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Climate emotions among Polish adolescents and students. Increase in emotional resources with age

Emocje klimatyczne u polskich adolescentów i studentów. Wzrost zasobów emocjonalnych wraz z wiekiem

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Abstract

Introduction and objective: Previous research shows that climate emotions can be associated with anxiety and mood disorders, and that the age group most sensitive to climate change are young people. The aim of this study was to determine the level of climate emotions among adolescents and university students, and to explore the type of relationship between climate emotions and levels of generalised anxiety and depression in this group, in search of explanatory mechanisms and protective factors. **Materials and methods:** The study involved 170 participants, including 66 adolescents (49 females, 14 males, and 3 non-binary individuals) aged 18 years, and 104 university students (including 79 females, 20 males, and 5 non-binary individuals) aged 18–33 years ($M = 22.85$; $SD = 2.58$). The following instruments were used: the Inventory of Climate Emotions (ICE) to measure climate emotions, the Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7) to determine the severity of generalised anxiety, and the Kutcher Adolescent Depression Scale (KADS) to measure depression risk. **Results:** The results indicate higher levels of climate anger and climate powerlessness among students and higher levels of climate contempt among adolescents. In addition, adolescents exhibited higher levels of generalised anxiety and depression than students. Regression analyses revealed that climate emotions are predictors of both generalised anxiety and depression in both study groups, but the patterns of these relationships are different. **Conclusions:** University students appear to cope with climate emotions and related distress more constructively than adolescents. To reduce the effects of climate anxiety and other emotions, it is worth focusing on strengthening young people's individual and social resources.

Keywords: climate emotions, climate anxiety, generalised anxiety, depression, adolescents

Streszczenie

Wprowadzenie i cel: Dotychczasowe badania wskazują, że emocje związane ze zmianami klimatycznymi mogą wiązać się z zaburzeniami lękowymi i zaburzeniami nastroju, a grupą wiekową najbardziej wrażliwą na zmiany klimatyczne są ludzie młodzi. Celem badań było określenie poziomu emocji klimatycznych u nastolatków i studentów oraz wyjaśnienie rodzaju związku pomiędzy emocjami klimatycznymi i poziomem uogólnionego lęku oraz depresji u nastolatków i studentów w poszukiwaniu mechanizmów wyjaśniających i czynników ochronnych. **Materiał i metody:** W badaniach uczestniczyło 170 osób, w tym 66 adolescentów (49 kobiet, 14 mężczyzn oraz 3 osoby niebinarne) w wieku 18 lat oraz 104 studentów (w tym 79 kobiet, 20 mężczyzn oraz 5 osób niebinarnych) w wieku 18–33 lata ($M = 22,85$; $SD = 2,58$). Zastosowano Inwentarz Emocji Klimatycznych (Inventory of Climate Emotions, ICE) do pomiaru emocji związanych ze zmianami klimatycznymi, skalę GAD-7 (Brief Measure for Assessing Generalized Anxiety Disorder) do określenia nasilenia uogólnionego lęku oraz Skalę Depresji Młodzieży Kutchera (Kutcher Adolescent Depression Scale, KADS) do pomiaru ryzyka depresji. **Wyniki:** Uzyskane wyniki wskazują na wyższy poziom gniewu klimatycznego i bezsilności klimatycznej wśród studentów oraz wyższe nasilenie pogardy klimatycznej u nastolatków. Ponadto adolescenci ujawniają wyższy niż studenci poziom uogólnionego lęku i depresji. Analizy regresji ujawniły, że emocje klimatyczne są predyktorami zarówno uogólnionego lęku, jak i depresji w obu badanych

grupach, jednak odmienne są wzorce tych powiązań. **Wnioski:** Studenci radzą sobie z emocjami klimatycznymi i napięciami emocjonalnymi bardziej konstruktywnie niż adolescenci. W celu redukowania skutków lęku klimatycznego i innych emocji warto skoncentrować się na wzmacnianiu zasobów indywidualnych i społecznych młodych osób.

