

DEVELOPMENT AND VALIDATION OF THE CLIMATE
CHANGE ANXIETY SCALE-SHORT FORMMaria Mirandi, Giorgio Ghizzoni, Carlo Garofalo, Elisa Delvecchio, Giacomo Rettori,
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Abstract

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Objective: this study aimed to provide preliminary validity evidence for an 8-item short form of the Climate Change Anxiety Scale (CCAS-SF) in a sample of Italian emerging adults. Specifically, it tested the factor structure, measurement invariance across sex, and construct validity of the CCAS-SF.

Method: the study involved 891 Italian emerging adults (32.40% male; Mage = 23.00, SD = 2.50; age range: 19–29 years). The researchers conducted a Confirmatory Factor Analysis (CFA) to evaluate the factor structure of the CCAS-SF. Measurement invariance across sex was tested through configural, metric, and scalar invariance. Internal consistency of the subscales was assessed, and correlations with anxiety and depression symptoms were examined to assess construct validity.

Results: the CFA supported a two-factor structure for the CCAS-SF, cognitive-emotional and functional impairment. Measurement invariance was confirmed across sex (configural, metric, and scalar invariance). The internal consistency of both subscales was good. Analysis revealed that females had higher levels of cognitive-emotional impairment compared to males, but there were no significant sex differences in functional impairment. Both subscales showed positive correlations with anxiety and depression symptoms.

Conclusions: the Italian CCAS-SF is a brief, valid, and reliable tool for assessing climate change anxiety. It is particularly useful for time-constrained research and as a resource for mental health professionals working with emerging adults.

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Key words: climate change anxiety, depression, emerging adults, general anxiety disorder, measurement invariance, psychometric properties

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1. Introduction

Concern about climate change has grown significantly in recent years, as its imminent threats exert clear social, cultural, physical, and psychological impacts on the present and future. Climate change anxiety is a negative response associated with concerns about climate change, including cognitive, emotional, and functional impairment (Schwartz et al., 2022). Climate change anxiety is characterized by cognitive/affective features like rumination, uncertainty for the future, a sense of impotence, and guilt, which can cause substantial distress and also characterize individual differences in anxiety and depressive traits (Clayton et al., 2017; Clayton, 2020; Clayton & Karazsia, 2020; Moser, 2007).

Several researchers conceptualize climate change anxiety as a dimensional psychological construct that varies along a continuum of severity, similarly to what is observed for anxiety and depression (Donati et al., 2024; van der Linden, 2017). Within this framework, low levels of climate change anxiety may lead to denial

of the phenomenon (Innocenti et al., 2023), moderate levels facilitate adaptation to the impacts of climate change (van der Linden, 2017), while high levels can culminate in a clinically relevant form of climate change anxiety (Albrecht, 2011; Goodwin et al., 2017). This theoretical approach avoids defining the phenomenon as a categorical diagnostic entity, instead emphasizing individual differences in emotional responses related to climate change.

Examining negative responses to climate change in emerging adults is especially important, as previous studies have shown that this age group tends to hold more pessimistic thoughts and perceptions about climate change compared to other life stages (Galway & Field, 2022; Martin et al., 2023; Plohl et al., 2023; Reyes et al., 2021). Given the alarming climate crisis and their development phase, emerging adults often experience feelings of helplessness, anger, and frustration about their future (Galway & Field, 2022). Therefore, they represent an important target group for climate change anxiety research.

Although robust sex differences in levels of anxiety

generally exist, with higher levels typically observed in females than males, the literature on sex differences in climate change anxiety showed some inconsistencies (McLean et al., 2011). Most previous studies (Clayton et al., 2023; Larionow et al., 2022; McLean et al., 2011; Verplanken et al., 2020; Wullenkord et al., 2021) have reported higher levels of climate change anxiety in females than in males with females scoring significantly higher in pathological concern (Verplanken et al., 2020). However, Clayton and Karazsia (2020) found no sex differences in the cognitive-emotional and functional components of climate change anxiety.

