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Eco-Anxiety and Trust in Science in Spain: Two Paths to Connect Climate Change Perceptions and General Willingness for Environmental Behavior

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Abstract: This article aims to better understand the mechanisms that connect climate change perceptions and general willingness to engage in pro-environmental behavior using Spanish cross-sectional data (N = 403) that included 102 members of environmental organizations. To do this, we first developed and validated the General Willingness for Environmental Behavior Scale (GWEBS), which includes the classical approach of voluntarily doing new actions but also actions implying not doing things (degrowth) and actions forced by social constraints. The exploratory and confirmatory factor analysis showed a good fit for the one-factor structure, which had adequate validity based on their relationship with other variables. Additionally, the GWEBS distinguished between women and men, left- and right-oriented people, and people who belonged to pro-environmental groups and people who did not. In the second place, we tested the parallel mediator role of eco-anxiety and trust in science in the relationship between climate change perceptions and the GWEBS. The results showed that eco-anxiety fully mediated and trust in science partially mediated such a relationship, making them crucial in terms of mobilizing the intention to act according to perceptions. This study contributes to understanding the psychological mechanisms that eventually drive pro-environmental behaviors and provides a clear direction for future research.

Keywords: eco-anxiety; trust in science; climate change perception; environmental behavior

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1. Introduction

The global environmental crisis is one of the most pressing issues of the 21st Century [1]. It includes various ecological crises happening in the world today, including climate change. The scientific evidence for anthropogenic climate change is overwhelming, and 97% of peer-reviewed papers accept that global climate change results from human activities [2,3]. Before this situation, feeling eco-anxiety should be a common human reaction. Still, this is not the case, and most people keep buying, consuming, and acting as if nothing is happening. The current mission of science, as well as psychology, is to promote social change and, with it, the pro-environmental behaviors that can reverse or at least stabilize the situation [4]. This is not always easy because when it comes to acting pro-environmentally, there is not one behavior but many that have very different scopes. Only Stern [5] proposed up to four major categories of pro-environmental behaviors and their subsequent subcategories more than two decades ago.

For these reasons, our objectives are as follows. Firstly, we developed an emotional measure of willingness to engage in environmental behavior, which is not reducible to any particular pro-environmental behavior but open to all, and second, we analyzed whether eco-anxiety and trust in science reinforce the connection between the perception of the climate situation and willingness to act pro-environmentally. This is especially important in the Spanish context in which, according to the Transatlantic Trends 2023 report by the

German Marshall Fund, climate change is the top global challenge concern for Spaniards, ahead of other major political, economic, and social issues, including the war over Russia's invasion of Ukraine [6]. It is surprising that given the perceived seriousness of the problem, most studies with Spanish samples have been only a part of eminently descriptive studies that do not address why people do not act as they think (e.g., [7,8]).

1.1. Perception and Behavior: An Essential Path but Not Sufficient

It is assumed that perceptions about climate change play a role in whether people take actions to mitigate their environmental impacts and whether they support government climate policies [9–14]. In this respect, reliable perceptions about climate change can be considered to have been a success across many disciplines in recent decades, making us aware of the incredible variety of climate change consequences. Such perceptions can be regarded as indisputably necessary, and there are good current models to explain what these variables depend on [15–17].

However, it is also well known that good perceptions of reality do not necessarily connect with coherent behaviors [10,18,19]. Many other variables may also explain why good perceptions about the situation are necessary but not enough to change behaviors and make significant impacts. One of them is behavioral intention, proposed long ago by the Theory of Planned Action that, above all, emphasizes the need to use variables at the same level of abstraction [20,21]. This means that in order to predict any pro-environmental behavior, for example, recycling, the best predictor will not be the pro-environmental attitude (too general) but the behavioral intention to recycle in a specific period.

An additional difficulty in the context of the climate crisis is that the pro-environmental behaviors and their corresponding specific behavioral intentions are innumerable, of very different scopes, and even of a different nature [5,22–24]. The possible universe of pro-environmental behaviors is so extensive that it can be considered pure arbitrariness to choose some to the detriment of others. Why are recycling, cycling, and saving energy better indicators than composting, cooking with a lid, and sticking to museum paintings? Furthermore, it must be taken into account that people not only do what they want, they do what they can, given their social conditions [25]. Trying to predict specific sets of pro-environmental behaviors that are subjectively grouped and that, in addition, may depend not only on psychological factors, can be a problem for researchers. In this respect, researchers need something more complex than one specific behavioral intention item to study the psychological mechanisms that promote multiple behaviors in line with what improves or at least does not worsen the environmental crisis. So, our first objective was to develop a new measure of general willingness to act pro-environmentally to which psychological variables such as eco-anxiety can be connected and which, in turn, are connected to very different sets of pro-environmental behaviors.

1.2. Eco-Anxiety: An Unpleasant Consequence That Precedes Willingness to Engage in Environmental Behavior

Nowadays, feeling anxious about the state of the planet appears to be universal [26], with evidence currently emerging from Europe [27,28], America [29], Canada [30], the Pacific Islands [31], and China [32]. In Spain, the levels of eco-anxiety seem to be among the highest in Europe (only behind Germany), with 55.2% of the population experiencing unpleasant emotions in this regard [7]. Despite this, there is much to study about its role and optimal level in promoting consistent behaviors that should resolve the causes where it originates.

