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Psychometric Properties of the Persian version of the Hogg Eco-Anxiety Scale (HEAS-P)

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Abstract

Eco-anxiety has emerged as an important construct in environmental mental health research, yet validated instruments for non-Western populations remain limited. Here, we evaluated the psychometric properties of the Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) in a large Iranian sample (N = 601). Confirmatory factor analysis supported the original four-factor structure, yielding excellent model fit (CFI = 0.96, TLI = 0.95, RMSEA = 0.041, SRMR = 0.034). The scale demonstrated high internal consistency (Cronbach's α = 0.94) and good test–retest reliability (r = 0.84, p < 0.001). Multi-group analyses established measurement invariance across gender, indicating comparable assessment of eco-anxiety in men and women. Convergent validity was evidenced by moderate to strong associations with general anxiety, depression, and environmental worry, whereas weak associations with happiness supported discriminant validity. Hierarchical regression analyses further demonstrated incremental validity, with eco-anxiety accounting for unique variance in environmental worry beyond general psychological distress. Collectively, these findings indicate that the HEAS-P is a reliable and valid instrument for assessing eco-anxiety in Persian-speaking populations, supporting its use in both research and clinical contexts.

Introduction

Climate crises pose profound threats to human survival, well-being, and mental health (Heinzel et al., 2023). These crises not only disrupt ecosystems and economies but also elicit intense psychological responses, including anxiety, depression, anger, and environmental grief, which can influence behavior and coping strategies (Ágoston et al., 2022). Individuals differ in their vulnerability, experiencing diverse forms and intensities of concern, worry, or fear in response to environmental change (Weiß, 2024). Among these responses, climate anxiety—persistent emotional distress and worry related to climate change—has emerged as a pressing global mental health concern (Hickman et al., 2021).

Despite growing recognition of eco-anxiety, the majority of research has been conducted in Western contexts, and validated assessment tools for non-Western populations remain limited. Reliable measurement is essential to understand the prevalence, predictors, and psychological consequences of eco-anxiety across diverse cultural settings. The Hogg Eco-Anxiety Scale (HEAS) is a widely used instrument, but its psychometric properties have not yet been established in Persian-speaking populations. Addressing this gap, the present study evaluates the reliability, factorial structure, and validity of the Persian version of the HEAS (HEAS-P) among Iranian adults.

Climate Change

Climate change is one of the most pressing health challenges of the twenty-first century, affecting human health both directly and indirectly (WHO, 2018). Manifestations include heatwaves, floods, and droughts. Human activities have altered the atmosphere, producing greenhouse effects that drive global warming (Cianconi, Betrò et al., 2020). These environmental changes threaten human survival and

mental health, and their impacts are predicted to intensify in the coming decades (Heinzel et al., 2023; Hickman et al., 2021; Corvalan et al., 2022). Heightened awareness of environmental threats has increased fear and anxiety worldwide (Boluda-Verdú et al., 2022). Climate-related disasters can contribute to post-traumatic stress disorder, depression, anxiety, exacerbation of psychotic symptoms, and suicidal ideation (Cunsolo et al., 2020). Environmental distress may manifest as grief, hopelessness, panic attacks, anger, and feelings of worthlessness (Drion et al., 2024; Clayton & Karazsia, 2020).

Media coverage plays a key role in shaping perceptions of climate change, exposing individuals to environmental threats even without direct experience (Weiß et al., 2024; Ogunbode et al., 2023). Consequently, climate anxiety is increasing globally, including among populations not directly affected by environmental disasters (Pihkala, 2020; Clayton & Karazsia, 2020; Thomas & Benoit, 2022).

Global surveys indicate that 45.9% of individuals are significantly concerned about climate change, with 28.2% experiencing severe climate anxiety (Ogunbode et al., 2022). Across 50 countries, 64% of respondents consider climate change a global emergency (UNDP, 2021). Among children and adolescents, 59% report deep concern, 84% moderate concern, and 19% have experienced climate-related nightmares (Hickman et al., 2021; Cunsolo et al., 2020).