In line with the various definitions proposed in the literature, several instruments have been developed to assess constructs related to the distress caused by concerns about climate change. These include the Climate Change Anxiety Scale (Clayton & Karazsia, 2020), the Climate Change Distress Scale (Searle & Gow, 2010), the Climate Change Distress and Impairment Scale (Hepp et al., 2023), the Climate Distress Scale (Reser et al., 2012), the Climate Change Worry Scale (Stewart, 2021), the Eco-Anxiety Questionnaire (Hogg et al., 2021), the Climate Change Hope and Despair Scale (Stevenson & Peterson, 2016), the Mental Health Problems related to Climate Change Questionnaire (Arnout, 2023), and the Brief Climate Change Distress Scale (Latkin et al., 2022). However, many of these tools assess constructs adjacent to climate change anxiety, such as climate-related distress, worry, or despair, without capturing the specific features of climate change anxiety itself. Among the available measures, we chose to focus on the Climate Change Anxiety Scale (Clayton & Karazsia, 2020), as it enables the assessment of both the cognitive-emotional and functional dimensions of climate change anxiety, thereby offering a more comprehensive evaluation of the construct. At the time of writing, two versions of the CCAS have been developed: the original 22-item version and a 13-item version. A brief presentation of the original 22-item version is given to contextualize the roots and background of the scale; however, the focus of the current paper is on the 13-item version. The original version of the CCAS (Clayton & Karazsia, 2020) consisted of 22 items and four factors. Two factors (cognitive-emotional impairment [CEI] and functional impairment [FI]) represent the core cognitive, emotional, and functional impairment components of climate change anxiety. The other two scales tapped into the direct experience of climate change and behavioral engagement to reduce climate change. The CCAS was initially validated in a US sample in which the majority of the subjects (about 50%) were between 25 and 34 years old but ranged from 18 to 75 years (Clayton & Karazsia, 2020). The scale showed good psychometric properties, specifically, the results showed an internally reliable measure of climate change anxiety.

Subsequently, Clayton and Karazsia (2020) observed that the first two factors (CEI and FI) were the most useful in defining climate change anxiety. This led to the development of a 13-item version of the CCAS by Clayton and Karazsia (2020). Afterward, the CCAS was also validated in other countries such as French-speaking European countries (Mouguiama-Daouda et al., 2022), Germany (Wullenkord et al., 2021), Poland (Larionow et al., 2022), United States (Cruz & High, 2022; Tam et al., 2023), Philippines (Simon et al., 2022), China, India, Japan (Tam et al., 2023), Slovenia (Plohl et al., 2023), Korea (Jang et al., 2023) and Italy (Di Fabio & Svicher, 2023; Innocenti et al., 2021). In agreement with Clayton and Karazsia's (2020) original study, the majority of studies (Hogg

et al., 2023) supported the two-factor structure of the CCAS (Mouguiama-Daouda et al., 2022; Plohl et al., 2023; Tam et al., 2023; Wullenkord et al., 2021). However, results about the internal structure of the CCAS have not always been consistent. For instance, Larionow et al. (2022) proposed a new three-factor structure including intrusive symptoms, reflections on climate change anxiety, and functional impairment. Additionally, Cruz and High (2022) as well as Innocenti et al. (2021) provided evidence in support of a mono-factorial structure. Taken together, previous studies using the CCAS showed good psychometric properties with some variability in the factor structure to represent the overarching construct of climate change anxiety.

Furthermore, although previous studies (Hickman et al., 2021) have highlighted the importance of assessing climate change anxiety in a population of emerging adults, few studies have specifically involved this population (Plohl et al., 2023; Reyes et al., 2021; Schwartz et al., 2022). Only Plohl et al. (2023) tested the two-factor structure and validity of this measure in a population of emerging adults, which demonstrated a positive correlation with climate concern, anxiety, stress, and neuroticism and a negative correlation with political conservatism and psychological resilience, and emotional well-being. An additional gap in the CCAS literature is represented by a dearth of knowledge on its measurement invariance across sex. Given the focus on sex differences in general anxiety and climate change anxiety, establishing measurement invariance for the most widely used measure of climate change anxiety is essential. This ensures that observed sex differences reflect genuine differences in the underlying constructs rather than statistical artifacts from non-invariant measurement properties.

