

Parental responses to climate threat: Italian validation of the Climate Self-Protection Scale and the role of eco-defenses, epistemic stances, and eco-anxiety

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ABSTRACT

Climate change has psychological repercussions that challenge individuals' basic assumptions about stability and safety and contribute to emotional suffering. Parents may be particularly vulnerable to eco-anxiety, given concerns about the long-term impact on their children's well-being. This research, conducted in Italy, examined how defenses against climate change ("eco-defenses") and epistemic stances (trust, mistrust, credulity) shape parents' eco-anxiety across two studies. In Study 1 ($N = 1259$ Italian-speaking adults), we validated the Italian version of the Climate Self-Protection Scale, confirming its original five-factor structure: Rationalization, Avoidance, Denial of Personal Outcome Severity, Denial of Global Outcome Severity, and Denial of Guilt. In Study 2 ($N = 986$ Italian parents), we investigated how eco-defenses and epistemic stances, and their interaction, were associated with the four eco-anxiety symptoms: affective symptoms, rumination, behavioral symptoms, and anxiety about personal impact. Both eco-defenses and epistemic stances showed significant associations with eco-anxiety, highlighting distinct pathways through which parents regulate the emotional burden of, and process information about, climate change. These findings identify eco-defenses and epistemic stances as key psychological processes in parental adaptation to ecological threats and highlight potential intervention targets to support family resilience.

1. Introduction

Climate change stands among the most significant challenges of the twenty-first century. Its repercussions extend well beyond environmental degradation, influencing social structures, political stability, economic systems, and psychological well-being (Intergovernmental Panel on Climate Change [IPCC], 2023). The United Nations (2020) has characterized it as "the defining crisis of our time," emphasizing that no region of the planet remains untouched by its consequences. The progressive rise in global temperatures, the intensification of extreme weather events, the acceleration of sea-level rise, and the rapid loss of biodiversity are collectively reshaping both ecosystems and human societies (IPCC, 2023; World Meteorological Organization, 2024).

Beyond its measurable physical and economic damages, climate

change also exerts profound psychological and existential effects by challenging individuals' basic assumptions about stability, safety, and the continuity of life, altering emotional experience, social connectedness, and the ways people imagine the future (Clayton, 2020; Koder et al., 2023; McBride et al., 2021). In this sense, climate change does not merely pose an external environmental threat; it also confronts individuals with disturbing information that must be registered, evaluated, and symbolically worked through, thereby mobilizing defensive processes and epistemic stances (i.e., trust, mistrust, credulity) that shape how the threat is psychologically metabolized.

Under these circumstances, eco-anxiety has been described as a multifaceted experience involving *affective symptoms*, such as excessive worry and heightened nervousness; rumination, including recurrent thoughts about ecological loss; *behavioral symptoms*, such as disruptions

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to sleep, education, and social interactions; and anxiety regarding *personal environmental impact* (Hogg et al., 2021). The negative effects of eco-anxiety have been documented across various regions, including Europe, the United States, Canada, the Pacific Islands, Africa, and the Philippines (Hickman, 2025). Eco-anxiety, particularly when combined with persistent exposure to information about environmental collapse, limited perceived control, and institutional inaction, may lead to chronic distress and feelings of helplessness (Boluda-Verdu et al., 2022; Stanley et al., 2021).

In this context, specific psychological defenses against climate change (Wullenkord & Reese, 2021) can be used to manage overwhelming affects and to preserve a sense of psychological continuity, but can also dampen engagement with climate reality or distort risk perception. At the same time, individuals adopt specific epistemic stances toward climate-related information (e.g., openness and trust versus mistrust, skepticism, or credulous adherence to polarized narratives) (Almassi, 2012; Code, 2015; Liao et al., 2024), which influence whether eco-anxiety becomes a catalyst for reflective, adaptive action or, conversely, fuels avoidance and paralysis. Investigating how eco-anxiety is embedded within particular defensive configurations and epistemic orientations is therefore crucial for understanding inter-individual differences in responses to climate threat, including among parents, and for identifying pathways that either support or hinder psychological and behavioral adaptation.

Italy, where the present study was conducted, offers a particularly relevant context for examining the psychosocial impacts of climate change. As part of the Southern European “climate hotspot,” the country faces growing exposure to heatwaves, droughts, and extreme weather events (Lionello & Scarascia, 2018). Recent data indicate a rise in climate-related disasters, with 351 events reported in 2024, a significant increase from the previous year (Legambiente, 2024). Italy also ranks among the European nations most affected by climate-related losses and fatalities over the past three decades (Adil et al., 2025). These escalating disruptions permeate everyday life, affecting experiences of safety, stability, and responsibility toward future generations. In this context, the family unit, and particularly the role of parents, emerges as a key setting in which climate-related emotions, beliefs, and behaviors are transmitted and regulated (Cuartas et al., 2026).

1.1. Parenthood in the age of climate change

Parents occupy a unique position within the ecology of the climate crisis. They are simultaneously caregivers, educators, role models, and individuals who must cope with their own anxieties and uncertainties about the future (Bechard et al., 2023; Sanson et al., 2018; Tracchegiani & Carone, 2026). The responsibilities of parenthood thus intersect with the social, emotional, and existential dimensions of climate change: protecting children from environmental threats, helping them process climate-related fears, and maintaining hope amid an increasingly unstable world (Cuartas et al., 2026; Howard, 2022; Shrum et al., 2023).

Empirical research suggests that parents frequently express greater concern about climate change, particularly regarding its long-term effects on their children's health, safety, and well-being (Cuartas et al., 2026; Dayton et al., 2022; Ekholm, 2020; Heffernan et al., 2023; Tracchegiani & Carone, 2026). For many, becoming a parent amplifies the salience of climate risk, intensifying both motivation to act and vulnerability to distress (Bechard et al., 2023). Additionally, climate concerns increasingly shape procreative attitudes, with some individuals deciding to remain childfree due to fears of contributing to environmental degradation or exposing children to an uncertain future (Dillarstone et al., 2023; Nakkerud, 2021; Schneider-Mayerson & Leong, 2020; Zimmermann et al., 2024).

On the other hand, those who are already parents and must raise children through ongoing environmental instability express concern about the physical, emotional, and economic consequences of climate change for their children (Cuartas et al., 2026; Dayton et al., 2022), and

experience heightened eco-anxiety and helplessness regarding the long-term outlook for their families (Ekholm, 2020; Heffernan et al., 2023; Schneider-Mayerson & Leong, 2020). Qualitative studies have documented parents' reports of sadness, guilt, and fear for their children's futures, often accompanied by frustration over political inaction and structural barriers to change (Gaziulusoy, 2020; Spiteri, 2025). Parents describe the emotional burden of managing both their own distress and their children's questions, striving to maintain honesty without inducing despair (Benoit et al., 2022; Carone et al., 2026; Léger-Goodes et al., 2023). These difficulties may reflect broader psychological processes, such as defenses and epistemic stances, that may modulate how individuals, including parents, manage the emotional weight of ecological awareness.

1.2. The role of eco-defenses and epistemic stances

Recent research has begun to conceptualize individuals' psychological responses to climate change not only in terms of emotional distress but also as mechanisms that serve to regulate threat perception and maintain psychological equilibrium in the face of ecological crisis (Hickman, 2025; Pihkala, 2024). When people lack the psychological resources to confront climate-related threats directly, they tend to employ defenses that shield them from both the perceived danger and the distressing emotions it provokes, avoiding internal conflict and preserving a coherent sense of identity (Hickman, 2025; Ágoston et al., 2022). In the absence of a consistent terminology to describe such strategies, the term *eco-defenses* will be used throughout the manuscript. Several forms of eco-defenses have been documented, ranging from the denial of climate change (Hickman, 2025; Jylhä et al., 2016) to emotion-focused strategies that downplay the seriousness of the issue (Ojala, 2015).

More recently, Wullenkord and Reese (2021) have developed the Climate Self-Protection Scale (CSPS) within the German context and have identified five eco-defenses: *Rationalization* denotes the cognitive reframing of personal inaction through justifications that reduce moral conflict; *Avoidance* reflects the tendency to disengage from distressing information; *Denial of Personal Outcome Severity* captures the tendency to downplay the personal relevance of climate change; *Denial of Global Outcome Severity* reflects a generalized minimization of the overall seriousness of climate change; and *Denial of Guilt* assesses the disavowal of personal responsibility or contribution to the problem. Although the literature employing the CSPS remains relatively limited, a small body of work has begun to document its external correlates, lending further validity to the construct. Most consistently, CSPS scores have been found to be negatively associated with pro-environmental behavior (Wullenkord & Reese, 2021), suggesting that climate self-protective strategies function as a barrier to environmentally relevant action.

This pattern is theoretically grounded in self-determination theory: need satisfaction has been associated with greater pro-environmentalism, whereas the absence of need satisfaction predicts both interpretive and implicative climate denial (Wullenkord, 2020). In line with this, basic psychological need satisfaction, including the needs for autonomy, competence, and relatedness, has been shown to negatively predict endorsement of the self-protective strategies measured by the CSPS. This suggests that individuals with unmet psychological needs are more likely to resort to eco-defensive processes when confronting climate-related threat. Furthermore, climate anxiety has been found to correlate negatively with climate denial and self-protective strategies (Wullenkord, 2022), suggesting that greater reliance on eco-defenses is associated with reduced emotional engagement with the climate crisis. Taken together, these findings position the CSPS within a broader nomological network, in which eco-defenses emerge at the intersection of unmet psychological needs, impaired engagement with environmental information, and reduced motivation for climate action. Nevertheless, eco-defenses in the Italian context, and the ways in which they may influence climate-related affect in parents, remain to be examined.

