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Examining the Relationship between Perceived Environmental Identity and Pro-Environmental Behaviors among Students at Zanjan University of Medical Sciences

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ABSTRACT

Background: Individuals with a strong environmental identity are deeply connected to and dependent on the natural world, which influences their perceptions of both nature and themselves. This study aims to examine the relationship between perceived environmental identity and pro-environmental behaviors among students at Zanjan University of Medical Sciences.

Methods: In 2024, a descriptive study was conducted involving 453 students from Zanjan University of Medical Sciences. Data were collected using an online questionnaire assessing environmental identity and pro-environmental behaviors and were analyzed using SPSS version 23. A significance level of less than 0.05 was considered.

Results: In the present study, 53% of the participants were male. The mean score for environmental identity was 81.34 ± 14.36, while the mean score for pro-environmental behaviors was 56.52 ± 16.96 on a scale of 100. A statistically significant correlation was found between environmental identity and pro-environmental behaviors ($r = 0.552$, $p < 0.001$). Female participants had significantly higher mean scores in both pro-environmental behaviors and environmental identity ($p < 0.05$). The educational level also showed a significant relationship with pro-environmental behaviors and environmental identity ($p < 0.05$).

Conclusion: While students exhibited a strong environmental identity, their pro-environmental behaviors were average. Health authorities should identify the barriers to these behaviors and design and implement awareness campaigns to enhance environmental health literacy among students.

1. Introduction

Protecting and restoring the environment is a major societal challenge. Efforts in environmental protection depend not only on government plans but also on individuals' daily choices and behaviors toward the environment and consumer products, including their willingness to forgo certain items (Rezaei, 2024). Pro-environmental behaviors (PEB) refer to a set of actions designed to reduce environmental harm or actively engage in the restoration of natural environments. These behaviors are essential for achieving a more sustainable future (Kim,

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2024). Therefore, promoting pro-environmental behaviors is crucial for mitigating the harmful effects of human activities on the environment and achieving sustainability, as many environmental changes stem from human actions (Innocenti et al., 2023). Research has underscored that the desire to be perceived as an environmentally responsible individual is closely associated with one's environmental identity (Elliott, 2013). Environmental identity (EID) refers to an individual's self-perception as an integral part of the natural environment, which can significantly influence behaviors that impact the environment. Those with a high EID often place greater moral importance on nature and animals, support biospheric values, and adopt a worldview that recognizes their interdependence with the natural world rather than asserting dominance over it (Clayton et al., 2021). EID is a multifaceted concept that illustrates how individuals perceive themselves concerning nature and determines their connection to ecological systems. It influences attitudes and behaviors regarding environmental issues. This concept has gained attention due to its role in promoting sustainable practices and shaping environmental policies, reflecting a personal relationship with nature that encompasses emotional, cognitive, and spiritual connections, affecting how individuals value and interact with their environment (Showmiya & Kumar, 2024). EID is shaped by various factors, especially early experiences in nature, along with family values, culture, education, and media. Over time, these influences create a unique personal EID (Showmiya & Kumar, 2024). A strong EID leads individuals to perceive themselves as responsible environmental agents, increasing their likelihood of engaging in activities like recycling and energy conservation, thereby aligning their actions with their identity (Mehdi et al., 2024). Moreover, EID can be a cost-effective means of promoting PEB, as individuals with a strong EID engage in such behaviors without external incentives (Van der Werff et al., 2013). Gordon (2010) also demonstrated that PEB among individuals is highly diverse, with EID, subjective experiences, context, and daily experiences in the community and environment playing significant roles in fostering PEB. In this regard, studying PEB, especially among the younger generation who are tasked with addressing both past and present environmental issues also adapting to future changes, is of paramount importance (De Leeuw et al., 2015). It has been proven that environmental education significantly impacts environmental awareness and knowledge, particularly in universities, where students are motivated to engage in environmental education (Zsóka et al., 2013). Previous research has shown diverse results regarding the impact of EID on behaviors, emphasizing the need for further investigation in various cultural contexts. Understanding these dynamics can facilitate the development of educational strategies to promote sustainable behaviors among individuals, especially among youth (Zeng et al., 2020). A study in Shiraz investigated the relationship between national identity and environmental behavior among humanities students, finding a significant correlation between the two (Mirfardi & Salamatian, 2020). Other research has shown that students in environment-related fields develop greater environmental literacy compared to those in unrelated disciplines, suggesting that their field of study enhances their understanding of environmental issues (Goldman et al., 2014). Additionally, an individual's role, such as a professor or student, correlates with positive environmental behaviors (Hansman, 2020). Studies in Indonesia indicate that environmental identity can predict pro-environmental behaviors, while connection to nature and perceived environmental identity independently influence youth environmental actions (Shadiqi et al., 2022; Taibe & Nurhikmah, 2023). Given these findings, the present research aims to explore the relationship between perceived EID and PEB among students. It is anticipated that the findings of this study will facilitate the development of effective educational and cultural programs designed to enhance environmental behaviors within academic contexts.

