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Climate anxiety: Conceptual considerations, and connections with climate hope and action

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ABSTRACT

Climate anxiety is a phenomenon which raises growing attention. Based on a national survey of climate-related feelings and behaviors ($N = 2070$) in Finland, we analyzed and discussed the concept of climate anxiety and its relationship with hope and action. We found that all our measures for climate anxiety (including worry and some stronger manifestations of anxiety) and hope (including efficacy beliefs) correlated positively with each other and climate action. Furthermore, climate anxiety and hope explained unique parts of variance in self-reported climate action. We propose that, in line with the Extended Parallel Process model (EPPM) that was used as a framework, the interplay of emotions needs to be considered when studying and explaining their effect on climate action. In conclusion, the results provide support for seeing climate anxiety and hope as intertwined and adaptive feelings, which could be needed to motivate humankind in finding solutions to climate change.

Climate change is a major ecological and social crisis of our time and, as such, can evoke a variety of psychological reactions (Cunsolo et al., 2020; Manning & Clayton, 2018). Scholarship is increasing, but there is a need for further research about these reactions and their interplay. One of the most pressing questions is the relation between climate anxiety and action (see e.g., Clayton, 2020; Clayton & Karazsia, 2020; Stanley et al., 2021).

The word anxiety is sometimes linked with anxiety disorders and, as such, it might be expected that a person who feels anxiety is not prone to act constructively. However, anxiety can manifest in diverse ways (Grupe & Nitschke, 2013; Kurth, 2018; LeDoux, 2016; Pihkala, 2020a) and climate anxiety, variously defined, has been shown to lead to both action and paralysis (e.g., Budziszewska & Jonsson, 2021; Clayton & Karazsia, 2020; Hickman, 2020; Nairn, 2019). It is therefore necessary to further study the varieties of climate anxiety and the factors that can shape climate anxiety into different outcomes, such as hope. Indeed, hope is suggested to be a key emotion in relation to climate crisis: without hope it can be difficult to find a reason to act (Bury et al., 2020; Ojala, 2012a). However, also the role of hope has been debated, as it could also suppress the sense of urgency and motivation to act (McQueen, 2021).

In this paper, we address the complex relationship between climate emotions and action. Different climate emotions are intertwined (e.g., Jensen, 2019), which calls into question their unique and combined effects on environmentalism, but research is scarce on this question. To address this gap in the literature, we use the Extended Parallel Process Model (EPPM model; Witte, 1992; Witte & Allen, 2000) as a framework, and investigate the interplay of climate-related anxiety and hope in explaining variance in self-reported climate action.

The data is a part of a large nationally representative sample from Finland, which is a country with vibrant climate activism and frequent societal discussions around climate anxiety, but where quantitative research on effects of climate emotions has not yet been published (but see e.g., Pihkala, 2020a). In Finland, climate anxiety ("ilmastoahdistus" in Finnish) is a widely known and discussed concept, whereas in many other countries and languages the discussion is more diffuse, and many

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different concepts are used (see Wardell, 2020). Thus, the Finnish context provides fruitful opportunities for study of climate anxiety and action.

1. Climate action

The consumption of wealthy western households account for a large share of greenhouse gas emissions (Oxfam, 2015), which highlights the need for individual lifestyle changes. Indeed, the consumption of Finnish households is as much as 68 percent of Finland's total greenhouse gas emissions (Seppälä et al., 2009). Although Finns as a whole report performing climate actions quite actively (Hyry, 2019), the total consumption of Finns is clearly too high (Global Footprint Network, 2019). According to the Global Footprint Network (2019), in 2019 Finns exceeded the natural resources Earth can renew in a single year at the beginning of April 2019. Notably, more research is needed to study the many aspects of climate action. Research in environmental psychology tends to focus on behaviors that are relevant in the environmental context but not necessarily effective specifically in climate change mitigation (e.g., recycling: Wynes & Nicholas, 2017) (see also Nielsen et al., 2021).

In the present paper, we focus on some of the behaviors through which an individual can take effective climate action: changing own consumption, travel, eating, and living habits to be more climate friendly (Salo & Nissinen, 2017; Wynes & Nicholas, 2017). In addition, we focus on societal participation and economic contributions as forms of climate action, including civic activism, influencing in volunteer organizations, compensating own greenhouse gas emissions, and donating to climate work (see also Ockwell et al., 2009; Roser-Renouf et al., 2014). Climate change mitigation requires extensive changes in society and thus societal participation is one of the most effective forms of climate action (White et al., 2019). Governments and corporations do not seem to sufficiently reduce consumption without public pressure, and while reducing individual consumption is important, it is not enough without social climate action (Ockwell et al., 2009). Hence, certain individual actions can be regarded as part of collective action.

2. Anxiety, hope, and climate action

The concept of climate anxiety is currently much used in both research and public discussion. Recent studies have revealed that climate anxiety is common at least among young people (Hickman et al., 2021), and manifests in various ways ranging from milder to very strong (Haseley, 2019; Hickman, 2020; Ogunbode et al., 2021; Pihkala, 2020a; 2020b). Reflecting this variation, existing research uses the concept of climate anxiety in different ways. Sometimes it is defined as rather strong anxiety (for discussions of this and varied framings, see Clayton & Karazsia, 2020; Stanley et al., 2021; Taylor, 2020), and sometimes as a general emotion, which means that the role of anxiety in motivating behavior change and information seeking are also included (Demski et al., 2017; Verplanken & Roy, 2013). It seems possible that the various definitions and connotations of climate anxiety influence the results about the relationship between climate anxiety and climate action. In the present paper, we build on such a concept of anxiety, which can be defined as feelings of tension, worried thoughts, and physiological changes (American Psychological Association, n.d.), and approach worry as a cognitive dimension of anxiety (Hirsch & Mathews, 2012). We define climate anxiety as feelings of anxiety that are significantly related to the climate crisis, and include both milder and more severe manifestations of these feelings.

Evolutionarily, anxiety has evolved to help people anticipate the dangers ahead and to work to prevent these dangers (Bateson, Brilot, & Nettle, 2011). Anxiety helps in directing attention to perceived threats and can provide the necessary determination to be able to act to avoid adverse outcomes as well as achieve future goals (Strack et al., 2017; Kurth, 2018). Indeed, research has shown that threat-related decision-making and behavior follow as much from emotional reactions as from cognitive evaluations (Loewenstein et al., 2001; Slovic et al., 2004). Naturally, experiences of anxiety may also lead to passive responses such as avoidance behavior (Fredrickson, 2001) and paralysis (Cox & Olatunji, 2019). Thus, we join those who argue that anxiety is a primarily normal reaction to a significant problem and can motivate action but may also lead to passivity (see, e.g., Kurth, 2018).