Climate Anxiety

Various definitions of climate anxiety exist in the literature (Van Dijk et al., 2025). The concept was first introduced by Maiteny in 2007 and expanded by Cossman. Since 2010, research on climate change and its psychological impacts has grown substantially (Pihkala, 2020). Glen Albrecht (2011) introduced “Psychoterratic Syndromes” to describe psychological effects from negative feelings about environmental change (Boluda-Verdú et al., 2022). The 2017 APA Eco America report defined climate anxiety as “chronic fear of environmental destruction” (Clayton, 2017). Related terms include “solastalgia” (environmental distress) and “eco-anxiety” (Coffey et al., 2021).

Some researchers conceptualize climate anxiety as an emotional response (Stanley et al., 2021), others as a moral feeling (Kurth & Pihkala, 2022) or deep existential anxiety (Pihkala, 2020). Most definitions combine negative emotions, worry, and distress (Kurth & Pihkala, 2022), and some emphasize its social and group dimensions (Stewart, 2021). Coffey et al. (2021) describe climate anxiety as a multidimensional phenomenon involving worry, fear, and cognitive-emotional distress. Although climate anxiety is not classified as a medical disorder, high levels are associated with reduced mental health, impaired emotional regulation, and concerns about the future (Tam et al., 2023; Van Valkengoed et al., 2023; Orrù et al., 2024). It may also influence behavior and promote environmental activism (Ali et al., 2024; Ogunbode et al., 2023).

HEASS-13 Questionnaire

Diagnostic tools are critical for identifying at-risk individuals and understanding the mental health impacts of climate change. While earlier scales focused primarily on emotional symptoms, contemporary instruments assess cognitive, emotional, and behavioral dimensions (Heinzel et al., 2023). The Climate Change Anxiety Scale (CCAS) by Clayton & Karazsia (2020) measures cognitive-emotional and functional disability dimensions. The ICE scale assesses eight emotional responses to climate change (Marczak et al., 2023). The HEAS-13 (Haak et al., 2021) is a 13-item multidimensional scale evaluating: 1) Emotional symptoms (e.g., nervousness, irritability); 2) Overthinking (e.g., persistent climate-related thoughts); 3) Behavioral symptoms (e.g., difficulty enjoying social interactions); and 4) Anxiety about personal impact (e.g., concern about individual responsibility). HEAS-13 captures indirect effects of environmental disasters and has shown a robust four-factor structure with high internal consistency in Australian and New Zealand samples. Correlations with general anxiety, depression, and stress were moderate, indicating its ability to measure distinct dimensions of climate anxiety.

Climate Anxiety in Iran

Most research on climate anxiety has focused on Western countries, but evidence suggests its global relevance (Spano et al., 2025). The Hogg Eco-Anxiety Scale (HEAS-13) has demonstrated robust psychometric properties across multiple cultural contexts, including Germany (Heinzel, Tschorn et al., 2023), Italy (Rocchi, Pileri et al., 2023; Spano, Ricciardi et al., 2025), Poland (Larionow, Mackiewicz et al., 2024), Libya (Ali, Jahan et al., 2024), Turkey (Çimşir, Şahin et al., 2024), Spain and Argentina (Rodríguez Quiroga, Peña Loray et al., 2024), and Portugal (Sampaio, Costa et al., 2023). However, studies in non-Western regions, especially those directly impacted by climate change, remain limited (Ali et al., 2024; Tam et al., 2023). The Middle East and North Africa (MENA) are experiencing rapid warming and environmental stress (Zittis et al., 2021). Iran, with its semi-arid climate, faces severe droughts, flooding, and water scarcity, impacting human health and well-being (Mansouri Daneshvar et al., 2019; Vaghefi et al., 2019). This study addresses a research gap by validating HEAS-13 in Iran, providing insights into climate anxiety in a non-Western population. Results can inform culturally relevant assessment tools and interventions for managing climate-related distress.