Słowa kluczowe: emocje klimatyczne, lęk klimatyczny, lęk uogólniony, depresja, adolescenci

INTRODUCTION

Climate change, the climate catastrophe predicted by the media and environmentalists, global warming, species extinction, and the near-total depletion of non-renewable energy sources – these are just a few of the many environmental challenges facing the world today (Taylor, 2020). Climate change is widely recognised as one of the most serious global health threats of the 21st century (Watts et al., 2018). Climate change, either in the form of slow, gradual or sudden climatic impacts, affects people's mental health. The Australian Medical Association (2019) has identified climate change as real and predicts that it will have serious consequences for global health, especially for those representing vulnerable groups lacking the ability to protect themselves. Many individuals report that they fear for themselves, their children and future generations, and experience a deep sense of loss, hopelessness, and anger when witnessing the effects of climate change. Media coverage often presents a dramatic vision of the future of the human species as a result of complex and difficult-to-control climate-related processes. It is therefore unsurprising that more and more people, exposed to such news, experience anxiety or even terror. This phenomenon has recently attracted the attention of the psychological community (Obradovich et al., 2018). To describe the psychological effects caused by the unfolding ecological crisis, both the media and the scientific community, among others, have adopted terms such as eco-anxiety (environmental anxiety – resulting from the ecological crisis) and climate anxiety (climate depression – occurring as a result of anthropogenic climate change, i.e. changes caused by human activity) (Clayton, 2020).

Researchers recognise that it is very important to understand the anxiety response triggered by the climate crisis (Watts et al. 2018). The term "eco-anxiety" was introduced by Albrecht (2019) and denotes a chronic fear of environmental annihilation. Other researchers define the term similarly (Clayton et al., 2017). "Eco-anxiety" is also described as psychological distress or anxiety related to the deterioration of environmental conditions (Usher et al., 2019), and anxiety arising from exposure to factors driving the environmental crisis (Pihkala, 2020). There are other terms used to describe anxiety caused by environmental change. For example, the term "ecological grief" refers to what a person feels in response to actual or anticipated damage to the natural world (Cunsolo and Ellis, 2018). On the other hand, "eco-anxiety" is a feeling of despair over the fragile state of the planet (Goleman, 2009), and environmental

anxiety is a state defined as arising from the lived experience of people who have experienced the devastation of their homes and environment (Higginbotham et al., 2006). Climate anxiety (CA) and related terms, such as climate distress and climate change anxiety, describe negative human emotions and psychological states in response to the global climate crisis and its associated risks (Clayton, 2020; Wu et al., 2020). Analysing the impact of climate change on psychological functioning, Thoma et al. (2021) described five impact pathways (i.e. biological, behavioural, cognitive, emotional, and social), whose interaction may render an individual more or less vulnerable to environmental stressors of risk factors from the perspective of the stress-vulnerability model. Duggan et al. (2021) noted that experiencing climate change can trigger not only fear and anxiety, but also a wide range of other emotions, especially negative ones (e.g. anger, irritation, worry, nervousness, or rage). Wu et al. (2020) postulated that scientific priorities in this area include: first, to develop and validate reliable and accurate research tools for measuring climate anxiety (CA); second, to determine the extent to which CA affects people's mental health; third, to identify the groups most affected by CA; and fourth, to promote effective psychological support methods for individuals with high levels of CA.

A variety of emotions related to climate change were found to predict an individual's mental health and well-being in different ways, according to a study by Stanley et al. (2021). Anxiety, sadness, and anger variously predicted pro-climate actions and affected people's mental health. Various correlations between different emotions felt in relation to climate change with human well-being have been identified, hence the recent emergence of the concept of climate emotions to complement the concept of climate anxiety (Albrecht, 2019; Berry et al., 2018; Chapman et al., 2017; Landmann, 2020; Marczak et al., 2023; Prescott et al., 2018).

Meta-analyses show that there are a number of negative emotions but also negative health effects associated with climate change, including somatic illness, panic attacks, and emotional reactions such as irritability, weakness, insomnia, sadness, depression, numbness, helplessness, hopelessness, guilt, frustration or anger, feelings of fear or uncertainty (Coffey et al., 2021; Doherty and Clayton, 2011; Gifford and Gifford, 2016). In addition to these negative responses, positive emotions and behaviours have also been reported, such as feelings of hope, strength and unity, especially when associated with collective action (Clayton, 2020). These feelings can also be a source of motivation to actively engage and focus on mitigation efforts (Clayton, 2020; Helm et al., 2018). Stanley et al. (2021) identified two additional, similar

but distinct eco-emotions (eco-depression and eco-anger) that showed different levels of activation and response to climate change. They found that eco-anger was associated with greater communal pro-climate behaviour, while eco-depression was less adaptive, predicting lower involvement in collective pro-climate action.

