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The effect of eco-anxiety on pro-environmental behaviors and mental well-being: a parallel mediation model

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Abstract

Background This study focuses on the concept of eco-anxiety and examines its effect on mental well-being through pro-environmental behaviors. In this context, green buying, recycling, and low-carbon behaviors were specifically chosen as pro-environmental actions because they represent the most common everyday practices individuals adopt to reduce environmental impact. Previous research has generally examined pro-environmental actions separately; however, to the best of our knowledge, no study has investigated these behaviors together or simultaneously tested their parallel mediating roles. By addressing this gap, the present study aims to provide a more comprehensive explanation of the relationship between eco-anxiety and mental well-being.

Methods The research was conducted using data collected through convenience sampling from 401 participants in a province in Turkey (51.1% female, 48.9% male; Generation X = 9.5%, Y = 49.4%, Z = 41.1%). While this approach ensured adequate sample size, it limits the generalizability of the findings. Data analyses were carried out using SPSS, AMOS, and the PROCESS macro software.

Results The findings indicate that eco-anxiety had a significant negative effect on mental well-being, while it had significant positive effects on green buying behavior, recycling behavior, and low-carbon behavior. Furthermore, pro-environmental behaviors were found to have a significant positive effect on mental well-being. Finally, the analysis revealed that pro-environmental behaviors served as parallel mediators in the relationship between eco-anxiety and mental well-being.

Conclusions These results suggest that, although eco-anxiety is typically seen as a negative emotional response, it may also motivate positive pro-environmental behaviors, which in turn contribute to improved mental well-being.

Keywords Eco-anxiety, Green buying behavior, Recycling behavior, Low carbon behavior, Mental well-being

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Introduction

In recent years, the growing emphasis on environmental protection and the adverse effects of pollution have heightened consumer awareness, making consumer environmentalism increasingly popular worldwide. In this context, purchasing decisions are no longer solely influenced by brand loyalty or price; consumers now also consider a brand's commitment to environmental friendliness, ethical practices, and sustainability. In other words, consumers are increasingly willing to purchase green products that do not harm the environment [1]. However, the insufficient and slow progress in addressing ecological crises has led to growing concerns about the future of the planet. This anxiety is prevalent even among individuals who are not directly affected by environmental issues [2]. Consequently, the impact of environmental problems extends beyond physical health, posing a threat to mental well-being as well. Environmental concerns can lead to negative emotions such as distress, anxiety, sleep disturbances, depression, and cognitive impairments in some individuals [3]. This condition, which results in such negative emotional responses, is referred to as eco-anxiety and is defined as the state of uncertainty about the future of the planet and fear of potential ecological disasters caused by the climate crisis [4].

Reports published by various organizations reveal that individuals' environmental concerns are not unfounded; on the contrary, these concerns are often exacerbated by the data presented. For instance, in its 2024 climate risk assessment report, the European Environment Agency (EEA) [5] stated that the year 2023 was the hottest year recorded globally in over 100,000 years. Even under optimistic scenarios aligned with the Paris Agreement—which aims to limit global temperature rise to 1.5 °C—the report forecasts that most climate-related hazards in Europe will intensify throughout the 21st century. Similarly, the United Nations Environment Programme (UNEP) [6], in its 2024 Emissions Gap Report, warned that failure to limit global warming to 1.5 °C puts the future of the planet at serious risk. To achieve this target, the report states that greenhouse gas emissions must be reduced by 42% by 2030 and by 57% by 2035.

These global findings underline the urgency of behavioral change, as individual activities represent an important source of greenhouse gas emissions. Indeed, there is a broad scientific consensus that greenhouse gases are the primary cause of anthropogenic climate change [10]. The majority of global greenhouse gas emissions are directly or indirectly linked to individuals' daily activities. People contribute directly to carbon dioxide emissions when they consume fossil fuels for cooking, heating, and transportation. On the other hand, the entire life cycle of consumer goods and services—such as food, clothing, and entertainment—generates embedded emissions that

contribute indirectly to carbon dioxide output [11]. Taken together, these observations emphasize how everyday choices can either exacerbate or mitigate environmental harm. If, collectively, we replace environmentally harmful behaviors in our daily lives with pro-environmental actions, it is indeed possible to mitigate environmental harm. Our experiences during the COVID-19 pandemic support this notion. During the global lockdown, there was a significant reduction in greenhouse gas emissions worldwide; fossil fuel-related emissions in 2020 were almost 20% lower than in 2019, a change attributed in part to reduced vehicular traffic [12]. Therefore, it is crucial to encourage pro-environmental behaviors such as low-carbon lifestyles, recycling, and green buying.

Accordingly, while behavioral change is essential, it is also important to explore the psychological factors that may encourage such change. In our study, we argue that a certain level of ecological concern must be activated in individuals in order to promote the pro-environmental behaviors discussed above. Although eco-anxiety may negatively affect individuals' well-being [13], we propose that this impact can be partially mitigated through the engagement in environmentally friendly behaviors—thereby reducing its adverse effects on mental well-being. In other words, we expect that eco-anxiety simultaneously influences mental well-being through three types of pro-environmental behaviors: green buying behavior, recycling behavior, and low carbon behavior. This relationship is framed within the Conservation of Resources (COR) Theory. Individuals who adopt environmentally friendly behaviors may feel mentally better because they perceive themselves as contributing to environmental protection [14]. While the literature tends to examine these concepts separately [15, 16, 17, 18], our study differentiates itself by considering all of these concepts collectively within a unified model.