Current Study

The present study used the 13-item Hogg Eco-Anxiety Scale (HEAS-13) to assess climate anxiety in Iranian adults. Specifically, we examined:

1. **Factor Structure**: Whether HEAS-P replicates the original four-factor model.
2. **Reliability**: Internal consistency (Cronbach's α) and test-retest reliability.
3. **Convergent Validity**: Correlations with GAD-7 and DASS-21.
4. **Divergent Validity**: Correlations with the Oxford Happiness Questionnaire (Short Form).
5. **Measurement Invariance**: Consistency of factor structure and psychometric properties across demographic groups (age, gender, education).

This study provides the first evidence for the psychometric properties of HEAS-P in a Persian-speaking population, contributing to cross-cultural research on eco-anxiety.

Materials and methods

Translation and Cross-Cultural Adaptation

The Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) was developed following standard translation and back-translation procedures (Sousa & Rojjanasrirat, 2011). First, two bilingual professionals with expertise in psychology and psychometric translation independently translated the original English HEAS-13 into Persian. Discrepancies were resolved through discussion and consensus. A back-translation into English was then performed by a native English speaker, which was reviewed by two clinical psychologists to ensure semantic and conceptual equivalence with the original scale. A pilot study with 23 participants assessed comprehensibility, clarity of instructions, response options, and item wording. Feedback was used to finalize the Persian version prior to the main study.

Participants

All participants provided written informed consent prior to participation. The study was approved by the Institutional Review Board of Kharazmi University and conducted in accordance with the Declaration of Helsinki. A large sample is generally required for scale validation, particularly for confirmatory factor analysis (CFA) (DeVellis, 2017; Brown, 2015; Kline, 2023). Guidelines suggest that N > 200 provides adequate statistical power, with samples of 300 considered good, 500 very good, and 1000 excellent for factor analyses (Costello & Osborne, 2005; Tabachnick et al., 2013; Williams et al., 2010). Accordingly, we recruited a high-volume sample to ensure robust CFA results.

Measures

Hogg Eco-Anxiety Scale-13 (HEAS-13)

The HEAS-13 (Hogg et al., 2021) assesses four dimensions of eco-anxiety: affective symptoms, rumination, behavioral symptoms, and anxiety about personal environmental impact. Each item is rated 0–3 (0 = not at all; 3 = nearly every day), total scores ranging 0–39. Higher scores indicate greater eco-anxiety.

Depression Anxiety Stress Scale-21 (DASS-21)

The DASS-21 (Lovibond & Lovibond, 1995; Persian version: Sahebi et al., 2005) measures depression, anxiety, and stress. Items are rated 0–3, with higher scores indicating greater severity. The scale was used to evaluate convergent validity.

Generalized Anxiety Disorder Scale (GAD-7)

The GAD-7 (Spitzer et al., 2006; Persian version: Naeinian et al., 2011) measures generalized anxiety over the past two weeks, rated 0–3 per item. Higher scores indicate higher anxiety severity.

Oxford Happiness Questionnaire – Short Form (OHQ-SF)

The OHQ-SF (Argyle et al., 1989; Persian version: Dehshiri et al., 2016) assesses happiness across 8 items rated 1–6. Higher scores indicate greater well-being. It was used to examine discriminant validity.

Procedure

Data were collected from January 2024 to February 2025 via online questionnaires distributed on Instagram, Telegram, and WhatsApp. Participants were Persian-speaking residents of Iran. Written informed consent was obtained before completion of demographic forms and the HEAS-13, DASS-21, and GAD-7 questionnaires.

Data Analysis

Data were analyzed using SPSS version 24.0 and AMOS version 24.0. Prior to the main analyses, assumptions of structural equation modeling (SEM) were examined and met. Given the random pattern of missing data, participants with more than 5% missing responses were excluded in accordance with recommended guidelines (Tabachnick & Fidell, 2019). Of the initial 616 participants, 7 cases exceeded this threshold and were removed, leaving 609 cases for subsequent analyses.