2. Materials and Methods

2.1 Study design and participants

This cross-sectional study was conducted in 2024 and involved 453 students from Zanjan University of Medical Sciences, using an online questionnaire for data collection.

2.2 Study inclusion criteria

The inclusion criteria were restricted to students enrolled in the 2023-2024 academic year who provided informed consent to participate in the study.

2.3 Sample size and sampling method

The sample size was determined using Cochran's formula, assuming a 50% prevalence of PEB at a 95% confidence level, resulting in 384 participants. To mitigate potential non-response bias, a total of 453 individuals were included in the study.

$$n = \frac{z2 \times p \times q}{d2}$$

n = sample size
P = 0.5 pro-environmental behaviors
Q = 0.5(1-p)
Z = 1.96 confidence level (95%)
D = 0.05 margin of error

The sampling process was conducted in two stages. In the first stage, all faculties were considered as strata. In the second stage, convenience sampling in accordance with the population of students in each faculty. Data were collected using a three-part instrument. The first part assessed the demographic information from participants, including age, gender, field of study, educational level, marital status, and place of residence. The second part evaluated PEB through a questionnaire developed by Mateer et al. (2022). This instrument comprised 11 items rated on a seven-point Likert

scale, ranging from 0 (never) to 6 (always). The total possible scores ranged from 0 to 66, with higher scores indicating better PEB. The third part measured participants' EID using the standard Environmental Identity Scale by Clayton et al. (2021). This section included 14 items rated on a seven-point Likert scale, from 1 (not at all true of me) to 7 (completely true of me). The total possible scores ranged from 14 to 98, with higher scores reflecting a stronger EID.

2.4 Validation of Data Collection Tools

Initially, the existing questionnaires were translated from English to Persian using the World Health Organization's standardized Backward-Forward method, following the acquisition of permission from the original developers (Nilsson et al., 2016). In the first step, the face validity of the questionnaires was assessed with a sample of 10 individuals from the target population, using an impact score threshold of 1.5. The resulting impact scores ranged from 2.73 to 5, and no items were excluded at this stage. Next, the content validity of the questionnaires was evaluated using the Content Validity Index (CVI) by a panel of 10 experts in health education, health promotion, and environmental health engineering. The experts rated the relevance of each item on a four-point scale (from "not relevant" to "completely relevant"). The ratio of experts who rated each item as "relevant" or "completely relevant" was calculated relative to the total number of experts. Scores greater than 0.79 were considered acceptable. The overall content validity was calculated using the Scale-Content Validity Index/Average (S-CVI/Ave) approach, with a value of 0.9 considered excellent. In this study, all item-specific CVI values exceeded 0.79, and the overall S-CVI/Ave for the questionnaire was calculated to be 0.9. Reliability was assessed using Cronbach's alpha coefficient in a pilot study involving 30 participants from the target group. A coefficient value greater than 0.7 was considered acceptable (Mikkonen et al., 2022). In the present study, Cronbach's alpha coefficients for PEB and perceived EID were determined to be 0.836 and 0.875, respectively.