Additionally, in our study, we conceptualize pro-environmental behaviors—which serve as a mechanism for reducing ecological anxiety—as mediating variables and focus on their impact on mental well-being. While previous literature has generally examined pro-environmental behaviors individually [17, 19, 20], our study considers these behaviors collectively within the same model as parallel mediators, making it one of the first studies to do so. Furthermore, eco-anxiety is typically associated with negative outcomes in the literature. However, we argue that a certain level of eco-anxiety can lead to positive outcomes—namely, pro-environmental behaviors—which, in turn, may contribute to individuals' mental well-being. These behaviors are also crucial for national well-being. Mental well-being is increasingly recognized as an indicator of national prosperity, as it is associated with productivity, longevity, and the proper functioning of society [21]. In other words, our study demonstrates

that individuals can transform their anxiety into action, thereby contributing not only to the environment but also to society and their own psychological health.

In addition to its theoretical contribution, the practical relevance of our study is underscored by its setting in Turkey, where recent environmental crises have heightened public concern. To illustrate, during the summer of 2023, numerous forest fires destroyed thousands of hectares of forest land. The same year, sudden and severe rainfall—linked to the climate crisis—caused devastating floods that resulted in 21 deaths and damage to 3,154 residences [8]. On February 13, 2024, a major environmental disaster occurred at a gold mine in İliç, Erzincan, where tons of cyanide and sulfuric acid were allegedly released into the environment [9]. Given this succession of environmental catastrophes, it is reasonable to assume that participants in our study—having been directly exposed to nationwide ecological threats over the past two years—responded to the scale items not merely based on abstract concerns but on lived experiences.

Literature review

Eco-anxiety

Recent studies [22, 23, 24] have shown that individuals' awareness of the general challenges posed by global climate change has increased, accompanied by a rise in psychological distress related to this awareness. Although research on this specific form of distress is still in its early stages, the term eco-anxiety, which is not yet listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), is emerging as a key concept [25]. However, there is currently no universally accepted definition, and a variety of terms—such as climate change anxiety, climate change worry, environmental distress, ecological grief, and eco-stress—are often used interchangeably [26]. In the literature, eco-anxiety is often described as a psychological state emerging in response to the direct or indirect effects of the climate and biodiversity crises, frequently defined as a “*chronic fear of environmental doom*” [27]. This psychological response can manifest as intense emotional distress, even in the absence of any immediate physical threat from ecological dangers in the individual's daily life [28]. Indeed, while eco-anxiety may appear as mild sadness or worry in some individuals, it can also lead to severe symptoms of depression and anxiety that significantly impair daily functioning [24].

Eco-anxiety and mental well-being

The World Health Organization (WHO) emphasizes that health is not merely the absence of disease, but also includes physical, mental, and social well-being as integral components of its definition [29]. In other words, the concept of *well-being* is inherently embedded in the definition of health [30]. Therefore, to be considered healthy,

an individual must possess not only physical health but also mental well-being. *Mental well-being* is defined as the ability of individuals to realize their potential, work productively, form strong and positive relationships with others, and contribute to the community to which they belong [31]. It encompasses happiness and life satisfaction, functionality, and a sense of purpose. Consequently, individuals who are able to fulfill their potential, cope effectively with everyday stressors, and experience psychological growth are considered to have sound mental well-being [21].

The phrase “ability to cope with stress,” which is embedded in the definition of mental well-being, indicates that stress can have a detrimental effect on mental well-being. *Eco-anxiety* arises as a response to heightened awareness of the risks posed by global ecological issues [32]. Therefore, it is plausible that individuals' awareness of environmental problems may lead to increased stress, thereby negatively impacting their mental well-being. Indeed, Abdelwahed and Ramish [13] found that eco-anxiety has a negative effect on psychological well-being. Therefore, these findings suggest that eco-anxiety is likely to undermine well-being by increasing stress levels. Based on this reasoning, our study hypothesizes that eco-anxiety adversely affects mental well-being. This assumption is grounded in the COR Theory [33], which posits that individuals strive to retain, protect, and build resources that they value [34]. The theory suggests that people are driven to minimize the loss of resources, safeguard existing ones, and acquire new resources, and that they engage in certain behaviors to achieve these goals [35]. Both the perceived and actual loss of resources are known to generate stress in individuals. In this context, resource loss represents an undesirable psychological state [36]. As environmental problems escalate, they pose threats to vital resources such as clean air, water, and soil. The fear of losing these essential resources may trigger eco-anxiety and cause individuals to experience significant stress, which, in turn, may undermine their mental well-being. Based on this reasoning, the first hypothesis of the study can be formulated as follows:

H₁ Eco-anxiety negatively affects mental well-being.

Eco-anxiety and pro-environmental behaviors

With the growing severity of environmental problems, research on the interaction between human behavior and the environment has gained increasing attention. Various human behaviors that impact the environment have been identified in the literature. In general, behaviors aimed at reducing ecological harm, improving environmental quality, and conserving natural resources are referred to as *pro-environmental behaviors* [17]. In this study, *green buying behavior*, *recycling behavior*, and *low carbon*

behavior are considered within the scope of pro-environmental behaviors.