Technically, eco-anxiety is described as any anxiety related to the global ecological crisis, including climate anxiety [33–35]. This broader perspective that examines anxiety in relation to a multitude of environmental issues places eco-anxiety at a high level of abstraction. That is why most authors define it as an emotional reaction of concern, worry, and fear, given global climate change threats and concurrent environmental degradation [36].

Such a general perspective does not prevent eco-anxiety from being understood as a multi-faceted concept [37]. At least four dimensions have been studied: affective symptoms, behavioral symptoms, negative emotionality, and rumination [38]. Because these underlying dimensions seem to be distinct from stress and depression, there is some consensus when considering eco-anxiety as a rational reaction to the enormity of the ecological threat humanity and the planet is facing [38]. In this respect, it would be considered a "practical anxiety" [39], leading to problem-solving attitudes [35,40] and pro-environmental actions [41].

Although experiences of anxiety relating to environmental crises include negative emotions, feelings of unpredictability, and uncontrollability, all of which are classic ingredients of anxiety disorders [35], most forms of eco-anxiety can be considered non-pathological. This non-pathological eco-version of anxiety is currently being associated with pro-ecological worldviews, green self-identity, and specific pro-environmental behaviors such as saving energy in the household, trying to influence family and friends to act pro-environmentally, taking public transportation instead of driving, or avoiding food waste [8,24]. These initial results suggest that eco-anxiety would not always be a state to be resolved or avoided but rather a desirable state that, together with other variables, such as trust in science that provides cognitive security to the unpleasant atmosphere created by eco-anxiety, can play an active and positive role in promoting a wide range of pro-environmental behaviors.

1.3. Trust in Science as a Metacognition of Confidence in One's Own Beliefs about the Climate Crisis

The scientific literature is the most trusted source of information about climate change [42,43]. It is estimated that there is 98% agreement amongst climate scientists that it is real and human-caused [44,45]. Although skepticism about climate change seems to be prevalent and tries to find support for scientific arguments [43,46], it is estimated that climate change denial or skepticism is less widespread than often assumed [47,48]. Therefore, trust in science mostly means confidence about one's own climate change beliefs, that is, the existence and danger of climate change.

Additionally, when people's ability and motivation to carefully process scientific information is limited, which is the case for most people most of the time [49,50], it is expected that people will use the message source as a heuristic cue to evaluate the message, with more congruent changes in response to scientific sources [51,52]. This seems to be the case for the Spanish population, where more than 60% of people consider that scientists are contributing "a lot" or "quite a lot" to face this severe global challenge [6].

Since trusting in science can exempt us from thinking carefully, it is possible to suggest that it can work as a form of metacognition that provides cognitive confidence and security in one's perceptions of climate change. This heuristic security in relation to the information source could play a relevant role in motivating pro-environmental behavior in any of its multiple formats.

Generally, trust in science has been associated with greater concerns about environmental issues [43,53]. It has also been associated with political ideology, with liberals being more likely than conservatives to trust science as a source of information about climate change [54]. These connections are promising, but much work remains to outline the role of trust in science concerning other variables. In this respect, we anticipated that trust in science could be the perfect partner for eco-anxiety, adding cognitive security to the emotional discomfort provided by eco-anxiety.

1.4. Objectives and Hypothesis

With the general objective of contributing to the understanding of the many psychological mechanisms that promote the huge number of pro-environmental behaviors on which stopping the climate emergency currently depends, we set two specific objectives: (1) developing a measure of the general willingness to engage in environmental behavior that makes

connections possible at a high level of abstraction in terms of the psychological variables; and (2) testing two indirect paths that, through the unpleasant emotion of eco-anxiety and the metacognition of trust in science, enable connecting climate change perceptions with a general willingness to engage in environmental behavior. These two related objectives can be useful when researching and designing policies and communication strategies to coordinate increasingly individual efforts against climate change.

Regarding objective 1, we started from the idea that using a single item to evaluate the intention to act in favor of the environment is simple and very common [55,56] but perhaps insufficient in terms of capturing its true meaning, especially if we take into account the great diversity of pro-environmental behaviors. They may imply doing (i.e., using public transport and planting trees) and the opposite, not doing (i.e., not consuming and not wasting), and also adhering to doing and not doing at the request of governments that legislate these policies, forcing and prohibiting the entire population from doing and not doing certain behaviors. In this regard, from 3 July 2021, the Directive EU 2019/904 on single-use plastics (single-use plastic plates, cutlery, straws, balloon sticks, and cotton buds) has been in force, and these items cannot be placed on the markets of EU Member States. Evaluating the degree of acceptance or rejection relating to social impositions that affect the freedom of all individuals in a society will not only lead to more reliable and precise intentional measures but will also allow for the design of restrictive policies that are necessary but that governments are afraid to undertake [57].