In recent years, the construct of epistemic stances has gained increasing relevance for understanding how individuals process and respond to reliable information (Campbell et al., 2021; Fonagy & Allison, 2014), including in the parenting domain (Carone et al., 2026). Epistemic trust refers to the capacity to evaluate communicated knowledge as trustworthy, relevant, and generalizable, thereby supporting adaptive engagement with socially transmitted information (Fonagy et al., 2015; Luyten et al., 2020). When this capacity is disrupted, individuals may develop epistemic mistrust, marked by pervasive skepticism toward expert or institutional sources, or epistemic credulity, the uncritical acceptance of information regardless of its reliability (Fonagy et al., 2019; Liotti et al., 2023).

Importantly, these epistemic stances should not be understood as opposite poles of a single continuum. Low epistemic trust does not necessarily imply high epistemic mistrust, and low mistrust does not necessarily indicate trust. Rather, epistemic trust, mistrust, and credulity are partly distinct ways of relating to socially communicated information that may coexist within the same individual to varying degrees. For example, a person may be generally open to information perceived as reliable while also showing skepticism toward certain sources or being credulous toward emotionally salient or personally resonant messages. In the context of climate change, these stances may shape whether parents engage with scientific and institutional communication in a reflective, persistently skeptical, or uncritically receptive manner.

Within this framework, epistemic stance may play a key role in determining how parents interpret information about climate change and, ultimately, how they defend against and emotionally adapt to conflictual realities (Cruciani, Fontana, et al., 2025; Fiorini Bincoletto et al., 2025; Liotti et al., 2025), including the climate crisis (Wullenkord & Reese, 2021). Epistemic stances are theoretically expected to moderate the relationship between eco-defenses and eco-anxiety on two converging grounds. First, eco-defenses and epistemic stances operate at partially overlapping but functionally distinct levels of psychological processing: while eco-defenses regulate the *affective and motivational* impact of climate threat, by minimizing, rationalizing, or avoiding it, epistemic stances determine the *informational* gateway through which climate-related content is received and evaluated. Specifically, the degree to which an individual is open to, skeptical of, or uncritically receptive to information about climate change will influence whether the same eco-defensive strategy is sufficient to contain resulting distress, or whether it is overwhelmed, reinforced, or bypassed by the quality of the epistemic stance.

In other words, a given level of eco-defense may translate into very different levels of eco-anxiety depending on whether the individual simultaneously maintains a calibrated epistemic openness (trust), a pervasive skepticism toward sources (mistrust), or an uncritical receptivity to alarming messages (credulity). Second, this moderation is consistent with broader theoretical formulations within the mentalizing and epistemic trust literature, which propose that epistemic stances function as higher-order regulators of the psychosocial processing of new, potentially threatening information (Fonagy et al., 2015; Luyten et al., 2020). From this perspective, epistemic trust is expected to support adaptive integration of threatening content, allowing eco-defenses to function as genuinely protective, reflective efforts rather than rigid avoidance strategies, whereas epistemic mistrust or credulity may distort or amplify threat appraisal in ways that undermine the regulatory function of eco-defenses.

1.3. Present research

The present research included two complementary studies focused on exploring eco-defenses in two large samples of adults, parents and non-parents. More specifically, Study 1 was preliminary to Study 2 and focused on the psychometric refinement and factorial validation of the CSPS in an Italian-speaking sample. We tested the proposed five-factor structure through confirmatory factor analysis (CFA), compared it to a

second-order model, and evaluated measurement invariance across gender, age groups, and parental status. Study 2 employed the validated Italian CSPS structure to investigate whether three distinct epistemic stances (trust, mistrust, and credulity) moderated the associations between climate-related defenses and different facets of eco-anxiety in parents, including affective symptoms, rumination, behavioral symptoms, and anxiety about personal impact.

In line with previous research (Wullenkord & Reese, 2021), we hypothesized that (1) the five-factor structure of the CSPS would be supported and show configural, metric, and scalar invariance across demographic groups (Study 1); and (2) epistemic stances would moderate the relationship between eco-defenses and eco-anxiety symptoms in parents (Study 2). However, given the absence of prior evidence on interactions between eco-defenses and epistemic stances in the context of climate change, no *a priori* hypotheses regarding the moderation effects were formulated.

2. Study 1

2.1. Methods

2.1.1. Procedure

Participants were recruited through snowball sampling methods, such as word-of-mouth and sharing the research link on social networks. After reviewing and accepting the online informed consent, participants completed the questionnaires via an online platform (Qualtrics). The informed consent page described (i) the aims and scope of the research; (ii) the voluntary nature of participation and the absence of any compensation; (iii) the right to withdraw at any time without consequences; (iv) the anonymous handling, secure storage, and exclusively aggregated reporting of the data, in compliance with the EU General Data Protection Regulation (Regulation EU 2016/679); (v) the absence of foreseeable risks beyond a possible minimal psychological discomfort related to reflecting on climate-related concerns; and (vi) the contact details of the principal investigator and of the Ethics Committee. Participants could proceed to the survey only after explicitly indicating their agreement; otherwise, the survey was automatically terminated. The survey took about 10 min. The study was approved by the Territorial Ethics Committee of Lazio Area 2 (protocol no. 77.24) and was conducted in accordance with the principles of the Declaration of Helsinki.

2.1.2. Participants

The initial dataset consisted of 1367 participants. Following the exclusion of 108 multivariate outliers (see Section 2.1.4), the final sample included 1259 individuals. Most participants were cisgender women ($n = 940$, 74.66%), with the remaining 319 being cisgender men (25.34%). Gender identity was assessed through a multiple-choice item with the following options presented in random order: “cisgender woman,” “cisgender man,” “transgender woman,” “transgender man,” “non-binary/genderqueer,” “other (please specify),” and “prefer not to answer”; no participant selected the “non-binary/genderqueer” or “transgender” categories. Sexual orientation was assessed through a separate multiple-choice item including “heterosexual,” “gay or lesbian,” “bisexual,” “queer/other (please specify),” and “prefer not to answer.” The mean age of the sample was 41.09 years ($SD = 12.19$; range = 18–73). Most participants identified as heterosexual ($n = 1,188$, 94.36%), followed by bisexual ($n = 41$, 3.26%), gay or lesbian ($n = 21$, 1.67%), and queer/other ($n = 9$, .71%). Nearly all participants were born in Italy ($n = 1,225$, 97.30%), and the majority were parents ($n = 1,016$, 80.70%). Regarding educational background, 678 participants (53.85%) had a high school diploma or lower, 226 (17.95%) had a bachelor's degree, 270 (21.45%) held a master's degree, and 85 (6.75%) had earned a Ph.D. or a postgraduate specialization. Employment status was distributed as follows: 754 participants (59.89%) were employed full-time, 262 (20.81%) part-time, and 243 (19.30%) were unemployed.

Excluded and retained participants did not differ on any of these socio-demographic characteristics.

These characteristics should be interpreted in light of the fact that the sample was a convenience sample rather than a representative sample of the Italian adult population. In particular, participants were disproportionately women and Italian-born; nationally, foreign residents account for approximately 9% of the Italian resident population (Istituto Nazionale di Statistica, 2025).

2.1.3. Measures

The CSPS was initially developed in German (Wullenkord & Reese, 2021). For the present study, the 26-item scale was adapted for an Italian-speaking population through a standard translation and back-translation procedure to ensure linguistic and conceptual equivalence. The original questionnaire assesses five defensive strategies used to cope with the threat of climate change: *Rationalization of Own Involvement* (7 items), *Avoidance* (8 items), *Denial of Personal Outcome Severity* (4 items), *Denial of Global Outcome Severity* (3 items), and *Denial of Guilt* (4 items, of which 2 are reverse-scored). Participants rate their agreement on a 7-point Likert-type scale (1 = *strongly disagree* to 7 = *strongly agree*). Higher scores indicate greater endorsement of each defensive strategy. In the present study, the internal consistency coefficients for the original scales were as follows: *Rationalization* ($\alpha = .92$), *Avoidance* ($\alpha = .92$), *Denial of Personal Outcome Severity* ($\alpha = .89$), *Denial of Global Outcome Severity* ($\alpha = .86$), and *Denial of Guilt* ($\alpha = .60$). The full Italian version of the CSPS, including all 24 retained items, is provided as Supplemental Material.

2.1.4. Data analysis

All statistical analyses were conducted using R (Version 4.6.0; R Core Team, 2026). Before conducting the main analyses, data were screened for missing values, multivariate outliers, and patterned responding. Given that survey responses were mandatory (forced choice), the only missing data were due to participant dropouts during survey completion. Participants with multivariate response patterns on the 26 CSPS items exceeding the Mahalanobis distance cutoff of $p < .001$ ($\chi^2(26) = 54.05$) were excluded from the analyses. We also screened the data for straightlining by inspecting invariant response patterns across the CSPS items; no additional cases were excluded on this basis. Response-time screening was also performed by flagging participants with completion times below one-third of the median survey duration; no further exclusions were made on this ground. No a priori power analysis was conducted for Study 1 because the primary aim was psychometric validation of the Italian version of the CSPS. However, the final sample size ($N = 1259$) was considered adequate for CFA and measurement invariance testing. The final five-factor model included 60 free parameters, yielding a participant-to-parameter ratio of approximately 21:1, which meets the 20:1 ratio recommended by Kline (2023) in line with the $N:q$ hypothesis (Jackson, 2003). The sample size also far exceeds the minimum sample sizes (from 30 to 460 cases, depending on model characteristics) that Wolf et al. (2013) found necessary for adequate power, unbiased parameter estimates, and proper solutions in simulated structural equation models. In the multigroup invariance analyses, in which the model is estimated separately within each group, we based our decisions on changes in approximate fit indices, which depend less on sample size than chi-square difference tests do; in particular, Cheung and Rensvold (2002) showed that ΔCFI is independent of model complexity and sample size.