Green buying behavior The act of purchasing environmentally friendly products out of a desire to protect the ecological environment for future generations is defined as *green purchase behavior* [19]. In other words, green buying behavior refers to the consumption of sustainable products that are recyclable and beneficial to the environment, while avoiding products that may harm the environment or society [37]. These definitions suggest that such behavior is driven by concerns for the future of the environment. Thus, it can be inferred that ecological anxiety may serve as a motivating factor for individuals to engage in green buying.

Although eco-anxiety is generally regarded as a negative condition for individuals' psychological health, it may also serve as a precursor to positive behaviors that benefit the environment. Individuals experiencing eco-anxiety may adopt environmentally conscious lifestyles as a way of coping with their distress [38]. Consistent with COR Theory [33], eco-anxiety individuals may turn to green consumption as a way of preserving resources. Indeed, several studies have shown that individuals with ecological concerns are more likely to choose green products [15, 39, 40, 63]. Based on this rationale, the following hypothesis can be proposed:

H₂ Eco-anxiety positively affects green buying behavior.

Recycling behavior Recycling behavior, considered a beneficial and healthy practice, refers to the action taken by individuals when they decide to recycle a product after it has reached the end of its use. The decision-making process behind this behavior is complex and influenced by a range of internal and external factors [70]. For instance, individuals who are concerned about the future of the environment are more likely to engage in recycling in order to prevent resource depletion and contribute to resource conservation [71]. Environmental concerns tend to outweigh conflicting attitudes such as laziness or apathy toward environmental protection [18]. In a study by Chang et al. [16], eco-anxiety was found to have a positive effect on recycling behavior. Based on this finding, and consistent with the COR Theory—which posits that eco-anxiety causes perceived resource loss and thus prompts individuals to adopt behaviors like recycling to mitigate that loss—the following hypothesis can be proposed.

H₃ Eco-anxiety positively affects recycling behavior.

Low carbon behavior Behaviors that positively influence energy consumption and have the potential to improve the structure and dynamics of an ecosystem or biosphere

are referred to as *low carbon behaviors* [17]. All consumer activities that contribute to the reduction of carbon dioxide emissions are considered low carbon behaviors [11]. Examples include purchasing green energy, buying energy-efficient appliances, adopting low-carbon technologies, and conserving energy [72]. As previously mentioned, individuals who are concerned about the disruption of the natural balance (i.e., those experiencing eco-anxiety) are more likely to engage in pro-environmental behaviors [16, 38, 40]. Supporting this view, Hu et al. [41] found that individuals with high environmental concern are more likely to prefer low-carbon modes of transportation. This suggests that individuals experiencing eco-anxiety may similarly be motivated to adopt low-carbon choices, again consistent with COR Theory [33]. Based on these findings, the following hypothesis can be proposed.

H₄ Eco-anxiety positively affects low carbon behavior.

Pro-environmental behaviors and mental well-being

The continuous deterioration of environmental conditions is adversely impacting not only the natural environment but also human health and well-being [38]. Therefore, it is believed that environmentally friendly behaviors contribute not only to the protection of nature and individuals' physical health but also to their overall well-being. In other words, within the framework of COR Theory, the resources gained through pro-environmental behaviors are expected to strengthen *mental well-being*, which is regarded as a psychological resource for the individual [42]. As suggested in the studies by Sun and Kim [14] and Kaida and Kaida [43], environmentally friendly actions enhance individuals' mental well-being by reinforcing their perception that they are contributing to environmental preservation. Taken together, these findings suggest that pro-environmental behaviors may function not only as ecological actions but also as psychological resources that buffer against stress. Accordingly, it is plausible to assume that pro-environmental behaviors such as green buying, recycling, and low carbon behavior have a positive effect on individuals' mental well-being. Building on this rationale, the following hypotheses are proposed:

H₅ Green buying behavior positively affects mental well-being.

H₆ Recycling behavior positively affects mental well-being.

H₇ Low carbon behavior positively affects mental well-being.

The parallel mediating role of Pro-Environmental behaviors

Anxiety is not always an emotion to be feared or avoided, as it can help individuals prepare for potential future threats. Therefore, as long as anxiety does not intensify into an overwhelming and uncontrollable state, it can be regarded as a normal and adaptive emotional response. However, it is also possible for anxiety to become chronic and maladaptive [44]. *Eco-anxiety*, likewise, may manifest as mild sadness and worry in some individuals, while in others, it may escalate into severe depression and anxiety [24]. In his study, Maiteny [45] states that when anxiety becomes chronic, individuals tend to exhibit one of three primary responses. First, some individuals may react with unconscious denial. In such cases, they seek relief from their anxiety through increased consumption in search of satisfaction. These individuals are not expected to engage in pro-environmental behaviors. The second, more conscious, response entails a shift toward green consumption. Instead of reducing their overall consumption, individuals in this category opt for environmentally friendly products, reflecting a limited behavioral change without a significant transformation in mindset or lifestyle. The third response involves a lifestyle transformation. Individuals in this category may take on additional roles, such as raising awareness among others and promoting behavioral change.

