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Environmental Connection, Awareness, and Behaviors in University Students: An Exploratory Portuguese Study

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Abstract: Addressing the Sustainable Development Goals (SDGs) within universities is an urgent necessity. Understanding and measuring the environmental behaviors of university students is an essential initial step in this process. This study had two primary objectives: to translate and adapt the General Ecological Behavior (GEB) Scale for European Portuguese and to provide an exploratory analysis of environmental connection, awareness, and behaviors within a Portuguese university student sample. A convenience sample of 112 university students, aged 18–65, was surveyed using a paper-based, self-report questionnaire. This instrument included sections on sociodemographics, environmental concerns, preferences, and self-report measures (GEB, GAD-7, and PHQ-9). We present the translation and adaptation procedure for the GEB, alongside preliminary findings that suggest acceptable reliability, factorial validity, and discriminant validity. Moreover, exploratory data on environmental connection, awareness, and behaviors are discussed. This study provides a foundational measure for future research into pro-environmental behaviors in the Portuguese context and contributes preliminary insights into the environmental attitudes and behaviors of Portuguese university students. We urge future research to focus on the SDGs, examining factors, measures, and strategies to enhance pro-environmental behaviors.

Keywords: environment connection; environmental awareness; environmental behaviors; university students; exploratory study; General Ecological Behavior (GEB); Portugal

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1. Introduction

Humanity is facing a global environmental crisis, with recurrent phenomes as deforestation, air, water, and soil pollution, depletion of natural resources, climate change, and consequent ecosystem degradation, including habitat change and species loss. The United Nations 2030 Agenda document [1] synthesized and turned into much clearer goals that were already known as essential at least since 1992 with Agenda 21. Seventeen integrated Sustainable Development Goals (SDGs) that combine economic, social, and environmental dimensions were explicitly defined. It states that it is mandatory to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources, and taking urgent action on climate change, so that it can support the needs of the present and future generations. The SDGs include inclusive and equitable quality education at all levels and, provide children and youth with a nurturing environment for the full realization of their rights and capabilities. Simultaneously, SDGs include the ambition to promote physical and mental health and well-being for all.

The United Nations Report 2023 [2] argues that the world was not on track to achieving the SDGs, partly because of a confluence of crises—the ongoing pandemic, rising inflation and the cost-of-living crisis, and planetary, environmental, and economic distress, along with regional and national unrest, conflicts, and natural disasters. This 2023 not ended report concludes that the overall progress toward the 2030 Agenda has been severely disrupted in the last three years, yet every inch of progress matters and counts. Therefore, it also argues that there is an ever-greater urgency to speed up progress on the SDGs, taking a systematic and strategic approach to drive and accelerate transformations. They recommend activating synergies in six entry points. The first entry point is human well-being and capabilities, and it establishes the importance of universal social protection and health coverage, education, and promotion of human well-being as a co-benefit of other policies.

In 2017, the Australia, New Zealand, and Pacific Network of the Sustainable Development Solutions Network [3] published a guide on how universities can engage with SDGs. They began to explain the lack of previous guidance material and the difficulties and challenges faced by universities in this matter and pose that it is necessary to innovate through developing sustainability competencies, appropriate instruction, and carrying out practical work consistent with theory. Improve education in universities, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning is crucial to continue and to spread out the progress toward achieving the integrated SDGs. Although, despite the efforts and the results confirmed by some scarce recent studies [4], higher education continues to face a challenge in implementing adequately the SDGs and the translation into real practice of students' engagement, learning, and behavioral changes towards sustainability.

Recent studies in Portugal [5] showed that Portuguese Higher Education Institutions present considerable institutional variation, and they address practical implications related to the awareness of Portuguese higher education institutions of their role and responsibility in furthering SDGs, namely that the SDGs could be operationalized in several ways, as course objectives, development of competencies, teaching methodologies, and research by professors and students.

Taking into consideration both, the urgency of action, and the difficulties and challenges faced by universities, namely the Portuguese ones, it is urgent to develop research on innovative tools and methods of assessment and intervention in environmental education and integrated SDGs. The authors argue that universities have an important responsibility to act on environmental education and promotion of pro-environmental behaviors [6]. It is a consensual process to cultivate conscious and active young people, who are capable of making choices for climate mitigation [7]. Some recent studies found that university students already present a more adequate environmental behavior than other citizens, despite the difficulties and challenges already mentioned [4]; therefore, efforts at this level can have promising efficiency in the future.

Measuring the environmental attitudes of university students and understanding what drives individual behavior toward the environment is the first and necessary step to plan programs to promote pro-environmental behaviors and climate mitigation.