2.5 Statistical Analysis

After data extraction, the information was transferred from Microsoft Excel to SPSS software (Version 2023) Since the data were collected electronically, there were no missing values. The normality of the data distribution was assessed using skewness and kurtosis metrics (Kim, 2013). For analytical analysis, Pearson's correlation coefficient, independent t-tests, and one-way ANOVA were used for normally distributed data. Non-parametric tests were employed for data that did not follow a normal distribution. A significance level of less than 0.05 was considered statistically significant.

3. Results and Discussion

In the present study, a total of 453 students from Zanjan University of Medical Sciences participated. The mean age of the participants was 23.15 ± 4.25 years, with an age range of 18 to 51 years. Regarding gender, 53% (240 individuals) of the participants were male. The demographic characteristics of the participants are detailed in Table 1.

Table 1. Demographic Characteristics of Participants

Variable	Category	Frequency (n)	Percentage
Age	Female	23.08 ± 4.69	-
	Male	23.22 ± 3.83	-
Gender	Female	213	47%
	Male	240	53%
Degree	Undergraduate (Bachelor')	187	41.3
	Master's	18	4.0
	Professional Doctorate	237	52.3
	Ph.D.	11	2.4
Faculty	Medicine	123	27.2
	Pharmacy	76	16.8
	Dentistry	47	10.4
	Nursing and Midwifery (Zanjan)[a]	68	15.0
	Nursing (Abhar)[b]	32	7.1
	Public Health	60	13.2
	Paramedical	47	10.4
Marital status	Single	428	94.5
	married	25	5.5
Place of residence	Native	103	22.7
	Non-native (Dormitory Resident)	259	57.2
	Non-native (Private Accommodation	91	20.1

*a: Faculty location in Zanjan
*b: Faculty location in Abhar

The mean and standard deviation of PEB, categorized by its dimensions, along with perceived EID among participants were analyzed, and the results are presented in Table 2. The mean score of participants was 56.52 ± 16.96 out of 100. A positive statistical correlation was observed between perceived EID and PEB (r = 0.553). The findings of this study also indicated a positive association between age and both PEB and perceived EID. In the present study, the mean scores of PEB and perceived EID were assessed based on gender, faculty of study, and place of residence. The results showed a significant difference in PEB and perceived EID based on gender and faculty of study. However, no significant difference was found based on place of residence. These findings are presented in Table 3. The results of the present study indicated that the students exhibited a moderate level of PEB, while their perceived EID was at a good level. This finding aligns with the results of the study on Tehran University students, where students also reported responsible behaviors towards the environment, with individuals' willingness acting as a predictor of these behaviors (Hemayatkhah Jahromi et al., 2017). Research has shown that when individuals view the environment and