Like anxiety, hope is a future-oriented complex concept that is used in various connotations and can include different emotions, desires, and cognitive appraisals. Scholars often make a separation between passive hope, which is usually called wishful thinking and is based on denial, and more active forms of hope, which are often called constructive hope (see Ojala, 2017). Bury et al. (2020) discuss two different emphases in research focusing on the role of hope for climate action: emphasis on motivation and efficacy, and emphasis on personal investment in climate matters. They argue that hope is especially meaningful as a motivator when the odds of success are low, which seems to be the case with the climate crisis. Hope can assist to withstand difficult situations as well as work actively for a better-rated future (Oettingen & Chromik, 2017). Hope is often conceptualized as a combination of motivation and efficacy beliefs, and can stem from strong personal investment in environmental values, identity, and behavior, or just from a sense of duty and moral attitudes (Drach-Zahavy & Somech, 2002; Snyder, 2000). The relationship between efficacy and hope thus seems to be important and intimate, and efficacy beliefs can be considered as one of the cognitive dimensions of hope. We thus approach climate hope as a concept that includes emotions and cognitive aspects, of which we focus on efficacy beliefs (see also Ojala, 2012b).

3. Extended parallel process model (EPPM) and climate emotions

To understand the roles of hope and anxiety in influencing climate action, we use as a framework the Extended Parallel Process Model (EPPM model; Witte, 1992; Witte & Allen, 2000), which examines how individuals react to fear-inducing stimuli. The model usually examines this through fear and self-efficacy alone, but in the present study, a construct of climate anxiety is applied to fear and a construct of climate hope to self-efficacy. According to the model, when detecting a potential threat, one first assesses 1) the severity of the threat (e.g., whether climate change has serious consequences) and 2) susceptibility to the threat (e.g., whether I will suffer the consequences of climate change). If the outcome of either assessment does not reach an alarming level, the threat processing ends, and the individual will not react to the threat. Thus, this stage is closely related to what has been studied with the concept of risk perception (see Bradley et al., 2020; van der Linden, 2017). Based on the EPPM model, fear is evoked if both the severity and susceptibility of the threat are perceived as high. This, in turn, triggers an efficacy appraisal to assess 3) response efficacy (e.g., can climate action mitigate climate change) and 4) self-efficacy (e.g., am I able to perform climate actions).

When applied to climate change, it can thus be presumed that if one perceives their ability to affect climate change as low, one is likely to try and control their fear with defenses instead of reacting to the threat. For example, avoidance ("Climate change is too distressing, I will not think about it") or denial ("Climate change won't affect me, it's a problem in the distant future"). However, if all four assessments are high, people will likely change their behavior to avoid the threat. In other words, if climate change is perceived as a severe threat and it is believed that people can influence it, people are more likely to change their behavior to mitigate climate change. This could suggest that when both climate anxiety and climate hope are experienced, the probability of an individual taking part in climate action increases.

Previous research seems to support the importance of considering both climate anxiety and climate hope when explaining climate action. Ojala (2008) found that hope alone was not related to climate action, but

there was an interaction between anxiety and hope. For those who were very concerned about the environment, hope was positively related to climate action, but for those who were only slightly concerned, hope was negatively related to climate action. According to Ojala (2008; 2015), the participants who experienced hope without worry, could have based their hope on denying the threat. In a recent study by Marlon et al. (2019), feelings of both doubt and hope related to humanity's ability to reduce climate change predict pro-climate political behavior and support for a greenhouse gas mitigation policy. In other words, climate activity is activated by recognizing that humans can mitigate climate change (a perception linked to climate hope), but we are not yet doing enough and therefore could fail (a perception linked to climate anxiety). Pleeging et al. (2021) found that a combination of knowledge, worry, and hope increased willingness to pay for green energy. And finally, an experimental study of climate communication found that when both the threat and one's ability to act are emphasized, the communication evokes both hope and enthusiasm as well as fear and anxiety (Feldman & Hart, 2016). Through hope and enthusiasm, this kind of communication could indirectly increase political activity related to climate change (see also Kleres & Wettergren, 2017; Krosnick et al., 2006; Roser-Renouf & Maibach, 2010).

In conclusion, based on the theory behind the EPPM model and previous research on climate emotions, it seems that climate anxiety and climate hope are interrelated and interplay in influencing action. Climate anxiety and worry could be needed to remind of the severity of climate change (Clayton & Karazsia, 2020; Verplanken, Marks & Dobromir, 2020), and climate hope to be able to live with knowing this and to be able to take climate action despite the risk of failing (Bury et al. 2020; Li & Monroe, 2017).

4. Aims and hypotheses

The *first* aim of the present study was to investigate the concept of climate anxiety and its relationship with climate hope and climate action. To do this, we aimed to assess both the cognitive and emotional aspects of anxiety and hope. While these are difficult to fully separate, we aimed to capture the cognitive aspects through statements including for example worried thoughts (anxiety index) and efficacy beliefs (hope index). Emotional states were assessed by self-reported existence, strength, and frequency of climate anxiety and climate hope. Moreover, to address the stronger manifestation of anxiety, we assessed if people connect psychosomatic symptoms to climate change and to what degree they estimate that climate emotions influence their functionality. As discussed above, previous studies have suggested both positive and negative effects of both anxiety and hope on climate action. Hence, we did not form hypotheses regarding the bivariate correlational analyses.

As the *second* aim, we investigated the unique and combined effects of the anxiety-index and the hope-index in explaining the probability of engaging in climate action. Firstly, we tested a hypothesis that hope moderates the effect of anxiety on climate action **(H1)** as suggested by the EPPM model (Witte, 1992; Witte & Allen, 2000). Moreover, we expected that when the effects of both anxiety and hope are tested simultaneously, they both have a unique and positive effect on climate action **(H2)**. Our hypotheses are based on some preliminary research results that suggest that if climate anxiety is experienced in combination with hope – and vice versa – these emotions are more likely to motive action (e.g., Marlon et al., 2019; Ojala, 2008).