Internal consistency for each of the five original CSPS subscales was assessed by calculating Cronbach's alpha using the *psych* package (Revelle, 2011). A CFA was performed with the *lavaan* (Rosseel, 2012) package to test the proposed five-factor structure of the CSPS. Given evidence of multivariate non-normality in the data, a robust maximum likelihood (MLR) estimator was used for all models. We specified and compared two competing models: (1) a first-order model with five correlated factors, and (2) a second-order model where the five factors

loaded onto two higher-order factors. Model fit was evaluated using multiple goodness-of-fit indices (Hu & Bentler, 1999): the Yuan–Bentler scaled chi-square (Yuan & Bentler, 2000), the Comparative Fit Index (CFI), the Tucker–Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) with its 90% confidence interval, and the Standardized Root Mean Square Residual (SRMR). For comparing nested models, we used the Satorra–Bentler scaled chi-square difference test (Satorra & Bentler, 2001), along with the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). Finally, we conducted multigroup CFAs to test the measurement invariance of the final five-factor model across gender (male vs. female), age groups (emerging adulthood: 18–29 years; established adulthood: 30–45 years; adulthood: 46 years and older), and parental status (parent vs. non-parent). We sequentially tested configural, metric, and scalar invariance. Invariance was evaluated by examining the change in fit indices between nested models ($\Delta CFI < .010$; $\Delta RMSEA < .015$), in line with established recommendations (Chen, 2007; Cheung & Rensvold, 2002).

2.2. Results

2.2.1. Confirmatory factor analysis

To evaluate the factorial validity of the 26-item CSPS, a CFA was conducted. Given the non-normal distribution of item responses, a robust maximum likelihood estimator (MLR) was employed, which combines Huber–White standard errors with a Yuan–Bentler scaled test statistic (Yuan & Bentler, 2000). The initial five-factor model, with all latent variables allowed to covary, demonstrated marginal fit to the data, $\chi^2(289) = 2137.04$, $p < .001$, robust CFI = .91, robust TLI = .90, robust RMSEA = .077 (90% CI [.074, .080]), and SRMR = .098.

Inspection of the standardized factor loadings revealed that two items from the Denial of Guilt factor, CSPS_17r and CSPS_26r, were performing poorly. CSPS_17r exhibited a near-zero standardized loading ($\beta = .03$), and CSPS_26r also loaded weakly on the intended factor ($\beta = .22$). Both items contributed disproportionately to overall model misfit and lacked theoretical clarity. Following psychometric guidelines (Kline, 2023) and practices adopted in similar scale development studies (Benzi et al., 2022), these two items were removed from the model.

After item removal, a revised 24-item five-factor model was estimated. Additionally, two theoretically justified residual covariances were included based on modification indices and item content: CSPS_7 with CSPS_8, both referring to the perceived personal consequences of climate change, and CSPS_22 with CSPS_23, both referring to avoidance of climate-related information and thoughts. These residual covariances were specified within the same factors and were therefore interpreted as reflecting item-specific overlap beyond the shared latent dimension. The revised model demonstrated substantially improved fit, $\chi^2(240) = 989.58$, $p < .001$, robust CFI = .96, robust TLI = .95, robust RMSEA = .055 (90% CI [.051, .058]), and SRMR = .040 (see Fig. 1). All standardized loadings in the final model were moderate to high (range: .63–.90) and statistically significant (Table 1). Internal consistency across the five subscales was acceptable to excellent, with Cronbach's alpha coefficients ranging from .71 to .92.

To test the hierarchical structure proposed in Wullenkord and Reese (2021), a second-order CFA was estimated, positing two higher-order factors: Interpretive Denial (comprising Denial of Personal and Global Outcomes) and Implicatory Denial (comprising Rationalization, Avoidance, and Denial of Guilt). This second-order model demonstrated inferior fit, $\chi^2(244) = 1037.97$, $p < .001$, robust CFI = .96, robust TLI = .95, robust RMSEA = .056 (90% CI [.052, .059]), and SRMR = .049. Because the final first-order five-factor model and the second-order model were estimated on the same 24-item structure, their fit was formally compared using a robust Satorra–Bentler scaled chi-square difference test. The second-order model fit the data significantly worse than the first-order model, $\Delta\chi^2(4) = 50.32$, $p < .001$. Furthermore, the loading of Avoidance on its second-order factor was weaker than expected ($\beta = .38$), raising concerns about the theoretical

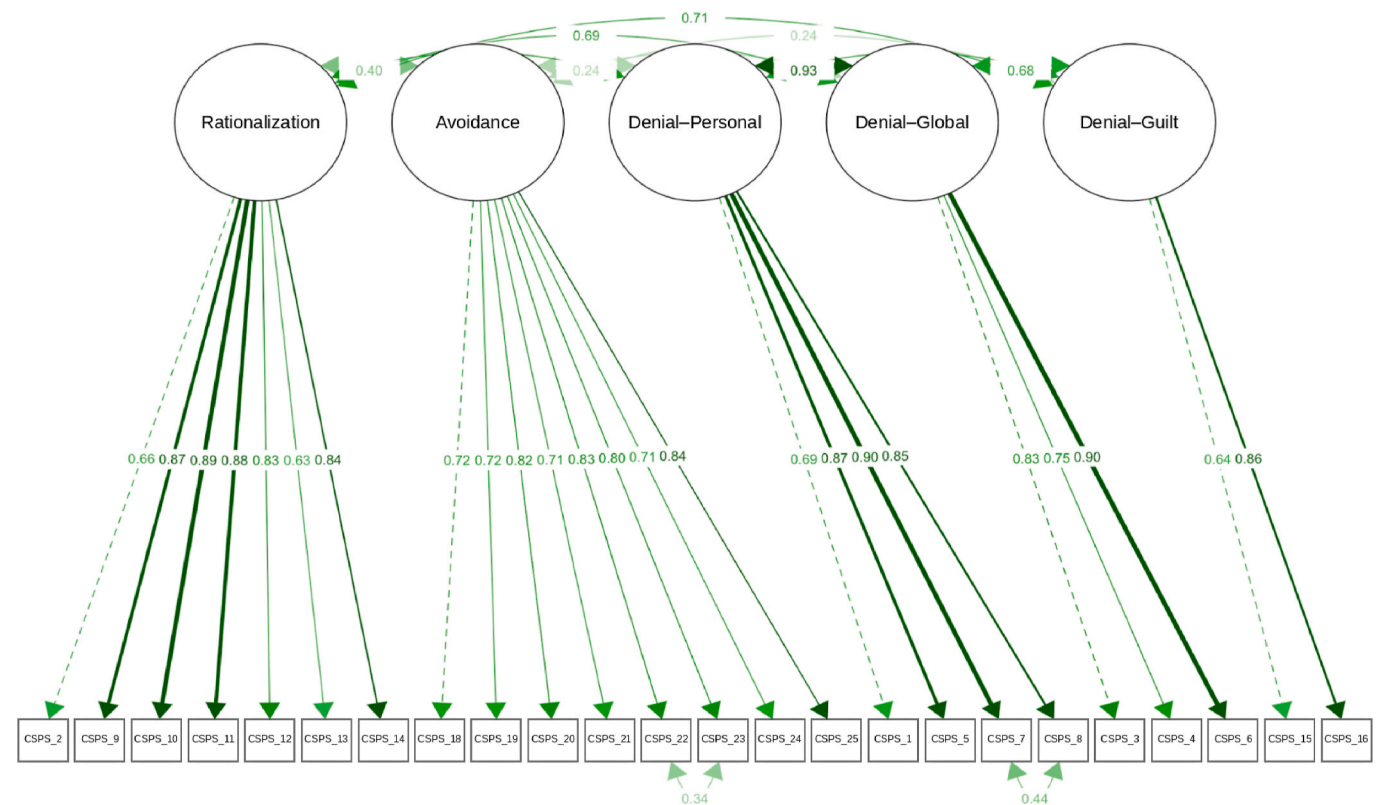


Fig. 1. Path diagram of the five-factor Climate Self-Protection Scale (CSPS) model (N = 1259)
Note. This figure displays the confirmatory factor analysis (CFA) model for the final 24-item Italian version of the Climate Self-Protection Scale (CSPS). Standardized path coefficients are presented, and all factor loadings and covariances were statistically significant at $p < .001$. The model includes five correlated latent variables: Rationalization of Own Involvement (R), Avoidance of Climate Threat (Avd), Denial of Personal Outcome Severity (D_P), Denial of Global Outcome Severity (D_G), and Denial of Guilt (Dn_G). Residual covariances were specified between Items CSPS_7 and CSPS_8 (within D_P) and between Items CSPS_22 and CSPS_23 (within Avd), based on modification indices and conceptual relatedness.

Table 1
Standardized factor loadings for the final five-factor model of the climate self-protection scale (CSPS) (N = 1259).

Item	Rationalization	Avoidance	Denial-Personal	Denial-Global	Denial-Guilt
CSPS_2	.655				
CSPS_9	.874				
CSPS_10	.893				
CSPS_11	.882				
CSPS_12	.826				
CSPS_13	.626				
CSPS_14	.843				
CSPS_18		.720			
CSPS_19		.720			
CSPS_20		.817			
CSPS_21		.709			
CSPS_22		.830			
CSPS_23		.801			
CSPS_24		.710			
CSPS_25		.837			
CSPS_1			.695		
CSPS_5			.872		
CSPS_7			.895		
CSPS_8			.854		
CSPS_3				.834	
CSPS_4				.753	
CSPS_6				.897	
CSPS_15					.643
CSPS_16					.856

Note. All values are standardized loadings from the final first-order confirmatory factor analysis model. Items CSPS_17r and CSPS_26r were removed due to poor performance. All loadings were statistically significant at $p < .001$.

coherence of the higher-order structure. Based on both fit indices and information criteria (the AIC and BIC, which penalize model complexity, were lower for the first-order model), the five-factor correlated model was retained as the final model (see Table 2 for model comparisons).