As the remaining variables contained less than 5% missing data, separate variance *t* tests were conducted to examine whether missingness was systematically related to other variables (Davey & Savla, 2010; Ho, 2014). The results indicated no significant systematic relationships. Consequently, missing values were handled using regression-based imputation, whereby missing observations were replaced with predicted scores derived from multiple regression analyses based on available data (Davey & Savla, 2010; Ho, 2014).

Multivariate outliers were identified using Mahalanobis distance (Meyers et al., 2006). Eight cases were identified as outliers and excluded from the dataset. The final sample therefore consisted of 601 participants.

The study pursued several analytic objectives. First, the reliability of the Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) was examined using multiple indicators. Second, confirmatory factor analysis (CFA) was conducted to assess whether the HEAS-P items were adequately represented by the original latent factor structure. Maximum likelihood estimation was employed to test the model using AMOS 24.0. Model fit was evaluated using multiple fit indices, including the Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Incremental Fit Index (IFI), Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA) with a 90% confidence interval. Consistent with established criteria, acceptable model fit was defined as GFI, CFI, TLI, and IFI values greater than .95, SRMR values below .08, and RMSEA values below .08 (Brown, 2006; Hu & Bentler, 1999).

Third, measurement invariance of the HEAS-P across sex and age groups was evaluated using a sequence of increasingly restrictive multi-group confirmatory factor analyses (MGCFA), following the procedure outlined by Vandenberg and Lance (2000). Specifically, configural, metric (weak), scalar (strong), and strict invariance models were tested sequentially. Each model was nested within the previous one, and invariance was considered supported when changes in the Comparative Fit Index (ΔCFI) were less than .01 (Cheung & Rensvold, 2002).

Finally, the fourth objective of the study was to examine evidence for the validity of the HEAS-P, including convergent, discriminant, and incremental validity.

Results

Descriptive Statistics and Preliminary Analyses

Descriptive statistics for all items of the Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) are presented in Table 1. Item means ranged from 0.36 to 0.85 (on a 4-point Likert scale), with acceptable variability (SDs between 0.67 and 0.92). Skewness and kurtosis values were within ± 2, indicating approximate normality. Item-total correlations ranged from 0.62 to 0.84, supporting item homogeneity.

Table 1
Descriptive statistics for Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) items (N = 601)

Item	Mean	SD	Skewness	Kurtosis	Item-total correlation
HEAS-P1	0.85	0.88	0.89	0.15	0.81
HEAS-P2	0.59	0.82	1.34	1.08	0.81
HEAS-P3	0.61	0.83	1.29	0.92	0.83
HEAS-P4	0.74	0.87	1.08	0.42	0.84
HEAS-P5	0.74	0.92	1.13	0.35	0.80
HEAS-P6	0.58	0.81	1.39	1.39	0.81
HEAS-P7	0.75	0.87	1.02	0.29	0.83
HEAS-P8	0.36	0.67	2.01	1.94	0.62
HEAS-P9	0.54	0.79	1.48	1.69	0.69
HEAS-P10	0.42	0.74	1.86	2.02	0.72
HEAS-P11	0.59	0.81	1.32	1.11	0.72
HEAS-P12	0.66	0.84	1.25	0.91	0.76
HEAS-P13	0.65	0.89	1.28	0.72	0.73

Note. M = Mean; SD = Standard Deviation; HEAS-P = Hogg Eco-Anxiety Scale–Persian version.

Internal Consistency and Test–Retest Reliability

The HEAS-P demonstrated excellent internal consistency (Cronbach's α = 0.94; McDonald's ω = 0.95). Subscale reliabilities were α = 0.91 for Emotional Symptoms, α = 0.89 for Behavioral Symptoms α = 0.88 for Anxiety about Personal Impact and α = 0.90 for Rumination. Test–retest reliability over a 4-week interval (n = 80) yielded r = 0.84 (p < .001), confirming good temporal stability.

