



universität
wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„Introducing a Mindfulness-based Intervention for Climate Anxiety and Effects on Pro-Environmental Actions“

verfasst von / submitted by

Johanna König, BSc MA

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of
Master of Science (MSc)

Vienna 2023

Studienkennzahl lt. Studienblatt /
degree programme code as it appears on
the student record sheet:

UA 066 840

Studienrichtung lt. Studienblatt /
degree programme as it appears on
the student record sheet:

Masterstudium Psychologie UG2002

Betreut von / Supervisor:

Univ.-Prof. Dipl. Psych. Sabine Pahl, Msc PhD

ABSTRACT

The present study investigates the intricate relationship between climate anxiety (CA) and pro-environmental actions (PEA) while employing an innovative mindfulness-based intervention. The objective is to explore the potential of reducing CA through mindfulness meditation and the subsequent influence on PEA. Climate change is a growing global concern, causing anxiety among individuals, particularly in younger populations. This research aims to bridge the gap between CA and its impact on environmentally conscious behavior, offering insights into how anxiety can be harnessed to drive positive action for climate change mitigation. The study enrolled 40 participants, primarily young adults, who took part in the intervention, comprising psychoeducation and meditation. The effectiveness of the intervention was assessed by measuring changes in CA levels before and after the intervention. Additionally, participants' future PEA were measured. The results did not show a statistically significant reduction in CA after the intervention. Regarding the relationship between CA and PEA, the findings cannot make a clear statement, due to the non-significant reduction in CA. However, the qualitative data highlighted the prominence of socio-political fears in the context of climate anxiety, urging for the inclusion in future research and measurement frameworks. In conclusion, this research contributes valuable insights into the complex relationship between CA and PEA. Despite not yielding definitive results, the study highlights the significance of socio-political fears, suggesting the need for inclusive measurements. Moving forward, a comprehensive strategy that combines mindfulness interventions with structured action plans and community involvement could offer a promising avenue to reduce CA and stimulate sustainable behavior.

ABSTRACT

Die vorliegende Studie untersucht die komplexe Beziehung zwischen Klimaangst (CA) und umweltfreundlichem Handeln (PEA) unter Anwendung einer innovativen achtsamkeitsbasierten Intervention. Ziel ist es, das Potenzial der Verringerung von Klimaangst durch Achtsamkeitsmeditation und den anschließenden Einfluss auf PEA zu untersuchen. Der Klimawandel ist ein wachsendes globales Problem, das vor allem bei jüngeren Menschen Ängste auslöst. Diese Studie soll die Lücke zwischen der Angst und ihrer Auswirkung auf umweltbewusstes Verhalten schließen und Erkenntnisse darüber liefern, wie die Angst genutzt werden kann, um positive Maßnahmen zur Eindämmung des Klimawandels voranzutreiben. Die Studie umfasste 40 Teilnehmer, hauptsächlich junge Erwachsene, die an der Intervention teilnahmen, die aus Psychoedukation und Meditation bestand. Die Wirksamkeit der Intervention wurde durch Messung der Veränderungen der CA-Werte vor und nach der Intervention bewertet. Außerdem wurde die zukünftige PEA der Teilnehmer gemessen. Die Ergebnisse zeigten keine statistisch signifikante Verringerung des CA-Wertes nach der Intervention. Hinsichtlich des Zusammenhangs zwischen CA und PEA können die Ergebnisse aufgrund der nicht signifikanten Verringerung von CA keine klare Aussage treffen. Die qualitativen Daten unterstrichen jedoch die Bedeutung sozio-politischer Ängste im Zusammenhang mit der Klimaangst, was eine Einbeziehung in künftige Forschungs- und Messrahmen nahelegt. Zusammenfassend lässt sich sagen, dass diese Studie wertvolle Erkenntnisse über die komplexe Beziehung zwischen CA und PEA liefert. Obwohl die Studie keine endgültigen Ergebnisse liefert, unterstreicht sie die Bedeutung sozio-politischer Ängste und legt den Bedarf an umfassenden Messungen nahe. In Zukunft könnte eine umfassende Strategie, die Achtsamkeitsinterventionen mit strukturierten Aktionsplänen und der Einbeziehung der Gemeinschaft kombiniert, einen vielversprechenden Weg zur Verringerung von CA und zur Förderung eines nachhaltigen Verhaltens bieten.

1. Introduction

1.1 Overview

Anxiety has proven to be a powerful feeling in our evolutionary process, holding the potential to help us anticipate dangers ahead (Bateson, Brilot, & Nettle, 2011) or act avoidant towards triggers (Frederickson, 2001). Both are ways of removing or avoiding the unpleasant feeling evoked by anxious thoughts. As there are two response patterns: an activating one and a paralyzing one (Stanley et al., 2021), very different in nature, the question is, how to implement this knowledge in the context of climate change, specifically in the change of behavioural outcomes. In other words: How can we use the feeling of anxiety induced by climate change – a feeling many people hold, especially in a younger population (Hickmann et al. 2021) – to generate more actions that help climate change mitigation?

The need for more research and productive results is urgently needed, due to climate change being a major ecological and sociological crisis of our time (Cunsolo et al., 2020). This crisis proves to be a serious threat to individual well-being and survival, and research tells us that humans and their actions are accountable for the drastic changes in earth's climate (Friedlingstein et al., 2019). Experiencing this crisis as humans also has a strong emotional impact for most people (Simon et al., 2022). There seems to be a linkage between climate emotions and general mental well-being (Stanley et al., 2021). Additionally, fear connected to climate change is growing worldwide and especially amongst young people (Hickmann et al., 2021). Therefore, climate anxiety presents a threat for the well-being of current and future generations. Furthermore, research on the relationship between climate anxiety and the mitigating climate-actions show no clear results. There is no distinctive answer yet, if people use climate anxiety rather positive and show more behaviour that benefits the combat of climate change or if they take the other route, avoid the topic, and show less actions.

The research presented in this paper holds great relevance. Further, intervention methods for climate anxiety are unexplored so far. This research is the first of its kind, opening a potentially new method to mitigate climate change. The potential of an interventional approach towards climate anxiety should be explored and linked to behavioural outcomes.

1.2 Climate Anxiety (CA) & Pro-Environmental Actions (PEA)

Currently, there is no clear answer on how CA¹ affects PEA². Research differs greatly in the direction of this relationship, with behavioural outcomes of CA ranging from action to paralysis or just no response at all (Sangervo et al., 2022; Clayton & Karazsia, 2020; Stanley et al., 2021; Verplanken

¹ This research proposal and the following thesis will use the term of "climate anxiety", because this terminology is commonly used in the literature and everyday speech. In this paper CA is used as an abbreviation for "climate-anxiety".