Table 2

Model fit indices for competing confirmatory factor analysis models of the CSPS (N = 1259).

Model	χ^2 (df)	Robust CFI	Robust TLI	Robust RMSEA [90% CI]	SRMR	AIC	BIC
Initial model (26 items)	2137.04 (289)	.909	.898	.077 [.074, .080]	.098	89173.15	89491.71
Final model (24 items)	989.58 (240)	.960	.954	.055 [.051, .058]	.040	79630.92	79939.21
Second-order model	1037.97 (244)	.958	.953	.056 [.052, .059]	.049	79679.74	79967.47

Note. The final first-order five-factor model was compared with the second-order model using a robust Satorra–Bentler scaled chi-square difference test. The second-order model fit significantly worse than the final first-order model, $\Delta\chi^2(4) = 50.32$, $p < .001$. All models were estimated with robust maximum likelihood (MLR); χ^2 values are Yuan–Bentler scaled test statistics, and RMSEA values are robust estimates.

2.2.2. Measurement invariance

To evaluate whether the final five-factor, 24-item structure functioned equivalently across demographic groups, a series of multigroup CFAs were conducted. Measurement invariance was assessed sequentially at the configural, metric, and scalar levels across participant gender (male vs. female), age groups (18–29 years, 30–45 years, 46 years and older), and parental status (parents vs. non-parents). These analyses followed widely accepted guidelines that emphasize not only statistical significance but also practical criteria such as changes in CFI, RMSEA, and SRMR (Chen, 2007; Cheung & Rensvold, 2002).

Across genders, all levels of invariance were supported. Fit indices remained stable across models, and the chi-square difference tests were nonsignificant, suggesting that the scale's structure, loadings, and intercepts can be considered equivalent for men and women. Invariance testing across age groups showed support for configural and metric invariance. Although the chi-square difference test for scalar invariance reached statistical significance, changes in CFI and RMSEA remained below the recommended thresholds ($\Delta\text{CFI} < .010$; $\Delta\text{RMSEA} < .015$). Thus, scalar invariance can be considered tenable, especially when interpreted in conjunction with practical fit criteria. Finally, invariance across parental status was also supported. The chi-square difference tests reached statistical significance for both the metric and the scalar models, but fit index changes were minimal and fell within acceptable limits.

Taken together, these results provide evidence for measurement invariance across gender, age, and parental status. While some statistical tests indicated differences at the metric and scalar levels, the overall pattern of evidence, including stable fit indices, supports a pragmatic interpretation of invariance. That is, the CSPS demonstrates sufficiently similar measurement properties across groups to permit meaningful comparisons of latent means in applied and research contexts (Putnick & Bornstein, 2016; see Table 3 for full invariance testing results).

3. Study 2

3.1. Methods

3.1.1. Procedure

A new sample was recruited using similar online and snowball sampling methods as in Study 1. After providing online informed consent, participants completed the questionnaires via an online survey

platform (Qualtrics); the survey took about 20 min. The informed consent page described the same six elements detailed in Study 1; participants could access the questionnaire only after explicitly indicating their agreement, otherwise the survey was automatically terminated. The study was approved by the *Territorial Ethics Committee of Lazio Area 2* (Approval No. 77.24), and was conducted in accordance with the principles of the Declaration of Helsinki.

3.1.2. Participants

The initial dataset for Study 2 comprised 1073 parents. After the removal of 87 multivariate outliers, identified with the same Mahalanobis distance criterion ($p < .001$; see Section 2.1.4), the final sample for Study 2 consisted of 986 cisgender parents ($n = 704$, 71.40% mothers; $n = 282$, 28.60% fathers). As in Study 1, gender identity was assessed through a multiple-choice item including “cisgender woman,” “cisgender man,” “transgender woman,” “transgender man,” “non-binary/genderqueer,” “other (please specify),” and “prefer not to answer”; no participant selected the “non-binary/genderqueer” or “transgender” categories. Participants were on average 44.85 years old ($SD = 9.22$; range = 21–62). Regarding sexual orientation, most identified as heterosexual ($n = 959$, 97.26%), while 1.42% identified as bisexual ($n = 14$), 1.12% as gay or lesbian ($n = 11$), and .20% as queer/other ($n = 2$). The vast majority were born in Italy ($n = 957$, 97.06%). Educational levels were distributed as follows: 7.71% held a Ph.D. or medical specialization ($n = 76$), 24.65% had a master's degree ($n = 243$), 16.33% a bachelor's degree ($n = 161$), 6.39% completed lower secondary school ($n = 63$), and 44.93% completed upper secondary education (technical, professional, or high school; $n = 443$). Employment status was reported as follows: 69.78% were employed full-time ($n = 688$), 20.28% part-time ($n = 200$), 8.92% unemployed without benefits ($n = 88$), and 1.01% unemployed with government assistance ($n = 10$). As in Study 1, this sample should be interpreted as a convenience sample rather than as representative of Italian parents. Participants were predominantly mothers and Italian-born. More broadly, the Italian demographic context is characterized by low fertility and delayed parenthood: in 2024, the total fertility rate was 1.18 children per woman, and the mean age of mothers at the birth of their first child was 31.9 years (Istituto Nazionale di Statistica, 2025).

Table 3

Measurement invariance of the five-factor CSPS across demographic groups (N = 1259).

Grouping Variable	Invariance Level	χ^2 (df)	$\Delta\chi^2$ (Δdf)	Robust CFI	Robust TLI	Robust RMSEA	SRMR
Gender	Configural	1499.5 (480)	—	.959	.953	.055	.040
	Metric	1509.5 (499)	9.73 (19)	.959	.955	.054	.041
	Scalar	1539.6 (518)	29.19 (19)	.959	.956	.053	.042
Age	Configural	1834.1 (720)	—	.956	.950	.057	.045
	Metric	1886.2 (758)	51.88 (38)	.955	.951	.056	.050
	Scalar	1982.1 (796)	96.36 (38)***	.953	.951	.056	.051
Parental Status	Configural	1481.8 (480)	—	.958	.952	.056	.043
	Metric	1516.3 (499)	34.24 (19)*	.958	.953	.055	.044
	Scalar	1576.9 (518)	64.01 (19)***	.956	.953	.055	.045

Note. All models estimated using robust maximum likelihood. $\Delta\chi^2$ is the Satorra–Bentler scaled difference test. χ^2 values are uncorrected maximum likelihood statistics. CFI = Comparative Fit Index; TLI = Tucker–Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual. * $p < .05$. *** $p < .001$. Fit differences remained within acceptable thresholds ($\Delta\text{CFI} < .010$; $\Delta\text{RMSEA} < .015$), supporting invariance despite some significant $\Delta\chi^2$.

3.1.3. Measures

Eco-defenses. The final 24-item Italian version of the CSPS, as refined in Study 1, was administered (Wullenkord & Reese, 2021). In the present study, the internal consistency coefficients ranged from acceptable to excellent: Rationalization ($\alpha = .93$), Avoidance ($\alpha = .92$), Denial of Personal Outcome Severity ($\alpha = .90$), Denial of Global Outcome Severity ($\alpha = .87$), and Denial of Guilt ($\alpha = .73$).

Eco-anxiety. The Hogg's Eco-Anxiety Scale (HEAS; Hogg et al., 2021; Rocchi et al., 2023) was administered to assess the frequency of four dimensions of eco-anxiety over the last two weeks: Affective symptoms (e.g., "Feeling nervous, anxious or on edge"), Rumination (e.g., "Unable to stop thinking about future climate change and other global environmental problems"), Behavioral symptoms (e.g., "Difficulty sleeping"), and Anxiety about a person's negative impact on the planet (e.g., "Feeling anxious about your personal responsibility to help address environmental problems"). Items were rated on a 4-point scale from 0 (*not at all*) to 3 (*nearly every day*). Higher scores indicated higher levels of the symptoms considered. In the current sample, the subscales also demonstrated good to excellent reliability: Affective Symptoms ($\alpha = .86$), Rumination ($\alpha = .87$), Behavioral Symptoms ($\alpha = .78$), and Anxiety about Personal Impact ($\alpha = .88$). The previously published Italian version of the HEAS, validated by Rocchi and colleagues (2023) through a standard forward- and back-translation procedure and supporting the four-factor structure of the scale in Italian adults, was used in the present study.

Epistemic stances. The 15-item *Epistemic Trust, Mistrust, and Credulity Questionnaire* (ETMCQ) (Campbell et al., 2021; Liotti et al., 2023) was administered to assess epistemic trust (e.g., "I find information easier to trust and absorb when it comes from someone who knows me well"), mistrust (e.g., "If you put too much faith in what people tell you, you are likely to get hurt"), and credulity (e.g., "I have too often taken advice from the wrong people") on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). In the current sample, the internal consistency for the subscales was good (α s = .79, .77, and .81 for trust, mistrust, and credulity, respectively). The previously published Italian version of the ETMCQ, validated by Liotti and colleagues (2023) through a standard forward- and back-translation procedure and supporting the three-factor structure of epistemic trust, mistrust, and credulity in an Italian sample, was used in the present study.

3.1.4. Data analysis

All statistical analyses were conducted in R (Version 4.6.0; R Core Team, 2026). Internal consistency was assessed using Cronbach's alpha. To verify whether the refined 24-item CSPS structure was replicated in the parent sample, we conducted a CFA using the *lavaan* package (Rosseel, 2012) with robust maximum likelihood estimation. Additional CFAs were conducted to evaluate the expected four-factor structure of the HEAS and the three-factor structure of the ETMCQ.