This study hypothesizes that individuals who exhibit the second or third coping responses—namely, those engaging in pro-environmental behaviors to manage anxiety—will report higher levels of mental well-being. As noted by Anneser et al. [46], coping with ecological anxiety through environmentally friendly actions provides individuals with a sense of control and security. This sense of control can, in turn, contribute to improved psychological health. Conversely, within the framework of the COR Theory, it can be inferred that if individuals do not engage in any behavioral change, the perception of resource loss may persist, which could in turn contribute to increased eco-anxiety and potentially undermine mental well-being. As Boluda-Verdú et al. [26] argue, if effective coping mechanisms are not developed, eco-anxiety can become a source of stress detrimental to mental health. Therefore, adopting environmentally friendly behaviors may alleviate the perception of resource loss and enhance mental well-being.

What distinguishes the present study from previous works is its attempt to empirically demonstrate the parallel mediating roles of different types of pro-environmental behaviors—green buying, recycling, and low-carbon practices—in the relationship between eco-anxiety and mental well-being. While earlier studies have generally discussed pro-environmental actions as coping strategies, to the best of our knowledge, no prior research has systematically differentiated between specific behavioral

categories or examined their simultaneous effects. By examining multiple pro-environmental behaviors in parallel, this study highlights not only their protective function against ecological threats but also their distinct and combined contributions to individuals' psychological health. Building upon this perspective, and within the framework of COR Theory, it can be argued that as individuals' anxiety levels rise, they are more likely to take actions aimed at minimizing resource loss. Conversely, when their anxiety is low or absent, they may attempt to accumulate surplus resources in anticipation of future losses [33]. Overall, these perspectives suggest that pro-environmental behaviors can serve a dual role: they mitigate ecological threats while also functioning as coping mechanisms that support mental health. In line with these insights, the present study aims to empirically demonstrate that eco-anxiety contributes positively to individuals' mental well-being through the parallel mediating role of pro-environmental behaviors. Accordingly, the hypotheses proposed in this study are as follows:

H₈ Green buying behavior mediates the relationship between individuals' level of eco-anxiety and their mental well-being.

H₉ Recycling behavior mediates the relationship between individuals' level of eco-anxiety and their mental well-being.

H₁₀ Low carbon behavior mediates the relationship between individuals' level of eco-anxiety and their mental well-being.

The research model developed based on the proposed hypotheses is as shown in Fig. 1.

Method

Participants and procedures

This study was designed as a quantitative, cross-sectional research based on the correlational survey model. The population of the study consists of individuals aged 18 and above residing in a province in Türkiye. Data were collected from these individuals using a convenience sampling method. According to the literature, for populations of 250,000 or more, or when the population size is unknown, a minimum sample size of 384 is recommended to ensure representativeness [47]. Based on this guideline, surveys were prepared and distributed online to collect data. Out of 405 responses received, after excluding those with missing demographic information, incomplete answers, or inconsistent response patterns, a total of 401 valid survey responses were included in the analysis. Therefore, the criterion of a minimum sample size of 384, as suggested in the literature, was met. However, it should be acknowledged that the use of a

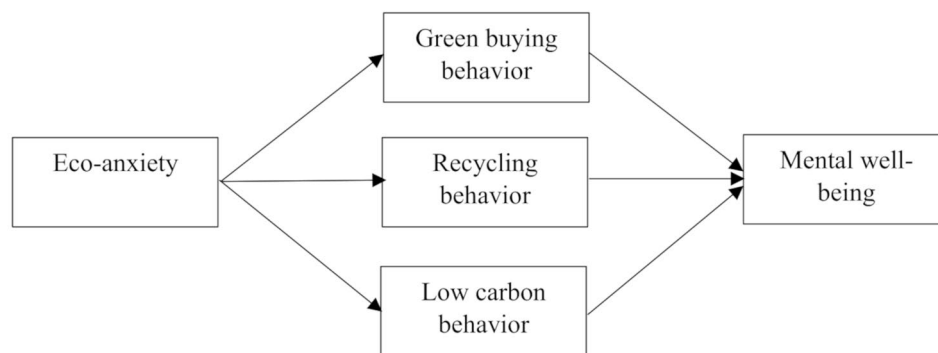


Fig. 1 Research model (the parallel mediating model)

Table 1 Demographic characteristics

Demographic Variables		F	%	Demographic Variables		F	%
Gender	Female	205	51.1	Education Level	High school or below	25	6.2
	Male	196	48.9		Associate degree	36	9.0
Marital status	Married	165	41.1		Bachelor's degree	280	69.8
	Single	236	58.9		Postgraduate degree	60	15
Generation	X	38	9.5	Sector	Public sector	104	25.9
	Y	198	49.4		Private sector	195	48.6
	Z	165	41.1				

convenience sampling method limits the generalizability of the findings, and this limitation should be taken into account when interpreting the results.

Initially, as shown in Table 1, the demographic characteristics of the participants were examined. Among the respondents, 51.1% ($n=205$) were female and 48.9% ($n=196$) were male; 41.1% ($n=165$) were married and 58.9% ($n=236$) were single; 9.5% ($n=38$) belonged to Generation X, 49.4% ($n=198$) to Generation Y, and 41.1% ($n=165$) to Generation Z. In terms of educational background, 6.2% ($n=25$) had a high school education or below, 9% ($n=36$) had an associate degree, 69.8% ($n=280$) held a bachelor's degree, and 15% ($n=60$) had a postgraduate degree. Regarding employment status, 25.4% ($n=102$) were employed in the public sector, 25.9% ($n=104$) in the private sector, and 48.6% ($n=195$) were unemployed. The information regarding the participants offers insight into the representativeness of the sample in relation to the general population and holds significance for assessing the generalizability of the findings.