Environmental connection, awareness, and behaviors are scarcely studied by university Portuguese students. Cultural-based differences in environmental attitudes have been found [8,9]; therefore, any analysis of human–environment interactions that do not consider the critical role of cultural risks will be an incomplete understanding of such interactions. It requires the identification of cultural drivers of action [10].

Self-report questionnaires are usually the preferred way to measure environmental behaviors and a dispose of psychometric instruments are available. In Portugal, however, there seems to be a shortage of general assessment tools for ecological behavior, despite this being an increasingly emerging and urgent area globally. To our knowledge, the only instrument validated to Portugal to assess related variables to the theme is the "Environmental Attitudes Inventory" [11], originally developed by Milfont and Duckitt [12], which

aims to assess individuals' environmental attitudes based on a multidimensional construct, addressing different facets related to the preservation and use of nature.

General Ecological Behavior (GEB) [13–15] has been frequently used and pointed out as being probably the most robust and the best established of these domain-general propensity measures [16]. Overall, the GEB scale demonstrated acceptable reliability, internal consistency, and discriminant validity, inclusively in university students of other countries than the original [17]. In sum, GEB has proven to be a tool for assessing general ecological behavior cross-culturally, sensitive, and valid, and a general ecological behavior tool for the detection of potential situational influences [17].

We concur with the perspective put forth by Gould and Schultz [18], who argue that to comprehend and address environmental problems effectively, it is essential to focus on the underlying dimensions of human–nature connections. They define these underlying dimensions as the personal beliefs that individuals harbor about their connection with the natural environment. Gould and Schultz contend that these beliefs are critical for elucidating the connections between human behavior and environmental issues. They assert that the resolution of environmental problems necessitates an alignment between these foundational beliefs and the behavioral changes needed for sustainable transitions. Furthermore, they explore the challenges inherent in studying these underlying dimensions and provide suggestions on how they can be addressed.

According to Kaplan and Kaplan [19], the concept of 'nature connection' describes the interplay and relationship that individuals or communities maintain with their natural environment. The sense of connection to nature embraces an array of emotions and cognitions. These range from feelings of closeness or affinity towards the natural world, comprehension of the interdependence among all life forms, and a responsible attitude towards the Earth and natural resources [20]. For Mayer and Frantz [21], this connection to nature is a key component of fostering ecological behavior and must be studied by social psychologists (and ecopsychologists) to comprehend it on a continuum. On one side, an individual might exhibit negligible connection or appreciation for nature, whereas, on the other side, an individual might manifest a profound, intrinsic bond with nature, considering it a crucial part of their identity and well-being.

A growing body of research has shown that connection to nature is strongly associated with environmental concern and environmentally responsible behavior [22], although this is not consensual [23].

An increasing number of international studies have been dedicated to studying factors of environmental behaviors such as connection to nature and several instruments have been developed [20,21], although, to our knowledge, there are no validated instruments for Portugal to assess connection to nature. One study compared Portuguese university students to Brazilian students and found a good level of concern and environmental attitude [24], in accordance with the result of the considerations presented by Paço et al. [25]. Such a result indicates that the environmental concerns of the Portuguese nationals do not differ much from those expressed by the Spanish, German, and English ones, a result that was also found by Vicente-Molina et al. [26] and, accordingly, with results of Domingues and Gonçalves [11]. However, studies on the relationship between connection, awareness, and environmental behavior in Portuguese university students, with validated instruments, are needed.

The objective of this study is twofold:

(a) To translate and adapt an instrument to assess the environmental behaviors of Portuguese university students, the GEB;
(b) To analyze exploratory data of environmental connection, awareness, and behaviors in a Portuguese sample of university students.

In this study, we aim to address the following research questions:

(a) Is the Portuguese version of the General Ecological Behavior (GEB) scale an adequate tool for measuring environmental behaviors among university students? Specifically,

what are its psychometric properties, including reliability and construct validity, in a Portuguese university context?

(b) What are the relationships and factors observed in demographic characteristics, environmental questions, and facets of environmental connection, awareness, and behavior?

Based on the existing literature and theoretical frameworks, we put forth several hypotheses.

The Portuguese version of the GEB will exhibit satisfactory reliability and construct validity, making it a suitable measure of environmental behaviors among Portuguese university students.

Most of the Portuguese university students in the sample will

(a) Believe that climate change is primarily due to human activity;
(b) Recognize the impact of climate issues on both Portugal and the world;
(c) Express high levels of concern regarding these issues;
(d) Acknowledge the role of individual behavior in influencing the climate situation;
(e) Prefer, enjoy, and frequently engage in nature-related activities;
(f) Perceive nature contact as a source of well-being.