Following the CSPS CFA, factor scores for the five CSPS dimensions were extracted and used as predictors in the primary regression analyses. This approach was chosen to maintain consistency with the CFA-based validation of the CSPS, as factor scores estimate participants' standing on the latent dimension while accounting for the measurement model. By contrast, HEAS and ETMCQ scores were computed as mean subscale scores because these instruments had already been validated in previous studies and were used here as theoretically defined outcome and moderator variables rather than as newly validated measures. This approach also preserved comparability with prior research using these scales. As a robustness check, the moderation models were repeated using mean composite scores for the five CSPS dimensions (see Section 3.2.5).

We then estimated a series of multiple linear regression models to examine whether epistemic trust, mistrust, and credulity moderated the associations between the five eco-defenses and the four eco-anxiety symptoms. This approach was preferred over a single latent structural equation model, in order to test specific moderation effects in a

transparent and parsimonious way; a full SEM with multiple latent interaction terms would have substantially increased model complexity and would have made the interpretation of individual moderation effects less straightforward, while the CSPS measurement model had already been validated in Study 1 and replicated in Study 2.

No a priori power analysis was conducted before data collection; therefore, we performed a sensitivity power analysis to determine the smallest effect that each regression model could reliably detect with the achieved sample size. We conducted the analysis in R with the *pwr* package (Version 1.3-0; Champely, 2020), using the *pwr.f2.test()* function for the *F* test of fixed-effects multiple linear regression models, with $\alpha = .05$ and power = .80. With $N = 986$ and 11 predictors (five eco-defenses, one epistemic stance, and five interaction terms; numerator $df = 11$, denominator $df = 974$), each model was sufficiently powered to detect an overall effect as small as Cohen's $f^2 = .017$, corresponding to $R^2 = .017$. For the test of a single regression coefficient within the same 11-predictor model, such as an individual interaction term (numerator $df = 1$, denominator $df = 974$), the minimum detectable effect was $f^2 = .008$, corresponding to a unique contribution of less than 1% of the outcome variance. Both values fall below the conventional benchmark for a small effect ($f^2 = .02$; Cohen, 1988). Predictors and moderators were mean-centered before creating interaction terms, following standard moderation-analysis convention. Although the CFA-derived CSPS factor scores were already approximately zero-centered, the same centering procedure was applied to all predictors and moderators for consistency; no additional scaling was applied. Significant interactions were probed using simple slopes and Johnson–Neyman intervals via the *interactions* package (Long, 2024) and visualized using *ggplot2* (Wickham, 2011).

3.2. Results

3.2.1. Confirmatory factor analyses of the CSPS, HEAS, and ETMCQ

Estimated with MLR to account for non-normality, the 24-item, five-factor CSPS model demonstrated good fit to the data: Yuan–Bentler scaled $\chi^2(240) = 872.16$, $p < .001$; robust CFI = .958; robust TLI = .952; robust RMSEA = .057, 90% CI [.053, .061]; and SRMR = .041. All fully standardized factor loadings were statistically significant ($ps < .001$), ranging from .658 to .899, supporting the validity of the hypothesized five-factor solution. Standardized factor loadings are presented in Supplemental Table S1. Additional CFAs were conducted for the HEAS and ETMCQ. The four-factor HEAS model showed good fit to the data, $\chi^2(59) = 262.16$, $p < .001$, CFI = .989, TLI = .986, RMSEA = .059, 90% CI [.052, .067], SRMR = .030, with standardized factor loadings ranging from .811 to .939. The three-factor ETMCQ model showed mixed fit, $\chi^2(87) = 907.51$, $p < .001$, CFI = .909, TLI = .890, RMSEA = .098, 90% CI [.092, .104], SRMR = .071. However, all standardized loadings were statistically significant and in the expected direction, ranging from .459 to .804. Given that the ETMCQ had been previously validated and showed acceptable internal consistency in the present sample, the theoretically defined subscale scores were retained for the regression analyses.

3.2.2. Moderation by epistemic trust

To examine whether epistemic trust moderated the relationship between eco-defenses and eco-anxiety outcomes, we estimated four multiple linear regression models that included interaction terms between epistemic trust (centered) and each of the five eco-defense strategies in predicting the four eco-anxiety symptoms. The regression model predicting affective symptoms was significant, $F(11, 974) = 8.83$, $p < .001$ (adjusted $R^2 = .080$). Parents with higher levels of trust ($\beta = .042$, $p = .007$) and lower denial of guilt ($\beta = -.167$, $p < .001$) reported greater affective symptoms. No interaction terms reached significance in this model.

For rumination, the regression model was also significant, $F(11, 974) = 6.17$, $p < .001$ (adjusted $R^2 = .055$). Parents who reported

greater denial of personal outcome severity ($\beta = .263, p = .008$), and lower denial of global outcome severity ($\beta = -.277, p = .004$) and denial of guilt ($\beta = -.095, p = .017$), showed higher levels of rumination. Again, no interaction terms reached conventional thresholds for significance.

Likewise, the model predicting behavioral symptoms was significant, $F(11, 974) = 1.98, p = .027$ (adjusted $R^2 = .011$). In this model, parents who reported greater denial of guilt showed lower behavioral symptoms ($\beta = -.083, p = .024$). Epistemic trust showed neither a significant main effect nor a significant interaction effect.

Finally, the overall model predicting anxiety about personal impact was significant, $F(11, 974) = 10.54, p < .001$ (adjusted $R^2 = .096$). Parents who reported greater epistemic trust ($\beta = .062, p = .001$) and avoidance ($\beta = .078, p = .002$), and lower denial of guilt ($\beta = -.154, p = .001$), experienced greater anxiety about personal impact. The interaction between rationalization and epistemic trust was significant ($\beta = .090, p = .030$; see Fig. 2). A simple slopes analysis indicated that rationalization was positively associated with anxiety about personal impact only at higher levels of trust (+1 SD; $\beta = .17, p = .02$), but not at mean or lower levels ($ps > .23$). A Johnson–Neyman analysis further confirmed this pattern, showing that rationalization was associated with increased anxiety about perceived impact when epistemic trust exceeded .53, which lies within the observed range of the moderator. This finding suggests that parents with greater epistemic trust were more likely to experience anxiety about their personal environmental impact when they made greater use of rationalization to defend against climate change. Table 4 displays complete statistics for the main effect of epistemic trust and its interactive effects on eco-anxiety symptoms.

3.2.3. Moderation by epistemic mistrust

To examine whether epistemic mistrust moderated the relationship between eco-defenses and eco-anxiety symptoms, we estimated four multiple linear regression models that included interaction terms between epistemic mistrust (centered) and each of the five eco-defense strategies in predicting the four eco-anxiety symptoms. The regression model predicting affective symptoms was significant, $F(11, 974) = 11.93, p < .001$ (adjusted $R^2 = .109$), with parents reporting greater mistrust ($\beta = .090, p < .001$) and avoidance ($\beta = .042, p = .041$), and lower denial of guilt ($\beta = -.186, p < .001$), showing higher levels of affective symptoms. Additionally, a significant interaction was found between avoidance and epistemic mistrust ($\beta = -.050, p = .004$; see Fig. 3). A simple slopes analysis revealed that avoidance was positively associated with affective symptoms at lower levels of epistemic mistrust (−1 SD; $\beta = .11, p = .004$). At average levels of epistemic mistrust, the

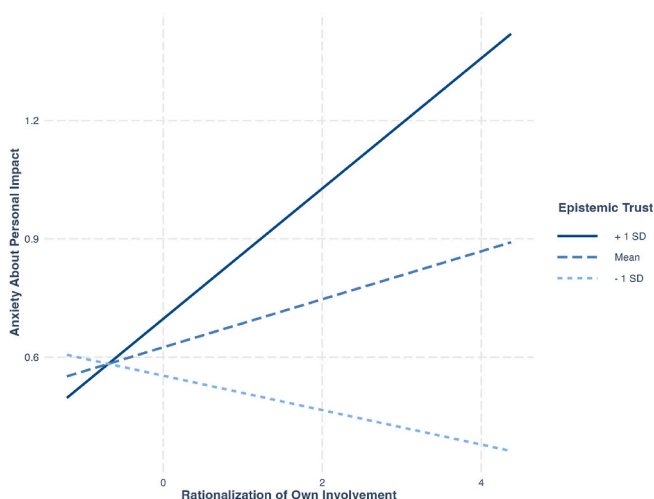


Fig. 2. Interaction between rationalization of own involvement and epistemic trust on anxiety about personal impact (N = 986 parents).

Table 4

Standardized regression coefficients for the moderation of epistemic trust on eco-anxiety symptoms (N = 986 parents).

Predictor	Affective Symptoms (β)	Rumination (β)	Behavioral Symptoms (β)	Anxiety about Personal Impact (β)
Epistemic Trust	.042**	.025	−.012	.062**
Rationalization	.016	−.035	.025	.061
Avoidance	.038	.017	.020	.078**
Denial of Personal Outcome	.144	.263**	.029	−.028
Denial of Global Outcome	−.164	−.277**	−.040	−.109
Denial of Guilt	−.167***	−.095*	−.083*	−.154**
Rationalization*Epistemic Trust	.030	.024	−.009	.090*
Avoidance*Epistemic Trust	.021	.033	.002	.017
Denial Personal*Epistemic Trust	−.079	−.025	.003	−.123
Denial Global*Epistemic Trust	.055	.019	.039	.058
Denial Guilt*Epistemic Trust	−.033	−.054	−.015	−.065
Adjusted R^2	.080	.055	.011	.096

Note. All β s are standardized regression coefficients. * $p < .05$. ** $p < .01$. *** $p < .001$.