² In this paper PEA is used as an abbreviation for "pro-environmental actions".

et al. 2020). An absence of a behavioural response was shown by Clayton and Karazsia (2020). They found CA to be neither positively nor negatively correlated with behavior (Clayton & Karazsia, 2020). Verplanken et al. (2020) found CA to be constructive as well as unconstructive for climate change mitigation. According to three studies by Verplanken et al. (2020), CA (which they refer to as “habitual global warning worry”) has the potential to be unconstructive and part of an intrapersonal dysfunction for some people, but for others it may be a positive adaptive pro-environmental response. The research team around Sangervo (2022) finds CA and PEA to be positively correlated. Further a study by Ogunbode et al. (2022) explored correlates of CA in 32 countries (N = 12,246) and further found positive linkage between CA and PEA. For correlational studies the importance of influencing factors is worth to take a look at. Such factors for CA are the “concern about climate change” and “environmental values” a person holds (Whitmarsh et al., 2022), as it is required in first instance to acknowledge the seriousness of climate change before being able to report feelings of CA. Other influential factors for the relationship between CA and PEA include “generalized anxiety”; “mindfulness”; “nature connectedness”; “experience of climate impacts”; “information seeking behaviour” and the “exposure to information” (Whitmarsh et al., 2022). After controlling for all this factors Whitmarsh et al. (2022) found that CA is not a unique predictor of PEA. Further, Whitmarsh et al. (2022) looked at the relation from CA to the different items of PEA. Their results suggested that CA predicts many but not all facets of PEA (Whitmarsh et al., 2022, p. 5). On the other side of the spectrum of how CA affects PEA is the theory, that feelings of anxiety towards climate change are not a beneficial factor, when it comes to the display of climate-positive behaviour. Supporting the idea of this thesis is a paper by Stanley et al. (2021). This shows the result that climate anxious people are less likely to take personal pro-environmental actions or join activism (Stanley et al., 2021).

1.3 Effects of Meditation on Anxiety

One key factor in the resilience and overall positive mental health is the practice of mindfulness, which is also associated with less CA and general anxiety (Whitmarsh et al., 2022). Mindfulness-based interventions (MBIs) demonstrate efficacy in reducing the symptom severity of anxiety in a broad range of treatment seeking individuals and perform comparably to cognitive-behavioural therapy (CBT) (Hofmann & Gómez; 2017). The overall goal is to “maintain attention on a particular focus, most commonly the somatic sensation of his or her own breathing” (Bishop et al., 2004). As the attention wanders from the focus point to inevitable thoughts and feelings, the instruction is to return to the point of focus, acknowledging the upcoming sensations and letting them pass (Bishop et al., 2004). A way to practice mindfulness is mindfulness meditation, which can consist of several meditation techniques, such as conscious breathing or focusing on selected sounds, body scan, and yoga exercises (Segal et al.; 2018). Intervention-based studies were able to proof the reducing effect of mindfulness meditation on anxiety. Such as Burgsthaler et al (2021), who found that that long-time meditation interventions over the span of eight weeks lead to reduced state anxiety in college students. Chen et

al. (2013) did a similar study and found reduced anxiety after an eight-week mindfulness intervention in nursing students. Even one single meditation leads to a significant effect in the reduction of state anxiety in adolescence (Blum et al., 2021).

1.4 Current research and hypotheses

The present research aims to use an intervention-based approach, building on the research of mindfulness-meditation, to reduce experienced CA. Further, the goal is to gain additional research on the ambiguity in the relationship between CA and PEA, by looking at the PEA a person is willing to show after reducing perceived CA. To explain this thought further, it is necessary to take the avoidant response of anxiety in the context of climate change into consideration, regarding the possibility that CA causes the topic to be ignored altogether and as a result no environmentally beneficial actions would be taken. A reduction in PEA after reduced CA would speak for a negative influence of CA on behavioural actions. This would support the theory of Stanley et al. (2021) of anxiety leading to avoidant behaviour towards climate change, which this paper also advocates for in its hypothesis and experimental design.

This paper aims to provide further research on the influence of CA on PEA, by following an interventional approach. Hence, following hypothesis were generated:

1.4.1 Hypothesis 1: CA Reduction between group

The intervention reduces CA significantly in the experimental group, in comparison to the control group. CA is measured before and after the intervention, with the difference in the items being compared to the ones of the control group, who had no intervention.

1.4.2 Hypothesis 2: CA Reduction within group

The intervention reduces climate-anxiety significantly in the experimental group, comparing the first measure (t1) of climate-anxiety and the second (t2) measure of climate-anxiety, with the second measure being lower.

1.4.3 Hypothesis 3: Effect CA on PEA

A lower score in CA leads to a higher score in the pro-environmental actions, leading the participants who completed the intervention to show higher scores in the PEA-scale, than the participants who did not partake in the intervention.

2. Method

2.1 Participants

Participants were recruited via the LABS-System of the University of Vienna. Registration took place beforehand, and testing occurred at set times in the “Neues Institutsgebäude” in rooms provided by the university. Data were collected from May to July 2023. The sample consists of 40 Ps, 30 females, M age =24.10 yrs. (range 19 - 31).

2.2 Procedure

On arriving at the testing room participants were briefly told about the main contents and the study duration. They were asked to choose an available PC of their liking and to start the study. At the beginning the declaration of consent was presented, with a forced answer for continuation of the study. After that the study continued as following:

1.1. Step 1: Demographic data

If happy to continue participants were asked their age; sex; education and knowledge of German. All question were multiple-choice, with the possibility to enter in a free category if needed for every question.

1.2. Step 2: CA short measure

Following a shortened measure of CA, inspired by the scale of Hogg et al. (2022), was presented. The CA-scale is described in more detail under 2.3.1.

1.3. Step 3: Recall CA in form of writing

After answering six questions regarding CA the participants were asked to reflect on their most dominant fears related to climate change. This first two steps additionally serve to prime participants of CA and make the topic present at that moment of time for the upcoming intervention. The instruction for the writing part was as follows: *“What follows is a reflection on your possible fears related to climate change. [...] The aim is to write down your possible fears that climate change triggers in you. You can put yourself in a specific situation that triggers fearful thoughts in you in connection with climate change. For me, this would be reading bad news in the newspaper or feeling the real consequences of climate change in my environment. You can also use your own scenarios. [...]”*. Participants had the option to enter up to five answers, but only one was mandatory.