Finally, our *third* aim was to test if climate anxiety and climate hope are not only connected to engagement in climate action, but also to how diversely an individual performs climate actions when being engaged. Thus, we conducted analyses among respondents who indicated that they have acted on climate change, with a focus on several high-impact climate actions, such as diet choices and societal participation. Our measure including a broad scope of high-impact actions provides novel results, as these actions have been more rarely addressed in research than the more general environmental actions (e.g., recycling), or are included in scales that also include less impactful actions (see also Nielsen et al., 2021). Based on previous research regarding the effects of emotional experiences on risk assessment and activating behaviors (Bradley et al., 2020; van der Linden, 2017), we considered it to be plausible that anxiety and hope increase the possibility of engaging in various forms of climate action: An individual who feels strongly for climate change may aim to find multiple ways to engage. We thus expected, similarly as above, that the hope-index moderates the effect of the anxiety-index on the diversity climate action **(H3)**, and that when studied simultaneously, both these emotional experiences predict unique parts of diversity of climate action **(H4)**.

5. Materials and methods

5.1. Participants and procedure

The survey was designed by The Finnish Innovation Fund Sitra,[6] in collaboration with an independent research company Kantar and the second and third authors of the present paper. The survey was based on a growing realization that there exists both climate anxiety and many other climate emotions/feelings (Hyry, 2021). Because only a limited number of studies had been carried out on climate anxiety in Finland by autumn 2018, Sitra identified a need to provide a broad-based picture of the variety of emotions/feelings that climate change evokes in Finns. The material was collected by Kantar by random sampling from an internet panel, which is maintained to represent the Finnish population over 15 years of age. The panel has 40,000 respondents available for sampling.

7495 panelists were invited to the study by e-mail with the introduction: "Welcome to respond to a study on climate change". The invitation sought as neutral expression as possible, indicating the study subject but avoiding more specific words such as climate anxiety. The aim was to collect a sample of 2000 respondents, which guarantees sufficient statistical power in nationally representative studies in Finland. Research invitations were sent in three batches in May 2019 (3rd, 6th, and 10th), so that the respondents would not be selected based on the time. A reminder for answering the questionnaire was sent once. The questionnaire was completed using an online query and took approximately 12 min to complete. The study followed the standards of ethical and professional conduct formulated in the ICC/ESOMAR International Codeon Market, Opinion and Social Research and Data Analytics. For more details about the study, see Hyry (2021).

2,070 people (50 % female) responded to the survey (participation percentage: 27.6 %). Age distribution was: below 30 (17 %), 30–45 (21 %), 46–55 (16 %), 56–65 (17 %) and over 65 (29 %). As to education, 17 percent had academic education, 42 percent basic education, 40 percent other education.

5.2. Material

The included set of questions was developed specifically to examine the variety of climate emotions/feelings in Finland (see Hyry, 2021). For the full list of items used in the present paper, see the Appendix. The response scales included the option 'Can't say', which was excluded if not otherwise mentioned.

Two-item scales were used for the *Anxiety-index* (Spearman Brown reliability coefficient = 0.77, range 1–4, $M = 2.38$, $SD = 0.79$) and the *Hope-index* (Spearman Brown = 0.69, range 1–5, $M = 3.54$, $SD = 1.03$). An exploratory factor analysis (Principal axis factoring, Direct oblimin) revealed that all these items loaded on the same factor (factor loadings:

[6] Sitra is a think tank and an investment company that operates directly under the supervision, but independently, of the Finnish Parliament to anticipate societal change, try out new operating models and accelerate business activities aimed at creating sustainable well-being.

0.53–0.87). However, based on concerns regarding construct validity, we maintained the items capturing anxiety separate from items capturing hope in the analyses (see the items in the Appendix, and our reflections on the overlap in the discussion-part).

Different aspects of self-identified feelings were measured by four questions. Participants first responded on a nominal scale (Yes/No) if they had felt different feelings related to climate change (*Existence* [of feelings]). Anxiety had been experienced by 27 percent ($N = 522$), and hope by 42 percent ($N = 773$), of the respondents. The complete list included 26 feelings of which anxiety and hope were relevant for the analyses in the present paper (analyses on other feelings, not related to the present study, will be reported elsewhere). Participants also estimated the strength and frequency of the emotions that they had reported experiencing in relation to climate change. We combined these items to form indexes of *Strength/Frequency* [of anxiety and hope]. If participants had not felt anxiety or hope (as indicated by the nominal Yes/No-question), the scores of these indexes were set to 0 (range 0–4) (Strength/Frequency of anxiety: Spearman Brown = 0.96, $M = 0.58$, $SD = 1.05$; Strength/Frequency of hope: Spearman Brown = 0.95, $M = 1.00$, $SD = 1.28$). Furthermore, participants were asked to estimate the effects of these experienced feelings (*Self-assessed Effects of Feelings on Climate Action*) (for response distribution, see Table 1).

Two indexes captured the stronger effects of anxiety. A single-item question measured the *Effect of Climate Emotions on Functionality* (range 1–4, $M = 1.32$, $SD = 0.6$). *Psychosomatic Symptoms* were measured by a list of six symptoms that participants could indicate experiencing (vs not experiencing) due to climate change. An index was built by calculating a sum score of the 'Yes' responses (range: 0–6, $M = 0.29$, $SD = 0.9$).[7]

Engagement in *Climate Action* was measured by a nominal single-item index.[8] If the response was 'Yes' (56 %, $N = 994$), participants could choose from a list of eight different climate actions in which ways they had been active in mitigating climate change in their daily life. The sum variable *Diversity of Climate Actions* was formed of answer options, ranging between 0 and 8.[9] Only a few respondents had done seven ($N = 2$) or eight ($N = 5$) actions. Thus, scores above 6 were combined into the same category (range: 0–7, $M = 2.57$, $SD = 1.5$).

Gender, age, and level of education were included as control variables, as previous studies have suggested that these variables may affect the experience of climate anxiety (e.g., Pew Research Center, 2019).

6. Results

6.1. Self-assessed effects on climate anxiety and hope on climate action

As shown in Table 1, most participants who had experienced anxiety estimated that this feeling has increased, at least to some degree (57.0 %), rather than decreased (24.0 %) their climate action. To address the interplay of emotions, we tested if self-assessed effect of anxiety on action would differ between the subgroups that either feel hope or do not feel hope (as indicated based on the responses on the nominal scale related to each emotion). We examined the distributions using a chi-squared test,[10] and found a statistically significant difference, $\chi 2(4) = 10.05$, $p = .04$. Closer examination revealed no systemic patterns between the groups regarding decreased or increased effects on action, an observation that was confirmed in post hoc analyses (as recommended by Beasley & Schumacker, 1995), adjusted residuals < 1.96, $ps > 0.005$ (Bonferroni correction). However, a large difference was found in the 'Can't say option': it was chosen more commonly in the subgroup that does *not* feel hope (23 %) than in the hope-subgroup (13 %) (adjusted residuals=+/-3.0, $ps = 0.003$).