In addition, as Tam et al. (2023) noted, further research across different societies and populations is needed to clarify whether climate change anxiety is a valid cross-cultural construct. In the Italian context, Innocenti et al. (2021) administered the CCAS (13 items) to 150 Italian adults (aged 19 - 76 years). They tested the reliability using Cronbach's alpha coefficients for each subscale and demonstrated good convergent validity, with the CEI correlating with indices of anxiety, depression, and environmental awareness. FI, on the other hand, was found to correlate with symptoms of anxiety but not depression. Both subscales were also correlated with pro-environmental behavior. Despite the differential pattern of associations with external correlates, Innocenti et al. (2021) proposed an alternative model to the two-factor structure, proposing a single-factor structure, representing general climate change anxiety. However, collapsing the two scales into a single total score may obscure differential associations with external correlates.

Recently, Di Fabio and Svicher (2023) proposed the original version of the CCAS (Clayton & Karazsia, 2020), consisting of 22 items and four factors with good reliability each. Specifically, the CEI and the FI subscales of the CCAS showed a negative correlation with positive affectivity and a positive correlation with negative affectivity. Therefore, the Italian version of the CCAS also yielded contrasting findings about its internal structure, similar to the international literature on this measure.

Although the use of the first two subscales of the CCAS (CEI-FI), containing the first 13 items of the scale, is prevalent in studies, the inconsistency of the factorial structure that best captures the covariation between items calls for further research on this measure. Moreover, the increasing demand for shorter assessment

tools highlights the importance of developing concise alternatives to measure climate change anxiety. Previous research has shown that questionnaire length and completion time are key factors in determining their acceptability, indicating that tools with fewer than 10 items and a completion time of less than 5 minutes are ideal (Kroenke et al., 2015; Levitt et al., 2007; Mitchell & Coyne, 2007). Shorter measures improve data quality and their applicability in both clinical and research contexts without compromising validity and reliability.

Against this background, the present study aimed: (1) to validate the proposed short form of the CCAS (CCAS-SF); (2) to test the factorial structure of the CCAS-SF (3) to test the reliability of the CCAS-SF scales; (4) examine measurement invariance across sex; (5) examine sex differences; (6) provide evidence of construct validity of the CCAS-SF by examining concurrent associations with individual differences in anxiety and depression. For the sake of comparison, the factor's structure and concurrent validity of the CCAS were included to gauge whether reducing the number of items would produce an unwarranted loss of information. Based on previous studies (Clayton & Karazsia, 2020; Innocenti et al., 2021; Pohl et al., 2023; Wullenkord et al., 2021), we expected the CCAS-SF to have a two-factor structure measuring CEI and FI and be invariant across sex. Despite inconsistent findings, we expected females to show higher levels on the CCAS-SF subscales. Finally, we expected CEI to be associated with both anxiety and depression, and FI to be associated with anxiety while remaining agnostic regarding associations between FI and depression due to previous contrasting findings.

2. Method

2.1. Participants and procedures

The study included 891 Italian emerging adults (32.40% male; $M = 23.00$ years, $SD = 2.50$; age range: 19-29 years). Most participants, 71.8% ($n=640$) were students, while 22.2% ($n=198$) were employed, 3.3% ($n=29$) were student-workers, and 2.7% ($n=24$) were unemployed.