Furthermore, we hypothesize that older students will report higher levels of pro-environmental behavior. Stronger beliefs about the severity and impact of climate change will correlate with increased pro-environmental behaviors. Students who recognize the human contribution to climate change and believe in their capacity to mitigate its effects will report higher pro-environmental behaviors. A connection to nature, as evidenced by the enjoyment of nature contact, the belief in nature's contribution to well-being, and frequent engagement in nature-based activities, will significantly relate to higher levels of pro-environmental behavior.

2. Materials and Methods

2.1. Participants

Non-probability sampling techniques were used to recruit participants. The inclusion criteria for the sample were (1) aged between 18 and 65 years old; (2) being a student at the University of the Interior of Portugal; (3) ability to read and write Portuguese; and (4) having Portuguese nationality. Students with other nationalities were excluded, as well as non-completed answered surveys.

A paper version of the survey was administered to a convenience sample composed of 112 university students enrolled in the Faculty of Human and Social Sciences at a university located in the interior of Portugal.

2.2. Instruments

The study employed paper-based self-report surveys, which consisted of the following components:

(1) Sociodemographic questions;
(2) Environmental questions, concerns, and preferences related to the environment (adapted from International Social Survey Programme 2020 Module on Environment Final Source Questionnaire);
(3) Self-report measures: General Ecological Behavior (GEB), Generalized Anxiety Disorder (GAD-7), and Patient Health Questionnaire (PHQ-9).

Sociodemographic questions include nationality, age, gender, educational attainments, marital status, residential status, and number of family members.

Environmental questions, concerns, and preferences were adapted from the International Social Survey Programme 2020 Module on Environment Final Source Questionnaire and included the eleven questions presented in Table 1.

Table 1. Environmental questions.

Environmental Questions	Type of Question
Which of these issues is the most important for Portugal today?	Multiple choice—8 options
There has been a lot of discussion about the world's climate and the idea that it has been changing over the last few decades. Which of the following statements comes closest to your opinion?	Multiple choice—4 options
Generally speaking, how concerned are you about environmental issues?	5-point Rating Scale
On a scale from 0 to 10, how worried are you about the impacts of climate change will be for the world in the future?	11-point Rating Scale
What importance do you think your behavior has on the climate situation of the planet?	11-point Rating Scale
Here is a list of some different environmental problems. Which problem, if any, do you think is the most important for Portugal as a whole?	Multiple choice—9 options
In the last twelve months how often, if at all, have you engaged in any leisure activities outside in nature, such as hiking, bird watching, swimming, skiing, other outdoor activities or just relaxing?	5-point Rating Scale
In the last twelve months how often, if at all, have you engaged in any leisure activities outside in nature, such as hiking, bird watching, swimming, skiing, other outdoor activities or just relaxing?	5-point Rating Scale
In the last twelve months how often, if at all, have you engaged in any leisure activities outside in nature, such as hiking, bird watching, swimming, skiing, other outdoor activities or just relaxing?	5-point Rating Scale
What is your favorite activity to relax? Choose from the 10 options.	Multiple choice—10 options
How much, if at all, do you enjoy being outside in nature?	5-point Rating Scale
How much do you feel that contact with nature promotes your well-being?	10-point Rating Scale
Thinking about your neighborhood, to what extent, if at all, was it affected by the climate issues over the last twelve months?	5-point Rating Scale

Self-report measures used were GEB, GAD-7, and PHQ-9.

2.2.1. General Ecological Behavior (GEB)

The GEB intends to assess environmental attitudes and behaviors. The current version of this instrument consists of 50 self-report items. Participants respond to each specific behavior using either Part A—32 questions in a 5-point frequency format (never = 0 to very often = 5) and Part B—18 questions in a yes–no format (yes = 1 and no = 0). Not applicable as an alternative response was available when participants were unable to provide an answer. Not applicable responses (NA) were treated as missing values, as well as unanswered items. Kaiser and colleagues [14] suggested these behaviors can be grouped into six domains: energy conservation, mobility and transportation, waste avoidance, consumerism, recycling, and vicarious social behaviors toward conservation. In numerous previous studies, the instrument has been shown to be reliable [16,27]. Higher scores indicate better compliance with environmental protection. GEB was calibrated previously in its typical way [28,29] as a Rasch scale using the dichotomous Rasch model (see Rasch, 1960/1980). It seemed defensible to assess participants' ecological lifestyles also based on a unidimensional model [30]. The 50 items were used in this study to test its psychometric proprieties.