When compared to anxiety, participants estimated even more commonly that hope has increased (79.6 %) rather than decreased (7.3 %) their climate action. As above, we examined the distributions in the two subgroups that either feel of do not feel anxiety. The chi-squared test revealed a statistically significant difference, $\chi 2(4) = 15.21$, $p = .004$. The most notable difference was that it was more common to indicate significantly increased climate activity due to climate hope in the anxiety-subgroup than could be expected if a zero-difference were true, while the opposite patterns were found in the subgroup that does not feel anxiety (adjusted residuals=+/-2.8, $ps = 0.004$). As in the above analyses, differences were observed in the 'Can't say'-option. The adjusted residual indicated a large z value (2.25, $p = .02$) but the difference was not statistically significant after the Bonferroni correction (limit: $p < .005$). All other differences were small and non-significant (adjusted residuals < 1.64, $ps > 0.10$). These results thus provide support for H1 and H3.

6.2. Correlation analyses

Table 2 presents correlations between the variables. Both our variables capturing engagement in climate action correlated positively with indexes for anxiety, indexes for hope, education, and (female) gender. Age correlated positively with engagement with climate action, but negatively with the diversity of climate action. Indexes for climate anxiety were intercorrelated, as were indexes for climate hope.

6.3. Probability of committing climate action

We then ran logistic regression analyses, where participation in climate action was placed as the dependent variable. Due to the overlap between the predictor variables, we tested five separate models where different sets of variables were included to investigate their unique and combined connections on climate action (see Table 3). In addition to these models, some effects were explored closer, and these results are only described in the text and not included in the table.

The first three models focused on our main predictor variables and included either the Anxiety index (Model 1) or the Hope-index (Model 2), or both these feelings (Model 3). Further, building on Model 3, we tested models including the Strength/Frequency of experiencing climate anxiety and hope (Model 4), and severe climate anxiety symptoms (Model 5). All the models included the control variables age, education, and gender. As the first step, we thus tested the effects of control variables and found that age (Odds Ratio [OR] = 1.05, $p = .002$), (female) gender (OR = 2.56, $p < .001$), and education (OR = 1.56, $p < .001$) are connected to a higher probability of committing climate action (Pseudo $R^2 = 0.11$).

The results of the two first models showed that the Anxiety-index was positively connected to the probability of committing climate action (OR = 3.81, $p < .001$, Pseudo $R^2 = 0.32$) (Model 1) as was the Hope-index (OR = 3.16, $p < .001$, Pseudo $R^2 = 0.37$) (Model 2). We also

[7] Of interest for conceptual discussion, closer examinations showed that 28.8 percent of respondents indicated that the word 'anxiety' describes their feelings about climate change very or rather well (5.4/23.4%), while only 5.5 percent indicated that climate emotions have negatively affected their ability to work or study (very much/rather much: 1.1/4.4%), and 86.8 percent had not experienced any psychosomatic symptoms.

[8] Closer examinations of the 'Can't say'-option (which was excluded from the analyses) showed that it was chosen rather commonly when asked if participants had done any climate actions (14%; $N = 296$). Rather high percentages were also observed for indicating feelings of anxiety (6.8%; $N = 140$) or hope (10.9%; N = 225) in response to climate change (Range across other items: 0.4–5, M=3.7%).

[9] The index was calculated only for respondents who had indicated that they had committed climate action in the earlier question.

[10] Because the response options did not include 'neither increased nor decreased action', these responses we likely reported in 'Don't know' option. We could thus not form a Likert-like scale that would enable parametric statistical tests.

Table 1
Proportion (%) of respondents who assess that climate anxiety and hope have increased or decreased their climate action.

	Effect on climate action (%)					
	Significantly increased	Increased to some degree	Decreased to some degree	Significantly decreased	Can't say	*N*
Effect of Anxiety						
Whole group	10.3	46.7	20.9	3.1	19.0	522
Subgroup with Hope	11.7	49.1	22.6	3.9	12.6*	230
Subgroup without Hope	10.6	43.3	20.8	2.0	23.3*	245
Effect of Hope						
Whole group	19.4	60.2	4.8	2.5	13.2	773
Subgroup with Anxiety	25.7*	57.8	7.0	1.4	8.3*	230
Subgroup without Anxiety	16.7*	62.5	4.1	2.6	14.1*	509

Note. *Statistically significant chi-square value after Bonferroni correction (p <.005), comparing subgroups that feel or do not feel hope/anxiety.

Table 2
Correlations Between the Different Conceptualizations of Climate Action, Climate Hope, and Climate Anxiety, as well as Control Variables.

	1	2	3	4	5	6	7	8	9	10
1. Climate Action (0 = no; 1 = yes)										
2. Climate Action (diversity)										
3. Anxiety-index	**0.44**	**0.33**								
4. Hope-index	**0.52**	**0.29**	**0.49**							
5 Anxiety (Strength/Frequency)	**0.25**	**0.23**	**0.59**	**0.17**						
6. Hope (Strength/Frequency)	**0.30**	**0.11**	**0.24**	**0.36**	**0.10**					
7. Functional Effects of Emotions	**0.12**	**0.18**	**0.36**	**0.09**	**0.39**	**0.14**				
8. Psychosomatic Symptoms	**0.13**	**0.12**	**0.27**	**0.08**	**0.40**	**0.10**	**0.58**			
9. Age	**0.09**	**-0.13**	**-0.10**	**0.05**	**-0.20**	**0.15**	**-0.19**	**-0.12**		
10. Education	**0.17**	**0.11**	0.03	**0.08**	-0.00	0.04	**-0.11**	**-0.08**	**0.20**	
11. Gender (man = 0; woman = 1)	**0.22**	**0.11**	**0.25**	**0.17**	**0.16**	0.02	-0.03	0.04	**-0.08**	0.01

Note. Correlations with 'Climate Action' and 'Gender': Spearmans rho, other correlations: Pearson; Statistically significant (ps < 0.05) correlations **bolded**.

observed that the connection between the Hope-index and climate action was somewhat stronger than the connection between the Anxiety-index and climate action. In the third model, both climate anxiety and climate hope were included simultaneously. Supporting H2, both variables had a unique effect on climate action and the model explained more variance (Pseudo R^2 = 0.42) than the models including either of the emotions by themselves. We also investigated if climate hope moderates the connection between climate anxiety and climate action. The interaction between climate anxiety and climate hope was not statistically significant (OR = 1.07, p =.33), and the model did not explain more variance than the model including only the main effects of anxiety and hope (Pseudo R^2 = 0.42). Thus, the results did not support H1, which stated that hope would moderate the correlation between anxiety and action.