Eligibility to participate was based on age, specifically being between 19 and 29 years. This criterion was verified through a self-reported age question presented at the beginning of the online questionnaire. Additionally, the invitation to participate in the study was explicitly addressed to individuals within this age range. The survey, which took approximately 30 minutes to complete, was administered via the Google Forms platform using personal devices such as smartphones, tablets, or computers. Researchers, trainees, and psychology students distributed the online questionnaire to friends and acquaintances identified as emerging adults via email or social media platforms (e.g., WhatsApp, Messenger). The survey's first page described the study, highlighting that participation was anonymous, voluntary, and could be withdrawn at any time. First, informed consent was obtained digitally via a mandatory question at the beginning of the questionnaire; only those who agreed were allowed to proceed. An information sheet on the first page clearly explained the purpose of the study and the procedures for data handling. It was also explicitly stated that participation was voluntary and that respondents could withdraw at any time without providing any explanation. The study was conducted in compliance

with the guidelines reported in the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of the University of Perugia, ID No. 36/2023.

2.2. Measures

2.2.1. The Climate Change Anxiety Scale – Short Form (CCAS-SF)

The Climate Change Anxiety Scale (CCAS; Clayton & Karazsia, 2020) comprises two subscales: the first is cognitive and emotional impairment (CEI; items 1-8) and functional impairment (FI; items 9-13). The CEI subscale investigates emotional and cognitive difficulties in response to climate change, such as rumination, difficulties in concentrating, sleeping, or crying. A sample item is "Thinking about climate change makes it difficult for me to sleep". The FI subscale indicates the extent to which concern about climate change interferes with the subject's ability to work or socialize. A sample item is, "My worries about climate change make it difficult for me to have fun with my family or friends." All items are measured on a 1-5 Likert scale.

In this study, a short version of the CCAS, consisting of 8 items, was proposed. Focus groups were conducted, involving five professional psychologists specializing in the field. After careful analysis of the individual items, it was decided to retain 8 items based on specificity and relevance. Specifically, the items retained from the original version (Clayton & Karazsia, 2020) were numbers 2, 3, 4, 6, 9, 10, 11, and 13. The choice of a short form was made to provide a faithful measure of climate change anxiety, including the same number of items for the two subclasses and keeping the most representative items of the total 13 to assess this construct in the shortest possible time (see supplementary material). Additionally, the 13-item version of the CCAS was administered to a subsample of 132 emerging adults.

2.2.2. General Anxiety Disorder scale (GAD-7; Spitzer et al., 2006)

The GAD-7 (Spitzer et al., 2006) is one of the most commonly used measures for measuring the severity of anxiety symptoms. It consists of 7 items that were assessed with 0 (never), 1 (some days), 2 (for more than half of the days), or 3 (almost every day). Examples of items include: "Having difficulty relaxing; "Getting annoyed or irritated easily". The Italian version of the GAD-7 has demonstrated good psychometric properties (Bolgeo et al., 2023). In this study, Cronbach's alpha for the GAD-7 was .88, indicating good internal consistency.

2.2.3. Patient Health Questionnaire - 9 (PHQ-9; Spitzer et al., 1999)

The PHQ-9 (Spitzer et al., 1999) is a valid questionnaire with good psychometric properties, designed for screening, diagnosis, monitoring, and measuring the severity of depression. It consists of 9 items rated from 0 to 3 corresponding to the symptoms of major depression according to the DSM-IV. Examples of items include: "Lack of interest/pleasure in doing things"; "Thinking that it would be better to die or injure oneself in some way". In this study, Cronbach's alpha of the PHQ-9 was .84, indicating good internal consistency.

3. Data Analysis

Statistical analyses were performed using the Statistical Package for Social Science (IBM SPSS Version 22) and R (Version 4.1.2; *lavaan*: Rosseel, 2012; *semTools* packages: Jorgensen et al., 2018). All analyses were conducted without any missing data. First, a short version of the CCAS consisting of 8 items, was proposed. Second, the two-factor solution was tested to assess the factorial structure (CFA) of the CCAS-SF on a sample of emerging adults. The two-factor solution was tested to assess the factorial structure (CFA) of the CCAS-SF using weighted least squares of the adjusted mean and variance (WLSMV) due to the ordinal nature of the observed variables. Furthermore, in a second independent sample of emerging adults ($n=132$), the factorial structure of the original CCAS was investigated to provide a means of comparison. The model fit was considered acceptable if the values of the root mean squared approximation error (RMSEA; Marsh et al., 2004), comparative fit index (CFI), and Tucker-Lewis index (TLI) were ≥ 0.90 (Bentler, 1990). Cronbach's alpha values $\geq .70$ were considered an index of acceptable reliability (Taber, 2017). Third, a multigroup CFA (MG-CFA) was performed to assess measurement invariance between sexes by examining configural, metric, and scalar invariance. Fourth, sex differences in CCAS-SF were examined using a t -test for independent samples, with Cohen's (1988) test used to determine the magnitude of these differences. Additionally, Pearson correlation coefficients were conducted to assess the correlation strength between CCAS-SF and CCAS with GAD, and PHQ-9, based on Cohen's (1992) guidelines that $r = .10$, $.30$, and $.50$ representing small, medium, and large effect sizes.

