The complete direct effects can be seen in Figure 7. Thus, feeling down about environmental issues does not seem to be why connectedness to nature affects personal climate behaviour. The mediation analysis summary is presented in Table 3.

Figure 7

Research model of hypothesis 4a, including the direct effects of paths a, b and c`



For *H4b* (*Eco-depression is expected to mediate the relationship between connectedness to nature and collective pro-environmental actions. The path between connectedness to nature and eco-depression is expected to be positive, while the path between eco-depression and personal pro-environmental behaviour is expected to be negative*), the mediating role of eco-depression on the relationship between connectedness to nature and collective pro-environmental behaviour was assessed. The results revealed an insignificant indirect effect of the impact of connectedness to nature on collective pro-environmental behaviour (b = 1.57, t = 1.53), thus not supporting *H4*. Still, the direct effect of connectedness to nature on collective pro-environmental behaviour in the mediator's presence was significant ($b_{c'}$ = 10.8, $p < 0.001$). The complete direct effects can be seen in Figure 8. Nevertheless, feeling down about environmental issues does not seem to be why this connection to nature affects collective climate behaviour. The mediation analysis summary is presented in Table 3.

Figure 8

Research model of hypothesis 4b, including the direct effects of paths a, b and c`

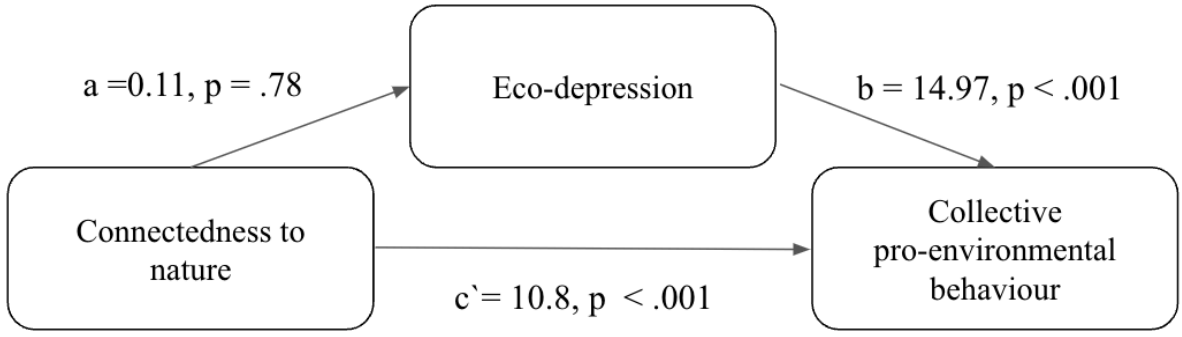


Table 3

Mediation analysis summary

Hypothesis	Total effect	Direct effect (c`)	Indirect effect	Confidence Interval		t-statistics	Conclusion
				Lower Bound	Upper Bound		
Hypothesis 2a	14.64	15.45	-0.81	-2.3	0.2	-1.29	No Mediation
Hypothesis 2b	12.37	8.6	3.75	1.64	6.36	3.1	Partial Mediation
Hypothesis 3a	11.89	12.29	-0.39	-1.8	0.7	-0.61	No mediation
Hypothesis 3b	12.37	8.22	4.18	1.7	7.4	2.82	Partial mediation
Hypothesis 4a	14.64	14.61	0.02	-1.2	1.2	0.04	No Mediation
Hypothesis 4b	12.37	10.8	1.57	-0.3	3.8	1.53	No mediation

Discussion

The present study aimed to investigate the connections between connectedness to nature, eco-emotions, and pro-environmental behaviours, shedding light on their predictive roles and mediating effects. Specifically, the study explored the relationship between connectedness to nature and both personal and collective pro-environmental behaviours, as well as the mediating effects of eco-anxiety, eco-anger, and eco-depression.

Summary of findings

The findings showed a positive relationship between connectedness to nature and both personal and collective pro-environmental behaviours. These results align with previous research suggesting that individuals who feel more connected to nature are more likely to engage in environmentally friendly actions (Davis et al., 2009; Davis et al., 2011; Mayer & Frantz, 2004; Nisbet et al., 2009; Schultz & Tabanico, 2007).