1.4. Step 4: Intervention or control group

Following this, depending on the group, participants either did the intervention or got further along with the study. The control group continued was asked to continue with the study. Details of the intervention are described under 2.3.3.

1.5. Step 5: Effectiveness in PEA

The next step was to describe one's own experience of effectiveness in their actions regarding climate change. They were asked: "*When I think about climate change, I feel my actions are [...].*" and had the option to slide a marker between meaningless and meaningful. Meaningless was ranked at 0 percent and meaningful at 100 percent.

1.6. Step 6: CA long measure

After that CA was questioned again, this time with all items presented, which are presented under 2.3.1.

1.7. Step 7: PEA measure

Successively participants completed the measures of PEA. They were provided with statements regarding PEA and had to rank those items on a Likert-scale. The PEA-scale is described in more detail under 2.3.2.

At the end of the study participants were debriefed with a follow-up question: "*How do you feel about climate change after this study? Feel free to share with me what the study of the topic has triggered in you.*" and had the opportunity to enter their email-address for further resources on the topic of CA. Afterwards participants were asked by the instructor how they experienced the study, handed an information-sheet, if wanted, and thanked for their participation.

3. Measures

3.1 Climate-Anxiety

The Hogg Eco-Anxiety Scale (HEAS-13), developed by Hogg et al. (2022), was the 'template' to measure CA in this study (Hogg et al., 2022). The scale consists of 12 items, loading on four dimensions: affective symptoms, rumination, behavioural symptoms, and anxiety of one's negative impact on the planet. It shows a high degree of reliability and validity (Hogg et al., 2022) and was chosen because it is representing CA at a commonly understood, non-clinical level.

For this study the HEAS-13 was reframed to measure state-anxiety, by changing the wording of the items. Additionally, three items were added (item 13, 14, 15), representing the dimension of socio-political factors influencing CA. These items were added after the conduction of the pre-test for the current study and seeing a possibility for an extension of the HEAS-13, based on the given answer in the association task. The items are rated on a response scale on 0 = *do not agree at all*; 1= *do not agree*; 2 = *agree* and 3 = *fully agree*. The rephrased items as well as the introduction are shown Appendix 2. In the study all items are phrased in German, but for this paper they were translated into English for continuity purposes. CA is questioned two times in the study, with items 1, 4, 8, 12, 15 presented at first measure and all items being presented at second measure. The items for the first measure were chosen based on the strongest factor-loading for each dimension after Stanley et al. (2021).

3.2 Pro-Environmental Actions

For the measure of pro-environmental actions an adaption of the PEA-scale by Stanley et al. (2021) is presented. The only change is the rephrasing of the base question enquiring future intentions, instead of already displayed behaviour. Participants rate on a scale from 0 (not show at all) to 100 (show at every opportunity) if they plan to show a certain behaviour in the following two weeks. Based on this question the scale requires to answer 8 items asking for personal behaviour (e.g., recycling, healthier food choices) and eight items for collective behaviour (e.g., protesting). As for the Hogg Eco-Anxiety scale (Hogg et al., 2022) the scale is presented in German but in this paper the items are translated into English. Under Appendix 2 the items are displayed.

3.3 Intervention

For the intervention a twelve-minute video was presented, which consisted of two parts: (1) a psychoeducation and (2) a mediation. The aim of the both parts of the intervention was to reduce CA. Pre-tests showed a (non-significant) reduction of two points on the rephrased HEAS-13. The audio is spoken by a women's voice and a forest scene is displayed on the screen for both parts. Figure 1 shows the participants view of the intervention on the screen.

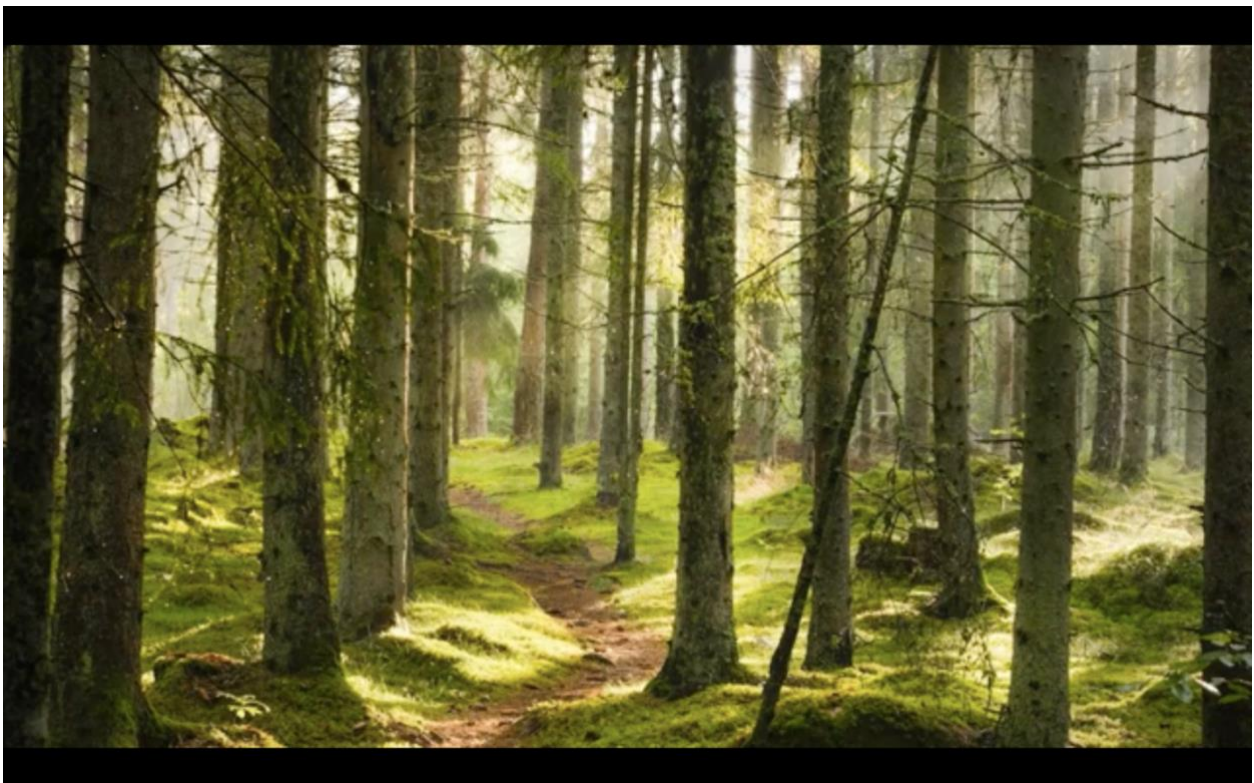


Figure 1 View of the intervention from the participants perspective.