To investigate whether the correlations differed

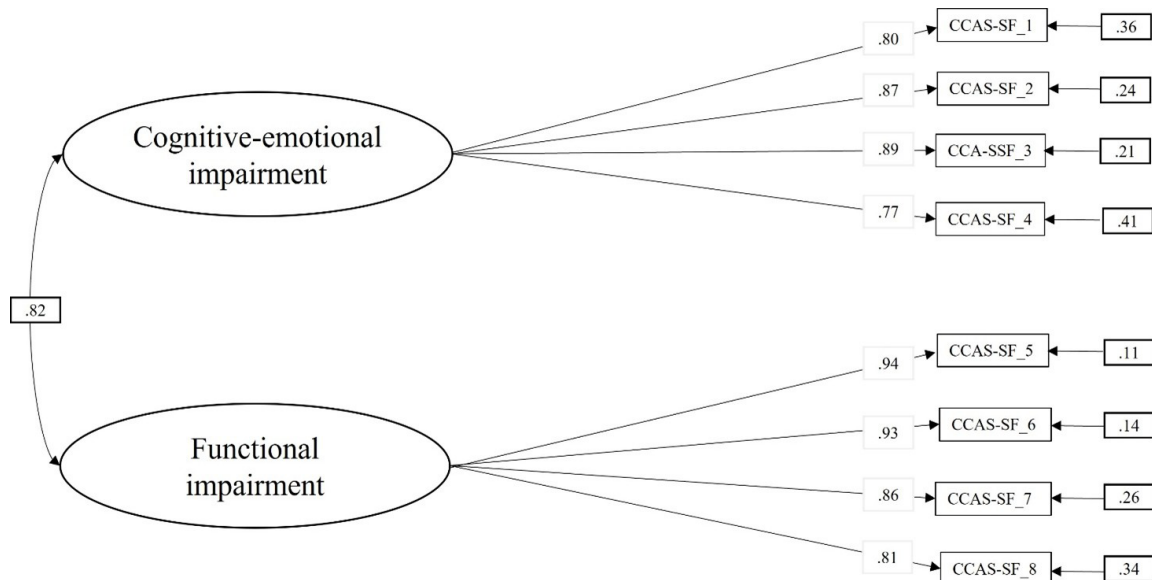
between males and females, Steiger's Z test (Steiger, 1980) was conducted.

4. Results

The results of the CFA supported the two-factor solution of the CCAS-SF, $\chi^2(19) = 336.218$, $p < .001$, CFI = 0.99, TLI = 0.99, RMSEA = .01 (90% CI = [.01, .01]) (see **figure 1**). All items loaded in the expected directions with the conceptually expected factor and were significant at $p < .001$. Factor loadings ranged from .77 to .94. As a means of comparison, a CFA of the full (13-item) CCAS in a smaller sample ($n = 132$) also supported a two-factor structure, $\chi^2(64) = 149.255$, $p < .001$, CFI = 0.99, TLI = 0.99, RMSEA = .10 (90% CI = [.08, .12]) with loadings ranging from .57 to .92. The internal consistency of the CCAS-SF was good, with Cronbach's alpha of .83 for both subscales. The two subscales were correlated with a large effect size ($r = .70$, $p < .001$), indicating that the two subscales investigate overlapping but partly different aspects of the same construct (**table 1**). The Pearson correlations between the corresponding subscales of CCAS and CCAS-SF (CCAS CEI with CCAS-SF CEI and CCAS FI with CCAS-SF FI) were close to 1, suggesting that reducing the number of items did not produce a substantial loss of information. The correlation between CEI and FI of the original 13-item CCAS was in line with the correlation between the two scales of the CCAS-SF (**table 1**).