The GEB used in this study was translated into European Portuguese by the research team, using a translation–backtranslation procedure [31]; both the English and Portuguese versions were compared, and the most accurate Portuguese version of each item was chosen. Independent reviewers contributed with considerations revised by the coordinating team. Spelling and grammatical language verification were followed by a pre-testing with 15 university students (with equivalent characteristics to the participants). To accommodate cultural and social differences, some items were adapted into Portuguese, instead of literally translated [32]. For the present study, authorization was requested from the original author to translate, adapt, and test its psychometric properties. Figure 1 presents an overview of the translation process and the current exploratory validation process.

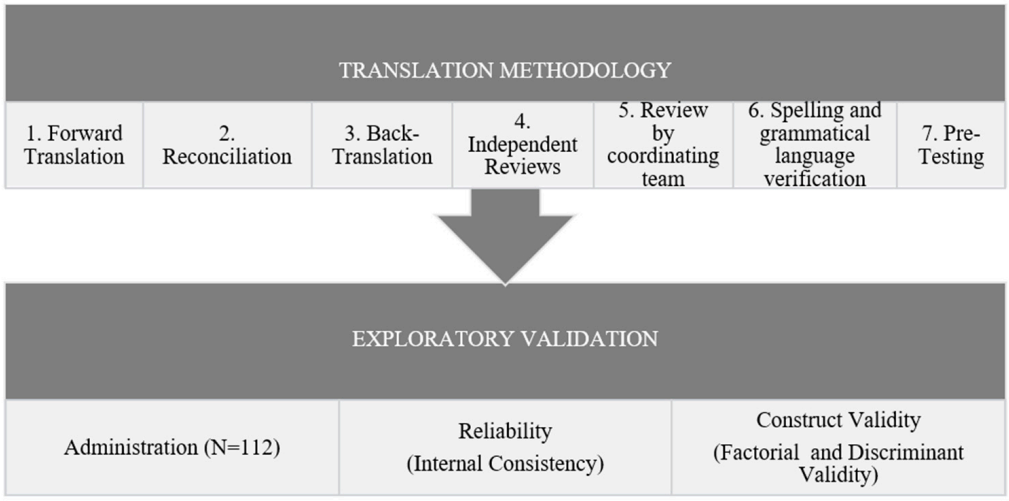


Figure 1. Overview of the process of translation and validation of the Portuguese version of the General Environment Behavior Scale.

2.2.2. Generalized Anxiety Disorder (GAD-7)

The GAD-7 [33] was used to assess anxiety symptomatology levels. It is a test composed of 7 items, with a Likert-type response scale, ranging from zero (rarely) to three (almost every day), aiming to assess the anxiety symptomatology, as well as its degree of severity. Thus, in this scale, the total score for the seven items varies between 0 and 21 points, with cut-off points classified as 5, 10, and 15, respectively, representing mild, moderate, and severe severity levels. Thus, a cut-off point of 10 or higher is considered a warning sign and may be a significant clinical condition, while a cut-off point of 15 is a strong warning sign and may indicate that the individual needs active treatment for anxiety. Considering its psychometric properties in its validation study for the Portuguese population, the GAD-7 was considered a valid and reliable measurement instrument [33,34].

2.2.3. Patient Health Questionnaire (PHQ-9)

The PHQ-9 [35] is a mental health screening instrument widely used in the general population, and it was used specifically for the assessment of depression symptomatology and its degrees of severity. It is an instrument that was initially derived from the Primary Care Evaluation of Mental Disorders (PRIME-MD), consisting of 9 items with a Likert-type response scale, ranging from zero (rarely) to three (almost every day), which allows the assessment of the symptoms of this disorder and their severity. The score can range from 0 to 27, being the greater the severity of symptoms the higher the total score obtained on the scale. Severity scores are classified as follows: 0 to 5 is no symptoms; 6 to 9, mild symptoms; 10 to 14, moderate symptoms; 15 to 19, moderate to severe symptoms; and greater than 20, severe symptoms. Regarding its psychometric properties, the PHQ-9 proves to be an adequate and valid test to be used in university students [36].

2.3. Procedures

All participants involved in this research were voluntarily invited to complete an anonymous survey in a paper format. The survey, estimated to take approximately 30 min to complete, was distributed directly by the research team to university students through a convenience sampling method. As a part of this process, the research team targeted accessible university students and handed out invitations for participation.

After receiving information about the study's goals and ensuring the confidentiality of the data, participants provided informed consent. The first pages of the survey included sociodemographic items and environmental questions and concerns.

Self-report instruments described were answered in the end (in the following order: GEB, GAD-7, and PHQ-9). Furthermore, participants were also reminded of any miss-

ing items prior to progressing to the next page, resulting in little missing outcome data. Answers were collected between May and June 2023. Participants' ethical treatment was safeguarded, in accordance with the Declaration of Helsinki [37] and the guidelines of the American Psychological Association [38]. The Ethics Committee of the University of Beira Interior (CE-UBI-Pj-2022-067) approved all the procedures of this study.