Confirmatory Factor Analysis (CFA)

The factor (dimensional) structure of Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) was assessed using confirmatory factor analysis (CFA) with the maximum likelihood (ML) method. The four-factor model showed an excellent fit: χ^2 (59) = 149.73, p < .001, CFI = 0.96, TLI = 0.95, RMSEA = 0.041, SRMR = 0.034. All standardized factor loadings were significant (p < .001), ranging from 0.48 to 0.76 (Fig. 1).

Measurement Invariance of the HEAS-P across Gender

To evaluate measurement and structural equivalence of the HEAS-P across gender, a series of multi-group confirmatory factor analyses (MG-CFA) were conducted using the maximum likelihood estimation method. The analyses were performed sequentially to assess configural, metric, scalar, and factor variance invariance between female (n = 373) and male (n = 228) participants. In the configural model, where all parameters were freely estimated, the model demonstrated a good fit to the data (χ^2 = 715.6, df = 322, CFI = 0.953, RMSEA = 0.041, SRMR = 0.0422). Constraining the factor loadings to be equal across groups (metric invariance) resulted in minimal change in model fit (ΔCFI = − 0.002, ΔRMSEA = + 0.001), supporting equivalence of the factor loadings. Adding equality constraints on item intercepts (scalar invariance) also maintained an acceptable fit (CFI = 0.947, RMSEA = 0.047, SRMR = 0.049; ΔCFI = − 0.004, ΔRMSEA = + 0.002), indicating equality of latent means across gender. Finally, equality constraints were placed on the latent factor variances to test factor variance invariance.

The resulting model (CFI = 0.96, RMSEA = 0.041, SRMR = 0.051) showed only trivial decreases in fit indices (ΔCFI = − 0.003, ΔRMSEA = + 0.001), which are below the recommended cut-off criteria (ΔCFI ≤ 0.01, ΔRMSEA ≤ 0.015; Chen, 2007).

Therefore, factor variance invariance of the HEAS-P was supported across gender, suggesting that the variability of the latent well-being construct was statistically equivalent for both male and female adolescents (Table 2).

Table 2
Model Fit Indices for Gender Invariance Testing

Model	χ^2(df)	CFI	RMSEA (90% CI)	SRMR	ΔCFI	ΔRMSEA	Decision
Configural	715.6 (322)	0.953	0.045 (0.040–0.050)	0.046	—	—	Acceptable
Metric	736.1 (335)	0.951	0.046	0.047	−0.002	+ 0.001	Invariant
Scalar	762.7 (348)	0.947	0.047	0.049	−0.004	+ 0.001	Invariant
Factor-Variance	789.3 (349)	0.944	0.048	0.051	−0.003	+ 0.001	Invariant

Note. CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Residual.

Convergent and Discriminant Validity

Convergent validity was supported by significant positive correlations between HEAS-P total and subscale scores and related constructs (GAD-7, DASS-21, Environmental Worry; r = 0.16–0.32, p < .001). Discriminant validity was confirmed by low or negative correlations with theoretically unrelated constructs (Happiness; r = − 0.05 to − 0.16, ns or p < .01) (Table 3).

Table 3
Correlations among HEAS-P, anxiety, depression, stress, and happiness (N = 601)

	GAD-7	DASS			Happiness
		Depression	Anxiety	Stress	
Emotional Symptoms	0.26***	0.16***	0.25***	0.22***	-0.07
Behavioral Symptoms	0.22***	0.11**	0.20***	0.17***	-0.05
Anxiety About Personal Impact	0.32***	0.21***	0.30***	0.26***	-0.16***
Rumination	0.30***	0.22***	0.32***	0.28***	-0.16***
Total	0.31***	0.20***	0.31***	0.27***	-0.12**

N*ote.* **p** < .05; **p** < .01; ***p** < .001. GAD-7 = Generalized Anxiety Disorder-7; DASS-21 = Depression, Anxiety, Stress Scales; HEAS-P = Hogg Eco-Anxiety Scale–Persian version.