Youth as a group prone to eco-anxiety

The high susceptibility of young people to eco-anxiety and climate depression has been shown by the results of several studies. For example, a 2019 survey in the US found that 57% of American teens report that climate change makes them anxious (Obradovich et al., 2018). In addition, surveys conducted around the world indicate that the majority of adolescent children have some knowledge of environmental problems and are more interested in them – and at the same time more worried about them – than adults. Some young people feel strong stress and anxiety about these issues (Obradovich et al., 2018). It seems that adolescents' greater vulnerability to environmental anxiety and climate depression compared to adults is due to the fact that they spend more time planning for the future than older generations. Adolescents today have more space to ponder social issues than older adults, who focus largely on the hardships of everyday life (Clayton and Karazsia, 2020). Another concept that explains why adolescents are particularly vulnerable to psychological difficulties resulting from progressive climate change is the theory of the developmental stages. Adolescence and early adulthood are key periods of physical as well as psychological human development. It is during this time that chronic stress significantly increases the risk of developing mood disorders, anxiety disorders, or substance abuse problems. The biological effects of such prolonged stress can be long-term and irreversible, and can increase the risk of psychopathology later in life (Obradovich et al., 2018).

Many researchers have shown that children and young people react more strongly emotionally to climate change. Consequences among them include emotional problems, depression, and anxiety (Clayton, 2020; Clayton and Karazsia, 2020). In addition, gender is an important factor in predicting responses to climate change; young women are more likely to experience climate stress (Gifford and Gifford, 2016). Women in general have been found to be more likely to experience post-traumatic stress disorder in response to climate risks (Coffey et al., 2021; Gifford and Gifford, 2016). The same trends were found in a study of Turkish students (Usta, 2023).

Adolescence is a formative and turbulent phase during which physiological, psychosocial, and cognitive changes leave adolescents vulnerable to psychological disorders (Shorey et al., 2022). Numerous population-based studies confirm the alarming increase in the prevalence of depression and anxiety among young people. Around 10–20% of children and adolescents have been shown to suffer from mental health problems (Merikangas et al., 2009). Depressive disorders, which remain one of the most common and recurrent mood disorders worldwide, currently affect up to 15% of adolescents and young adults (Kessler et al., 2001; Thapar et al., 2012). Depending on the criteria and diagnostic methods used, it is estimated that depression is diagnosed in 1–2% of prepubertal children (Egger and Angold, 2006), and in 5–20% of adolescents (pubertal youth) (Fleitlich-Bilyk and Goodman, 2004). Recent meta-analyses indicate that the prevalence of elevated depressive symptoms among adolescents increased from 24% between 2001 and 2010 to 37% between 2011 and 2020 (Shorey et al., 2022). Also, there was an increase in depressive symptoms in adolescents comparing the periods before the pandemic and during the COVID-19 pandemic, with pandemic-related restrictions (such as school closures) causing a significant increase in effect (Ludwig-Walz et al., 2022). Adolescent depression is related to a number of adverse phenomena such as school/academic failure, juvenile delinquency, illicit substance abuse, or suicide (Mojs et al., 2015). Additionally, generalised anxiety disorder (GAD) is one of the most prevalent anxiety disorders among children and adolescents, with an average prevalence of 2.2% to 3.6% (Costello et al., 2005; Mohammadi, 2020).

The aim of the study is to identify the severity of climate emotions in secondary school and university students, and to establish the relationship between climate emotions and generalised anxiety and depression, in search of explanatory mechanisms and protective factors.

The following research hypotheses are formulated:

H1: Secondary school adolescents exhibit higher levels of negative climate emotions than university students.

H2: Climate emotions are significant predictors of GAD in secondary school adolescents, and a different kind of relationship occurs in these two groups.

H3: Climate emotions are significant predictors of depression in secondary school adolescents and university students, and a different kind of relationship occurs in these two groups.