Before the video started participants were instructed to use the present headphone and turn on full screen. Detailed instructions were presented to ensure the consistent execution of the intervention and were written as following: *“Please watch the following video now: Click on “View on YouTube” to open the video in full screen mode! Plug in your headphones and turn on the sound. Sit comfortably and set the video to full screen mode. The video lasts about 12 minutes. A forest scene is always shown, over which a text is spoken. Please listen carefully! When the video is over, please minimise the screen and return to the study.”* Following, the psychoeducation and meditation are described briefly.

3.3.1 Psychoeducation

The duration of the psychoeducation was 7 minutes and 45 seconds, with the main goal being for participants to acknowledge that the prevalence of CA is common among a younger population and that there are possibilities to handle the fear of climate change in a productive and uniting manner. Inspiration for the text was taken from interview excerpts featuring Rachel Malena-Chan (founder of „ecoanxiousstories“) (EcoAnxiousStories, 2023) and her statements. The whole excerpt of the intervention can be found under Appendix 1.

The beginning of the psychoeducation says as following:

“For now, I would like to thank you for agreeing to participate in this study. I understand that it is not always easy to face your own emotions about climate change. However, the next ten minutes will be about just that. Now this can be emotionally challenging, but it can also be a rewarding experience if you engage with it.[...]”

After an introduction and an overview off the following minutes, participants are presented with facts about CA:

“First of all, it is a very normal feeling to experience fear when thinking about climate change [...] It is important to understand that this is a collective feeling and that it is shared by many other people. Therefore, you are definitely not alone in your possible fear of climate change. Many other people feel the same way.”

The psychoeducation continues with the goal to take away fear from the topic of climate change, in order to do so it states:

“Of course, you may often feel guilty or feel like you're not doing enough when confronted with the issue of climate change. This is often because of the discrepancy between the narrative that the world is ending and the solutions we are presented with, such as avoiding plastic bags or using reusable straws. These solutions contrast greatly with the enormous threat that climate change poses. The inconsistency of these two aspects leads to cognitive dissonance, which can cause anxiety and mental tension.”

At the end of the psychoeducation the main intention was to create a bigger picture, where participants see their role in the climate crisis more clearly:

“This connection with others can build a strong community that will help you tackle climate change for yourself and future generations. It is important to realise that the fight against climate change will not end within our lifetime. Therefore, we should start building skills and capacity now to continue the fight for generations to come.”

3.3.2 Mediation

The second part of the video consisted of a meditation with a duration of 4 minutes and 12 seconds. As soon as the video switched from the psychoeducation to the mediation additional nature sounds were presented. This was to get the participants emerged into the feeling of being in a nature and heighten the focus on the auditive stimuli for relaxation. The picture on the screen was the same for the whole duration of the intervention. At the start of the meditation participants were instructed to take the thoughts they had during the psychoeducation and let them come and go and relax for the next four minutes.

The meditation started as following: *“Now take a moment and sit comfortably. Close your eyes if you like or focus on the forest scene and the sounds. Take a deep breath in through your nose and out through your mouth. With each inhale, fresh air flows into your body and the lungs expand, and with each exhale you feel the stress in your body and mind dissolve. Feel the muscles soften and relax. and breathe in deeply again through your nose and out through your mouth.”* The meditation continues and supports the participant to reach a mindful state and feel the relaxation nature can provide.

4. Results

4.1 Preliminary analysis

The preliminary analysis of assumptions shows all requirements for the statistical analysis to be fulfilled. For the one-way MANOVA the Shapiro-Wilk test ($p = .05$) shows all groups to be normally distributed across both dependent variables. Additionally, multicollinearity was not an issue in the analysis as correlations between dependent variables were low ($r < .90$). No multivariate outliers were found, as assessed by the Mahalanobis distance ($p > .001$). The Levene's test shows that the homogeneity of the error variances was given for both independent variables, the PEA-score, and the CA-score at second measure ($p < .05$). There was homogeneity of covariances, as assessed by Box's test ($p > .001$). Additionally, for the repeated-measures ANOVA the data shows no outliers. All the groups were normally distributed, as displayed by the Shapiro-Wilk test ($p < .001$).

The reliability analysis used Cronbach's alpha to calculate the internal consistency for the two scales of the dependent variables. The measure of climate anxiety after the intervention, which consists of fifteen questions, shows that the internal consistency of this questionnaire is acceptable, with Cronbach's alpha for positive affect = .780. The measure of PEA, which consists of fifteen

questions, shows a good internal consistency of this questionnaire, with Cronbach's alpha for positive affect = .815.

4.2 Main analysis

The analysis follows a mixed-methods approach, using both quantitative and qualitative data. Hypothesis 1-3 were explored using different ANOVAS and analysing quantitative data. For Hypothesis 1 and 3, both looking at between-subject factors, a one-way MANOVA was calculated, for Hypothesis 2, looking at within-subject factors, a repeated-measures ANOVA was used. Hypothesis 4 used qualitative frequency as well as correlation analysis, to determine the main categories and subcategories of the data.

4.2.1 Hypothesis 1: CA Reduction between groups

Does the intervention lead to lower levels of CA in the testing-group in comparison to the control-group in the post-scores? The one-way MANOVA showed no significant main effect for CA ($F(2,37) = 1.526$, $p = .231$, partial $\eta^2 = .076$, Wilk's $\Lambda = .924$, Table 1).

4.2.2 Hypothesis 2: CA Reduction within groups

Is there a difference between the first measure and the second measure of CA in the intervention group? A repeated measures ANOVA found no statistically significant difference between the first (mean control = 8.65, SD = 2.43; mean intervention = 9.15, SD = 2.28).and the second (mean control = 8.40, SD = 2.26; mean intervention = 8.55, SD = 2.50) measure of CA in the intervention group nor the control group ($F(1, 38) = 2.01$, $p = .164$, partial $\eta^2 = .050$, Wilk's $\Lambda = .950$). The interaction between time (pre- and post-measure of CA) and group (intervention and control group) similarly shows no significant effect ($F(1, 38) = .341$, $p = .563$, partial $\eta^2 = .009$, Wilk's $\Lambda = .991$). The means and the standard deviations for the CA pre and post intervention are presented in Table 1.