Data collection instruments

A literature review was conducted to identify appropriate scales for the study, and scales originally developed in both Turkish and English were selected. The English-language scales were translated into Turkish following the standard translation and back-translation procedures [48]. In this process, two independent experts who had completed their doctorates in the fields of management and psychology carried out the translation, after which

the translations were compared. The identified discrepancies were reviewed by a third independent researcher, and consistency was ensured. After this process, another academicians who was not involved in the initial translation stage carried out the back-translation of the scales. Subsequently, a comparison was made with the original scale, and after the necessary revisions were implemented, the final Turkish version was prepared. Prior to data collection, a hard copy of the questionnaire was administered to a small group of participants with diverse demographic and professional characteristics. In this pilot testing process, the clarity, cultural relevance, and comprehensiveness of the scale items were evaluated; in particular, face validity (clarity and comprehensibility of the items) and content validity (the extent to which the items adequately represent the intended construct) were examined. Based on this pre-testing, the final version of the questionnaire was adapted to a 5-point Likert scale (1 = Strongly Disagree/Never, 5 = Strongly Agree/Always). Ethical approval was obtained from the Ethics Committee of Kafkas University, informed consent was obtained from all participants, and confidentiality of participant information was strictly maintained. Moreover, in the case of the scales, the interpretation was carried out based on the mean values of the responses to the relevant items. Details regarding the scales used in the study are provided below.

Eco-Anxiety To measure the level of eco-anxiety, the 13-item *Eco-Anxiety Scale* developed by Hogg et al. [49]

Table 2 Fit values of scales

Models	CMIN/DF 0 < $\chi^2/df \leq 5$	RMR ≤ 0.10	CFI ≥ 0.90	IFI ≥ 0.90	TLI ≥ 0.90	RMSEA ≤ 0.08
Eco-anxiety	1.965	0.049	0.972	0.972	0.963	0.049
Green buying behavior	2.762	0.027	0.997	0.997	0.991	0.066
Low carbon behavior	0.009	0.002	1.000	1.000	1.000	0.000
Recycling behavior	1.333	0.005	1.000	1.000	0.999	0.029
Mental well-being	2.789	0.033	0.968	0.969	0.945	0.067

Chi-Square/Degrees of Freedom=CMIN/DF, Root Mean Square Residual=RMR, Comparative Fit Index=CFI, Incremental Fit Index=IFI, Tucker–Lewis Index=TLI, Root Mean Square Error of Approximation=RMSEA

and adapted into Turkish by Uzun et al. [50] was used. The scale consists of four dimensions: affective symptoms, behavioral symptoms, rumination, and anxiety about personal impact. Uzun et al. [50] reported a Cronbach's alpha coefficient of 0.910 for the overall scale, while the sub-dimensions demonstrated reliability coefficients of 0.830, 0.860, 0.840, and 0.840, respectively. In this study, the overall Cronbach's alpha was determined as 0.870.

Green buying behavior To measure green buying behavior, the 3-item *Purchase Behavior Scale* developed by Chaudhary [51] was used. In the original study, the researcher reported a Cronbach's alpha coefficient of 0.910, indicating high internal consistency. The alpha coefficient in this study, however, is 0.868.

Low carbon behavior To measure low carbon behavior, the 3-item *Low Carbon Readiness Index Scale* developed by O'Brien et al. [52] was employed. In the original study, the scale demonstrated a Cronbach's alpha coefficient of 0.830, indicating acceptable internal reliability. In this study, it was determined as 0.838.

Recycling behavior To assess recycling behavior, four items from the *Recycling Behavior Scale* developed by Smith et al. [53] were utilized. In their study, Smith et al. [53] reported a Cronbach's alpha coefficient of 0.840, indicating good internal consistency. In our study, this coefficient was calculated as 0.935.

Mental Well-Being To measure mental well-being, the *Warwick-Edinburgh Mental Well-Being Scale* developed by Tennant et al. [54] and adapted into Turkish by Demirtaş and Baydemir [55] was used. The scale consists of 7 items and has a unidimensional structure. Demirtaş and Baydemir [55] reported a Cronbach's alpha coefficient of 0.860, indicating a high level of internal reliability. In this study, it was determined as 0.783.

Findings

Validity and reliability results

To determine the validity of the scales used in the study, confirmatory factor analysis (CFA) was conducted using

Table 3 Findings on reliability and validity

	Cronbach's Alpha	CR	AVE
Eco-anxiety	0.870	0.941	0.554
Green buying behavior	0.868	0.871	0.694
Low carbon behavior	0.838	0.846	0.648
Recycling behavior	0.935	0.935	0.783
Mental well-being	0.783	0.804	0.376

the AMOS 18.0 software package. Items with standardized regression (factor) loadings below 0.400 were excluded from the analysis [56]. The item factor loadings for each scale ranged as follows: for eco-anxiety, between 0.664 and 0.838; for green buying behavior, between 0.751 and 0.874; for low carbon behavior, between 0.775 and 0.847; for recycling behavior, between 0.820 and 0.934; and for mental well-being, between 0.428 and 0.738. Model fit was assessed using indices such as Chi-Square/Degrees of Freedom (CMIN/DF), Root Mean Square Residual (RMR), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Tucker–Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). Modifications between items were made when necessary to improve model fit. Ultimately, the fit indices obtained after CFA for each scale met the accepted reference criteria, and these values are presented in Table 2.