MATERIALS AND METHODS

Participants

The study was conducted among 170 young individuals. It included two samples: 66 adolescents in their final year of secondary school and 104 university students. The sample of adolescents consisted of individuals aged 18 years old (49 women, 14 men, and three study participants who indicated a non-binary gender identity). Slightly more than half of the adolescent sample was from rural areas (56.1%), while the remaining teenage participants were from small towns (up to 50,000 residents) (7.6%), medium-sized cities (50,000–150,000 residents) (9.1%), and large cities (over 150,000 residents) (27.3%). The sample of university students

Climate emotions/variables	Min.	Max.	*M*	*SD*	Skewness	Kurtosis
Climate anger	4.00	20.00	15.20	3.92	−0.629	−0.189
Climate contempt	4.00	20.00	9.24	3.96	0.627	−0.213
Climate enthusiasm	4.00	20.00	13.41	3.08	−0.496	0.416
Climate powerlessness	4.00	20.00	13.38	3.05	−0.589	0.601
Climate guilt	4.00	20.00	11.07	3.71	0.012	−0.360
Climate isolation	4.00	20.00	10.09	3.73	0.199	−0.413
Climate anxiety	4.00	20.00	13.58	3.84	−0.500	−0.146
Climate sorrow	4.00	20.00	14.94	3.59	−0.651	0.032
Generalised anxiety (GAD)	0.00	28.00	12.64	6.72	0.260	−0.531
Depression	6.00	24.00	13.57	4.67	0.177	−0.801
M – mean; *SD* – standard deviation.						

Tab. 1. Descriptive statistics (N = 170)

consisted of 79 women, 20 men, and five individuals indicating a non-binary gender identity, aged between 18 and 33 years ($M = 22.85$; $SD = 2.58$). Slightly more than half of the student sample was from large cities (52.9%), whereas the remaining participants were from medium-sized cities (14.4%), small towns (10.6%), and rural areas (22.1%). Pearson's chi-square test indicated that the gender distribution of study participants was similar in both samples (adolescents and university students) ($\chi^2 = 0.101$; $p = 0.951$).

The study was approved by the Ethics Committee of Maria Curie-Skłodowska University (14/2024).

Measures

1. Inventory of Climate Emotions (ICE)

The Inventory of Climate Emotions (ICE) (Marczak et al., 2023) is a 32-item questionnaire used to assess various emotions experienced in relation to climate change: climate anger, climate contempt, climate enthusiasm, climate powerlessness, climate guilt, climate isolation, climate anxiety, and climate sorrow. Responses are given on the Likert scale ranging from 1 – "definitely no" to 5 – "definitely yes" (Marczak et al., 2023). The reliability of the scale in the study group ranges from a = 0.75 (climate powerlessness) to α = 0.88 (climate anxiety).

2. Kutcher Adolescent Depression Scale (KADS)

The Kutcher Adolescent Depression Scale KADS (Mojs et al., 2015) is a 6-item tool for diagnosing the risk of adolescent depression. Participants respond to the scale's statements using a Likert scale from 0 (hardy ever) to 3 (all the time) (Mojs et al., 2015). The reliability of the KADS in the present sample is α = 0.89.

3. Brief Measure for Assessing Generalized Anxiety Disorder (GAD-7)

The Brief Measure for Assessing Generalized Anxiety Disorder GAD-7 (Spitzer et al., 2006) is used to identify likely cases and measure the severity of symptoms of GAD. The scale consists of seven items, rated by respondents on a Likert scale from 0 (not at all) to 3 (nearly every day) (Spitzer et al., 2006). The reliability of the GAD-7 in the study sample is α = 0.92.

RESULTS

Descriptive statistics

In the study, climate-related emotions as well as indicators of GAD and depression indicators were analysed. Tab. 1 presents the descriptive statistics for the whole sample. The values of skewness and kurtosis indicate that the variables do not deviate from normal distribution.

Inferential statistics

In order to verify the hypothesis related to differences in climate-related emotions between adolescents and students, a *t*-test was applied. Tab. 2 presents the average results for each compared variable and indicates significant differences. The obtained results clearly indicate a higher level of climate anger and climate powerlessness among student participants in comparison to adolescents. The inferential *t*-test indicates that the observed differences are significant at the 0.01 level. The opposite pattern of results was noticed in the case of climate contempt. Participating adolescents demonstrated a significantly higher level of climate contempt than the students (see Tab. 2). Other comparisons did not bring any significant results.