Upon reviewing the existing literature and drawing from our conceptualization of a general willingness to engage in environmental behavior, we developed four novel items aimed at assessing four distinct content areas: emotional inclination to contribute, readiness to abstain from activities harmful to the environment (primarily degrowth and reduced consumption), perceived likelihood of engaging in additional pro-environmental actions, and openness to societal restrictions. These items collectively capture our conception of general willingness toward environmental behavior, characterized by its emotional essence and expansiveness across various behaviors. Initially drafted in Spanish, the items were translated into English, as presented in Table 1. We hypothesized a one-factor structure, suggesting a latent construct comprised of four observed variables (H1). Regarding objective 2, we hypothesized that perceptions about climate change [48] would be related to the previously developed General Willingness for Environmental Behavior Scale (GWEBS) through eco-anxiety [38] and trust in science (H2). In this regard, we started from the empirical evidence that each variable has shown some connection with specific pro-environmental behaviors or intentions but not in relationship models of several variables and not with Spanish samples. Because being female and holding liberal political views are generally associated with higher climate change risk perceptions and willingness to take action to mitigate climate change [16,54,58,59], we controlled gender and political orientation in our mediation model. Additionally, we controlled different levels of environmental sensitivity operationalized in this study, such as belonging to an environmental group.

Table 1. The table shows the sociodemographic information of the participants.

Variable	N	%
Gender		
Women	257	64.1
Men	142	35.4
Educational attainment		
Primary school	7	1.7
Secondary education/vocational training	60	14.4
University education	327	80.9

Table 1. *Cont.*

Variable	N	%
Place of residence		
Spain	403	100
Other	0	0
Environmental activism		
Yes	102	25.5
No	301	74.5
Political orientation		
Left	271	67.6
Right	130	32.2

Note. N total = 403.

2. Materials and Methods

2.1. Participants and Procedure

The participants were recruited between March and June 2023 via a questionnaire launched with the snowball mechanism sent through mail and social networks. We aimed to ensure diversity in the composition of the sample by considering factors such as age, gender, educational level, residency (within or outside of Spain), political orientation, and environmental activism status (registered with an ecological association). To ensure that our sample included activist individuals, we contacted four national environmental associations, who sent the questionnaire to their members through their internal channels. The participants were required to fulfill the following eligibility criteria to participate in the study: (a) be at least 18 years old, and (b) hold Spanish citizenship. All of the participants were given an informed consent form outlining the study's objectives, the investigation procedure, the estimated duration, and the principles of confidentiality and anonymity. The participants willingly volunteered for the research and could withdraw at any time. Furthermore, the participants were given the email address of one of the researchers in case they required assistance with any issues arising from their participation. After completing an informed consent form, the participants were asked to complete the questionnaire individually and in a quiet place with the fewest possible distractions. Given the online nature of the study, data collection was facilitated through the use of Google Forms, utilizing a non-probabilistic sampling method. The university ethics committee approved the study's procedures (Ref. 0407202327123), and it was carried out in compliance with the ethical standards of the Declaration of Helsinki.

Given the variables involved in this study, the target sample size was predetermined accordingly through an a priori statistical power analysis using G*Power 3.1 [60]. Assuming a small effect size of f2 = 0.02, with a = 0.05 and power = 0.80, the needed sample size was N = 395. In total, the sample was composed of 403 participants of Spanish nationality, with an age range between 18 and 81 years (M = 42.74, SD = 14.91). The complete sociodemographic data are shown in Table 1.

The Climate Change Perceptions Scale (CCP) [48] measures five dimensions of climate change: the perceived reality, human causes, negative consequences, spatial proximity, and the temporal distance of its implications. We used the short version of five items (1 = completely disagree; 5 = completely agree). The items were as follows: 'I believe that climate change is real' (reality); 'The main causes of climate change are human activities' (causes); 'Climate change will bring about serious negative consequences' (valence of consequences); 'My local area will be influenced by climate change' (spatial distance of consequences); and' It will be a long time before the consequences of climate change are felt' (temporal distance of consequences. R). Cronbach's alpha was 0.82.

The Hogg Eco-Anxiety Scale (HEAS-13) [38] measures anxiety in response to the global environmental crisis through four underlying factors: affective symptoms, behavioral symptoms, negative emotionality, and rumination. It focuses on enduring and non-pathological forms of anxiety. A 6-month time frame was used as per the instructions to ensure the stability of the measure, stating the following: "Over the last six months, how often have you

been bothered by the following problems when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)? Some example items are listed as follows: "Worrying too much" (affective symptom), "Unable to stop thinking about past events related to climate change" (rumination), "Difficulty working and/or studying" (behavioral symptom), and "Feeling anxious about the impact of your behaviors on the earth" (negative emotionality). The range of responses on the scale was as follows: 0 = not at all; 1 = several of the days; 2 = over half the days; and 3 = nearly every day". Cronbach's alpha was 0.91.

Concerning the credibility of science, we used a single item to ask participants about their level of agreement with the following sentence: "I trust the veracity of the information on the climate crisis offered by science". The responses ranged from 1 = strongly disagree to 4 = strongly agree.