To assess the reliability of the scales used in the study, Cronbach's alpha coefficients were examined. The following values were obtained: 0.870 for eco-anxiety, 0.868 for green buying behavior, 0.838 for low carbon behavior, 0.935 for recycling behavior, and 0.783 for mental well-being (see Table 3). As Cronbach's alpha values above 0.700 are generally considered acceptable for reliability [57], and all coefficients in this study exceed that threshold, it can be concluded that the scales used demonstrate satisfactory internal consistency.

In addition to the above analyses, Composite Reliability (CR) and Average Variance Extracted (AVE) values were also calculated to further assess the reliability and validity of the scales, and these results are presented in Table 3. According to the literature, a CR value above 0.700 is considered acceptable [56], while an AVE value should exceed 0.400 [58]. However, in cases where the AVE value falls below the recommended threshold,

Table 4 Fit index values of different models

Indexes	Reference Value	Research Model	Model 1	Model 2	Model 3	Model 4
CMIN/DF	$0 < \chi^2/sd \leq 5$	1.956	2.438	2.648	2.499	2.753
RMR	≤ 0.1	0.079	0.117	0.128	0.138	0.172
CFI	> 0.90	0.938	0.905	0.891	0.901	0.884
IFI	> 0.90	0.938	0.906	0.892	0.902	0.884
TLI	> 0.90	0.930	0.895	0.880	0.891	0.873
RMSEA	≤ 0.08	0.049	0.060	0.064	0.061	0.066

Model 1 = EcoA and GBB combined; LCB, RcB and MWb separate

Model 2 = EcoA and LCB combined; MWb and RcB combined; GBB separate

Model 3 = EcoA and RcB combined; MWb and GBB combined; LCB separate

Model 4 = EcoA and RcB combined; MWb, GBB and LCB combined

Table 5 Correlation analysis findings

Variables	1	2	3	4	5	Mean	S. D.
1. Eco-anxiety	1					2.607	0.669
2. Green buying behavior	0.251**	1				3.246	0.893
3. Low carbon behavior	0.390**	0.640**	1			3.215	0.917
4. Recycling behavior	0.199**	0.485**	0.547**	1		3.178	1.068
5. Mental well-being	-0.333**	0.197**	0.158**	0.199**	1	3.606	0.631

**= $p < .01$

validity may still be considered adequate if the CR value is higher than both the AVE value and the reference threshold [59]. In this context, the CR values obtained (eco-anxiety = 0.941, green buying behavior = 0.871, low carbon behavior = 0.846, recycling behavior = 0.935, and mental well-being = 0.804) and the AVE values (eco-anxiety = 0.554, green buying behavior = 0.694, low carbon behavior = 0.648, recycling behavior = 0.783, and mental well-being = 0.376) met the recommended criteria and thresholds.

Findings related to common method bias

Prior to hypothesis testing, the study also examined the presence of common method bias. Common method bias refers to the systematic error in the variance shared among variables, which arises from collecting data from the same source or rater. To detect this bias, Harman's single-factor test was employed [60], and multiple models were created for the employed scales to compare model fit indices (see Table 4). For the single-factor test, an exploratory factor analysis was conducted on all scale items. As a result, a seven-factor structure with eigenvalues greater than 1.00 was obtained, and the highest explained variance was found to be 12.875%. Therefore, no significant common method bias was observed. In addition, the model fit indices of the research model were compared with those of the alternative models (see Table 4). The results showed that the research model met the reference fit criteria and demonstrated better model fit than the alternative models.

Findings of hypothesis testing analysis

In this study, a correlation analysis was conducted to examine the relationships among the variables of eco-anxiety, green buying behavior, low carbon behavior, recycling behavior, and mental well-being. Prior to conducting the analysis, skewness and kurtosis values were assessed to test the assumption of normality. The skewness values (eco-anxiety = 0.010; green buying behavior = -0.440; low carbon behavior = -0.555; recycling behavior = -0.155; mental well-being = -0.320) and kurtosis values (eco-anxiety = -0.178; green buying behavior = -0.300; low carbon behavior = -0.118; recycling behavior = -0.588; mental well-being = 0.197) were all within the acceptable range of -2 to +2, thereby satisfying the normality assumption [61]. Consequently, Pearson correlation analysis was performed, and the results are presented in Table 5.

According to the results presented in Table 5, significant positive correlations were found between eco-anxiety and green buying behavior ($r = .251, p = .000$), eco-anxiety and low carbon behavior ($r = .390, p = .000$), and eco-anxiety and recycling behavior ($r = .199, p = .000$). In contrast, a significant negative correlation was observed between eco-anxiety and mental well-being ($r = -.333, p = .000$). These significant relationships indicate that it is appropriate to proceed with regression analyses for hypothesis testing.