Climate emotions	Adolescents *M*	Students *M*	*t*
Climate anger	14.26	15.80	−2.53**
Climate contempt	11.11	8.06	5.25***
Climate enthusiasm	13.21	13.54	−0.69
Climate powerlessness	12.70	13.82	−2.36**
Climate guilt	10.96	11.13	−0.28
Climate isolation	9.84	10.25	0.68
Climate anxiety	13.06	13.91	−1.41
Climate sorrow	14.54	15.20	−1.16
M – mean.			
** $p < 0.01$; *** $p < 0.001$.			

Tab. 2. Comparison of climate-related emotions and anxiety between adolescents and university students

Predictors	B	SE	Beta	t	p	VIF	R	R²	F
Climate anger	0.320	0.255	0.212	1.253	0.215	2.141	0.48	0.23	2.18*
Climate contempt	−0.035	0.208	−0.023	−0.170	0.866	1.364			
Climate enthusiasm	−0.426	0.296	−0.237	−1.442	0.155	2.014			
Climate powerlessness	−0.183	0.291	−0.109	−0.627	0.533	2.246			
Climate guilt	0.980	0.313	0.639	3.133	**0.003**	3.096			
Climate isolation	0.076	0.242	0.049	0.315	0.754	1.773			
Climate anxiety	−0.550	0.292	−0.395	−1.885	0.065	3.271			
Climate sorrow	0.284	0.306	0.178	0.927	0.358	2.738			

SE – standard error; **VIF** – variance inflation factor.
* $p < 0.05$.

Tab. 3. *Climate-related emotions as predictors of GAD in adolescents* (n = 66)

Predictors	B	SE	Beta	t	p	VIF	R	R²	F
Climate anger	0.437	0.194	0.384	2.253	**0.028**	2.141	0.48	0.23	2.07*
Climate contempt	0.104	0.158	0.090	0.660	0.512	1.364			
Climate enthusiasm	−0.272	0.224	−0.200	−1.210	0.231	2.014			
Climate powerlessness	−0.105	0.221	−0.083	−0.475	0.636	2.246			
Climate guilt	0.691	0.238	0.596	2.907	**0.005**	3.096			
Climate isolation	−0.031	0.184	−0.026	−0.169	0.867	1.773			
Climate anxiety	−0.397	0.222	−0.377	−1.788	0.079	3.271			
Climate sorrow	−0.215	0.232	−0.179	−0.926	0.358	2.738			

SE – standard error; **VIF** – variance inflation factor.
* $p < 0.05$.

Tab. 4. *Climate-related emotions as predictors of depression in adolescents* (n = 66)

Predictors	B	SE	Beta	t	p	VIF	R	R²	F
Climate anger	0.281	0.179	0.188	1.572	0.119	1.644	0.42	0.18	2.54**
Climate contempt	0.282	0.172	0.176	1.643	0.104	1.319			
Climate enthusiasm	0.112	0.191	0.057	0.586	0.559	1.104			
Climate powerlessness	0.666	0.243	0.298	2.747	**0.007**	1.357			
Climate guilt	0.238	0.189	0.151	1.262	0.210	1.653			
Climate isolation	−0.150	0.181	−0.098	−0.831	0.408	1.591			
Climate anxiety	0.048	0.212	0.029	0.225	0.822	1.923			
Climate sorrow	−0.101	0.200	−0.062	−0.504	0.615	1.732			

SE – standard error; **VIF** – variance inflation factor.
** $p < 0.01$.

Tab. 5. *Climate-related emotions as predictors of GAD in university students* (n = 104)

The analysis with regard to the second hypothesis started by comparing the difference in the average level of GAD and depression indicators between students and adolescents participating in the study. It appeared that adolescent participants demonstrated significantly higher level of GAD symptoms in comparison to the students. Similarly, the younger participants exhibited significantly higher level of depressive symptoms compared to their older colleagues. Further comparisons explored the role of climate emotions as predictors of GAD and depression in the group of students and adolescents. They brought interesting insights. The analysis demonstrated that the model considering climate emotions significantly predicted the intensity of GAD symptoms, accounting for a 23% increase in the prediction of GAD. Among the emotions included in the model,

climate guilt was found to be the most important predictor of GAD symptoms (Tab. 3).