Incremental Validity

Hierarchical regression assessed whether HEAS-P predicted environmental worry beyond general psychological distress. In Step 1, DASS-21 subscales explained $R^2 = 0.41$. Adding HEAS-P in Step 2 significantly increased explained variance ($\Delta R^2 = 0.05$, total $R^2 = 0.346$), $F(1, 598) = 283.17$, $p < .001$. HEAS-P total scores remained a strong positive predictor ($\beta = 0.50$, $p < .001$), demonstrating incremental validity (Table 4).

Table 4
Hierarchical regression for incremental validity of HEAS-P

Predictor	β	t	p	R^2 / ΔR^2
Step 1				$R^2 = 0.41$
Depression	+ 0.22	+ 5.49	< 0.001	
Step 2				$\Delta R^2 = 0.05$
HEAS	+ 0.29	+ 4.55	< 0.001	

Note. HEAS-P = Hogg Eco-Anxiety Scale–Persian version. Step 1 controls for general psychological distress (DASS-21 subscales); Step 2 adds HEAS-P total score to evaluate incremental validity.

Discussion

The present study evaluated the psychometric properties of the Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) in a large sample of Iranian adults. Overall, the findings provide robust evidence that the HEAS-P is a reliable, valid, and culturally appropriate instrument for assessing eco-anxiety within a non-Western context that is highly vulnerable to climate change. By extending the validation of HEAS-13 to

Iran, this study contributes to the growing international literature on the measurement of climate-related emotional distress and addresses an important geographical and cultural gap.

Dimensional structure of eco-anxiety

Consistent with the original validation study (Hogg et al., 2021) and subsequent cross-cultural adaptations, confirmatory factor analysis supported the four-factor structure of the HEAS-P, encompassing emotional symptoms, behavioral symptoms, anxiety about personal impact, and rumination. This finding reinforces the conceptualization of eco-anxiety as a multidimensional construct that extends beyond generalized emotional distress. In line with contemporary theoretical perspectives (Pihkala, 2020; Clayton & Karazsia, 2020), eco-anxiety appears to involve not only affective responses but also cognitive preoccupation and behavioral interference, as well as moral and responsibility-related concerns regarding one's role in environmental degradation.

Importantly, the replication of this factor structure in an Iranian sample suggests that these core dimensions of eco-anxiety may reflect a relatively universal psychological response to environmental threats, even though the specific socio-political and environmental contexts differ across countries. This supports calls within environmental psychology to move beyond Western-centric models and test theoretical constructs in culturally diverse settings.

Reliability and temporal stability

The HEAS-P demonstrated excellent internal consistency at both the total scale and subscale levels, indicating a high degree of coherence among items measuring eco-anxiety-related experiences. Moreover, the strong test–retest reliability over a four-week interval suggests that eco-anxiety, as assessed by the HEAS-P, represents a relatively stable psychological state rather than a transient emotional reaction. This temporal stability aligns with prior research conceptualizing eco-anxiety as a chronic form of concern linked to ongoing awareness of environmental degradation and future-oriented threats (Clayton, 2017; Hickman et al., 2021).

Measurement invariance across gender

Measurement invariance analyses indicated that the HEAS-P operates equivalently across men and women, supporting configural, metric, scalar, and factor variance invariance. This finding is particularly relevant given mixed evidence in the literature regarding gender differences in environmental concern and climate-related distress. The establishment of invariance suggests that observed gender differences in eco-anxiety, if present, are likely to reflect true differences in the latent construct rather than measurement bias. From a methodological perspective, this strengthens the utility of the HEAS-P for comparative research and population-level assessments.

Construct validity and nomological network

Evidence for convergent and discriminant validity further supports the construct validity of the HEAS-P. As expected, eco-anxiety was moderately and positively associated with general anxiety, depression, and

stress, indicating shared variance with broader psychological distress. However, these associations were not so strong as to suggest conceptual redundancy, reinforcing the argument that eco-anxiety is a distinct psychological construct rather than a mere manifestation of general anxiety.