The results indicated that eco-anxiety does not mediate the relationship between connectedness to nature and personal climate action. However, eco-anxiety was found to significantly mediate the relationship between connectedness to nature and collective pro-environmental actions. Stanley et al. (2021) also found a significant relationship between these factors. Nevertheless, in contrast to their study, which found that eco-anxiety predicts lower levels of collective action, this study could not support this. This research showed that eco-anxiety predicts higher levels of collective action. The use of different measurements for eco-anxiety might explain these differences.

According to this research, eco-anger acts as a significant mediator between connectedness to nature and collective pro-environmental behaviour. On the other hand,

eco-anger did not mediate the relationship between connectedness to nature and personal climate action. This means that while anger can drive people to participate in collective actions, it may not significantly impact personal environmentally friendly behaviour. This differs from a recent study by Stanley et al. (2021), who found that eco-anger predicts both personal and collective pro-environmental behaviour. The different findings could be explained by the differing measuring instruments used.

Moreover, eco-depression did not mediate the relationship between connectedness to nature and either personal or collective pro-environmental actions. Even though eco-depression did predict higher levels of collective action, which is in line with what Stanely et al. (2021) found. Differences in measurement tools might explain differing findings. Additionally, the results showed no significant relationship between connectedness to nature and eco-depression. Thus, it is not the case that feeling more connected to nature results in stronger feelings of eco-depression.

Connectedness to nature and pro-environmental behaviour

This study's findings align with the biophilia hypothesis, which suggests that people with a strong connection with nature are more likely to engage in activities promoting environmental well-being. This connection is believed to be rooted in humans' evolutionary history, as proposed by Wilson in 1984 (as cited in Nisbet & Zelenski, 2013). The study measured "connectedness to nature" as an indicator of the biophilia hypothesis. It suggests that people with a high level of connectedness to nature may have a stronger inclination towards biophilia, which could positively influence their attitudes and behaviours towards the environment. The study's findings support the biophilia hypothesis regarding environmental attitudes and actions, showing a

positive correlation between connectedness to nature and individual and collective pro-environmental behaviours.

Mediation effects of eco-emotions on connectedness to nature and pro-environmental behaviour

The Protective Action Decision Model (PADM) proposed by Lindell and Perry (2012) explains the findings of this study. According to PADM, the decision-making process regarding protective actions in response to a perceived threat involves several stages, including the perception of the threat, emotional response to the threat, evaluation of coping options, and decision to take protective action. In this study, it was found that the connection to nature is crucial in shaping individuals' perceptions of environmental threats. People who feel deeply connected to nature are more aware of the collective impact of environmental challenges, including those related to climate change (Verplanken et al., 2020).

The study observed that eco-anxiety and eco-anger mediate the emotional response to perceived environmental threats within the framework of PADM. These eco-emotions act as catalysts, translating connectedness to nature into collective pro-environmental behaviour. This finding suggests that individuals who feel a strong connection to nature and experience these eco-emotions are more motivated to address environmental challenges collectively, moving beyond mere awareness to concrete actions for environmental protection on a collective level (van Zomeren et al., 2004).

The study also found that engaging in collective pro-environmental behaviours, such as participating in environmental movements or advocating for sustainable policies, can be viewed as a coping mechanism. These behaviours allow individuals to actively contribute to addressing

perceived environmental threats and collectively work toward solutions. Thus, eco-anxiety and eco-anger serve as motivations that drive individuals to seek collective actions to cope with the emotional distress caused by environmental concerns (van Zomeren et al., 2004), which aligns with PADM's emphasis on emotional responses influencing protective actions.

However, the study did not find a significant mediating role of eco-anxiety and eco-anger on personal pro-environmental behaviour. This suggests that while these emotions motivate participation in collective actions, they may not significantly influence personal environmentally friendly behaviour, highlighting the differential impact of emotions on individual and collective pro-environmental actions.

The study also found that eco-depression did not mediate the relationship between connectedness to nature and collective or personal pro-environmental behaviour. However, eco-depression did predict higher levels of collective climate action, which is also in line with PADM's emphasis on emotional responses influencing protective actions.