Table 1 Mean differences and standard deviations of the repeated-measures ANOVA, displayed for control-group, intervention-group and total.

	Control		Intervention	
	M	SD	M	SD
Climate Anxiety Pre-Intervention	8.65	2.28	9.15	2.28
Climate Anxiety Post-Intervention	8.40	2.26	8.55	2.50

4.2.3 Hypothesis 3 Effect CA on PEA

Is there a difference between the two groups (control and intervention) on PEA? A one-way MANOVA found no statistically significant differences between the groups on the PEA-score, nor the CA-score ($F(2,37) = 1.526$, $p = .231$, partial $\eta^2 = .076$, Wilk's $\Lambda = .924$). A nonsignificant reduction in the CA mean of the intervention group, in comparison to the control group, is visible (mean control = 20.95, SD = 5.28; mean intervention = 18.70, SD = 5.51). Similarly, a nonsignificant reduction in the PEA mean of the intervention group, in comparison to the control group, is shown (mean control = 861.60, SD = 184.87; mean intervention = 755.30; SD = 278.20). The detailed mean differences can be taken from Table 2.

Table 2 Mean differences and standard deviations of the MANOVA for climate anxiety and pro-environmental actions, displayed for control and intervention-group.

	Control		Intervention	
	M	SD	M	SD
Climate Anxiety	20.95	5.28	18.70	5.51
Pro-Environmental Actions	861.60	184.87	755.30	278.20

4.3 Explorative analysis

The explorative analysis deals with the addition of a social-political aspect to the concept of CA. The idea therefore came after the qualitative results of pre-test were evaluated, showing a high

fear level of topics that can be summarized under the category of socio-political fear. Therefore, the question arose: Are additionally added items for socio-political fear (constituted of 3 items) a beneficial extension to the concept of climate anxiety? To answer this question two ways of analysis - a qualitative and a quantitative one - were chosen:

1. *Qualitative analysis*: Breaking down the data following the qualitative-content analysis from Kuckartz (2018). Therefore, the data from “Step 3: Recall CA in the form of writing” was used and the given statements were sorted into inductively created categories (Kuckartz, 2018), which acted as main categories for the analysis. The main categories are *personal fears*, *socio-political fears*, and *direct planetary fears*. Each category defines that the statements inside can be only assigned into this specific cluster. This shows a clear indication for the relevance of socio-political fears in the concept of CA, as 41 of the 111 statements were assigned into the category of socio-political fears.

Further, the statements in the main categories were sorted into additional subcategories, to gain further insights into the distinctive fears described in each category. For personal fears the subcategories are *generational fear*; *personal sacrifices*; *time-limit* and *uncertainty*, for socio-political fears the subcategories were *war and discrimination of the global south*; *polarisation* and *global health*, and for direct planetary fears the subcategories were *extreme weather situations* and *planetary destruction*. The main- and subcategories are displayed in Figure 1.

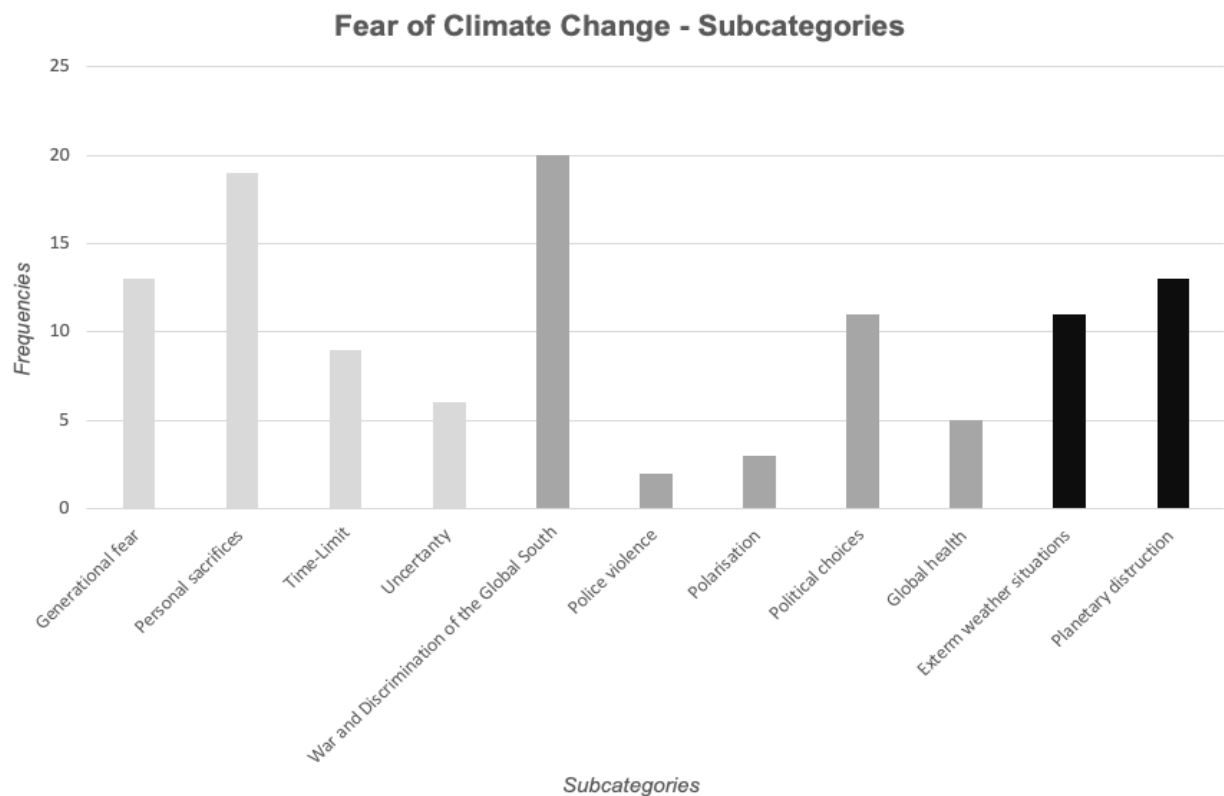


Figure 1 Results of the qualitative data from the open-answer questions of the study, asking for fears about climate change, three main-categories are personal fears, socio-economic fears and direct planetary fears.