2.2. Data Analyses

First, to develop a global measure of willingness to behave in favor of the environment, following a cross-validation approach, the total sample was divided randomly into two equal-sized subsamples using the SPSS program, version 28. The M age of the first group was 41.83, with an SD of 15.16. The subsample has an M age of 44.07 years and an SD of 14.91. We used the first subsample to obtain descriptive statistics for the items and to observe whether they fit a normal distribution. We tested the multivariate normal distribution assumption using the Mardia test in R software (version 3.6.3 [61]). Subsequently, after checking the matrix data with the Kaiser–Meyer–Olkin coefficient (KMO) and Bartlett's test—to discern whether there was an adequate intercorrelation between items—we also performed exploratory factor analysis (EFA). This allowed us to examine the distribution patterns of the items and the underlying dimensions using principal axis estimation and direct oblique rotation [62]. We retained the dimension numbers based on a parallel analysis and the goodness of model fit [63].

Secondly, we conducted confirmatory factor analysis (CFA) using the first subsample in R software [61]. The CFA utilized robust maximum likelihood estimation, and model fit was assessed through the use of various indices, including the chi-square (χ^2) test, comparative fit index (CFI), Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA) with a 90% confidence interval, and standardized root mean square residual (SRMR). For RMSEA, values less than or equal to 0.08 indicated excellent fit, and values less than or equal to 0.06 indicated good fit. TLI values above 0.95 and between 0.90 and 0.95 indicated excellent and acceptable fit, respectively. SRMR values less than or equal to 0.08 indicated excellent fit [64]. Once the model fit was confirmed, the second sample was utilized for cross-validation. Subsequently, factor coefficients were obtained using CFA analysis with the total sample. The R program was used in these procedures. Later, with the total sample, to evaluate the reliability, convergence, and discriminant validity of the model, we utilized Cronbach and Omega's alpha coefficients, composite reliability (CR, with 0.70 or higher indicating good model reliability), average variance extracted (AVE, with 0.50 or higher indicating proper convergence), and the square root of the AVE (which should be higher than the highest correlation with any other latent variable) [65].

Third, to assess the validity of the evidence based on its relationships with other variables, we computed the Pearson correlations of the GWEBS with climate change perceptions, eco-anxiety, and trust in science. Correlations ranging from 0 to 0.3 are considered weak, those ranging from 0.3 to 0.5 are considered moderate, those ranging from 0.5 to 0.7 are considered strong, and those ranging from 0.7 to 1 are considered very strong, whether positive or negative [66].

Fourth, we assessed various levels of measurement invariance across gender, environmental activism, and political orientation using multigroup confirmatory factor analyses (CFAs). The less restrictive, or configural, model aimed to determine whether men and

women, activists and non-activists, and individuals with left and right political orientations conceptualized a general willingness to engage in environmental behavior similarly. This model estimated the same structural model for both groups without imposing any constraints on parameters such as loadings, thresholds, and item variances. The metric invariance model introduced constraints by setting factor loadings that were equal across groups, assessing whether men and women, activists and non-activists, and individuals with left and right political orientations interpreted the items on the GWEBS similarly. A scalar model further imposed constraints by fixing thresholds equal across the groups, examining whether latent factors exhibited identical item scores for different subgroups. Subsequently, we applied a strict invariance model, which set loadings, thresholds, and item variances to the same values across groups, allowing for an assessment of whether measurement error was consistent between men and women, activists and non-activists, and individuals with left and right political orientations. The cutoff values proposed by Cheung and Rensvold [67] to support a more restrictive invariance measurement model were changes in the comparative fit index (CFI) of less than or equal to 0.010 and changes in root mean square error of approximation (RMSEA) of less than or equal to 0.015. Subsequently, we employed an independent sample *t*-test (for two groups) to compare means. Cohen's d-effect sizes were also calculated according to the tests utilized.

Finally, parallel mediation analysis was conducted with the total sample using PROCESS (Version 2; Model 4 [68]) to examine the indirect effect of climate change perceptions (X) on willingness to engage in environmental behavior (Y) based on the rates of eco-anxiety (M1) and trust in science (M2) and controlling for the influence of sociodemographic and ideological characteristics (i.e., gender, environmental activism, and political orientation). Following Hayes' [68] procedures for testing indirect effects with serial mediators, bias-corrected confidence intervals for indirect associations were estimated based on 5000 bootstrap samples. A CI that does not include 0 in these models indicates a statistically meaningful association.

3. Results

3.1. Evaluating the Influence of Common Method Bias

We employed the common method factor to evaluate the potential negative impact of common method bias (i.e., collecting data from a single source and selecting a specific moment for data collection) on the results presented [69]. Our analysis revealed that the common method factor accounted for 24.87 percent of the variance. Given that the common method factor ideally should not surpass 25% [70], we concluded that common method bias does not raise reliability concerns regarding the presented findings.

3.2. The General Willingness for Environmental Behavior Scale

We conducted a preliminary and exploratory analysis. The skewness and kurtosis values for the observed variables (i.e., items) in subsample 1 were acceptable. However, significant results were obtained for the Kolmogorov–Smirnov test (univariate normality) (ps < 0.001) and Mardia test (multivariate normality) (MS = 242.25, $p < 0.001$; MK = 10.48, $p < 0.001$), indicating that the samples deviated from a strictly normal distribution (see Table 2).