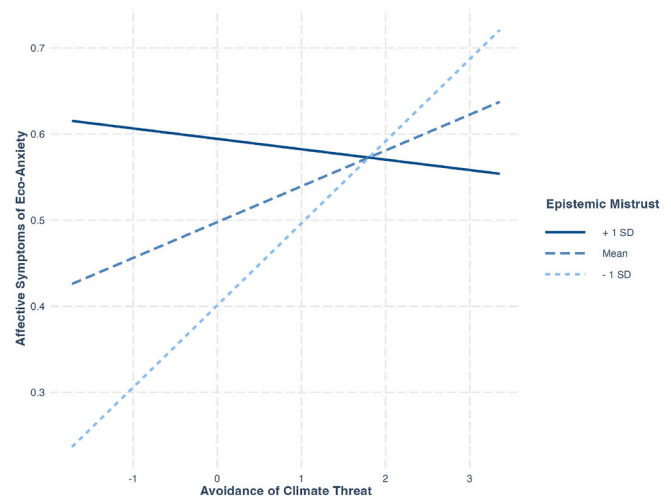


Fig. 3. Interaction between avoidance of climate threat and epistemic mistrust on affective symptoms (N = 986 parents).

association was weaker ($\beta = .04, p = .041$), and it was non-significant at higher levels (+1 SD; $\beta = -.02, p = .491$). A Johnson–Neyman analysis confirmed this pattern, indicating that the positive association of avoidance with affective symptoms held when epistemic mistrust was below .55, indicating that parents who made greater use of avoidance were more emotionally affected when they had lower epistemic mistrust.

In the model predicting rumination, the regression was also significant, $F(11, 974) = 7.98, p < .001$ (adjusted $R^2 = .072$). Parents with greater epistemic mistrust ($\beta = .063, p < .001$) and denial of personal outcome severity ($\beta = .246, p = .010$), and lower denial of global outcome severity ($\beta = -.261, p = .005$) and denial of guilt ($\beta = -.116, p = .003$), reported higher levels of rumination. As with affective symptoms, a significant interaction was observed between epistemic mistrust and avoidance ($\beta = -.061, p < .001$; see Fig. 4). Simple slopes analysis indicated that avoidance was associated with greater rumination at lower levels of epistemic mistrust (−1 SD; $\beta = .13, p < .001$), but

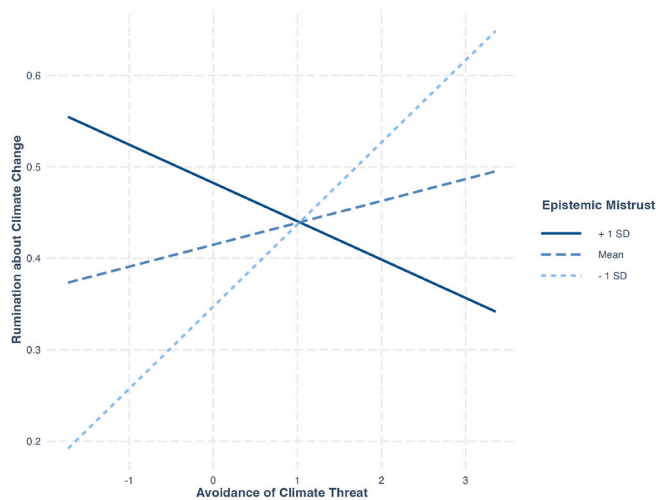


Fig. 4. Interaction of avoidance of climate threat and epistemic mistrust on rumination about climate change (N = 986 parents).

not at mean levels ($\beta = .02, p = .255$) or higher levels (+1 SD; $\beta = -.08, p = .151$). A Johnson–Neyman analysis confirmed that this relationship was significant for epistemic mistrust values below .67, suggesting that rumination was particularly elevated among parents with lower epistemic mistrust who relied more on avoidance strategies.

The behavioral symptoms model was also significant, $F(11, 974) = 2.92, p = .001$ (adjusted $R^2 = .021$), with higher epistemic mistrust ($\beta = .056, p < .001$) and lower denial of guilt ($\beta = -.089, p = .014$) emerging as the only significant predictors. No interaction terms reached statistical significance in this model.

Finally, the model predicting anxiety about personal impact was significant, $F(11, 974) = 12.10, p < .001$ (adjusted $R^2 = .110$), with parents reporting greater mistrust ($\beta = .118, p < .001$) and avoidance ($\beta = .079, p = .002$), and lower denial of guilt ($\beta = -.174, p < .001$), feeling more anxious about their personal impact. No interaction effects were significant. Table 5 displays the complete statistics for the main effect of epistemic mistrust and its interactive effects on eco-anxiety symptoms.

3.2.4. Moderation by epistemic credulity

To examine whether epistemic credulity moderated the relationship between eco-defenses and eco-anxiety symptoms, we estimated four multiple linear regression models including interaction terms between epistemic credulity (centered) and each of the five eco-defense strategies in predicting the four eco-anxiety symptoms. The regression model predicting affective symptoms was significant, $F(11, 974) = 12.14, p < .001$ (adjusted $R^2 = .111$). Parents with greater epistemic credulity ($\beta = .098, p < .001$) and lower denial of guilt ($\beta = -.157, p < .001$)

reported higher levels of affective symptoms. No interaction terms were significant in this model.

In the model predicting rumination, the regression was also significant, $F(11, 974) = 9.46, p < .001$ (adjusted $R^2 = .086$). Parents with greater epistemic credulity ($\beta = .085, p < .001$) and denial of personal outcome severity ($\beta = .247, p = .011$), and lower denial of global outcome severity ($\beta = -.258, p = .007$) and denial of guilt ($\beta = -.082, p = .037$), reported higher levels of rumination. Importantly, there was a significant interaction between avoidance and epistemic credulity ($\beta = -.044, p = .008$; see Fig. 5). A simple slopes analysis indicated that avoidance was positively associated with rumination only at lower levels of credulity (-1 SD; $\beta = .10, p = .029$), but not at mean ($p = .60$) or higher levels (+1 SD; $p = .87$). A Johnson–Neyman analysis confirmed that the effect of avoidance on rumination was significant only when epistemic credulity was below $-.47$, within the observed range of the moderator. This suggests that less credulous parents may ruminate more about climate change when they rely more on avoidance strategies.

The behavioral symptoms model was also significant, $F(11, 974) = 6.25, p < .001$ (adjusted $R^2 = .055$). Parents with greater epistemic credulity ($\beta = .093, p < .001$) reported higher behavioral symptoms. The interaction between avoidance and epistemic credulity was also significant ($\beta = -.036, p = .017$; see Fig. 6). However, simple slopes for this model did not reach significance at any level of the moderator ($ps > .27$), suggesting that this interaction should be interpreted with caution.

Finally, the model predicting anxiety about personal impact was significant, $F(11, 974) = 11.33, p < .001$ (adjusted $R^2 = .103$). Parents

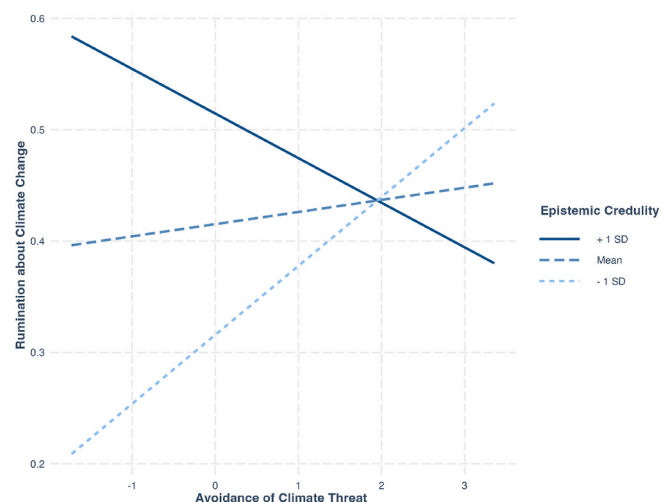


Fig. 5. Interaction between avoidance of climate threat and epistemic credulity on rumination about climate change (N = 986 parents).

Table 5

Standardized regression coefficients for the moderation of epistemic mistrust on eco-anxiety symptoms (N = 986 parents).

Predictor	Affective Symptoms (β)	Rumination (β)	Behavioral Symptoms (β)	Anxiety about Personal Impact (β)
Epistemic Mistrust	.090***	.063***	.056***	.118***
Rationalization	.004	-.032	.011	.058
Avoidance	.042*	.024	.015	.079**
Denial of Personal Outcome	.159	.246*	.038	-.021
Denial of Global Outcome	-.172	-.261**	-.046	-.115
Denial of Guilt	-.186***	-.116**	-.089*	-.174***
Rationalization*Epistemic Mistrust	.034	-.007	-.008	.013
Avoidance*Epistemic Mistrust	-.050**	-.061***	-.009	-.019
Denial Personal*Epistemic Mistrust	-.122	.045	.055	.060
Denial Global*Epistemic Mistrust	.089	-.040	-.070	-.070
Denial Guilt*Epistemic Mistrust	-.004	.007	.021	-.028
Adjusted R^2	.109	.072	.021	.110

Note. All β s are standardized regression coefficients. * $p < .05$. ** $p < .01$. *** $p < .001$.