2.4. Statistical Methods

Descriptive statistics were calculated (percentages, mean scores, and standard deviations) for the sample's demographic, environmental questions, concerns, and preferences, as well as symptomatology screening results and GEB unifactorial results.

Reliability, through internal consistency, was measured using the following techniques and cut-offs: mean of the inter-item correlation (adequate if >0.30), corrected item-total correlation (adequate if >0.50) [39], and Cronbach's alpha (sufficient if >0.50 for early stages of research) [40].

Construct validity was determined by factorial and discriminant validity. Bartlett's test of sphericity and the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) [41] were performed for test sample adequacy. KMO criterion of 0.50 is barely acceptable [41]. Exploratory factor analysis (EFA) using the method of analyzing main components and varimax rotation was used to test preliminarily the model fit of GEB. To determine which items belonged to each factor, we extracted items if they loaded $\geq$ 0.4. In addition, we examined the number of factors based on parallel analysis using the rawpar.sps procedure [42]. Discriminant validity was assessed using the correlations with external criteria, examined through the correlation between GEB either with GAD-7 or PHQ-9. Following the guidelines presented by Ratner [43], the correlations were classified as weak (0–0.3), moderate (0.3–0.7), and strong (>0.7–1.0). Pearson correlation was used to test the association of GEB scores to GAD-7 and PHQ-9. It was also used to test the association of age variables.

For exploratory analysis of environmental awareness, connection, and behaviors, Spearman correlation coefficients were calculated to assess the association between variables. Additionally, the Mann–Whitney test was used to examine differences between comparison groups, namely with respect to gender and preference for relaxation activities in nature.

Statistical analyses were considered at a 0.05 significance level. All analyses were performed with Statistical Package for Social Sciences (IBM SPSS, Statistics version 21).

3. Results

A total of 112 university students between 18 and 65 years of age (Mage = 22.11; SD = 7.13) participated in the study. The majority (83.0%) identified as female, were single (92.9%), resided in urban settings (71.4 %), and were regular students (90.2%). Most participants were pursuing degrees in psychology (87.5%), while sociology students accounted for 11.6% of the sample. Most students (76.8%) affirmed the need to be separated from their family of origin due to attending college. Further, 51.8% reported residing in shared houses with colleagues or friends, 14.3% in college residences, 7.1% with parents or family members, and 5.4% mentioned living alone or in another situation.

The results obtained on screening symptomatology instruments (GAD-7 and PHQ-9) suggest that the majority of participants may be at higher risk for developing mental health problems. More specifically, regarding the PHQ-9 measure, 23.2% had moderate symptoms of depression, 18.8% had moderate to severe symptoms, and 12.5% had severe symptoms. Furthermore, analyzing the GAD-7 scores the results showed 42.8% of participants presented significant anxiety symptoms (GAD-7 > 10).

Table 2 shows the sociodemographic and clinical characteristics in more detail.

Table 2. Sociodemographic characteristics and clinical characteristics of the sample.

Variable	Category	n	%
Gender	Male	17	15.2
	Female	93	83.0
	Other	2	1.8
Marital Status	Single	104	92.9
	Married/marital partnership	7	6.3
	Divorced/separated	1	0.9
Place of Residence	Urban area	80	71.4
	Rural area	27	24.1
	Missing values	5	4.5
Household Number of Members	1	8	7.1
	2	12	10.7
	3	44	39.3
	4 and more	48	42.9
Year of Course	1	51	46.4
	2	38	34.5
	3	21	19.1
	Missing values	2	1.8
Student Residence	University residence	16	14.3
	Flat with another student	58	51.8
	Flat alone	6	5.4
	Flat/house with relatives	8	7.1
	Other	2	1.8
	Missing values	22	19.6
Student Status	Regular student	101	90.2
	Working student	10	8.9
	Missing values	1	0.9
PHQ-9 Degrees of Severity	No symptoms	27	24.1
	Mild symptoms 6–9	21	18.8
	Moderate symptoms 10–14	26	23.2
	Moderate to severe symptoms 15–19	21	18.8
	Severe symptoms > 20	14	12.5
	Missing values	3	2.7
GAD-7 Degrees of Severity	No symptoms	21	18.8
	Mild symptoms > 5	37	33.0
	Moderate symptoms > 10	20	17.9
	Severe symptoms > 15	34	30.4

3.1. Environmental Questions and Concerns

A notable portion of students expressed their concern about various issues affecting Portugal, specifically, 28.6% of respondents considered the economy as the most critical issue, while 17.6% prioritized healthcare, 10.9% education, 8.4% poverty, 2.5% immigration and criminality, and only 2.5% mentioned the environment. Interestingly, a significant proportion (12.6%) did not identify any of these issues as the most important or were unable to make a choice.