Building on Model 3, we tested Model 4 and found that the previously described result patterns did not change, meaning that all the effects remained statistically significant, and no large changes were observed in beta values. The main effects of both the Strength/Frequency of experiencing anxiety (OR = 1.2, p =.049) and the Strength/Frequency of experiencing hope (OR = 1.3, p <.001) were statistically significant (pseudo R^2 = 0.44). We also tested the effect of the interaction term of the Strength/Frequency indexes and found it to be statistically significant but negative (B = -0.30, p <.001), while not altering the main effects. For closer examination, we created nominal scales including high (above the mean) and low (below the mean) scores on the standardized measures for the Strength/Frequency indexes. The results showed the correlation between the Strength/Frequency of hope and climate action was statistically significant when experiencing lower anxiety (r = 0.37, p <.001) but not when experiencing higher anxiety (r = 0.06, p =.26). Similar results were observed in the correlation between Strength/Frequency of anxiety and action between groups that experience less (r = 0.34, p <.001) or more hope (r = 0.07, p =.08). This suggests that when experiencing stronger emotion (regardless of if the emotion is anxiety or hope), additional other feelings do not help explaining more variance in climate action. These results thus do not support expectations based on the EPPM model and H2.

And finally, the results of model 5 showed that when the more severe anxiety symptoms are included to the model, the effect of Strength/Frequency of climate anxiety becomes non-significant (OR = 1.2, p =.08). Neither self-estimated negative effects of climate emotions on functionality (OR = 1.0, p =.92) nor psychosomatic symptoms (OR = 1.1, p =.27) had unique effects on the probability of committing climate action. This result did not change even when we investigated the effects closer by only including one of these variables separately to the model (ORs = 1.1/1.1, ps = 0.36/0.29).

6.4. Diversity of climate action

To address our third aim, we ran analyses in the climate action subset (N = 994). A similar approach was used as in the previous analyses, meaning that five main linear regression models were ran to test predictors of diversity of climate action (see Table 4), as well as additional clarifying analyses.

Before running the analyses, we tested a base model including only the control variables. Age (β = -0.15, p <.001), (female) gender (β = 0.08, p =.008), and education (β = 0.13, p <.001) had statistically significant effects the diversity of climate action (R^2 = 0.04). In Model 1 (R^2 = 0.13), also the Anxiety-index was positively connected to the diversity of climate actions (β = 0.31, p <.001) and in Model 2 (R^2 = 0.12), a positive effect of the Hope-index was found (β = 0.28, p <.001). Model 3, which included both the Anxiety-index and the Hope-index (R^2 = 0.17), explained a somewhat larger share of variance in climate action than the models testing their effects separately. Follow-up regression analyses confirmed that the increase in explained variance in Model 3 was statistically significant when comparing to Model 1 (ΔR^2 = 0.04) and Model 2 (ΔR^2 = 0.05)(ps < 0.001). The connection between the Hope-index (β = 0.21, p <.001) and climate action was roughly similar to that of the Anxiety-index (β = 0.25, p <.001). We also tested moderation effect and found no support for it as the interaction term of the Anxiety-index and the Hope-index was non-significant (β = 0.02, p =.55). Thus, the results support H4 but not H3: both anxiety and hope were linked to higher engagement in diverse climate action, but hope

Table 3
Summary of Logistic Regression Models Predicting the Probability of Committing Climate Action (No = 0, Yes = 1) (N = 2070).

	Pseudo R^2	*B*	*SE*	*OR* (95 % CI)
Model 1	0.32			
Age		0.08***	0.02	1.08 (1.05, 1.12)
Gender		0.60***	0.11	1.83 (1.47, 2.28)
Education		0.48***	0.08	1.61 (1.38, 1.88)
Anxiety-index		1.34***	0.08	3.81 (3.24, 4.48)
Model 2	0.37			
Age		0.04*	0.02	1.04 (1.00, 1.07)
Gender		0.78***	0.12	2.18 (1.74, 2.74)
Education		0.40***	0.08	1.50 (1.23, 1.76)
Hope-index		1.15***	0.07	3.16 (2.77, 3.61)
Model 3	0.42			
Age		0.06**	0.02	1.06 (1.03, 1.10)
Gender		0.59***	0.12	1.81 (1.43, 2.30)
Education		0.42***	0.09	1.52 (1.28, 1.79)
Anxiety-index		0.87***	0.09	2.40 (2.00, 2.87)
Hope-index		0.89***	0.07	2.44 (2.12, 2.81)
Model 4	0.44			
Age		0.05	0.02	1.05 (1.02, 1.10)
Gender		0.64***	0.13	1.90 (1.47, 2.45)
Education		0.44***	0.09	1.56 (1.31, 1.86)
Anxiety-index		0.72***	0.11	2.04 (1.64, 2.55)
Hope-index		0.81***	0.08	2.24 (1.93, 2.61)
Anxiety (Strength/Frequency)		0.16*	0.08	1.18 (1.00, 1.38)
Hope (Strength/Frequency)		0.26***	0.06	1.30 (1.17, 1.45)
Model 5	0.44			
Age		0.06*	0.20	1.06 (1.02, 1.10)
Gender		0.67***	0.14	1.96 (1.50, 2.55)
Education		0.46***	0.09	1.59 (1.32, 1.90)
Anxiety-index		0.65***	0.12	1.91 (1.52, 2.41)
Hope-index		0.84***	0.08	2.31 (1.98, 2.70)
Anxiety (Strength/Frequency)		0.16	0.09	1.17 (0.98, 1.40)
Hope (Strength/Frequency)		0.27***	0.06	1.31 (1.18, 1.47)
Functional Effects of Emotions		0.01	0.15	1.01 (0.76, 1.36)
Psychosomatic Symptoms		0.10	0.10	1.11 (0.92, 1.34)