Bartlett's test ($\chi^2 = 638.81$, df = 6, $p < 0.001$) and the KMO coefficient (0.78) in subsample 1 indicated satisfactory intercorrelation among the items, supporting the interpretation of the factorial solution. Specifically, exploratory factor analysis (EFA) yielded a one-factor solution with an eigenvalue of 2.66, accounting for 66.5% of the total variance. This solution was supported by acceptable goodness-of-fit indices (χ^2 [6] = 638.81, $p < 0.001$, TLI = 0.95, RMSEA = 0.062, SMRS = 0.03). Additionally, the items exhibited appropriate factor loadings and discrimination indices (>0.50) (see Table 2).

Table 2. The table shows the descriptive statistics and EFA loadings of the 4 items of the GWEBS.

	M (SD)	Skewness	Kurtosis	r Item-Test	F1
Item 1. Within my means, I want to do my bit to stop the environmental crisis (*Spanish: Dentro de mis posibilidades, deseo aportar mi granito de arena para frenar la crisis medioambiental*).	4.22 (1.02)	−1.13	0.38	0.78	0.82
Item 2. I am willing to accept the social constraints necessary to improve the environmental situation (*Spanish: Estoy dispuesto a aceptar las restricciones sociales que sean necesarias para mejorar la situación del medio ambiente*).	3.91 (1.13)	−0.9	0.05	0.76	0.86
Item 3. I am willing to voluntarily decrease (consuming less) (*Spanish: Estoy dispuesto a decrecer voluntariamente (consumir menos*).	3.74 (1.26)	−0.68	−0.62	0.76	0.86
Item 4. Assess the likelihood that you will incorporate new actions for the environment into your daily life over the next year (*Spanish: Valora cuál es la probabilidad de que incorpores nuevas acciones medioambientales en tu vida diaria a lo largo del próximo año*).	3.78 (1.09)	−0.78	0.01	0.84	0.71

Note. N_1 = 213. Items 1–3 have a 5-point Likert scale from 1 (strongly disagree) to 5 (totally agree). Item 4 was from 1 (absolutely unlikely) to 5 (maximum probability).

3.3. Evidence Based on Internal Structure Relationships with Other Variables and Measurement Invariance

The first subsample confirmed the one-factor structure with excellent fit indices: χ^2 [6] = 291.91, $p < 0.001$, TLI = 0.98, CFI = 0.99, RMSEA = 0.059 (90% CI [0.00, 0.20]), SMRS = 0.01. A similar fit was found in the second subsample: χ^2 [6] = 364.43, $p < 0.001$, TLI = 0.98, CFI = 0.99, RMSEA = 0.069 (90% CI [0.00, 0.20]), SMRS = 0.01. These results support H1. Further validation was carried out using the entire sample, yielding excellent fit [71]: χ^2 [6] = 643.86, $p < 0.001$, TLI = 0.98, CFI = 0.99, RMSEA = 0.061 (90% CI [0.00, 0.16]), SMRS = 0.01. The internal consistency of the factor was also excellent, with the reliability indices presented in Table 3. All computed metrics (i.e., composite reliability, average variance extracted (AVE), square root of AVE, mean, and standard deviation) fell within the reference range (see Table 3 and Figure 1).

Table 3. The table shows bivariate correlations, means, standard deviations, Cronbach's alpha, McDonald's omega, composite reliability, average variance extracted (AVE), and square roots of AVE for study variables.

	1	2	3	4
1. Climate Change Perceptions Scale	-			
2. Hogg Eco-Anxiety Scale	0.18 ***	-		
3. Trust in Science	0.72 ***	0.27 ***	-	
4. GWEBS	0.37 ***	0.32 *	0.52 ***	-
M	3.75	1.77	3.83	3.94
Sd	0.88	0.56	1.23	0.93
α	0.82	0.91	-	0.83
ω	0.86	0.92	-	0.83
CR	0.9	0.94	-	0.89
AVE	0.72	0.55	-	0.53
AVE square roots	0.85	0.74	-	0.73

Note. N total = 403. M = mean; SD = standard deviation; α = Cronbach's alpha; ω = McDonald's omega; CR = composite reliability; AVE = average variance extracted; * $p < 0.05$, *** $p < 0.001$.

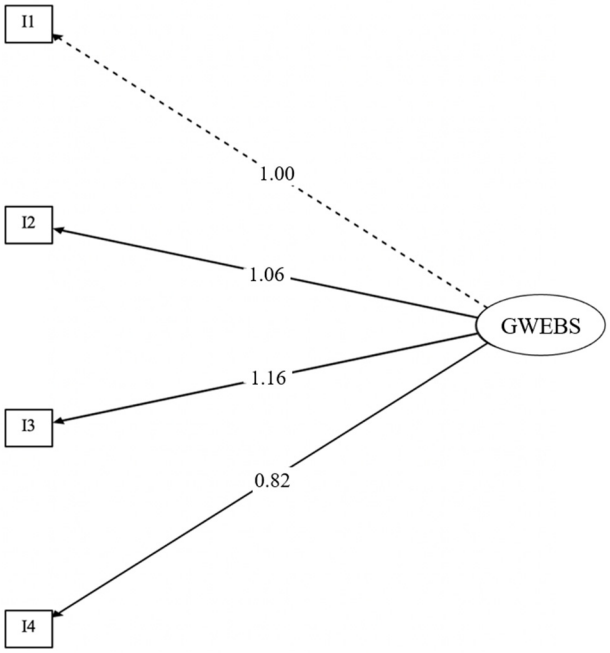

Figure 1. The figure shows the factor structure of the GWEBS.