Sample and means

Eco-anger had the largest average of all the eco-emotions in this research, which is noteworthy because it stands out, especially considering that eco-anger is less well-studied than eco-anxiety. Thus, previous research might have missed valuable information by not including eco-anger in their studies. Since eco-anger has yet to be widely studied, there is not much comparison, but in the research of Stanley et al. (2021), eco-anger was also one of the highest out of the eco-emotions. They suggest that eco-anger might be a healthy adaptive form of coping since engaging in collective pro-environmental actions allows individuals to express their anger collectively and address issues at a systemic level (Stanley et al., 2023), whereas eco-anxiety and

eco-depression might be taxing, which adds significance to this finding. Thus, the fact that the average eco-anger score was the highest among participants may be beneficial since it may be a more healthy adaptive response compared to the other eco-emotions.

Additionally, the notable difference between personal and collective pro-environmental behaviour scores is crucial for understanding behavioural patterns. On average, participants reported personal pro-environmental behaviours more than collective pro-environmental behaviour. On the same note, in the study of Stanley et al. (2021), personal action was also reported way more than collective action. There might be various reasons for this. For one, personal pro-environmental behaviours often involve actions within an individual's control, such as using reusable items, reducing personal energy consumption, or practising sustainable lifestyles. People may feel more autonomy and control over personal behaviours than collective actions, where a larger group or external factors may influence the outcomes (Jugert et al., 2016). Additionally, there might be a psychological distance associated with collective pro-environmental actions. Individuals may feel that their contribution to collective efforts is less noticeable or impactful, making them perceive that their actions may not make a significant difference (Van Lange & Huckelba, 2021).

Moreover, it is crucial to consider the gender imbalance in the sample, where around 80% of participants were women. This finding aligns with research suggesting a societal association between the female gender and nature, possibly influenced by the "mother nature" concept and the stereotypical feminine traits associated with caring and nurturing (Liu et al., 2019). This gender skew may impact the generalisability of the findings and highlights the need for caution in interpreting the results, emphasising the importance of diverse and representative participant samples in research studies.

Limitations and strengths

The current study has several notable strengths. First, it addresses a significant research gap by examining the relationships between connectedness to nature, two different types of pro-environmental behaviour, and three distinct eco-emotions in a single study. This comprehensive approach is necessary because previous research has tended to focus on one or two types of these factors at a time. Additionally, the developed measures for eco-anger and eco-depression in this study proved reliable, which is a significant strength since no validated scales are available for these variables yet.

However, it is also essential to recognise some of the study's limitations. One of the main limitations is the cross-sectional design, which means that the study cannot establish causal relationships between the variables. This is because the data were collected at a single point in time rather than over a more extended period.

Another potential limitation of the study is that it relies on self-reported measures, which may introduce response biases (Oskamp & Schultz, 2005). Thus, it must be acknowledged that participants may be inclined to report more pro-environmental behaviour than they actually engage in because they believe it is socially desirable. This transparency in acknowledging potential biases is crucial in maintaining the integrity of this research.

Finally, while the study's sample includes people of various ages, there is limited gender diversity, which may limit the generalisability of the findings. However, despite these limitations, it is crucial to note that this study still provides valuable insights into the relationships between connectedness to nature, pro-environmental behaviour, and eco-emotions. Therefore, it is important to interpret the findings within the context of these limitations and appreciate the value they bring to the field.

Practical Implications

The results of this study have significant implications for interventions aimed at promoting pro-environmental behaviours. The study suggests that recognising the positive relationship between connectedness to nature and personal and collective pro-environmental actions may enhance individuals' willingness to engage in environmentally friendly behaviours. Therefore, interventions that foster a sense of connection to nature may be more effective in promoting pro-environmental behaviours than interventions that do not highlight this connection.

Furthermore, the study highlights the vital role of eco-emotions, especially eco-anxiety and eco-anger, in mediating the relationship between connectedness to nature and pro-environmental behaviours. This indicates that addressing emotional responses to environmental issues in environmental campaigns and educational programs is crucial. Helping individuals understand and express their emotions about environmental issues can contribute to more effective environmental communication and behaviour change (Chawla, 2015). Strategies that acknowledge and validate individuals' emotional reactions to environmental issues while providing actionable steps may be more effective in promoting pro-environmental behaviours (Clayton, 2020; Maibach et al., 2010). One can better understand and engage individuals in pro-environmental behaviours by recognising and addressing eco-emotions' significance.