nature as part of their identity, it positively influences their environmental attitudes and behaviors, such as energy conservation, recycling, and the use of green products (Nabizadeh Moghadam et al., 2020). However, a study in the U.S. revealed that among individuals with a high EID, only 34% agreed to perform PEB (Truelove et al., 2021). The correlation between PEB and perceived EID was confirmed in this study, echoing the findings of Yoon and Joung (2021), who reported a strong positive correlation between the two. Moreover, a study that was conducted among the employees of a production in Tehran demonstrated that green organizational identity significantly positively impacted employees' green behaviors (Mirahsani et al., 2024). The present study also found that age positively correlated with both PEB and perceived EID, with a stronger correlation observed for PEB. This finding is supported by the works of Kosic et al. (2024) and Patel et al. (2017). However, there are studies in this field that found no statistically significant correlation between age and overall environmental behaviors (Whitmarsh & O'Neill, 2010). Age-related differences in PEB may stem from generational characteristics and the effects of aging, influenced by life conditions, opportunities, and resources (Ágoston et al., 2024). Older individuals typically exhibit a higher EID, potentially because younger individuals are in the process of identity exploration and have not yet reached commitment. In research conducted in urban and rural areas of Australia and Finland, it was shown that younger adolescents showed less identity exploration compared to older ones (Nurmi et al., 1996). Additionally, Nabizadeh Moghadam et al. (2020) indicated that educational level and age did not significantly affect individuals' EID or attitudes. However, connections to nature vary across age groups, being stronger in childhood and diminishing during adolescence due to psychological changes (Liefländer & Bogner, 2014). The study found that women had significantly better perceived EID and PEB compared to men. This aligns with the findings of Pride et al. (2021), where women scored higher than men in home and travel PEB. Conversely, Miao and Cagle (2020) reported that gender did not correlate with environmental concerns, emphasizing the importance of self-perception, with females exhibiting significantly higher EID than males. This discrepancy may be attributed to the different experiences with nature that males and females encounter. Nabizadeh Moghadam et al. (2020) further supported the notion that gender significantly impacts attitudes and ultimately influences individuals' EID. The results of the present study showed that the faculty of study has a significant relationship with both PEB and perceived EID, with students from the Faculty of Health having higher average scores compared to students from other faculties. This result is not unexpected, as students in the Faculty of Public Health receive education on the environment and the importance of its protection during their courses, which can influence their sense of attachment to the environment and their PEB. Pro-environmental behaviors are more prevalent among groups that have an interest in environmental issues (Hansmann et al., 2020). In the study by Goldman et al. (2014), the field of study also significantly impacted individuals' perceptions of environmental issues and the transmission of environmental concepts. In the present study, no significant differences were found based on place of residence in either perceived EID or PEB, which is consistent with the study done in New Zealand and the U.S. (Snider et al., 2021). Watson et al. (2015) showed in their study that students living in green dormitories exhibited more pro-environmental and recycling behaviors, and even students with weak environmental identities experienced a greater increase in responsible environmental behaviors (ERBs) from living in green dormitories compared to those with stronger environmental identities. In the research that has been done in this field, students residing in dormitories considered sustainable living important; however, the lack of proper recycling facilities, lack of awareness, and costs were the main barriers to PEB (Chaplin & Wyton, 2014). also, childhood connection with nature or connection to a native environment influences individuals' environmental sensitivity. Native individuals tend to have a deeper and stronger connection to their environment, whereas non-native individuals are less likely to have such a strong connection (Chawla, 1998). In contrast, the present study found no significant differences in perceived EID or PEB based on place of residence, aligning with the findings of Snider et al. (2021). A study among dormitory students reported that students living in green dormitories exhibited more pro-environmental and recycling behaviors, noting that even those with weaker environmental identities showed a greater increase in responsible environmental behaviors (ERBs) compared to those with stronger identities (Watson et al., 2015). Similarly, research in this field in England showed that students in dormitories valued sustainable living; however, barriers such as inadequate recycling facilities, lack of awareness, and costs hindered PEB (Chaplin & Wyton, 2014). The present study has several limitations due to its cross-sectional design. A primary limitation is the inability to establish causal relationships between variables. Additionally, the potential for bias in self-reported behaviors, particularly social desirability bias, could impact the results. Given that the research was conducted at Zanjan University of Medical Sciences, caution should be exercised when generalizing the findings to other universities with different cultural and social contexts. However, this study marks a valuable contribution to the examination of EID and PEB among Iranian students. With a lack of similar research in this field within the country, it helps bridge existing knowledge gaps and offers useful insights for researchers and policymakers. Future research should be conducted across various universities to enhance the generalizability of the results. Moreover, qualitative studies aimed at gaining a deeper understanding of the factors influencing perceived EID and PEB, as well as the motivations behind these behaviors, can play a crucial role in designing and implementing effective educational interventions.