Climate emotions also appeared to be significant predictors of depression-like symptoms among the group of adolescents. Among these, an increase in climate anger and climate guilt was the strongest indicator of the increase in depressive-like symptoms (Tab. 4).

Comparisons made in reference to the group of investigated students also confirmed that the model including climate emotions is significant for predicting GAD, and accounts for an increase in explained variance of around 18%. However, it is climate powerlessness that appeared to be significantly and positively correlated with GAD symptoms among students. Tab. 5 presents the results of regression analysis.

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Predictors	B	SE	Beta	t	p	VIF	R	R²	F
Climate anger	0.333	0.144	0.274	2.307	**0.023**	1.644			
Climate contempt	0.281	0.138	0.216	2.032	**0.045**	1.319			
Climate enthusiasm	−0.152	0.154	−0.096	−0.984	0.328	1.104			
Climate powerlessness	0.193	0.196	0.106	0.984	0.327	1.357	0.43	0.19	2.75***
Climate guilt	0.205	0.152	0.160	1.346	0.181	1.653			
Climate isolation	−0.010	0.146	−0.008	−0.069	0.945	1.591			
Climate anxiety	0.004	0.171	0.003	0.026	0.979	1.923			
Climate sorrow	0.129	0.161	0.097	0.799	0.426	1.732			
SE – standard error; **VIF** – variance inflation factor. ***$p < 0.001$.									

Tab. 6. Climate-related emotions as predictors of depression in university students (n = 104)

The model of depression predictors that included climate emotions also fit the student group well, but the increase in explained variance of depressive symptoms was only around 17%. Here, climate anger and climate contempt appeared to be positively, but weakly, corelated with the depression indicator. Tab. 6 presents all results obtained in the regression analysis.

DISCUSSION AND CONCLUSIONS

Our study confirmed higher levels of GAD, depression, and climate contempt in adolescents, and higher levels of climate anger and powerlessness in students. In contrast, levels of climate emotions, including climate anxiety, were not particularly elevated. Furthermore, climate emotions were found to be significantly associated with generalised anxiety and depression in both groups. Climate emotions are predictors of both generalised anxiety and depression in both groups. The higher the level of climate-related emotions such as anger, contempt, or guilt, the higher the levels of generalised anxiety and depression. However, the mechanisms underlying these relationships differ between the two groups.

The level of generalised anxiety, very high in adolescents, is explained by climate guilt. Similarly, guilt explains depression in this group, alongside anger. Guilt is a negative and overwhelming, self-directed emotion that increases psychological discomfort and blocks the search for coping options (Gawda, 2017). In contrast, among students, GAD is explained by a sense of powerlessness, while depression is explained by anger and contempt.

Research conducted on a group of Polish secondary school and university students is consistent with results from studies in other countries regarding the association between climate emotions and GAD and depression. Schwartz et al. (2022) showed significant and positive associations between climate anxiety and symptoms of depression and anxiety disorders. Higher levels of climate anxiety were associated with an increased risk of depression and generalised anxiety disorder. It has been shown that climate anxiety can have a variety of health consequences, including the aforementioned increased risk of depression, sleep disturbances,

and difficulties with concentration (Cianconi et al., 2020; Obradovich et al., 2018). A Canadian study found that 78% of young people reported that climate change negatively affects their overall mental well-being, and 37% stated that the emotions they feel in response to climate change make their daily lives difficult (Galway and Field, 2023). It is also possible to conclude from the data shown in the study that the anxieties accompanying young people are not only related to their daily lives, but also to how they function in the future, including concerns about having children. For this reason, young respondents are hesitant about having offspring. The fear of what is yet to come in their perception is so strong that they declare that the future appears frightening (Galway and Field, 2023). Similar findings were made in a 2017 report by the American Psychological Association (APA), which indicated that among young people in particular, climate change can significantly increase levels of stress and anxiety about the future, which in turn can contribute to elevated symptoms of generalised anxiety and depression (Clayton et al., 2017). Research indicates that stronger negative climate emotions exacerbate symptoms of depression and anxiety (Schwartz et al., 2022).