Future research

The current study has comprehensively analysed the intricate connections between connectedness to nature, eco-emotions, and pro-environmental behaviours. However, the findings have highlighted specific gaps and limitations that necessitate further exploration and

investigation. Several research avenues have emerged from these findings that could enhance understanding of these relationships.

Firstly, the study identified a positive relationship between eco-anxiety and collective pro-environmental actions, which contradicts some previous findings. Therefore, further investigation is needed to understand the nuances of eco-anxiety as a mediator between connectedness to nature and collective pro-environmental actions. Exploring contextual factors or individual differences influencing how eco-anxiety drives collective actions can provide a more comprehensive understanding.

Additionally, the study identified different emotional pathways, which have contrasting results in other studies. Therefore, there is a need for more research to compare and contrast how various eco-emotions impact personal and collective pro-environmental behaviours. Identifying the conditions under which eco-anxiety and eco-anger act as activating emotions will contribute to a nuanced understanding.

Moreover, the current study employed a cross-sectional design, limiting the ability to establish causation. Therefore, future research could benefit from longitudinal designs, tracking participants over time to explore how changes in connectedness to nature relate to shifts in eco-emotions and subsequent pro-environmental behaviours.

Furthermore, although eco-depression did not mediate the relationship between connectedness to nature and collective pro-environmental actions, the study indicated a predictive role. Therefore, investigating the mechanisms behind this relationship, including the potential restorative effects of pro-environmental actions, would deepen understanding.

Also, to enhance the generalisability of findings, future research should aim for more gender-diverse samples. Exploring how gender influences the relationships between

connectedness to nature, eco-emotions, and pro-environmental behaviours can provide a more comprehensive understanding.

Finally, while the study developed reliable measures for eco-anger and eco-depression, continued efforts to validate these scales and refine measurement tools will strengthen the reliability and validity of future research in this emerging area.

Conclusion

This research investigated the relationships between connectedness to nature, eco-emotions, and pro-environmental behaviours. The results supported a positive association between connectedness to nature and personal and collective pro-environmental actions. Eco-anxiety and eco-anger were identified as significant mediators, suggesting that emotional responses play a crucial role in shaping individuals' environmental behaviours.

The study contributes to the growing literature on the psychological factors influencing pro-environmental behaviours. It provides practical insights for designing interventions considering individuals' emotional responses and connectedness to nature. For example, interventions that foster a stronger connection to nature should be designed to promote climate action. Future research should explore these relationships further, considering additional variables and employing longitudinal designs to establish causation.

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Appendix A

Table 1

Characteristics of the sample (N = 93)

Variable		*n*	*%*
Age	18-25 years	32	34.4
	26-30 years	19	20.4
	31-40 years	21	22.6
	41-50 years	11	11.8
	51 or older	10	10.8
Gender	Female	76	81.7
	Male	15	16.1
	Non-binary/third gender	1	1.1
	Prefer not to say	1	1.1
Nationality	Dutch	21	22.6
	German	35	37.6
	Other [a]	37	39.8

Note. [a] American, Australian, Austrian, British, Danish, Finnish, French, Greek, Hungarian, Irish, Lithuanian, Norwegian, Portuguese, and Slovenian.

Appendix B

INFORMATION ABOUT THE RESEARCH

Version for participants

How do eco-emotions influence the relationship between one's connectedness to nature and pro-environmental behaviours?

PSY-2223-S-0201

Why do I receive this information?

You are receiving this information because you are being invited to participate in the research for a Master's thesis regarding eco-emotions. You, in particular, are invited to participate since a broad perspective is needed to gain insight into the new eco-emotion area.
Since this research is part of a Master's thesis, this research involves a Master's student and the accompanying thesis supervisor.

Do I have to participate in this research?

Participation in the research is voluntary. However, your consent is needed. Therefore, please read this information carefully. Ask all the questions you might have, for example because you do not understand something. Only afterwards you decide if you want to participate. If you choose not to participate, you do not need to explain why, and there will be no negative consequences for you. You have this right at all times, including after you have consented to participate in the research.