Notably, eco-anxiety showed negative associations with happiness, supporting discriminant validity and highlighting the potential well-being costs of persistent climate-related worry. At the same time, incremental validity analyses demonstrated that the HEAS-P explained unique variance in environmental worry beyond general psychological distress. This finding is particularly important for environmental psychology, as it underscores the added value of climate-specific measures in understanding individuals' responses to environmental threats. It suggests that eco-anxiety captures aspects of concern, responsibility, and cognitive engagement with climate change that are not adequately assessed by generic mental health instruments.

Implications for environmental psychology and applied contexts

The present findings have several implications for both research and practice. From a theoretical standpoint, the validation of the HEAS-P in Iran contributes to the cross-cultural robustness of eco-anxiety as a psychological construct and supports its relevance in regions experiencing acute environmental stressors, such as water scarcity, droughts, and extreme weather events. From an applied perspective, the HEAS-P offers researchers and practitioners a psychometrically sound tool for identifying individuals experiencing elevated eco-anxiety and for evaluating the psychological impact of climate-related events, policies, and interventions.

Importantly, recognizing eco-anxiety as a multidimensional and partially independent construct has implications for intervention design. Interventions targeting eco-anxiety may need to address not only emotional distress but also rumination, behavioral withdrawal, and feelings of personal responsibility, potentially integrating elements of meaning-focused coping, collective efficacy, and climate engagement.

Comparison with Previous Studies

Our results are consistent with the original validation study by Hogg et al. (2021), which also found a four-factor structure, high internal consistency, and significant associations with related psychological constructs. The Cronbach's alpha coefficients and factor loadings in the Persian version are comparable to those reported in Australia and New Zealand, supporting **cross-**cultural applicability of the HEAS-13.

The observed correlations with anxiety and depression (convergent validity) are in line with prior studies indicating that eco-anxiety is associated with general psychological distress, yet remains conceptually distinct. Discriminant validity was confirmed through low correlations with happiness, reinforcing that HEAS-P measures eco-anxiety rather than general well-being.

Implications for Practice

The HEAS-P can be used in both research and clinical practice in a practical and meaningful way. It can help clinicians and researchers identify individuals who are experiencing high levels of eco-anxiety and who may need psychological support. The scale is also useful for tracking changes in eco-anxiety over time, making it suitable for evaluating the effectiveness of interventions such as climate-focused therapy or educational programs. Beyond individual assessment, the HEAS-P can contribute to mental health policy and public awareness efforts by shedding light on how eco-anxiety is experienced within Iranian society. Importantly, because the scale captures aspects of environmental worry that go beyond general psychological distress, it allows practitioners and policymakers to design more targeted and climate-specific mental health responses.

Cultural Considerations

Iran, like many countries in the MENA (Middle East and North Africa) region, is directly impacted by climate change, including droughts, water scarcity, and extreme weather events. This study provides evidence that eco-anxiety is relevant in non-Western populations, consistent with global findings (Spano et al., 2025). The successful replication of the four-factor structure indicates that the psychological experience of eco-anxiety may have cross-cultural stability, although cultural nuances in expression and coping strategies should be explored in future research.

Strengths and Limitations

This study has several notable strengths. First, the large sample size (N = 601) provided adequate statistical power for confirmatory factor analysis and measurement invariance testing, enhancing the robustness of the findings. Second, the translation and cultural adaptation of the HEAS-P were conducted using a rigorous and standardized approach, supporting the cross-cultural validity of the instrument. Third, the study offered a comprehensive psychometric evaluation by examining multiple properties, including reliability, factorial structure, measurement invariance, convergent and discriminant validity, and incremental validity.

Several limitations should also be acknowledged. Data collection relied on online surveys, which may have limited the participation of individuals with restricted internet access and reduced the representativeness of the sample. In addition, the cross-sectional design does not allow for causal inferences or conclusions about changes in eco-anxiety over time. Finally, the study focused exclusively on Iranian adults; therefore, the generalizability of the findings to adolescents, older adults, or clinical populations remains uncertain and should be addressed in future research.