In terms of seeking evidence of validity relative to other variables, as expected, the GWEBS score correlated positively with participants' total scores in all studied variables: climate change perceptions, eco-anxiety, and trust in science (see Table 3).

Next, we assessed GWEBS invariance across gender, environmental activism, and political orientation. Table 4 supports the configural, metric, and scalar invariances across all of them. This suggests that men/women, activists/non-activists, and individuals with left/right orientations conceived the GWEBS construct and interpreted its items in a similar manner. Additionally, the latent factors exhibited equivalent item scores across these groups. Although strict invariance was not fully achieved across gender, scalar invariances were confirmed for activism and political orientation. This allowed us to compare GWEBS means and variances between activists/non-activists and left/right orientations.

Table 4. The table shows fit indices and comparison of invariance models.

Models	χ^2 [df]	CFI	TLI	RMSEA [90% IC]	ΔCFI	ΔRMSEA
Gender						
Configural Invariance	4.17 [2] ***	0.997	0.997	0.061 [0.000, 0.170]	-	-
Metric Invariance	7.55 [5] ***	0.996	0.990	0.051 [0.000, 0.0119]	−0.001	−0.010
Scalar Invariance	12.75 [8] ***	0.992	0.989	0.055 [0.000, 0.0108]	−0.004	0.004
Strict Invariance	41.33 [12] ***	0.953	0.953	0.111 [0.075, 0.149]	−0.039	0.056
Environmental activism						
Configural Invariance	5.95 [2] ***	0.993	0.993	0.061 [0.000, 0.165]	-	-
Metric Invariance	8.94 [5] ***	0.993	0.983	0.062 [0.000, 0.195]	0.000	0.001
Scalar Invariance	18.02 [8] ***	0.983	0.973	0.077 [0.029, 0.128]	−0.010	0.015
Strict Invariance	28.74 [12] ***	0.974	0.972	0.089 [0.050, 0.130]	−0.009	0.012
Political orientation						
Configural Invariance	3.55 [2] ***	0.997	0.984	0.062 [0.000, 0.166]	-	-
Metric Invariance	6.88 [5] ***	0.997	0.992	0.048 [0.000, 0.114]	0.000	−0.014
Scalar Invariance	9.80 [8] ***	0.997	0.995	0.034 [0.000, 0.093]	0.000	−0.014
Strict Invariance	17.23 [12] ***	0.991	0.991	0.047 [0.000, 0.092]	−0.006	0.013

Note. N total = 403. *** $p < 0.001$.

Finally, and from an inter-subjects perspective, the GWEBS revealed differences between (1) Participants in environmental groups and those not (t (402) = −8.23, $p < 0.001$,

d = 0.35, M Non-activists = 3.74, SD = 0.93 vs. M Activists = 4.42, SD = 0.65); (2) women and men (t (402) = −2.53, p = 0.006, d = 0.26, M Men = 3.75, SD = 1.00 vs. M Women = 3.99, SD = 0.55); and (3) left and right-oriented participants (t (402) = 4.78, $p < 0.001$, d = 0.52, M Left = 4.08, SD = 0.82 vs. M Center right = 3.60, SD = 0.99). These differences suggest that women, left-oriented individuals, and members of environmental associations exhibit a higher general willingness to engage in environmental behavior compared to men, right-oriented individuals, and those not belonging to environmental associations.

3.4. Connecting Climate Change Perceptions and Willingness to Engage in Environmental Behavior through Eco-Anxiety and Trust in Science

We conducted a parallel mediation analysis to explore if climate change perceptions influence GWEBS through eco-anxiety and trust in science while controlling for gender, environmental activism, and political orientation. As Figure 2 shows, climate change perceptions were indirectly linked to a higher general willingness to engage in environmental behavior via increased eco-anxiety [b = 0.02, SE = 0.01, 95% CI (0.01, 0.05)] and trust in science [b = 0.24, SE = 0.05, 95% CI (0.14, 0.35)]. In essence, eco-anxiety and trust in science act as mediators, linking climate change perceptions with the inclination to behave environmentally, as measured by the GWEBS.