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

Table 4
Summary of Linear Regression Models Predicting Self-Reported Diversity of Committing Climate Action in the Climate Action Subset (N = 994).

	adjusted R^2	β	95 % CI
Model 1	0.13		
Age		-0.08*	(−0.06, −0.01)
Gender		0.03	(−0.10, 0.26)
Education		0.13***	(0.14, 0.37)
Anxiety-index		0.31***	(0.51, 0.75)
Model 2	0.12		
Age		-0.13***	(−0.08, −0.03)
Gender		0.07*	(0.02, 0.38)
Education		0.12***	(0.12, 0.36)
Hope-index		0.28***	(0.39, 0.60)
Model 3	0.17		
Age		-0.08*	(−0.06, −0.01)
Gender		0.03	(−0.10, 0.26)
Education		0.12***	(0.12, 0.35)
Anxiety-index		0.25***	(0.37, 0.63)
Hope-index		0.21***	(0.27, 0.48)
Model 4	0.19		
Age		-0.08*	(−0.06, −0.01)
Gender		0.02	(−0.12, 0.25)
Education		0.13***	(0.13, 0.37)
Anxiety-index		0.24***	(0.32, 0.65)
Hope-index		0.19***	(0.22, 0.45)
Anxiety (Strength/Frequency)		0.06	(−0.02, 0.17)
Hope (Strength/Frequency)		0.08*	(0.02, 0.16)
Model 5	0.19		
Age		-0.06	(−0.06, 0.00)
Gender		0.05	(−0.06, 0.34)
Education		0.14***	(0.15, 0.40)
Anxiety-index		0.21***	(0.26, 0.60)
Hope-index		0.19***	(0.22, 0.46)
Anxiety (Strength/Frequency)		0.03	(−0.07, 0.14)
Hope (Strength/Frequency)		0.07*	(0.00, 0.15)
Functional Effects of Emotions		0.10*	(0.04, 0.42)
Psychosomatic Symptoms		0.02	(−0.08, 0.13)

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

did not moderate the correlation between anxiety and action.

In model 4 (R^2 = 0.19), the previously described result patterns did not change. The main effect of the Strength/Frequency of hope was statistically significant (β = 0.08, p =.013), but the Strength/Frequency of anxiety was not (β = 0.06, p =.13). Again, we tested the effect of the interaction term of the Strength/Frequency indexes and found it to be statistically significant but negative (β = -0.07, p =.018). As in the previous analyses on the probability of committing climate action, the results showed the correlation between the Strength/Frequency of hope and diversity of climate action was statistically significant when experiencing lower anxiety (r = 0.22, p <.001) but not when experiencing higher anxiety (r = -0.02, p =.76). Similar, but less pronounced, results were observed in the correlation between Strength/Frequency of anxiety and action between groups that experience less (r = 0.34, p <.001) or more hope (r = 0.14, p =.002), as these both correlations were statistically significant, but the latter was somewhat weaker. These results thus do not support expectations on the moderating effect of hope in the correlation between anxiety, that the EPPM model and H2 would suggest.

Finally, the results of model 5 showed that when the more severe anxiety symptoms are included to the model, the effect of age (β =.06, p =.079) become non-significant. The effect of self-estimated negative effect of climate emotions on functionality was statistically significant (β = 0.10, p =.018) in this full model, but the effect of psychosomatic symptoms was not (β = 0.02, p =.62). However, the model did not explain more variance in climate action, which suggests a high overlap between the indexes for climate anxiety, also supported by the lower tolerances scores (0.52 – 0.63) related to these items in comparison to the tolerance scores of indexes for climate hope (0.82 – 0.86) or control variables (0.85 – 0.95).

7. Discussion

The purpose of this study was to examine the concept of climate anxiety and its relationship with climate hope and climate action. The EPPM model was used as a framework in this paper. The model examines how individuals react to fear-inducing stimuli and how both fear and self-efficacy affect whether an individual modifies their behavior towards the threat (Witte, 1992; Witte & Allen, 2000). We applied the concepts of anxiety (including worry) and hope (including efficacy) to this framework. The results showed, in line with the model and the hypotheses, that the Anxiety-index and Hope-index had unique and positive effects on our indexes for climate action, and that experiencing both these feelings simultaneously explained approximately 4–5 percent more variance in climate action than either emotion on its own. All examined emotions correlated with each other and with climate action, even the most severe manifestations of climate anxiety. However, the results did not support the hypothesized moderation effect whereby hope would moderate the correlation between climate anxiety and action.

The results bring more clarity to the concept of climate anxiety and its role in relation to behavior. Climate anxiety was positively connected with climate action, which shows the value of climate anxiety as an adaptive response. Supporting this conclusion, 29 percent of the respondents considered climate anxiety as a suitable word for their feelings, but it was less common to report one or more of the psychosomatic anxiety symptoms (13 %) or think that that climate emotions have negatively affected one's ability to work or study (5.5 %) (see also Hyry, 2019). This suggests that many of the respondents saw climate anxiety as a wider phenomenon, not linked just with strong symptoms. Thus, certain contradictions in some previous research about the relationship between climate anxiety (or eco-anxiety) and action may be due to

different definitions and study designs. If climate anxiety is approached in the study design only or mainly as strong and paralyzing anxiety (Clayton & Karazsia, 2020; Stanley et al., 2021), it seems to be less connected with action. In other words, our study joins the results of others who have differentiated between more and less pathological aspects of anxiety and worry in relation to environmental issues: if this differentiation is made in study design, the adaptive potential of eco-anxiety can reveal itself (Demski et al., 2017; Marlon et al., 2019; Verplanken et al., 2020; Verplanken & Roy, 2013). However, it is noteworthy that in our study even the most severe manifestations of anxiety correlated with increased climate actions.