Our study of young Poles, on the one hand, highlights the relevance of a variety of climate-related emotions as predictors of mental health, which is in line with previous findings (Hayes et al., 2018; Xu et al., 2018); on the other hand, it shows distinct mechanisms underlying this relationship in adolescents and slightly older individuals. A novel aspect in this study is the comparison of these mechanisms across both groups. As already mentioned, in adolescents, both GAD and depression are exacerbated by climate-related guilt, while in students GAD is associated with climate-related powerlessness, and depression is explained by climate-related anger and contempt. Powerlessness as a correlate of GAD appears fairly consistent with the mechanisms underlying GAD (Mohammadi, 2020). Similarly, the relationship between anger, contempt, and depression; the mechanisms of anger and contempt appear to be more dynamic and constructive (Jasielska, 2015). Anger, for example, is an emotion that motivates the search for solutions (Gawda, 2017). Anger and contempt can serve as protective mechanisms (Fischer and Giner-Sorolla, 2016).

Contempt belongs to the same group of emotions as anger due to its shared characteristics (Gawda, 2024). However, climate contempt, as defined by the authors of the questionnaire (Marczak et al., 2023) is directed at those involved in disseminating information about climate change. Activating anger and contempt in situations of perceiving climate change, experiencing emotions, and receiving information about such changes seems more mature than self-recrimination and guilt, which is the case in adolescents (Stanley et al., 2021). This is because it results in a more effective acquisition of psychological comfort (Gawda, 2024). As adolescents grow older, they build emotional resources that enable them to cope with tension in a more constructive way than in adolescence. Marczak et al. (2023) found a strong negative correlation of climate contempt with policy support, and a moderate negative correlation with individual mitigation behaviour, confirming the protective importance of climate contempt as an emotion belonging to the spectrum of anger and serving similar functions as anger. Furthermore, climate isolation and powerlessness were not found to be meaningfully related to climate-relevant behaviour (Marczak et al. 2023). Adolescents who experience powerlessness tend to exhibit less active engagement and show increased levels of depression and GAD.

While neither climate anxiety nor climate emotions are clinical problems in themselves, they may contribute to an increase in GAD and depression in young people, and this could become a serious public health issue (Clayton et al., 2017). It is worth noting that there is a significant relationship between these emotions and age. The higher the age, the more effective the coping mechanisms and, at the same time, the more effective the reduction of emotional tensions and anxiety. As people become more emotionally competent, they are better able to recognise and cope with climate-related emotions as well as other sources of tension. To reduce the effects of climate anxiety and other emotions, it is worth focusing on building the emotional resources of young people. Indeed, this is a group that requires special attention. This could include training for therapists, the development of psychological support programmes, and educational campaigns targeting young people. Climate change education should be conducted in a way that not only informs individuals of the risks, but also shows opportunities for action and adaptation. This approach can help reduce fear by channelling social energy into proactive action. For clinical levels of GAD and depression, psychotherapeutic and/or psychiatric support may be crucial. Combined treatment involving two supportive pathways – psychotherapy and pharmacotherapy – is more effective in preventing the relapse of affective disorders than no treatment or either method used alone. If the severity of symptoms is not profound and the patient's functioning is not significantly impaired, the first choice may be individual psychotherapy and family therapy, combined with psychoeducational meetings with social or communication skills training (Hammen, 2004; Rabe-Jabłońska, 2007). In this context,

it may be particularly important to reveal the mechanisms underlying eco-anxiety, shift perspectives, strengthen individual and family problem-solving resources, and turn to something existential (e.g. community, meaning in life, spirituality), as well as incorporate mindfulness training and meditation (Raile, 2023; Whitmarsh et al., 2022). Our study is not without limitations. The main limitation is that our sample is not representative of the regions of Poland most affected by climate change, such as floods, wildfires, and strong winds. As a result, the surveyed group reported relatively low levels of negative climate emotions and climate anxiety.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the authorship and/or publication of this article.

Author contribution

Original concept of study; collection, recording and/or compilation of data; analysis and interpretation of data; writing of manuscript; final approval of manuscript: AB, BG, NJS, KLŚ, AT. Critical review of manuscript: AB, BG, AT.

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