For this purpose, the SPSS extension *PROCESS Macro* was used. Specifically, Model 4, as proposed by Hayes [62]—which allows for both simple and parallel mediation analysis—was employed. The analysis was conducted using 5,000 bootstrap samples with a 95% confidence

Table 6 Model 4 findings

Green buying behavior (GBB)				
	β	SE	t	p
Eco-anxiety (EcoA)	0.335	0.065	5.181	0.000
Low carbon behavior (LCB)				
	β	SE	t	p
Eco-anxiety	0.535	0.063	8.463	0.000
Recycling behavior (RcB)				
	β	SE	t	p
Eco-anxiety	0.317	0.078	4.049	0.000
Mental Well-being (MWb)				
	β	SE	t	p
Direct effect of eco-anxiety	-0.437	0.045	-9.700	0.000
Green buying behavior	0.096	0.042	2.308	0.022
Low carbon behavior	0.126	0.044	2.862	0.004
Recycling behavior	0.074	0.032	2.342	0.020
Total effect of eco-anxiety	-0.314	0.045	-7.051	0.000
	Effect	BootSE	LLCI%95	ULCI%95
EcoA on MWb via GBB	0.032	0.016	0.004	0.065
EcoA on MWb via LCB	0.067	0.025	0.021	0.118
EcoA on MWb via RcB	0.024	0.013	0.001	0.053

interval. In the model, eco-anxiety was entered as the independent variable, mental well-being as the dependent variable, and green buying behavior, low carbon behavior, and recycling behavior as mediators. The results are presented in Table 6.

The results presented in Table 6 indicate that eco-anxiety has a significant negative effect on mental well-being ($\beta = -0.437$; $p = .000$), thereby supporting H_1 . As shown in the table, eco-anxiety positively affects green buying behavior ($\beta = 0.335$; $p = .000$), recycling behavior ($\beta = 0.317$; $p = .000$), and low carbon behavior ($\beta = 0.535$; $p = .000$). Therefore, H_2 , H_3 , and H_4 are supported.

In addition, pro-environmental behaviors were found to have a significant positive effect on mental well-being: green buying behavior ($\beta = 0.096$; $p = .022$), recycling behavior ($\beta = 0.074$; $p = .020$), and low carbon behavior ($\beta = 0.126$; $p = .004$). Accordingly, H_5 , H_6 , and H_7 are supported.

Finally, the results for indirect effects indicate that eco-anxiety significantly affects mental well-being through green buying behavior (indirect effect = 0.032; CI = [0.004, 0.065]), low carbon behavior (indirect effect = 0.067; CI = [0.021, 0.118]), and recycling behavior (indirect effect = 0.024; CI = [0.001, 0.053]) (see Table 6). These findings support H_8 , H_9 , and H_{10} .

Discussion

This study examined the effect of eco-anxiety on mental well-being through the mediating role of pro-environmental behaviors. The findings revealed that eco-anxiety has a negative direct effect on mental well-being, which is consistent with previous research in the literature

[13]. On the other hand, the study also found that eco-anxiety positively influences pro-environmental behaviors—namely, green buying, recycling, and low carbon behaviors. This suggests that individuals experiencing eco-anxiety tend to take responsibility by engaging in behaviors aimed at protecting the environment and conserving resources. This finding aligns with prior studies in the literature [15, 16, 63, 41].

Furthermore, the results demonstrated that pro-environmental behaviors have a positive impact on individuals' mental well-being. Green buying, recycling, and low carbon behaviors were empirically shown to contribute positively to mental well-being. In line with the aim of the study, mediation analyses revealed that eco-anxiety has indirect effects on mental well-being through pro-environmental behaviors, operating simultaneously in a parallel mediation model. Therefore, while eco-anxiety negatively affects mental well-being directly, it can also play a supportive role in mental well-being indirectly by encouraging individuals to adopt environmentally friendly behaviors.

Based on these findings, the following theoretical and practical implications can be drawn.

Theoretical contributions

A review of the literature reveals that only a limited number of studies have focused on the mediating role of pro-environmental behaviors [64, 65, 66], and most of these studies are concentrated within the field of organizational behavior. Furthermore, pro-environmental behaviors—such as green buying behavior, recycling behavior, and low carbon behavior—are generally treated as outcome

variables, with research primarily exploring the factors that influence these behaviors [19, 20, 67, 68]. By simultaneously examining green buying, recycling, and low-carbon behaviors as parallel mediators, this study addresses a gap in the literature and provides a more comprehensive understanding of how eco-anxiety relates to mental well-being.

Another contribution of our study lies in presenting a novel framework that expands the behavioral dimensions of Conservation of Resources (COR) theory. Within the scope of COR Theory, eco-anxiety is conceptualized as a psychological stressor fueled by the perception that environmental resources are under threat. Accordingly, individuals engage in pro-environmental behaviors in an attempt to counteract this perceived threat and, as a result, experience improved psychological well-being. The findings support this applicability of COR Theory, showing that eco-anxiety increases pro-environmental behaviors, which in turn enhance mental well-being. This perspective suggests that pro-environmental behaviors may serve as a psychological resource conservation strategy.

Previous studies in the literature have predominantly focused on the detrimental consequences of mental health, such as psychological distress, anxiety, and stress [e.g., 22]. However, the findings of our study approached the outcomes from a constructive perspective, revealing that eco-anxiety may serve as a driving force when it transforms into behaviors involving environmental responsibility. Therefore, in contrast to the dominant view that regards this type of anxiety as solely negative, our study highlights its potential to be positioned as a coping mechanism.