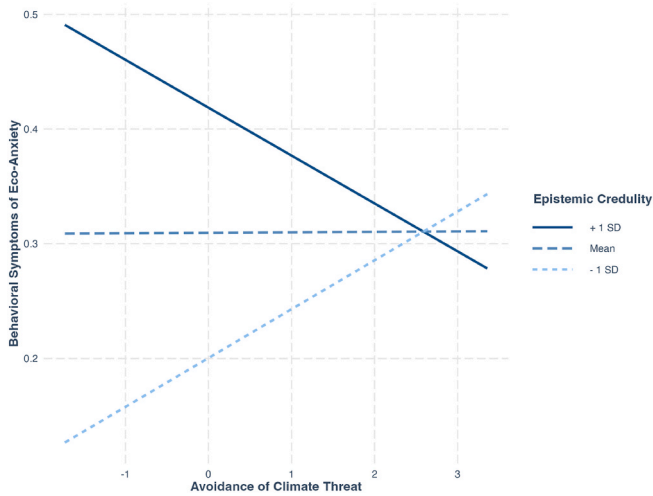


Fig. 6. Interaction between avoidance of climate threat and epistemic credulity on behavioral symptoms (N = 986 parents).

reporting greater epistemic credulity ($\beta = .092, p < .001$) and avoidance ($\beta = .075, p = .003$), and lower denial of guilt ($\beta = -.137, p = .004$), felt more anxious about their personal environmental impact. No interaction effects were significant in this model. Table 6 displays the complete statistics for the main effect of epistemic credulity and its interactive effects on eco-anxiety symptoms.

3.2.5. Robustness check with mean composite scores

As a robustness check, we repeated all 12 moderation models using mean composite scores for the five CSPA dimensions instead of CFA-derived factor scores, to examine whether the results depended on the scoring method used for eco-defenses. This robustness check yielded a pattern of findings substantively similar to that of the primary factor-score models: it replicated all five interaction effects reported in the primary analyses (rationalization $\times$ epistemic trust on anxiety about personal impact; avoidance $\times$ epistemic mistrust on affective symptoms and rumination; avoidance $\times$ epistemic credulity on rumination and behavioral symptoms), with one additional small interaction between avoidance and epistemic credulity predicting affective symptoms. Therefore, the main findings did not depend on the use of CFA-derived factor scores.

4. General discussion

The present research explored eco-defenses in Italian adults through two studies. Study 1 demonstrated the validity of the CSPA in the Italian context, confirming a five-factor structure that is psychometrically robust across samples of different genders, ages, and parental status.

Study 2 employed the CSPA to explore eco-defenses in a sample of Italian parents, showing significant associations with eco-anxiety symptoms moderated by epistemic stances.

4.1. Psychometric properties of the Italian CSPA

Regarding Study 1, the Italian 24-item version of the CSPA demonstrated robust psychometric properties and presented a factorial structure that largely mirrored the original version developed in the German context (Wullenkord & Reese, 2021). Specifically, the five factors that emerged in the present study were: *Rationalization*, *Avoidance*, *Denial of Personal Outcome Severity*, *Denial of Global Outcome Severity*, and *Denial of Guilt*. The replication of the original factor structure in the Italian context suggests that the underlying dimensions of eco-defenses may reflect broader psychological processes that may emerge similarly across cultures. As with ego defenses, which have been shown to display a high degree of cross-cultural stability (Békés et al., 2024), eco-defensive patterns appear to represent shared ways of regulating inner tension in response to climate change. Thus, despite cultural and contextual differences between Italy and Germany, individuals in both contexts appear to employ comparable defensive strategies to protect themselves from overwhelming ecological threats and maintain a sense of coherence and control. Moreover, the invariance analyses confirmed the scale's stability and applicability across diverse subsamples of the Italian population. The findings indicated consistent measurement properties across demographic variables that may affect individual response to climate change, such as gender (Evangelista et al., 2024; Man et al., 2024; Rocchi et al., 2023), age (Rocchi et al., 2023; Ágoston et al., 2022), and parental status (Ekholm, 2020).

4.2. Eco-defenses and eco-anxiety symptoms

The validated Italian version of the CSPA enabled further testing of the scale's validity in Study 2, by exploring the associations between parental eco-defenses and eco-anxiety symptoms moderated by epistemic stances. A positive association was found between avoidance and both affective symptoms and anxiety about personal impact, suggesting that avoidance may serve as a defensive reaction to heightened emotional activation in parents who feel directly threatened by environmental change. Such dynamics align with broader research indicating that avoidance can serve as an affect-regulation strategy when individuals feel overwhelmed by climate-related fears (Marshall, 2014). While the present findings do not speak exclusively to parenting processes, and the measures used were not specifically adapted to this population, it is noteworthy that prior research has documented similar avoidant tendencies in parents and their potential transmission to children (Mead et al., 2012; Sanson et al., 2018). These findings align with a growing body of research showing that avoidant responses to climate change are linked to heightened emotional distress rather than its

Table 6

Standardized regression coefficients for the moderation of epistemic credulity on eco-anxiety symptoms (N = 986 parents).

Predictor	Affective Symptoms (β)	Rumination (β)	Behavioral Symptoms (β)	Anxiety about Personal Impact (β)
Epistemic Credulity	.098***	.085***	.093***	.092***
Rationalization	.007	-.048	.002	.042
Avoidance	.026	.011	.000	.075**
Denial of Personal Outcome	.110	.247*	.032	-.041
Denial of Global Outcome	-.128	-.258**	-.035	-.097
Denial of Guilt	-.157***	-.082*	-.064	-.137**
Rationalization*Epistemic Credulity	-.001	-.037	-.011	-.071
Avoidance*Epistemic Credulity	-.031	-.044**	-.036*	-.018
Denial Personal*Epistemic Credulity	-.006	.110	.132	.082
Denial Global*Epistemic Credulity	.025	-.088	-.100	-.054
Denial Guilt*Epistemic Credulity	-.015	.000	-.009	.022
Adjusted R^2	.111	.086	.055	.103

Note. All β s are standardized regression coefficients. * $p < .05$. ** $p < .01$. *** $p < .001$.

reduction (Schwarz et al., 2026; Van Valkengoed et al., 2023).

The positive association between denial of personal outcome severity and rumination suggests that parents who deny their own vulnerability in relation to climate change may nonetheless remain cognitively pre-occupied with the issue, reflecting ambivalence between acknowledging and repressing threat-related concerns. It was previously suggested that responses to eco-anxiety exist along a continuum ranging from adaptive engagement and constructive action to maladaptive paralysis, as in the case of denial (Hayes et al., 2019; Pihkala, 2020). From this perspective, the co-occurrence of defensive denial of possible personal outcomes and persistent rumination may reflect parents' movement along this spectrum, oscillating between emotional activation that motivates concern for their children's future and defensive processes that aim to restore psychological equilibrium in the face of overwhelming threat. This finding supports the idea that partial acknowledgment of threat, combined with defensive distortion of its personal relevance, may sustain rumination by leaving the underlying concern unresolved (Kühner et al., 2024).

On the other hand, the negative association between denial of global outcome severity and rumination suggests that broader minimization of the seriousness of climate change may help reduce repetitive worry. This effect may be reinforced by the psychological distance often associated with global climate outcomes, which are typically perceived as temporally remote and sporadic rather than immediate and continuous aspects of everyday life (Karl & Stanley, 2024; McDonald et al., 2015; Veckalov et al., 2021). Such perceived distance can attenuate emotional engagement, allowing individuals to preserve a sense of stability and normality. This may be particularly relevant in contexts where ongoing caregiving demands require emotional regulation, such as parenthood. Nevertheless, it should be noted that denial may serve as a functional strategy in the short term, but it is generally regarded as maladaptive in the long term, as persistent avoidance of reality can prevent emotional processing, adaptive engagement, and constructive action in response to climate change (Mendy et al., 2024).

Finally, the negative associations between denial of guilt and all eco-anxiety symptoms suggest that disavowing personal responsibility for environmental degradation may serve as a moral and emotional buffer. Previous research (e.g., Kovács et al., 2024; Ágoston et al., 2022) indicates that guilt is linked to pro-environmental motivation: negative feedback about personal impact has been shown to trigger guilt that leads to increased pro-environmental behavior. Conversely, denying guilt may reduce distress in the short term while suppressing the motivational function that guilt can serve in promoting adaptive responses to climate change. This form of moral distancing may reduce feelings of helplessness in the face of an uncontrollable global threat.

For parents, this form of distancing could mitigate feelings of failure or helplessness regarding their children's future, allowing them to preserve a coherent and effective parental self in the face of an uncontrollable global threat (Léger-Goodes et al., 2023). However, although denying guilt may provide immediate emotional relief, it also suppresses the motivational aspects of guilt that can promote moral reflection and corrective action in the context of climate change (Aaltola, 2021). In this way, it may limit parents' engagement in pro-environmental behaviors that could otherwise transform concern for their children's future into adaptive responses (Grønhoj & Thøgersen, 2017). Although the sample consisted of parents, these findings may generalize to other populations facing similar ecological pressures. Future research using parent-specific measures would be needed to determine the extent to which parental role concerns specifically moderate these associations.

4.3. Epistemic stances and eco-anxiety

Regarding epistemic stances, the results showed that epistemic trust was positively associated only with affective symptoms and anxiety about personal impact, whereas both epistemic mistrust and credulity showed positive associations with all eco-anxiety symptoms. This

pattern is in line with previous results suggesting that the ability to evaluate and rely on trustworthy information may heighten emotional awareness without producing generalized distress, while excessive epistemic mistrust or uncritical credulity toward information sources may amplify mental health symptoms (Cruciani, Liotti, et al., 2025; Fiorini Bincoletto et al., 2025; Fonagy et al., 2015; Li et al., 2023).