Why this research?

Previous research showed that climate change and environmental problems could produce varying emotions in oneself, which can also influence our actions in regard to climate change. Thus, this research aims to investigate this relationship and to add to current knowledge.

What do we ask of you during the research?

You will first be asked for your consent to participate in this study. Afterwards, you will be asked for some general demographic information about yourself to be able to gain some insight into the participant pool of this research. Then, the main part of this study will take place where you will be asked to answer some questions about your emotions regarding climate change, your actions in relation to environmental problems and your connectedness to nature. It is expected to take 10-15 minutes to answer the questionnaire. Unfortunately, there will be no compensation or reward for participating in this study.

What are the consequences of participation?

As mentioned, there are no direct benefits that come with participating, but nevertheless, there are some indirect benefits. By completing this study, you may gain some knowledge about climate action and the emotions that may be associated with it in yourself. Thus, you may learn something about yourself in the process as well. But it is important to note that those outcomes can not be guaranteed.

It might be that thinking about your emotions concerning climate change results in some form of mental discomfort. This risk is assumed to be low. Nevertheless, if you experience any discomfort or distress during or after this study, please do not hesitate to contact one of the researchers, talk to other people in your life, or reach out to mental health specialists.

How will we treat your data?
The data will be processed for educational purposes in the context of a Master's thesis. When communicating about the results, no personal information of individual participants will be discussed. Additionally, since there is no way to trace specific information back to one particular participant, the study is anonymous. You will not be asked for any information that could directly or indirectly identify you. Per institutional guidelines, the obtained data must be stored for ten years.

What else do you need to know?
You may always ask questions about the research: now, during the research, and after the end of the research. You can do so by emailing one of the researchers involved.

Ramona Wächtler r.wachtler@student.rug.nl
Therre van Blerck t.van.blerck@rug.nl

Do you have questions/concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl.

As a research participant, you have the right to a copy of this research information. You are free to take a screenshot or use your phone to take a picture of this research information.

Appendix C

Thank you for taking the time to answer these questions.
Your response has been recorded.

Some further information:

This study explores people's psychological distance towards climate change and how it hinders immediate action. It is suggested that feeling connected to nature can reduce this distance and lead to pro-environmental behaviour. The study introduces the concept of eco-emotions (eco-anxiety, eco-anger, and eco-depression) and examines their role in mediating the relationship between connectedness to nature and pro-environmental actions.

The research aims to answer two main questions:

1. What is the link between connectedness to nature and pro-environmental behaviours?
2. How do different eco-emotions influence the relationship between connectedness to nature and pro-environmental actions?

If you are interested in the results of this study, you can contact r.wachtler@student.rug.nl.

Appendix D

Eco-depression scale

"Over the last two weeks, how often have you been bothered by the following problems when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)?"

1. I couldn't seem to experience any positive feelings at all
2. I found it challenging to work up the initiative to take action regarding climate change
3. I felt that I had nothing to look forward to
4. I felt down-hearted and blue when thinking about future climate change and other global environmental problems
5. I was unable to become enthusiastic about anything
6. I felt that life was meaningless
7. Feeling depressed about the impact of your personal behaviours on the earth
8. Feeling depressed about your personal responsibility to help address environmental problems
9. Feeling depressed that your personal behaviours will do little to help fix the problem

Response scale: 0 = not at all, 1 = several of the days, 2 = over half the days, 3 = nearly every day.

Eco-anger scale

"Over the last two weeks, how often have you been bothered by the following problems when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)?"

1. Feeling angry or frustrated
2. Feeling angry about climate change and other global environmental problems

3. Feeling angry about past events related to climate change
4. Angry or hostile feelings towards individuals/groups that damage the environment or significantly contribute to climate change
5. Angry about future climate problems
6. Annoyed by others that do not pay attention to climate change
7. Feeling angry about the impact of your personal behaviours on the earth
8. Feeling angry that your personal behaviours will do little to help fix the problem

Response scale: 0 = not at all, 1 = several of the days, 2 = over half the days, 3 = nearly every day.