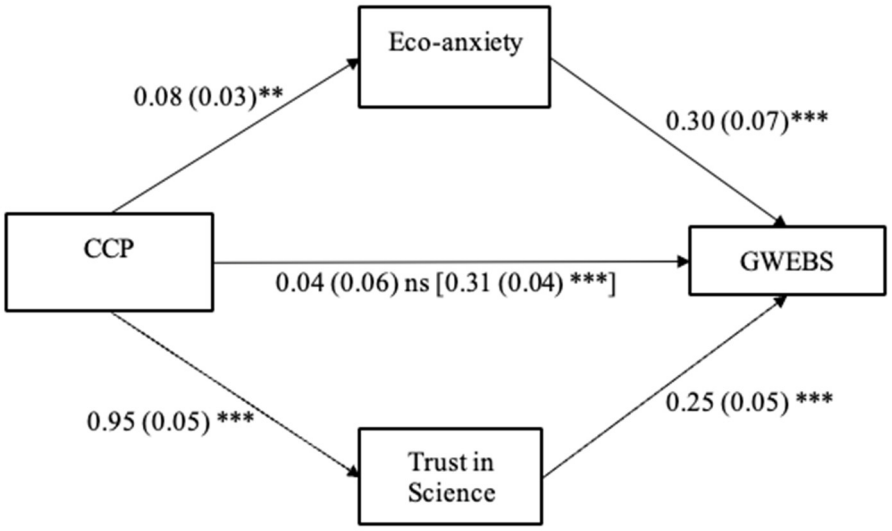

Figure 2. The mediation model depicts the indirect effect of climate change perceptions (CCP) on willingness for environmental behavior scale (GWEBS) through eco-anxiety and trust in science. Note. All reported values are unstandardized estimates (*b values*), with their SE reported in parentheses. The total effect of climate change perceptions on willingness to behave in favor of the environment appears in brackets [ ]. ns = no significant; ** $p < 0.01$; *** $p < 0.001$.

These relationship patterns confirmed H2, indicating that perceiving climate change as real, human-caused, having severe consequences, and occurring nearby might be necessary but insufficient in terms of fostering a willingness to engage in environmental behavior. In this context, feeling eco-anxiety was fully essential, while trusting scientific information on the climate crisis was partially necessary. These relationships remained significant even after controlling for gender, political orientation, and environmental activism.

4. Discussion

We agree that there are many reasons to feel eco-anxiety nowadays [7,35], especially if you trust the information provided by science about the climate crisis [42,43]. However, there are no known data that, in general, or in the particular context of Spain, analyze how eco-anxiety and trust in science can be jointly channeled into adaptive responses, that is, into the many pro-environmental behaviors and actions that are needed to reduce the worst consequences associated with climate change. This serious problem can only be

understood if we consider the practical difficulty of connecting psychological constructs with a high level of abstraction to particular behaviors. Following Fishbein and Azjen [21], many researchers have used the intention of acting pro-environmentally as a variable as a predictive or explanatory variable of specific pro-environmental behaviors [14,16,72]. This is not sufficient since the set of pro-environmental behaviors to ultimately predict is very broad and has different associated costs and impacts, depending not only on people's will but also on the social conditions in which they live [5,25]. Thus, our first objective in facing this problem was to develop a new measure of general willingness to engage in environmental behavior that helps better connect psychological constructs regardless of the specific pro-environmental behaviors.

In this respect, we can conclude that the GWEBS, which was not limited to any particular pro-environmental action but rather a general willingness to do, not to do (degrow), accept social restrictions, and ultimately "do your bit" for the environment, showed a reliable one-factor structure that related well to climate change perceptions, eco-anxiety, and trust in science. Additionally, the GWEBS distinguished between women and men, left- and right-oriented people, and people who belonged to pro-environmental groups and people who did not. In line with the literature (e.g., [16,59,73–75]), women, left-oriented people, and environmental activists showed a higher general willingness to engage in environmental behavior than men, right-oriented people, and people who did not belong to any pro-environmental group or association, respectively. In this respect, and bearing in mind that the climate emergency situation referred to by international organizations calls for the collaboration of the entire population, more studies are needed to comprehensively analyze the psychological processes at play in men and right-wing politically orientated people in relation to climate change.

From now on, and as part of the validation process, the GWEBS can be used as a dependent variable, which is how it was used in this study to subsequently investigate the psychological mechanisms that promote environmental behavior. However, the GWEBS can also be used as an independent or mediating variable regarding the diversity of behaviors people can perform in particular situations. Although this is a straightforward way of conducting future research, we can anticipate that the GWEBS should be able to explain very different subsets of pro-environmental behaviors.

In any case, the GWEBS includes aspects that have been little studied, such as the willingness of individuals to accept a loss of freedom that would entail making truly restrictive social policies in line with what the climate emergency demands. It is not only what each person can do individually but also what they are willing to accept in terms of social impositions. We anticipate that the more people are willing to accept restrictions, the more likely governments will be able to articulate them into regulations that can stop and reverse the cascade of changes that have already begun.

Regarding our second objective, we sought to investigate the mechanisms explaining why climate change perceptions do not seem to be associated as frequently as desirable as actions [16,19]. For this, we tested the mediating role of eco-anxiety and trust in science. In this respect, we can conclude that eco-anxiety, completely, and trust in science partially contributed to strengthening the desired relationship between the perception of climate change, which is understood as real, negative, proximate, and caused by human beings, and a general willingness to take action, measured using the GWEBS.

Considering eco-anxiety to be a non-pathological emotional response of discomfort regarding the global environmental crisis and trust in science as a metacognition that provides security in the beliefs that people have about climate change, we can conclude that both variables play a significant role in mobilizing the intention to act according to perceptions. The first may activate necessary emotional discomfort, and the second may be cognitive security that legitimizes it. However, there are studies in which trust in science precisely diminishes or even nullifies concern about the climate crisis [76,77]. So-called "wishful thinking" can manifest through denialism, hope in easy solutions, or a blind trust that future technology will automatically solve our problems without requiring substantial

changes in human behavior [78]. New studies are necessary to specify when trust in science activates pro-environmental behavior and when it deactivates it.