2. *Quantitative analysis:* Taking the results from the item-statistics and comparing values from the added items for socio-political fear with the already existing items in the HEAS-13 (Hogg et al., 2022), which means looking if participants rate the added items with a similar fear-value as the original items. Results show that, the additionally created items for socio-political fear, being the items 13 (mean = 1.78), 14 (mean = 2.30) and 15 (mean = 2.40) have the highest means on the Likert-Scale ratings. This indicates that participants value these additionally added items with the highest fear-ratings of all. The mean over all items was = 1.32 with a range from .175 to 2.40. Additionally, the added items show similar squared multiple correlation scores as the original-scale items, including item 13 ($r = .406$); item 14 ($r = .641$); item 15 ($r = .675$), further showing their fit for the HEAS-13.

5. Discussion

5.1 Summary of findings

This study investigated the relationship between CA and PEA in an interventional setting, looking at possibilities to reduce climate change related fear and its connection to our behavioural outcomes. Overall, this study did not create a working intervention for CA. Nevertheless, there was a reduction in CA after the intervention of almost two points, suggesting the possibility to reduce CA via a mindful and meditational approach, relating to findings on general anxiety (Chen et al., 2013; Blum et al., 2021). Hence, there was no difference due to the intervention in the CA-scores, it is not possible to make statements regarding PEA.

Furthermore, this study added the dimension of socio-political fears to the concept of CA. Qualitative and quantitative data attests that the added items were the highest ranking, therefore the ones rated as the most feared, of all items. Overall, the study showed three distinct subcategories to the concept of CA: personal fears; planetary fears and socio-political fears. The latter being excluded from current measures of CA. This category of socio-political fears shows the subcategories of the fear of “war and discrimination of the global south”, “police violence”, “polarisation” and “global health”. These results show that socio-political fears in regard to CA are an important topic for young people and should be incorporated into an official measuring system.

5.2 What is the connection between CA and PEA?

The main question this paper tried to answer, still remains inconclusive. Nonetheless, there is a lot of evidence pointing into one distinct direction: CA does affect PEA positively. The research on this topic does support this idea either seeing a positive (Ogunbode et al. 2022; Whitmarsh et al., 2022; Sangervo et al., 2022) or no (Verplanken et al. 2020; Clayton & Karazsia, 2020) connection between CA and PEA. Many of these studies work with a correlational approach, where causality

cannot be assumed and confounding factors, such as concern about climate change and environmental values a person holds (Whitmarsh et al., 2022), have a meaningful influence. However, the evidence for a negative relationship between CA and PEA is only supported by one paper (Stanley et al., 2021), which uses only two items to measure CA.

5.3 Limitations and future research

Limitations of this study are present and open the possibilities for further research. The first limitation is a flaw in the study design itself, building an intervention to work and reduce CA, as a mandatory condition to look at the influence on PEA. The novelty in the design of the intervention, consisting not only of a meditation but also a psychoeducation, was not well researched enough for this choice of experimental structure. Additionally, the meditation was rather short in comparison to other studies (Chen et al., 2013; Blum et al., 2021). This was done to keep the overall length of the study in reasonable length for participants. Further, I would shorten the psychoeducation and lengthen the mediation.

A further limitation is the single presentation of the intervention to the participant without any requests or incentivisation for behavioural changes. A one-time intervention is not enough to change habitual behaviour.

Additionally, a limitation of the current study is the measurement of PEA, asking for self-reported behaviour in the future. The design of the study made it necessary to ask for prospective behavioural outcomes, as it is done in a wide range of studies asking for behavioural changes, however this never truly depicts actual behaviour.

What is to gain from this study for future research? In conclusion, my train of thought after conducting this study does support the theory that CA influences PEA positively. The thing is, how does this benefit us as a society? Should we all have so much fear of climate change that we do act accordingly and show more PEA? We know about the linkage of CA and general anxiety. I propose the idea of a more horizontal approach, looking at the combination of different settings, such as group intervention, making distinct plans on how to change behaviour together, sharing stories about our fears, strengthening the opportunities for politic engagement, and if it all is overwhelmingly too much, having the opportunity to use meditation and mindfulness to ground ourselves. This study shows that young people have a high concern for the future of this planet and look for an open discourse about it. The length and depth of the answers received in the open question part of this study confirm that. The conversation around climate change is an issue that also includes a lot of hopelessness, and a one-time intervention without proposed solutions for improvement may trigger even more anxiety. The intervention might have brought the previously ignored issue into consciousness. Therefore, it needs the combination of several aspects and most importantly options for improvement - otherwise a meditation itself is not enough to help with the fear of climate change. I propose a clear point of contact for people to address their emotions. This space should be structured in its methods, using a mix of

exchange and solutional approaches and finding options for people to connect and work on clear output. In this setting, I see a way to go from being afraid of climate change to actual changes in our behaviour, also using parts of the intervention presented in this study.

References

- American Psychological Association. (2023, Februar 22). *Anxiety*. <https://www.apa.org/topics/anxiety>
- Bateson, M., Brilot, B., & Nettle, D. (2011). Anxiety: An Evolutionary Approach. *The Canadian Journal of Psychiatry*, 56(12), 707–715. <https://doi.org/10.1177/070674371105601202>
- Blum, H., Rutt, C., Nash, C., Joyce, V., & Buonopane, R. (2021). Mindfulness Meditation and Anxiety in Adolescents on an Inpatient Psychiatric Unit. *Journal of Health Care Chaplaincy*, 27(2), 65–83. <https://doi.org/10.1080/08854726.2019.1603918>
- Chen, Y., Yang, X., Wang, L., & Zhang, X. (2013). A randomized controlled trial of the effects of brief mindfulness meditation on anxiety symptoms and systolic blood pressure in Chinese nursing students. *Nurse Education Today*, 33(10), 1166–1172. <https://doi.org/10.1016/j.nedt.2012.11.014>
- Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders*, 74, 102263. <https://doi.org/10.1016/j.janxdis.2020.102263>
- Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69, 101434. <https://doi.org/10.1016/j.jenvp.2020.101434>
- Cox, R. C., & Olatunji, B. O. (2019). Differential associations between chronotype, anxiety, and negative affect: A structural equation modeling approach. *Journal of Affective Disorders*, 257, 321–330. <https://doi.org/10.1016/j.jad.2019.07.012>
- Cunsolo, A., Harper, S. L., Minor, K., Hayes, K., Williams, K. G., & Howard, C. (2020). Ecological grief and anxiety: The start of a healthy response to climate change? *The Lancet Planetary Health*, 4(7), e261–e263. [https://doi.org/10.1016/S2542-5196\(20\)30144-3](https://doi.org/10.1016/S2542-5196(20)30144-3)
- Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist*, 56(3), 218–226. <https://doi.org/10.1037/0003-066X.56.3.218>
- Friedlingstein, P., Jones, M. W., O'Sullivan, M., Andrew, R. M., Hauck, J., Peters, G. P., Peters, W., Pongratz, J., Sitch, S., Le Quéré, C., Bakker, D. C. E., Canadell, J. G., Ciais, P., Jackson, R. B., Anthoni, P., Barbero, L., Bastos, A., Bastrikov, V., Becker, M., ... Zaehle, S. (2019). Global Carbon Budget 2019. *Earth System Science Data*, 11(4), 1783–1838. <https://doi.org/10.5194/essd-11-1783-2019>
- Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health*, 5(12), e863–e873. [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3)
- Hofmann, S. G., & Gómez, A. F. (2017). Mindfulness-Based Interventions for Anxiety and Depression. *Psychiatric Clinics of North America*, 40(4), 739–749. <https://doi.org/10.1016/j.psc.2017.08.008>