Recent literature increasingly conceptualizes eco-anxiety as a spectrum ranging from adaptive to maladaptive forms, suggesting that it can also manifest as "practical anxiety," an emotionally engaged yet action-oriented response to ecological threat (Pihkala, 2020). Moderate levels of eco-anxiety have been associated with higher pro-environmental behavior and civic engagement, whereas very high levels tend to correspond with psychological distress (Lutz et al., 2023; Pasquariello et al., 2025; Pavani et al., 2023). Within this framework, epistemic trust may serve as a protective factor, promoting a balanced approach to engaging with climate-related information. Its selective association with affective activation and anxiety about personal impact, dimensions specifically linked to pro-environmental behavior (Hogg et al., 2024; Türkarslan et al., 2023), suggests that confidence in reliable information sources supports constructive emotional mobilization. Conversely, epistemic mistrust and credulity may represent risk factors for maladaptive eco-anxiety, as they distort the appraisal of climate information, through either pervasive skepticism or uncritical acceptance, respectively, thereby intensifying emotional arousal.

4.4. Moderation of eco-defenses by epistemic stances

Epistemic stances moderated the association between eco-defenses and eco-anxiety. Among parents with higher epistemic trust, that is, greater openness to evaluating information as reliable and relevant, rationalization was associated with greater anxiety about personal impact. This suggests that, for individuals who generally trust information sources, rationalizing personal inaction does not simply neutralize concern; rather, awareness of the problem may persist and feed back into perceived responsibility (Liotti et al., 2025). On the other hand, greater avoidance was associated with higher levels of rumination at lower levels of both epistemic mistrust and credulity, and with higher levels of affective symptoms at lower levels of epistemic mistrust.

It is important to note that although epistemic mistrust and credulity generally show negative correlations with epistemic trust (Campbell et al., 2021; Liotti et al., 2023, 2025), low levels of mistrust and credulity do not automatically imply high epistemic trust. Rather, they may represent a specific configuration characterized by an epistemic disengagement (Delamain et al., 2025), that is, a generalized indifference toward information rather than an active stance. In other words, whereas elevated epistemic mistrust or credulity may, paradoxically, provide parents with a maladaptive interpretive filter, either by persistently doubting information or by adhering to it uncritically, low levels of both may indicate reduced engagement with information from the environment. In this vein, parents who are neither mistrustful nor credulous may nonetheless defend by broadly avoiding climate-related content. Such generalized disengagement could, in turn, leave them more vulnerable to the development of eco-anxiety symptoms when confronted with distressing climate information, as avoidance limits opportunities for processing, integrating, and contextualizing ecological threats in a more regulated way. These mechanistic interpretations remain necessarily speculative given the cross-sectional and correlational nature of the present data, and warrant direct empirical testing in future longitudinal and experimental research.

4.5. Limitations

The present study has several limitations. The cross-sectional design prevents drawing causal inferences in the association between study variables; additionally, it is not possible to draw firm conclusions regarding the efficacy and effectiveness of eco-defenses in regulating

eco-anxiety symptoms in the long term. For example, although denial is consistently associated with worse psychological outcomes in the long term (Pohl & Swynedouw, 2025), in the present study, it was associated with lower eco-anxiety symptoms, and its detrimental effect over prolonged periods could only be hypothesized. Future longitudinal studies are warranted to further investigate these issues.

A second limitation concerns the modest amount of explained variance in several regression models, especially those predicting behavioral symptoms of eco-anxiety. Although some associations reached statistical significance, likely facilitated by the large sample size, the low R^2 values indicate that eco-defenses and epistemic stances account for only a small proportion of variability in these outcomes. Therefore, the findings should not be interpreted as providing strong prediction of eco-anxiety symptoms at the individual level. Rather, they identify small but theoretically meaningful associations between defensive, epistemic, and emotional processes. Behavioral symptoms of eco-anxiety are likely influenced by additional factors not assessed in the present study, including previous exposure to climate-related events, general anxiety and depressive symptoms, perceived efficacy, environmental identity, political orientation, media exposure, social support, family communication patterns, and opportunities for pro-environmental action (e.g., Ogunbode et al., 2022; Whitmarsh et al., 2022). Future studies should integrate these variables and use longitudinal designs to better estimate the real-world relevance and predictive utility of these processes.

A third limitation pertains to the conceptualization of eco-defenses, which likely encompasses a blend of unconscious ego defense processes and more conscious, deliberative coping strategies. In the present study, these layers remain theoretically intertwined, as the distinction between automatic, unconscious defensive operations and intentional efforts to regulate climate-related distress is not explicitly addressed. Future research will be essential to disentangle these components, for example, by integrating implicit or performance-based measures of defensiveness, or multi-method approaches that combine self-report, behavioral indicators, and clinician-rated measures. A fourth limitation relates to the use of the HEAS to assess eco-anxiety, which, although it provides a psychometrically sound measure, does not capture “functional eco-anxiety” components (e.g., worry that motivates climate action or the adoption of pro-environmental behaviors) (Kurth & Pihkala, 2022; Pihkala, 2020). In this vein, future studies should also examine the impact of eco-defenses on these more practical aspects of eco-anxiety.

A fifth limitation concerns the framing of parents as a single, specific group in Study 2, which restricts the generalizability of our findings regarding the relevance of eco-defenses and epistemic stances to non-parent populations who experience eco-anxiety. A further consideration concerns the composition of the two convenience samples, which did not include parents who identified as non-binary, genderqueer, or transgender. This limits the generalizability of the findings to the full diversity of the Italian parental population and represents an important avenue for future research with more inclusive sampling strategies. In addition, because data in both studies were collected anonymously and without personal identifiers, we cannot deterministically establish whether any individual took part in both samples; although the two studies were carried out in distinct data-collection waves with different eligibility criteria (Study 2 explicitly screened for parental status), a minor degree of unintended overlap cannot be formally ruled out.

4.5.1. Future directions

Several questions raised by the present findings remain open and merit systematic investigation. First, longitudinal designs would be needed to clarify the directional and potentially reciprocal relationships between eco-defenses, epistemic stances, and eco-anxiety over time. Second, the mechanisms underlying the observed moderation effects, including the role of epistemic disengagement, should be examined directly, for instance using experimental or experience-sampling designs. Third, future studies should employ parent-specific measures and include non-parent comparison groups to determine whether the

associations observed here are specific to the parenting context or reflect broader patterns of climate-related psychological adaptation. Finally, the relationship between eco-defenses and the more functional, action-oriented dimensions of eco-anxiety, including pro-environmental behavior and civic engagement, warrants further direct investigation.

5. Conclusions

The present study is the first to explore the associations between eco-defenses, epistemic stances, and eco-anxiety among parents, providing unique insights into the psychological processes through which parents cope with climate threats. In this vein, both eco-defenses and epistemic stances, as well as their interaction, were associated with specific eco-anxiety symptoms, highlighting distinct ways through which parents regulate the emotional burden of, and process information about, the climate crisis. The validation of the Italian version of the CSPS confirmed a five-factor structure that is psychometrically robust across parent and non-parent samples.

The results of the present research have several clinical implications. On the one hand, therapeutic interventions should address the different ways in which parents engage with information about the climate crisis and cope with the resulting distress, in order to strengthen protective factors against environmental uncertainty. At the same time, it is important to recognize that how parents approach and manage climate change can also affect family dynamics, for example, by intensifying parents' dual role of managing personal distress while supporting their children's emotional needs (Benoit et al., 2022; Léger-Goodes et al., 2023; Tracchegiani et al., 2026). In this vein, interventions should aim to normalize and help parents manage their emotions related to the climate crisis, as well as to foster adaptive ways of engaging with climate change information. On the other hand, therapeutic approaches should also focus on developing appropriate communication strategies that help parents address their children's emotional needs and sustain family hope in an uncertain climate future (Howard, 2022; Shrum et al., 2023).

From a broader perspective, the present findings contribute to a growing body of work suggesting that the psychological dimensions of climate change, including how individuals defend against and emotionally process ecological threats, are relevant not only at the individual level but also in relational and family contexts, as evidenced by prior research (Cuartas et al., 2026; Sanson et al., 2018). Whether and how the processes identified here unfold within parent-child relationships remains an important question that deserves additional future investigation. This highlights how the climate crisis should be understood not only as an environmental issue, but also as a relational and existential one.

Supporting parents in managing eco-anxiety can strengthen family resilience and, by extension, collective capacity to face ecological challenges. Interventions at the educational and community levels should, therefore, integrate psychological dimensions of climate change, promoting emotional regulation, critical engagement with information, and intergenerational dialogue. In doing so, societies may cultivate not only environmental sustainability but also psychological sustainability (Boluda-Verdu et al., 2022; Pihkala, 2020), ensuring that families are equipped to navigate the uncertainties of the climate crisis.

CRedit authorship contribution statement

Gianluca Cruciani: Writing – original draft, Visualization, Validation, Methodology, Investigation, Data curation. **Ilaria Maria Antonietta Benzi:** Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation. **Jacopo Tracchegiani:** Writing – review & editing, Visualization, Resources, Investigation, Data curation. **Tommaso Boldrini:** Writing – review & editing, Visualization, Validation, Investigation. **Nicola Carone:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Data

curation, Conceptualization.

Ethics declaration

Written informed consent to take part in the study and to publish the article has been obtained from all participants or their legal representatives. The privacy rights of participants have been observed.

This study was performed in compliance with relevant laws, regulatory frameworks and guidelines where the research took place.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Data availability statement

The datasets used and/or analyzed during the present study are available from the corresponding author upon reasonable request.

Ethical approval declaration

The study was approved by the Territorial Ethics Committee of Lazio Area 2 (protocol code no. 77.24).

Declaration of generative AI and AI-assisted technologies in the writing process

No Generative AI and AI-assisted technologies were used in the preparation of this manuscript.

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Declaration of competing interest

None.

Appendix A. Supplementary data

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