Moreover, the use of data from Türkiye provides a valuable contextual contribution to the literature. A series of recent environmental crises has heightened public awareness and concern. This study therefore offers evidence from a context where eco-anxiety is shaped not only by abstract global risks but also by lived experiences of environmental disasters.

Practical implications

As previously noted, without a collective shift in behavior, the world is likely to face far more severe environmental conditions in the future. Many governments are attempting to address these challenges through legislative measures aimed at reducing greenhouse gas emissions, air pollution, soil contamination, and more. Efforts are also being made in the area of waste management to support environmental sustainability. Türkiye is among these countries; however, despite the enactment of environmental laws and regulations, the steps taken toward environmental protection and sustainability appear to be insufficient. For instance, according to the Turkish

Statistical Institute [69], Türkiye's total greenhouse gas emissions in 2023 increased by 6.9% compared to the previous year. Furthermore, the 2024 report by the Temiz Hava Hakkı Platformu states that in 2023, at least 92% of the Turkish population was exposed to air pollution levels exceeding the standards set by the World Health Organization [7]. These findings highlight the urgent need to foster voluntary behavioral change among individuals—beyond what legislation alone can achieve.

In our study, we argue that individuals are more likely to adopt and maintain environmentally friendly behaviors when they are made aware of both the personal and societal benefits of these behaviors, as well as the potential damage that may result from failing to engage in them. Creating greater awareness about current environmental problems and their negative consequences can help to trigger a moderate level of environmental concern, which in turn may encourage citizens to engage in pro-environmental behaviors. Moreover, it is essential to communicate that such behaviors are not only beneficial for the environment but also for individuals' mental health. The empirical findings of our study demonstrate that eco-anxiety can serve as a motivational force that drives pro-environmental behavior and, through these behaviors, can also improve mental well-being. In other words, by purchasing green products, supporting recycling initiatives, and adopting low-carbon behaviors, individuals not only contribute to environmental preservation but also protect their own mental health. Therefore, it would be beneficial for government-supported programs, public campaigns, and educational initiatives to emphasize these points. It may be beneficial to inform citizens—through educational programs or various social campaigns—about which behaviors are environmentally beneficial and which are harmful, while also clearly demonstrating the positive outcomes that may result from changing these behaviors.

Finally, considering the negative impact of eco-anxiety on individuals' mental well-being, we believe that it is important to develop psychological support programs aimed at helping people cope with this form of anxiety. In this context, psychological counselors may provide support by encouraging individuals to use environmentally friendly behaviors as a means of managing their environmental concerns. In doing so, individuals who are able to regulate their anxiety may also maintain greater balance in their mental well-being.

Limitations and recommendations

The conclusions drawn regarding the outcomes of ecological anxiety in this study should be interpreted within the scope of certain limitations. First, the data were collected from a single province in Türkiye using a convenience sampling method, which restricts the generalizability of

the findings. Second, the study employed a cross-sectional research design, which prevents the establishment of causal relationships between variables. Third, the study focused only on three types of pro-environmental behavior—green buying behavior, recycling behavior, and low carbon behavior—while other forms of environmentally responsible behavior (e.g., water conservation, sustainable transportation choices) were not considered.

Although the findings indicated that pro-environmental behaviors have statistically significant and positive effects on mental well-being, the effect sizes were relatively modest ($0.074 \leq \beta \leq 0.126$). This suggests that while green buying, recycling, and low carbon behaviors contribute to mental well-being, their influence is limited and should be examined alongside other variables. Therefore, the results should be interpreted with caution and not overstated, as they provide an initial but important step toward understanding the mechanisms linking eco-anxiety, pro-environmental behaviors, and mental well-being. Future studies should build on these insights by expanding the model to include additional pro-environmental behaviors and by testing conditional models that incorporate both moderator and mediator variables. Such efforts would help to achieve a more comprehensive and nuanced understanding of the complex interplay between environmental concerns, sustainable behaviors, and psychological outcomes.

Conclusion

In conclusion, this study demonstrates that eco-anxiety, which is generally perceived in the literature as a psychological source of stress, may also have certain positive outcomes. Specifically, eco-anxiety can serve as a motivating force for exhibiting pro-environmental behaviors such as green buying behavior, recycling behavior, and low-carbon behavior, which in turn contribute to mental well-being. Moreover, by revealing the mechanism related to the parallel mediating role of pro-environmental behaviors, the Conservation of Resources (COR) theory is extended, positioning these behaviors as both protective and resource-regenerating strategies. Therefore, eco-anxiety should not be regarded solely as a risk or stress factor, but also utilized in practice as a motivating strategy.

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Author contributions

Y.K. and G.K. designed the study. Y.K. developed the conceptual framework and hypotheses. Y.K. collected the data. G.K. performed and interpreted the statistical analysis. All authors reviewed the manuscript.

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Data availability

The datasets used in the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted anonymously with voluntary participants from the general public in Türkiye, without collecting any personal or identifiable data. Ethical approval for this study was obtained from the Kafkas University Scientific Research and Publication Ethics Committee for Social and Human Sciences. The study was conducted in accordance with the principles of the Declaration of Helsinki and the guidelines of the Committee on Publication Ethics (COPE). Informed consent to participate was obtained from all participants prior to data collection, ensuring confidentiality and integrity throughout the research process.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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