The MCFA results confirmed the configural, metric, and scalar invariance across sex (**table 2**). This suggested that the same factor structure with equivalent factor loadings and intercepts can be recovered for males and females. The independent samples t -test showed that females had higher levels of CEI than males ($t = -3.05$ $p < .01$), with a small effect size, $d =$

Figure 1. Standardized factor loadings and factor correlations in the CCAS-SF



Note. CCAS-SF = Climate Change Anxiety Scale - Short Form

CCAS-SF_1 = "Thinking about climate change makes it difficult for me to sleep".

CCAS-SF_2 = "I have nightmares about climate change".

CCAS-SF_3 = "I find myself crying because of climate change".

CCAS-SF_4 = "I go away by myself and think about why I feel this way about climate change"; CCAS-SF_5 = "My concerns about climate change make it hard for me to have fun with my family or friends".

CCAS-SF_6 = "I have problems balancing my concerns about sustainability with the needs of my family".

CCAS-SF_7 = "My concerns about climate change interfere with my ability to get work or school assignments done".

CCAS-SF_8 = "My friends say I think about climate change too much".

-.22, whereas no differences emerged in the FI. The CCAS-SF subscales showed positive and statistically significant correlations with both psychopathological constructs assessed, namely anxiety symptoms and depressive symptoms, in both males and females (**table 3**). Specifically, the correlation between both CCAS-SF subscales and depressive symptoms were stronger in males compared to females (CEI-SF: $Z=1.84$, $p=.033$; FI-SF: $Z=1.66$, $p=.049$) (**table 4**).

5. Discussion

The present study reported on the development and preliminary validation of an 8-item, short version of the CCAS, investigating its psychometric properties in a sample of Italian emerging adults, a stage of the lifespan particularly vulnerable to the psychological effects of climate change (Galway & Field, 2022).

In line with previous results (Clayton & Karazsia,

Table 1. Correlation between CCAS and CCAS-SF

	M	SD	1.	2.	3.	4.
1. CEI	1.69	0.64		.79**	.95**	.76**
2. FI	1.59	0.70			.73**	.99**
3. CEI-SF	6.40	2.78				.70**
4. FI-SF	6.55	2.92				

Note. CEI= cognitive and emotional impairment; FI= functional impairment; CEI-SF= cognitive and emotional impairment-Short Form; FI-SF= functional impairment- Short Form

** $p<.001$

Table 2. Measurement invariance of CCAS-SF across sex

	χ^2	df	$\Delta\chi^2$	CFI	Δ CFI	RMSEA	Δ RMSEA	SRMR	Δ SRMR	TLI
CCAS-SF										
Configural	1219.63	167		.994		.091		.053		.994
Metric	1219.63	167	0.000	.994	0.000	.091	0.000	.053	0.000	.994
Scalar	1523.41	236	303.79	.993	-0.001	.085	-0.006	.051	-0.003	.995

Note. CFI = comparative fit index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; TLI = Tucker-Lewis index.

Table 3. Correlations among CEI-SF and FI-SF with PHQ-9 and GAD-7

	M	DS	1.	2.	3.	4.
1.CEI-SF	1.60	.70		.70**	.29**	.24**
Males	1.50	.70		.76**	.36**	.30**
Females	1.65	.70		.67**	.24**	.19**
2.FI-SF	1.64	.73			.26**	.18**
Males	1.60	.80			.33**	.22**
Females	1.66	.70			.22**	.16**
3.PHQ-9	9.02	5.40				.73**
Males	8.19	5.47				.75**
Females	9.44	5.32				.72**
4.GAD-7	9.11	5.33				
Males	7.40	5.03				
Females	9.93	5.28				