Thus, we propose that an ideal measure(s) of climate anxiety would consider both adaptive and pathological forms of anxiety (similar aims have been expressed by Verplanken et al., 2020; Stanley et al., 2021; Wullenkord et al., 2021; see also the discussion in Clayton & Karazsia, 2020). However, dividing climate anxiety this way is not simple. For example, it may be difficult to differentiate the exact causes for the more severe anxiety reactions. Particularly as they may be resulted by multiple and overlapping circumstances, such as stressful life events. Consequently, recognizing the sources of symptoms such as sleeping disorders or decreased functionality requires analytical efforts and developed emotional skills. Experimental research designs or physiological measurements (e.g., skin conductance response) could provide more reliable measurements. It should also be mentioned that there are ongoing attempts to develop measures for climate anxiety (see e.g., Clayton & Karazsia, 2020; Hogg et al., 2021), and future research could test the EPPM model using these kinds of validated measures. When our measures are compared with other recent measures, the following observations can be made. Compared to the Climate anxiety scale (CAS) developed by Clayton & Karazsia (2020), the measures we used did not focus so heavily on cognitive-emotional impairment and functional impairment. Compared to the Hogg Eco-anxiety Scale (Hogg et al., 2021), our measures did not include as much focus on rumination. However, both of these scales include content related to efficacy, as does our measures: see the item 22 in CAS, "I believe I can do something to help address the problem of climate change" (Clayton & Karazsia, 2020, p. 4) and the item "Feeling anxious that your personal behaviours will do little to help fix the problem" in the Hogg Eco-anxiety Scale (Hogg et al., 2021, p.5).

The connections between the Hope-index and climate action were in line with some previous results (e.g., Ojala, 2012b) while contradicting some others that have suggested that hope does not motivate climate action (van Zomeren et al., 2019). As with climate anxiety, these conflicting results appear to be due to differences in definitions and measurement methods. If just hope is measured in general, it is not possible to know whether hope arises from e.g., belittling the severity of climate change (see also Bury et al., 2020). Our construct of the Hope-index had a strong emphasis on efficacy beliefs, and we echo the views of Bury et al. (2020) about the importance to explore and integrate various frameworks of hope (see also Li & Monroe, 2017; 2019). However, it is noteworthy that also our measure for Strength/Frequency of hope correlated positively with climate action.

Participants self-assessed that hope (80 %) increased their climate actions more than anxiety (57 %). Interestingly, the subgroup of participants with climate anxiety seemed to benefit more from hope: hope was estimated to significantly increase climate action by 26 percent of participants with anxiety, but by only 17 percent of participants without anxiety. This provides support for the EPPM model and H1 and H3. However, this interpretation should be treated with caution because it was supported only in the chi-squared test, not in the regression analyses (see discussion below). Moreover, supporting H2 and H3, both the Anxiety-index and the Hope-index had unique and positive effects on the probability of participating in climate action and on the diversity of climate actions (see also Marlon et al., 2019). Importantly, the Strength/Frequency of feeling climate hope explained unique variance in both of our measures for climate action. This is not surprising as people may have strong feelings that pass quickly, while feeling some other emotions more regularly. If hope is felt strongly, but only occasionally, it may have less impact on motivating behaviors. An additional explanation for this result is that our Hope-index measure had a strong emphasis on efficacy, while the Strength/Frequency measure captured specifically hope.

Together, these results highlight the importance of climate hope and illustrate how constructive hope can help people function in difficult situations, as for example Oettingen and Chromik (2017) suggest. This is noteworthy as public discourses often tend to emphasize catastrophic climate scenarios and the distress that climate change evokes. This is understandable when considering the nature of the threat, but we argue in line with Kelsey (2020) that there is a need to promote feelings of constructive hope to encourage climate action. For example, by bringing forth encouraging examples of how individuals and communities work for sustainable development (see also Corner et al., 2020) and communicating that meaningfulness is possible even in dire circumstances (Ojala, 2016).

Climate anxiety and climate hope were strongly intercorrelated and all the items measuring the Anxiety-index and Hope-index loaded on the same factor. This indicates that the relations between them are rather intimate, which is not surprising considering that both anxiety and hope are reactions to uncertainty and are strongly future-oriented. Anxiety about the present and the future has been described as an essential part of hope because hope includes uncertainty by definition, as we hope for things we are not sure will happen. Ojala (2007) as well has presented anxiety and hope associated with climate change to be different shades of the same phenomenon. It is possible that the respondents experiencing climate hope have first experienced climate anxiety and have managed to find ways to live with their climate anxiety. However, the interaction terms of climate anxiety and climate hope were either statistically non-significant (Anxiety and Hope-indexes) or provided evidence that does not support the EPPM model (Strength/Frequency). These results do not thus support H1 or H3, which could indicate that hope does not moderate the effect of climate anxiety on climate action (but see above discussion of the chi-squared analyses). Another plausible explanation is that such a moderation effect is difficult to study using cross-section data and a longitudinal arrangement is necessary to explore it. We encourage scholars to aim to replicate our results using alternative measures to capture the key constructs of the EPPM model in the climate context.

Future research should also investigate further the other aspects of the complex interplay of emotional reactions. For example, when studying climate anxiety, it would be important to also measure forms of climate hope, efficacy, coping, and/or resilience, since they may moderate the effect of climate anxiety on behavior (see also Mah et al., 2020; Brosch 2021). In addition, there is a need for further research about the role which emotional skills play in dealing with anxiety and in practicing action (Hamilton, 2022). Also, alternative measures need to be utilized in addition to self-reports. As our data showed, a relatively high percentage of participants could not say if they had felt climate anxiety or climate hope. This is not surprising as disentangling the causes for emotions can be difficult. It is also probable that not all climate anxiety was revealed in the self-reported data, as some eco-anxiety is not recognized by the persons themselves (Hoggett, 2019; Pihkala, 2017; Weintrobe, 2012). In addition, some respondents may have shunned the concept of anxiety, because of a lively political discussion about climate anxiety in Finland. Thus, it is possible that the actual number of Finns who experience climate anxiety is even larger than the 29 percent revealed in the survey. Nevertheless, the fact that so many Finns did recognize climate anxiety is significant.

An important limitation can be mentioned in relation to our measures for climate action. In addition to the known problems related to self-assessment of pro-environmental behaviors (Kormos & Gifford, 2014), a high percentage could not say if they have done climate action. Perhaps the complexity of climate discussions causes uncertainty on