Regarding climate change, most students (73.7%) attributed it mainly to human activities, while 21.8% believed it was primarily due to natural processes. A smaller group (4.5%) considered climate change a result of both natural processes and human activities in equal parts.

Levels of concern about environmental changes yielded a median score of 4, with 43.8% of students falling into this category. Further, 17% of students expressed the maximum level of concern (5 points), while only one student claimed to have no concerns whatsoever.

The degree of concern expressed about future environmental changes yielded a median score of 8 on a scale from 1 to 10. Of the students surveyed, 14.3% expressed the maximum

level of concern. Moreover, 66.1% of students scored their concerns at a level between 7 and 10. Notably, no responses lower than 3 were recorded, and only 1.8% of respondents selected a level of concern lower than 5 (the middle level of the scale).

Remarkably, respondents indicated relatively low scores when asked about the level of importance they believe their behavior has on the planet's climate status. Only 9.8% of the respondents rated their impact as the maximum of 10 points, with an equal percentage assigning a score of 9 points. The median score obtained was 7, representing 18.8% of the responses. Furthermore, 21.4% of respondents chose a level of 8 points.

The majority of students identified "water scarcity" (23.2%) as the most significant climate problem for Portugal, followed by "use of our natural resources" (13.4%) and "air pollution" (9.8%). Only 8% selected "climate change". Interestingly, 2% of respondents did not consider any of the 9 options to be a climate problem for Portugal. A further 11.6% were unable to make a choice, and 16.1% did not provide an answer.

The majority of students reported engaging in leisure activities in nature several times a month (36.6%). The second most common response was participating in such activities several times a year (28.6%). A small percentage of respondents, 2.7%, reported daily engagement, while 11.6% reported involvement several times a week.

In question exploring relaxation methods preferred by university students, the most preferred methods included listening to music (30.3%), going for a walk in the fresh air (14.3%), watching TV series (12.6%), and enjoying views of the sea (10.1%), selected from a list of 10 options. Interestingly, activities involving contact with natural resources were significantly disfavored, with 39% of respondents opting for these methods compared to 62%.

The majority of respondents reported enjoying being in nature, with the median score being the maximum value of 5 (55.4%), followed by a score of 4 (31.3%). Notably, no respondents selected the minimum value, and only one student opted for a score of 2.

Similarly, the majority of respondents reported that contact with nature promotes their well-being at the maximum level of 10 points (40.2%), followed by responses of 9 points (20.5%), and 8 points (19.6%). Notably, no responses lower than 3 were recorded, and only one student each chose scores of 3, 4, and 5.

Interestingly, the majority of respondents (40.2%) reported experiencing minimal effects from climate issues over the past year, followed by a moderate level of impact (25.9%) and no impact at all (21.4%). A smaller proportion (8.9%) indicated experiencing substantial effects from climate issues, with only 3 students choosing the maximum impact level of 5 points.

3.2. Portuguese General Ecological Behavior (GEB)

Upon administering the questionnaire to a pilot group of 15 participants, with the intent to gather feedback on the translation and adaptation of the GEB scale for a Portuguese context, it was concluded that the items generally appeared to be well-formulated and easily understood.

3.2.1. Description of GEB

Means and SDs for the Portuguese version of the GEB items are presented in Table 3. The lowest average corresponds to item 7 of the Scale Part of the Yes/No items (M = 0.06, SD = 0.40) and the highest to item 32 of the Scale Part with 5-point items (M = 4.57, SD = 1.08). The total average of the Preliminary Portuguese version of the Ecological General Behavior (GEB) was 97.82 (SD = 13.27).

Table 3. Description of GEB items (n = 112).

Scale Part A 5-Point Format Items	Mean	SD
1	2.52	1.61
2	2.38	1.05
3	2.31	0.90
4	2.48	1.56
5	4.33	1.05
6	2.44	1.80
7	1.38	0.81
8	3.29	1.84
9	1.62	1.36
10	3.51	1.21
11	2.45	1.37
12	3.06	1.30
13	3.67	1.35
14	2.60	1.32
15	1.38	0.79
16	2.92	1.22
17	2.45	1.41
18	2.68	1.33
19	2.89	1.24
20	1.02	1.09
21	1.48	1.24
22	3.60	1.33
23	1.99	1.35
24	2.87	1.11
25	2.88	1.09
26	1.96	1.55
27	2.13	1.76
28	2.63	1.92
29	2.04	1.09
30	3.92	1.64
31	1.64	1.35
32	4.57	1.08
Scale Part B Yes/No Items	**Mean**	**SD**
1	0.99	0.25
2	0.27	0.55
3	0.94	0.33
4	0.46	0.75
5	0.07	0.34
6	0.46	0.55
7	0.06	0.40
8	1.45	1.31
9	1.43	1.05
10	1.04	0.33
11	0.41	0.67
12	1.52	1.32
13	1.69	1.34
14	0.66	1.11
15	0.38	0.81
16	1.41	1.16
17	1.29	1.29
18	0.25	0.63

SD: standard deviations.