Note. CEI-SF= cognitive-emotional impairment-Short Form; FI-SF=functional impairment-Short Form; GAD-7= General Anxiety Disorder scale; PHQ-9= Patient Health Questionnaire

** $p<.001$

Table 4. Sex Differences in Correlations: Steiger's Z Test Results

	Males	Females	Z	p
CEI-SF - FI-SF	.76**	.67**	2.58	.005
CEI-SF - PHQ-9	.36**	.24**	1.84	.033
CEI-SF - GAD-7	.30**	.19**	1.63	.052
FI-SF - PHQ-9	.33**	.22**	1.66	.049
FI-SF - GAD-7	.22**	.16**	0.87	.193
PHQ-9 - GAD-7	.75**	.72**	0.91	.182

Note. CEI-SF= cognitive-emotional impairment-Short Form; FI-SF=functional impairment-Short Form; GAD-7= General Anxiety Disorder scale; PHQ-9= Patient Health Questionnaire

2020; Hogg et al., 2023; Larionow et al., 2022) on the CCAS, the two-factor structure of the CCAS-SF was supported, with adequate reliability for both scales. The CCAS-SF has several advantages over the 13-item version: it is shorter, with a reduced response load, which improves data quality (Rolstad et al., 2011), and it encourages sustained attention. Also, while reducing the questionnaire length, it retained good psychometric properties, with better fit and factor loading indices than the CCAS, administered in an independent sample.

The almost 1-to-1 correlation between the two versions, the brevity of the CCAS-SF, and the adequate reliability of the latter highlight the advantages of using a short version that maintains the same, if not better, psychometric properties with fewer items. Ensuring assessments are brief while remaining valid and reliable is important in clinical settings where outpatient encounters are brief and competing demands are present (Lantos et al., 2023; Levell, 2022). By using short measures, researchers could reduce costs and improve participation rates (Edwards et al., 2004), as well as avoid fatigue and negative participant reactions, which could lower data quality (Credé et al., 2012).

This study also supports the measurement invariance of the CCAS-SF across sex. The present study is the first to provide evidence of the measurement invariance of the CCAS-SF to assess climate change anxiety in males and females (at least with the proposed short version) suggesting that the reported sex differences reflect true differences across sex rather than a methodological artifact. The results obtained suggest that the CCAS-SF is a suitable tool to measure climate change anxiety for males and females aged 19-29 years and can be used to safely estimate sex differences without measurement biases. Regarding sex differences, this study is in line with the majority of previous studies (Gubler et al., 2019; Larionow et al., 2022; Li & Monroe, 2019; Stevenson & Peterson, 2016; Wullenkord et al., 2021) that have shown that females have higher levels of climate change anxiety than males, probably because females have a more ecologically favorable worldview than males (Clayton et al., 2023; Verplanken et al., 2020). In our sample, females had higher levels of cognitive-emotional impairment in relation to climate change than males. However, no sex differences emerged in functional impairment, defined as an individual's ability to perform daily activities, such as the ability to work or socialize. In other words, even though male participants reported fewer cognitive and emotional symptoms, the general functioning (e.g., ability to work and have fun) was similarly impaired as in females.

The CCAS-SF subscales showed positive and statistically significant correlations with anxiety and depressive symptoms in both males and females. Moreover, males showed stronger associations than females for CCAS-SF subscales and depressive symptoms. Although females tend to report higher levels of climate change anxiety, these results indicate that in males, this anxiety is more strongly associated with clinically relevant symptoms of depression. This may be explained by the fact that males more frequently adopt emotion regulation strategies based on the inhibition or suppression of anxious emotions, which, if prolonged over time, may promote the onset and maintenance of depressive symptoms (Kuehner, 2017). This result aligns with previous studies (Clayton & Karazsia, 2020; Innocenti et al., 2021; Plohl et al., 2023; Wullenkord et al., 2021) that have shown a correlation between climate change anxiety, anxiety, and depression. In our study, we found a stronger correlation between climate change anxiety and depressive symptoms, suggesting