which actions can reliably be counted as climate action. Interestingly, among the participants who had indicated they had done climate action, 81 did not select any of the alternatives for action given in the study. This could mean, for example, that the respondents have been unsure if they have done climate-friendly deeds, or that they have a more positive picture of their climate engagement than is warranted. Moreover, some respondents may also have overestimated the number of their actual climate actions. Even though a large proportion of Finns report being active in climate action (e.g., Lehtonen et al., 2020), the overall per-capita emissions of Finland and Finnish households are very large on a global scale (e.g., Global Footprint Network, 2019). The vague wording of our questions leaves much room for erroneous judgements of climate action. For example, some environmental behaviors are not relevant in climate change mitigation (e.g., choosing organic food), but participants may have counted them as climate action when responding to the questions. However, we argue that our measure for the diverse climate behaviors is relevant. It is difficult to measure exactly what impact any action has on mitigating climate change. Thus, the knowledge of individuals' efforts to engage in various actions (e.g., changing eating habits and engaging in civic activism), is informative regardless of what specific actions they have chosen. A further shortcoming is that climate action was measured on a nominal scale; hence it was not possible to examine how often climate action was taken. Furthermore, the diversity of climate action measure emphasized *changing* one's own activities. Consequently, it does not differentiate how frequently climate action is conducted or capture climate action among respondents who have always acted sustainably (e.g., used only public transport). And finally, a relatively high percentage of participants could not say if anxiety (19 %) or hope (13 %) had influenced their climate action. The difficulty was particularly pronounced when assessing the effect of anxiety when not experiencing hope (23 %, as compared to hope-subgroup; 13 %). Future research could investigate if in the midst of despair (not feeling hope), people find it more difficult to estimate the potential value of anxiety for action, and then when a person feels hope, the effects of anxiety can be retrospectively perceived. The survey was not originally meant for academic use, which explains some shortcomings with measurements.

As a further limitation, it should be noted that participation percentage was only 28. The research invitation sought to be neutral, but the respondents who feel the most strongly about climate change may have been most interested in participating. This might have distorted the results. However, the data has several strengths which is why it was chosen for analysis regardless. Research often uses student or convenience samples, and thus the nationally representative and well-powered sample (N = 2070) that we analyze provides rare insights. We believe that the results can be applied to many populations especially in industrialized countries, but naturally care must be taken to ensure that contextual differences are adequately considered.

Cultural contexts influence emotions and responses to climate change due to differences in national policies, grassroot climate movements, and public discourses and perceptions (e.g., Du Bray et al., 2019; Wullenkord et al., 2021). There is an urgent need to investigate psychological responses to climate change in countries that are currently underrepresented in research (Tam & Milfont, 2020) and research from various contexts may also help to better understand general dynamics of these complicated matters. This is particularly important when considering that the concepts related to climate emotions are relatively new and there are great differences between countries in relation to how well people are familiar with them. Especially as some preliminary results suggest that the relationship between climate anxiety and action differs across countries (e.g., Wullenkord et al., 2021; Stanley et al., 2021; Mouguiama-Daouda et al., 2022). In Finland, there has been a growing national discussion about climate anxiety since Autumn 2017 (Santaoja, 2018), which expanded after the release of the 2018 IPCC report, unusual heatwaves in North Europe and the rise of the school climate strike movement. Thus, it has been easy to survey climate emotions and anxiety in a country like Finland, while the whole phenomena and language about it is new in some other places. Even in Finland, respondents have at least slightly different understandings about what climate anxiety means, but the data is still relevant since it reflects the common ways in which the concept is understood among the public. A further contextual consideration is that most Finns have not suffered directly from strong physical impacts of climate change, although unusual and sometimes dangerous weather is increasing also in Finland. Nevertheless, our study supports the existence of the psychological impacts of climate change even in countries where there are not yet strong physical impacts (see also du Bray et al., 2019).

In conclusion, we presented here results of a large, comprehensive, and nationally representative data that provides support for seeing climate anxiety and hope as wide, intertwined, and adaptive emotions. Although there is much that needs to be studied further, some practical conclusions can be explored. According to the EPPM model, one way to support people with strong climate anxiety is to help them find ways to channel anxiety into climate action and to try to increase climate hope, efficacy, and a sense of meaningfulness in life (see also Doherty, 2018). This can be conceptualized also as increasing resilience (Davenport, 2017; Doppelt, 2017). Different social contexts and intersectional justice issues need consideration here, since not every-one has the same opportunities to feel efficacy and practice action (see Manning & Clayton, 2018; Ray, 2020; Whyte, 2016). Overall, our study joins the rapidly growing efforts in exploring the affective dimensions of the climate crisis. In this field, more interdisciplinary research is needed to clarify the roles of emotions, feelings, affects, and moods in relation to the climate crisis (or ecological crisis), and to support psychological adaptation and find solutions to climate change.

CRediT authorship contribution statement

Julia Sangervo: Conceptualization, Data curation, Formal analysis, Project administration, Writing – original draft. **Kirsti M. Jylhä:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing. **Panu Pihkala:** Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Material

NB: All the items presented below included the response option 'I can't say' (excluded from the analyses).

Anxiety-index

1. How well does the word anxiety describe your feelings about climate change?
2. How worried are you about climate change?

   1 = Not at all/Not at all worried; […] 5 = Very well/Very worried

Hope-index

1. I believe that the effects of climate change can be significantly mitigated
2. The actions of individuals have a role to play in mitigating climate change

1 = Strongly Disagree; […] 5 = Strongly agree

*Existence, Strength, Frequency, and Self-assessed Effects of Emotions/ Feelings**

1. What feelings has climate change has evoked in you?
- Anxiety
- Hope

0 = No; 1 = Yes

2. Estimate how strong your emotions/feelings have been
3. Estimate how often you experience these climate-related emotions/ feelings?
4. Estimate the effect your feelings have had on how actively you are acting to mitigate climate change

1 = Only minor/Less than once a month/ Significantly decreased;
2 = Moderate/A few times a month/ Increased to some degree;
3 = Strong/A few times a week/ Decreased to some degree;
4 = Very strong/Every day/ Significantly decreased

* The Finnish word ["tunne"], does not differentiate between emotion and feeling

**Only indicated in relation to feelings that respondents indicated having experienced

Effect of Climate Emotions/feelings on Functionality

How much the emotions/feelings caused by climate change have negatively affected your ability to work or study?

1 = Not at all; […] 4 = Very much

Psychosomatic Stress Symptoms

Which of the following effects do you think that you have experienced due to climate change?

- Sleep disorders
- Nausea
- Stomach symptoms
- Shortness of breath
- Palpitations
- Decreased functional capacity

0 = No; 1 = Yes

Climate action

Have you been active in mitigating climate change in your daily life?

0 = No; 1 = Yes

How have you been active in mitigating climate change in your daily life?

- I have changed my consumption habits
- I have changed my travelling habits
- I have changed my eating habits
- I have changed my living habits (e.g., the use of electricity or warm water)
- I have engaged in civic activism
- I have been involved in organizational activities
- I have compensated my emissions
- I have donated to climate work

0 = No; 1 = Yes

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