3.2.2. Exploratory Factor Analysis and Reliability

Prior to conducting the main components method, Bartlett's test of sphericity was performed, and the Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO) was evaluated. The results showed Bartlett's test of sphericity was significant (C2 (1225) = 2200.6, $p < 0.001$), and the KMO value was >0.5 (KMO = 0.524) indicating that factor analysis was low but barely acceptable for the present dataset. In our study, factor loadings and eigenvalues were considered as criteria for retaining items in factors. Parallel analysis was also undertaken using the rawpar.sps procedure [42], using 1000 parallel datasets, principal components analysis, and permutations of the raw dataset. As such, the parallel analysis indicated an eight-factor solution. Subsequently, the analysis of factorial structure was forced to extract eight factors according to the main components method accounting for 45.8% of the total variance.

The Cronbach's α internal consistency coefficient for the GEB scale was 0.60, indicating a total alpha value that is low but acceptable according to the criteria of Nunnally [40] for the early stages of research. Furthermore, none of the items substantially affected the total reliability coefficient of the GEB scale if they were deleted.

Regarding the Cronbach's alpha coefficient analysis for factorial structure obtained, the results show the first factor comprised six items (preliminary validation sample $\alpha = 0.49$; eigenvalue = 5.08), the second and the third is composed of five items (preliminary validation sample $\alpha = 0.67$; eigenvalue = 4.14 and preliminary validation sample $\alpha = 0.69$; eigenvalue = 3.01, respectively). Likewise, the fourth factor comprised seven items (preliminary validation sample $\alpha = 0.69$; eigenvalue = 2.26), the fifth and sixth were composed of five items (preliminary validation sample $\alpha = 0.25$; eigenvalue = 2.22 and $\alpha = 0.02$; eigenvalue = 2.17). Finally, the seventh factor comprised four items (preliminary validation sample $\alpha = 0.55$; eigenvalue = 1.99), and the eighth had a preliminary validation sample $\alpha = 0.05$; eigenvalue = 1.92.

3.2.3. Discriminant Validity

Correlation analyses were conducted between General Ecological Behavior (GEB) and psychological distress variables (PHQ-9 and GAD-7) to determine if the scales assess distinct constructs. The results did not reveal statistically significant correlations, thereby suggesting the discriminant validity of the GEB in relation to the assessment of psychological distress within this sample.

3.3. Exploratory Data on Environmental Connection, Awareness, and Behaviors

GEB total score is significantly related to the age of university students (r = 0.21, $p = 0.03$); level of concern about environmental change (rS = 0.24, $p = 0.02$); level of concern about climate change in the future (rS = 0.27, $p < 0.01$); level of importance that students think their behavior has on the climate situation of the planet (rS = 0.22, $p = 0.03$); level of enjoyment being outdoors in nature (rS = 0.23, $p = 0.02$); and the level of well-being that students feel that contact with nature promotes (rS = 0.29, $p < 0.01$).

No significant relation was observed between the GEB score and the frequency of activities in nature in the last year, nor the extent reported, to which neighbors were affected by climate issues.

Students who prefer relaxing activities in nature (Mdn = 103) exhibited significantly more pro-environmental behaviors, as evaluated by GEB score, than those who do not prefer relaxing activities in nature (Mdn = 98.5), U = 828.5, z = −2.66, $p < 0.01$.

No statistically significant differences were observed in GEB scores concerning the gender variable or the academic course variable.

4. Discussion

The primary aim of this study was to translate and adapt the General Ecological Behavior (GEB) instrument, thereby providing a tool for assessing environmental behaviors

among university students. This work establishes a domain-general propensity measure that can be further used to study the Portuguese population.

The second aim of this study was to explore data on environmental connection, awareness, and behaviors among a sample of Portuguese university students, thereby contributing preliminary knowledge to this field in Portugal.

This study's findings suggest that the factor validity and reliability of the GEB are marginally acceptable in this initial phase. However, it is imperative to continue data collection for further analysis and refinement of the GEB's factor model. Future work should also explore its convergent validity, re-evaluate its factorial structure using alternative methods like principal axis factoring, and perform confirmatory factorial analysis. Given that several studies have affirmed the validity of the GEB [16], particularly among university students [17], its continued exploration holds significant potential for further enlightening our understanding of this field.