- Hogg, T. L., Stanley, S. K., O'Brien, L. V., Wilson, M. S., & Watsford, C. R. (2021). The Hogg Eco-Anxiety Scale: Development and validation of a multidimensional scale. *Global Environmental Change*, 71, 102391. <https://doi.org/10.1016/j.gloenvcha.2021.102391>
- Kuckartz, U. (2018). *Qualitative Inhaltsanalyse: Methoden, Praxis, Computerunterstützung* (4. Auflage). Beltz Juventa.
- Ogunbode, C. A., Doran, R., Hanss, D., Ojala, M., Salmela-Aro, K., van den Broek, K. L., Bhullar, N., Aquino, S. D., Marot, T., Schermer, J. A., Wlodarczyk, A., Lu, S., Jiang, F., Maran, D. A., Yadav, R., Ardi, R., Chegeni, R., Ghanbarian, E., Zand, S., ... Karasu, M. (2022). Climate anxiety, wellbeing and pro-environmental action: Correlates of negative emotional responses to climate change in 32 countries. *Journal of Environmental Psychology*, 84, 101887. <https://doi.org/10.1016/j.jenvp.2022.101887>
- Rachel Malena-Chan. (o. J.). *Eco Anxious Stories*. <https://ecoanxious.ca/about-us/>
- Sangervo, J., Jylhä, K. M., & Pihkala, P. (2022). Climate anxiety: Conceptual considerations, and connections with climate hope and action. *Global Environmental Change*, 76, 102569. <https://doi.org/10.1016/j.gloenvcha.2022.102569>
- Segal Z., Williams M., & Teasdale J. (2018). *Mindfulness-based cognitive therapy for depression*. Guilford publications.
- Simon, P. D., Pakingan, K. A., & Aruta, J. J. B. R. (2022). Measurement of climate change anxiety and its mediating effect between experience of climate change and mitigation actions of Filipino youth. *Educational and Developmental Psychologist*, 39(1), 17–27. <https://doi.org/10.1080/20590776.2022.2037390>
- Stanley, S. K., Hogg, T. L., Leviston, Z., & Walker, I. (2021). From anger to action: Differential impacts of eco-anxiety, eco-depression, and eco-anger on climate action and wellbeing. *The Journal of Climate Change and Health*, 1, 100003. <https://doi.org/10.1016/j.joclim.2021.100003>
- Verplanken, B., Marks, E., & Dobromir, A. I. (2020). On the nature of eco-anxiety: How constructive or unconstructive is habitual worry about global warming? *Journal of Environmental Psychology*, 72, 101528. <https://doi.org/10.1016/j.jenvp.2020.101528>
- Verplanken, B., & Whitmarsh, L. (2021). Habit and climate change. *Current Opinion in Behavioral Sciences*, 42, 42–46. <https://doi.org/10.1016/j.cobeha.2021.02.020>
- Vidic, Z. (2021). Multi-year investigation of a relaxation course with a mindfulness meditation component on college students' stress, resilience, coping and mindfulness. *Journal of American College Health*, 1–6. <https://doi.org/10.1080/07448481.2021.1987918>
- Whitmarsh, L., Player, L., Jiongco, A., James, M., Williams, M., Marks, E., & Kennedy-Williams, P. (2022). Climate anxiety: What predicts it and how is it related to climate action? *Journal of Environmental Psychology*, 83, 101866. <https://doi.org/10.1016/j.jenvp.2022.101866>

Appendix

Appendix 1: Text for the intervention (translated from German to English) inspired by EcoAnxiousStories (2023)

For now, I would like to thank you for agreeing to participate in this study. I understand that it is not always easy to face your own emotions about climate change. However, the next ten minutes will be about just that. Now this can be emotionally challenging, but it can also be a rewarding experience if you engage with it. To begin, I will now talk about climate anxiety, how and why we experience this emotion. This will be followed by a short guided meditation. Your task is to please just listen and participate.

Then we can get started.

First of all, it is a very normal feeling to experience fear when thinking about climate change: More than 50% of participants in a large-scale study reported feeling sad, scared, angry, powerless, helpless and guilty when thinking about climate change. 59% of participants were very or extremely concerned and 84% were at least moderately concerned. It is important to understand that this is a collective feeling and that it is shared by many other people. Therefore, you are definitely not alone in your possible fear of climate change. Many other people feel the same way.

An important idea to consider is this: your role in the story of the climate crisis depends less on who you are and more on when you are. This may sound unfamiliar at first, but it is of great importance to better understand the emotional impact of climate anxiety. It is important to keep in mind that we are in a climate crisis that has been going on for hundreds of years. This means that the crisis was not caused by our actions today alone, nor can it be ended by us alone.

But you are here at this historic moment - this chapter in our history - where we are all together at a turning point. That is good news, because this is the chapter where everything changes. You are part of a transitional generation simply by existing and having your heart beat. It is important that you realise that this is where you belong. Even though you may not yet know how you can best contribute to solving the climate crisis in your daily actions. Either way, you are an important part of this story and have the opportunity to make a positive difference. You are where you belong. And if you feel anxious, it's probably because you have a really rich story behind your anxiety.