Future Directions

Future research should examine the predictive validity of the HEAS-P, particularly its ability to predict behavioral responses to climate change, such as pro-environmental actions or avoidance behaviors. Longitudinal studies are also needed to investigate how eco-anxiety fluctuates over time in response to

climate-related events or psychological interventions. In addition, cross-cultural validation studies in other Middle Eastern and non-Western populations would help clarify the broader applicability of the scale. Finally, further research should explore the clinical utility of the HEAS-P, especially among individuals with pre-existing anxiety or mood disorders, to determine its usefulness in clinical assessment and intervention planning.

Conclusion

The Persian version of the Hogg Eco-Anxiety Scale (HEAS-P) is a psychometrically robust instrument for measuring eco-anxiety in Iran. It demonstrates high reliability, stable four-factor structure, measurement invariance across gender, and sound construct validity. The HEAS-P provides researchers and clinicians with a comprehensive tool to assess eco-anxiety, enabling informed interventions and contributing to the understanding of environmental mental health in non-Western context.

Declarations

Ethics Approval

This study was conducted in accordance with the ethical standards of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of Kharazmi University (Approval No.: IR.KHU.REC.1402.087).

Consent to Participate

Written informed consent was obtained from all participants prior to their inclusion in the study. For participants under the age of 18, informed consent was obtained from their parents or legal guardians. In addition, Informed consent was obtained from all the experts involved in the study.

Consent for Publication

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

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Author Contribution

JH conceived the study, designed the research methodology, supervised all stages of the project, and led the data analysis and interpretation. JH also drafted the original manuscript and performed the major revisions. FJ contributed to data collection and assisted with preliminary analyses and manuscript preparation. Both authors read and approved the final manuscript.

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Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to ethical restrictions and the need to protect participant confidentiality, but are available from the corresponding author on reasonable request.

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Figures

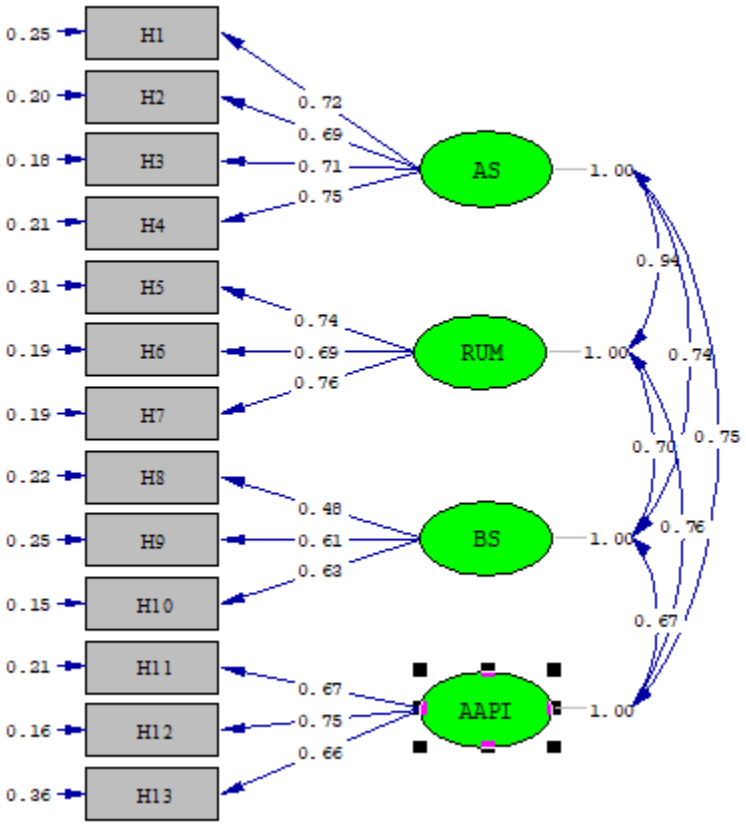


Figure 1

Standardized factor loadings for CFA