that environmental concerns can amplify feelings of despair and helplessness typically associated with depression. This indicates that climate anxiety is not limited to environmental worries but also reflects a deep sense of loss, impotence, and frustration (Moser, 2007), aspects more closely related to depression than to anxiety. Unlike anxiety, which is characterized by heightened worry and tension, the chronic helplessness stemming from climate anxiety can push individuals toward depressive states. This persistent concern can become dysfunctional, contributing to rumination and deterioration of mental health (Clayton, 2020; Schwartz et al., 2022). Emerging adults are particularly vulnerable, as they face uncertainties about their life goals in an unstable context. Anticipatory fear can hinder their motivation and sense of purpose, which are crucial during this developmental phase (Schwartz et al., 2022). Consequently, these feelings may lead to detachment from future planning and result in depressive symptoms (Galway & Field, 2022; Martin et al., 2023).

The present study had some limitations: first, construct validity testing was limited to anxiety and depression, whereas correlations with other constructs related to climate change anxiety were also not investigated (Aguirre et al., 2024; Bonaiuto et al., 2016; Mouguiana-Daouda et al., 2022). Second, the present study may not generalize to populations from other stages of the lifespan. Third, the reliance on self-report measures alone may have introduced mono-method biases. Future studies should replicate the research by further investigating the correlations between climate change anxiety and external factors (Bonaiuto et al., 2016; Mouguiana-Daouda et al., 2022), as well as other individual factors such as personality traits (i.e. neuroticism, extraversion, and conscientiousness) (Aguirre et al., 2024). It would also be valuable to investigate climate change anxiety using multiple methods and expand the study to specific populations, such as adolescents, who, as emerging adults, are considered particularly vulnerable to the consequences of climate change (Van Nieuwenhuizen et al., 2021).

In conclusion, the present study developed an 8-item short version of the Climate Change Anxiety Scale (CCAS-SF), showing its validity and reliability in a sample of emerging adults. Thanks to its brevity and ease of administration, this tool represents a valuable resource for the rapid and accurate assessment of climate change anxiety, with important clinical and policy implications. From a clinical perspective, the significant correlations observed between the CCAS-SF and general symptoms of anxiety and depression indicate that climate change anxiety is associated with a broader pattern of psychological distress. These findings highlight the importance for mental health professionals of incorporating environmental dimensions into the assessment of an individual's psychological functioning. CCA-SF enables clinicians to identify individuals who exhibit relevant levels of climate change anxiety in a reliable and concise way, and to more effectively tailor preventive strategies and therapeutic interventions aimed at the management of climate change anxiety. Moreover, the use of CCA-SF in longitudinal studies could further investigate climate change anxiety evolution over time and its relationship with other indicators of mental health, in order to clarify its role within broader psychopathological frameworks. At the policy level, the adoption of the CCAS-SF in public health surveys and large-scale research provides crucial data to understand the prevalence and psychological impact of climate change anxiety, particularly among

emerging adults. Such data can support the development of targeted preventive policies, including the systematic implementation of screening programs for climate change anxiety within public mental health services, coupled with early intervention protocols aimed at timely identifying and mitigating associated anxiety and depressive symptoms in a timely manner (Clayton et al., 2017). Mental health promotion initiatives should encompass evidence-based awareness campaigns designed to enhance understanding of the psychological risks linked to climate change. Concurrently, it is essential to develop structured educational programs in schools and universities focused on strengthening adaptive coping strategies and psychological resilience, thereby facilitating the management of climate change anxiety and encouraging pro-environmental behaviors (Ojala, 2012; Reser & Swim, 2011). To maximize the effectiveness of these interventions, adopting a multidisciplinary approach that integrates actions addressing both the environmental and psychological dimensions of climate change is critical, fostering synergy among mental health services, environmental education, and sustainability policies.

In summary, the CCAS-SF emerges as a promising tool for assessing climate change anxiety in emerging adults, due to its ease of administration and robust psychometric properties.

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