Of course, you may often feel guilty or feel like you're not doing enough when confronted with the issue of climate change. This is often because of the discrepancy between the narrative that the world is ending and the solutions we are presented with, such as avoiding plastic bags or using reusable straws. These solutions contrast greatly with the enormous threat that climate change poses. The inconsistency of these two aspects leads to cognitive dissonance, which can cause anxiety and mental tension.

So it is perfectly normal for such feelings to arise and for anxiety and mental strain to result. But it is important to talk about it and understand what triggers it in us and how we can deal with it. We have

to learn to live with this discrepancy and still move forward. But we can also talk about choices we can make together to make it less difficult, to make it less dissonant and to make sure that what we know, what we love and what we do fits together and comes together.

Now here is the question of how we can specifically deal with this fear of climate change?

Fears often arise from a feeling of powerlessness. The opposite of fear is not relaxation, but action. You cannot overcome your fears through relaxation alone, even though it can help you cope with your everyday life. The ultimate answer lies in power shifting and sharing our stories with each other. By connecting with each other. It is important that we become aware of what we love and what we grieve in order to empower ourselves and move forward.

A first step in overcoming fears is not to focus exclusively on the challenges and pretend that you have no choice. Instead, you should consciously look at your own choices. Instead, you should consciously look at your choices. You have choices to work with others, to focus on your values and to talk about how you feel. It is important that you do this in a way that is personally valuable to you and grounds you.

As humans, we want to feel that what we are doing in our lives is meaningful. This can be on a personal level, but you also know that the story is so much bigger than your little decision. Still, we don't have to feel guilty about it, because the system we live in often can't allow for good choices. Instead, we can get angry, organise and actually resist this system and the choices it produces. It's important to make a connection between our fear and system-level change, because that's what feels really meaningful.

The role you will play in combating climate change in the coming years depends in large part on you. How do you feel about this responsibility? What impact does it have on you? Does it affect your relationship with your job, your family or the environment? Is it things like summer holiday plans that may be affected? Where do you feel changes in your life and how do you deal with them?

To cope with climate change, it is important to connect with your core values. Think about what is really important to you and how you can draw courage from it. It is not about working through a list of environmentally friendly activities or changing your personality to fit into a new group. It's about taking action where you have influence and networking with people who want to join and fight with you for a better future.

This connection with others can build a strong community that will help you tackle climate change for yourself and future generations. It is important to realise that the fight against climate change will not end within our lifetime. Therefore, we should start building skills and capacity now to continue the fight for generations to come.

I would like to share these thoughts with them now. For the next few minutes, a guided meditation will be spoken - giving you time to reflect on what has been said so far and to come to peace.

Here happens the switch to the meditation.

Now take a moment and sit comfortably.

Close your eyes if you like or focus on the forest scene and the sounds.

Take a deep breath in through your nose and out through your mouth.

With each inhale, fresh air flows into your body and the lungs expand, and with each exhale you feel the stress in your body and mind dissolve.

Feel the muscles soften and relax. and breathe in deeply again through your nose and out through your mouth.

Relax your eyebrows.

Relax the muscles in your face.

Lower your shoulders and imagine that you are creating more space between your shoulders and your ears.

Relax your body and feel your weight on the chair.

Breathe in and out deeply.

And once deeper in

And out.

In this moment of stillness, allow your thoughts to come and go.

You hear the chirping of the birds and the rustling of the leaves.

Focus on the sounds you hear in this moment.

Notice when your thoughts wander.

Then return to the sounds of the forest.

Let your thoughts linger here and focus on the sounds of the forest.

*90 seconds of silence

When you are ready, you can open your eyes.

and slowly return to everyday life.

Thank you for participating up to this point. Here are a few more questions. Please fill them in according to your current feelings after the meditation and what has been said before.

Thank you!

Appendix 2:

HEAS-13 (Hogg et al., 2022) – rephrased

*“Indicate your level of agreement for the following statements. These statements deal with how much the following problems worry you **at this moment** when you think about climate change and other global environmental conditions (e.g., global warming, ecological degradation, depletion of resources, species extinction, ozone hole, pollution of the oceans, deforestation). Please state your **current feelings, at the present time** and relate the statements to climate change. It is important that you state what you are feeling right **now - this minute**.”*

1. Thinking about climate change makes me feel nervous, anxious or irritable.

2. I am not able to stop or control brooding about climate change.
3. I worry too much about climate change.
4. When thinking about the current and future situation of the earth's climate, I experience feelings of anxiety.
5. I can't stop thinking about climate change and other global environmental issues.
6. I can't stop thinking about past events related to climate change.
7. I'm afraid I won't be able to sleep today because of concerns about the Earth's climate.
8. I think it might be difficult to enjoy social situations with family and friends because of my fear of climate change.
9. I think there might be difficulties with work and/or learning because of my fear of climate change.
10. I am concerned about the impact of my personal behaviour on the earth.
11. I feel fear of personal responsibility to contribute enough to the solution of existing environmental problems.
12. I fear that my personal behaviour will do little to solve the problem.
13. I fear that in the future, my democratic rights will be limited due to political reactions to climate change.
14. Ich habe Angst vor gesellschaftspolitischen Veränderungen(Unruhen, Diskriminierung, Flucht, Krieg, Rassismus) die durch den Klimawandel ausgelöst werden.
15. I fear that global inequalities will worsen drastically due to climate change.

PEA-scale (Stanley et al., 2021) – rephrased

“The following are statements about your planned behaviour over the next two weeks. Please rate whether you will not show the following behaviour at all (set scale to 0) or on every occasion (set scale to 100).”

Personal behaviour:

1. Use of products that are more environmentally friendly.
2. Buy products that have been produced locally.
3. Switch the gas and/or electricity consumption in the house/flat.
4. Reduce water consumption in the house/flat and in the garden.
5. Switch off the lights at home whenever possible.
6. Fixing things instead of replacing them.
7. Recycle/compost household waste as much as possible.
8. Make my diet climate-friendly (vegetarian/vegan/low meat/seasonal products/organic food)

Collective behaviour:

1. Participate in demonstrations for more climate justice.
2. Write a letter or email to a member of parliament.
3. Vote for parties because they have the fight against climate change in their programme.
4. Openly express your opinion about climate change to family and friends.
5. Openly express their opinions about climate change to strangers.
6. Trying to change another person's mind about climate change.
7. Sign a petition online or in person.
8. Express your thoughts or information about climate change on social media.