Nevertheless, our results indicate that the surveyed university students did not perceive environmental issues as a primary concern for Portugal, and they reported minimal impact from climate-related problems. While some authors suggest that this lack of environmental awareness can lead to reduced engagement in pro-environmental behaviors [44], our study did not find evidence to support this assertion.

Interestingly, more than 20% of respondents believe that environmental changes are primarily due to natural processes, while only a small fraction (9.8%) are certain about the impact their behaviors have on the planet's climate status. Even so, a significant proportion of more than 60% express high concern about these changes. As some scholars have pointed out, this discrepancy or lack of awareness can diminish engagement in pro-environmental behaviors [44], while environmental concerns can increase it [8]. Thus, the associations found in this study between beliefs, perceived behavioral impact on the planet's status, and the measure of pro-environmental behavior, are consistent with this perspective.

It is surprising that while the majority of students enjoy contact with nature and believe it contributes to their well-being, they reported a low frequency of nature-related activities and a preference for relaxation activities that do not involve nature. Similarly, other studies, particularly those involving Spanish university students, have identified incongruities between beliefs and daily pro-environmental behaviors [4]. This finding becomes more significant given that students who prefer relaxation activities in nature reported significantly more pro-environmental behaviors. We can conclude that despite the presence of an affective nature connection, behaviors promoting practical engagement with nature could be of crucial importance for fostering pro-environmental behavior efficiently.

The implications of these findings are important to underscore, as they suggest that facilitating access to nature-based activities could enhance pro-environmental behaviors. Furthermore, educational initiatives highlighting the importance of environmental issues to specific regions could foster greater awareness and pro-environmental behavior. Chuvieco et al. [8] also advocate for environmental education, arguing that universities need to modify their current approaches to offer more comprehensive perspectives on environmental problems, including a focus on ethical considerations and practical behavior. The strategies under consideration should be integrated with previously proven effective interventions, such as cognitive dissonance, goal setting, social modeling, and prompts [45].

The level of concern, verified in our study, was not found to be related to pro-environmental behaviors consensually [8], but it is accordingly with the few studies performed with Portuguese university students [11,24–26]. Our study did not find significant differences based on gender, which is inconsistent with findings from other studies [8]. However, the year of the academic course and the course field are also not found in other studies [8]. These discrepancies might be attributed to our study's sample size and homogeneity. Hence, future research should continue to investigate these variables to better understand their influence on environmental behavior.

Another significant finding from our study pertains to the high levels of anxiety and depression among the university students. Even though data was collected during

an academically stressful period of exams, the results underscore the urgent need to prevent, assess, and address mental health issues among students, particularly prior to evaluation periods. Environmental activities and contact with nature could also be explored as strategies to promote mental health in this population. After all, combining mitigation strategies with health-promoting activities can lead to co-benefits for both human health and environmental protection, thus bolstering planetary health [46] and contributing to two interconnected Sustainable Development Goals (SDGs).

The primary limitation of this study is related to the sample. Convenience sampling, especially with a small sample size, may not provide a fully representative sample of the overall population. Our sample is specifically drawn from university students in the interior of Portugal, a region with abundant access to nature where the effects of climate change are not acutely perceived. Many researchers in this field argue that a significant challenge with climate issues is the paradox wherein those who contribute most to the problem often feel the least impact of its consequences [47]. Despite the fact this sample could be not fully representative of the overall population, a homogenic sample in this initial phase was based on the reduction in confounding effects of heterogeneity.

Future studies should continue to explore this field with a larger and more diverse sample size, including a wider variety of institutions and academic courses, and employ more rigorous sample selection criteria.

Studies of more instruments and methodologies to study connection with nature and environmental behaviors are needed, namely with implicit association tests of nature connection as suggested by other authors [18].

5. Conclusions

In summary, this study has provided a domain-general propensity measure for pro-environmental behaviors, offering a foundation for future research in the Portuguese context. It has also contributed preliminary knowledge about the environmental connection, awareness, and behaviors of Portuguese university students. The results underscore the importance of enhancing environmental awareness and pro-environmental behaviors through efficient educational strategies at universities. Facilitating access to nature-based activities emerges as a particularly promising approach, given its potential to promote both human health and environmental protection simultaneously.

However, given the limitations of the current study, further investigation is required. We especially encourage future research dedicated to the Sustainable Development Goals (SDGs) and the examination of diverse samples, factors, measures, and strategies to enhance pro-environmental behaviors.

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