This knowledge must be considered if confirmed in new studies. At the research level, it is necessary to confirm the relationships between the use of the GWEBS in new samples and with other measures, especially with various existing pro-environmental behaviors. Moreover, it may address practical issues such as the perspective from which to communicate and educate individuals on issues relating to climate change or how to increase its presence in cross-sectoral policies [17]. In this regard, we can anticipate that changing people's behaviors that are not in line with the interests of the planet may require hope and optimism regarding solutions. However, according to our results, it also requires distressing discourses that mobilize the necessary doses of non-pathological anxiety that drive action. Parallel trust in science could be reinforced since it works for most people as a confidence heuristic in relation to their perceptions about climate change. Feeling anxious but certain of the causes can activate a general desire to act pro-environmentally, manifesting in different sets of pro-environmental behaviors.

This article has some limitations. First, we acknowledge that willingness to engage in environmental behavior differs from actual enacted behavior. It is an urgently important objective to investigate the connection of the GWEBS with the great diversity of possible pro-environmental behaviors, grouped into very different sets according to the conditions in which each person lives. Nonetheless, studying the promotion of a general willingness to engage in environmental behavior is important in itself because communication campaigns can be carried out concerning acting pro-environmentally regardless of the specific set of behaviors. In this respect, encouraging a general willingness to act could be considered the first step in a chain that ends in specific behaviors. It may not seem like much, but it is important because encouraging people's desire to act in a pro-environmental direction can involve many behaviors. Perhaps not all of them can be achieved, but different combinations can. Studying the variables that can predispose people in this direction is necessary and is part of the change.

Secondly, we used a convenience sample and a cross-sectional design, which do not allow us to test for the cause-and-effect relationships hypothesized. Therefore, future lines of research should employ longitudinal designs to overcome these limitations and test the practical implications of our model. Additionally, employing various sampling procedures would help mitigate potential self-selection bias.

Thirdly, it is crucial to recognize that although the GWEBS has been tailored for the cultural and linguistic context of Spain, variations in the Spanish language exist among different Spanish-speaking Latin American and Caribbean countries. Consequently, researchers utilizing this measure should thoroughly evaluate the items using an adaptation approach and provide valid evidence to ensure that the conclusions drawn are as pertinent as those derived from the Spanish version. It would also be beneficial to validate the GWEBS across different age groups, political orientations, cultural contexts, and languages to investigate potential cultural differences in the presented findings.

Finally, we know that individuals are not the only actors in the play. Governments and companies also have an important role to play [79]. However, changes at the individual level are crucial and urgent [80] because, ultimately, individuals consume, protest, vote, and have the strength to induce important changes when they are a clear majority fully aware of the crisis. The results of this study tell us that there is still work to do in order for people to perceive and appreciate the magnitude of scientific data. Despite that, some valuable pieces of information can be extracted. In this respect, eco-anxiety is an unpleasant but necessary emotion that should be encouraged. This is also the case for trust in science, which provides heuristically security in relation to the existing information on climate change. Both variables seem to help connect climate change perceptions and willingness to behave accordingly, even when gender, political orientation, and ecological sensitivity are controlled.

5. Conclusions

We can conclude that the General Willingness for Environmental Behavior Scale (GWEBS) seems to have a reliable one-factor structure, which is strongly related to climate change perceptions, eco-anxiety, and trust in science. Its four items measure aspects that, until now, were not included together in the intentional variables. Specifically, it measures the willingness to do, but also the willingness not to do (degrow), the willingness to accept social restrictions, and ultimately, the willingness to "do your bit" for the environment. Promoting increases in in what the GWEBS evaluates may be an intervention target as we anticipate this measure will be related to very different sets of specific pro-environmental behaviors. It can also be a specific indicator of environmental sensitivity, which would be helpful in terms of implementing restrictive social measures. In the field of research, we believe that the GWEBS can be an appropriate dependent variable to connect psychological variables with high levels of abstraction, such as eco-anxiety, trust in science, resilience, hope, etc. In this regard, we can specifically conclude that in our sample of 403 Spanish participants that included members of environmental organizations, eco-anxiety and trust in science reinforced the desired relationship between the perception of climate change, which is understood as real, negative, proximate, and caused by human beings, and the general willingness to engage in environmental behavior.

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Abbreviations

AVE	Average variance extracted
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CI	Confidence interval
CCP	Climate change perceptions scale
CR	Composite reliability
EFA	Exploratory factor analysis
GWEBS	General Willingness for Environmental Behavior Scale
HEAS	Hogg eco-anxiety scale
KMO	Kaiser–Meyer–Olkin coefficient
M	Mean
RMSEA	Root mean square error of approximation
SD	Standard deviation
SE	Standard error
SRMR	Standardized root mean square residual
TLI	Tucker–Lewis index

α	Cronbach's alpha
ω	McDonald's omega

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