Table 2. Mean, Standard Deviation, Skewness, Kurtosis of PEBc and EIDd Scores, and the Correlation Matrix between Age, PEB, and EID Scores

Variables	Range scale[a]	Min-Max[b]	X ± SD	Mean (out of 100) ± SD	Kurtosis	Skewness	1	2	3	4
AGE	0-36	6-36	21.18±5.94	-	10.354	2.759				
PEB[c] individual	0-30	0-30	16.12±6.69	58.84±16.50	-0.132	-0.180	0.026[e] 0.583			
PEB collective	0-66	10-66	37.30±11.19	53.75±23.32	0.031	-0.433	0.154**[e] 0.0001	0.565**[d] 0.0001		
PEB[c] Total	14-98	32-98	79.7219±14.08	56.52±16.96	0.096	-0.323	0.105*[e] 0.026	0.862**[d] 0.0001	0.894**[f] 0.0001	
Perceived Environmental Identity (EID)[d]	0-36	6-36	21.18±5.94	81.3488±14.36	-0.856	-0.187	0.137**[e] 0.03	0.456**[d] 0.0001	0.532**[f] 0.0001	0.553**[f] 0.0001

a: The lowest and highest values that can be obtained, b: The lowest and highest values that were obtained in this study, c: Pro-Environmental Behaviors, d: Environmental Identity, e: Extracted from Spearman's test, f: Extracted from Pearson's test, $^{*}p < 0.01$, $^{**}p < 0.05$

Table 3. Mean Scores of PEBg and EIDh by Gender, Educational Level, Faculty of Study, and Place of Residence

Demographic Variables		PEB[g] individual	PEB[g] collective	PEB[g] Total	Perceived Environmental Identity (EID)[h]
		X ± SD	X ± SD	X ± SD	X ± SD
Gender	Female	21.96±5.64	22.17±6.57	39.17±10.75	83.2160±12.38
	Male	20.49±6.11	15.15±6.66	35.65±11.33	76.6208±14.78
	t; p[a] / z ;p[b]	t; p 2.639;0.0009*	t; p 3.305;0.001*	t; p 3.386;0.001*	z ;p -5.010;0.001*
Faculty	Medicine	21.01±6.13	16.08±6.79	37.09±11.65	79.5203±14.66
	Pharmacy	18.88±5.43	14.01±6.20	32.89±9.65	77.3421±12.52
	Dentistry	20.51±5.66	17.36±6.93	37.78±11.68	78.6596±14.44
	Nursing midwifery(Zanjan)[e]	20.96±6.13	15.25±6.78	36.21±11.19	76.2059±15.92
	Nursing (Abhar)[f]	23.53±6.00	18.63±5.59	42.16±9.75	86.7188±10.68
	Public Health	22.88±5.29	18.83±5.61	41.72±9.84	84.6333±11.25
	Paramedicine	22.57±5.70	14.51±7.23	37.09±11.61	79.2128±14.50
	F; p[c] / z ;p[d]	F; p 4.297;0.00001*	F; p 4.781;0.001*	F; p 4.902;0.0001*	z ;p 23.942569;0.0001*
address	native	21.84±5.31	16.67±6.64	38.51±10.36	81.4078±11.74
	Non-native of the dormitory	20.97±5.96	15.75±6.69	36.72±11.23	78.8919±15.11
	Non-native of a private home	21.02±6.53	16.57±6.77	37.59±11.95	80.1758±13.39
	F; p[c] / z ;p[d]	F; p 0.833;0.435	F; p 0.951;0.387	F; p 0.375;0.983	z ;p 0.744;0.698

X: Mean, SD: Standard Deviation, a: Extracted from independent t-test, b: Extracted from the U-Mann Whitney test, c: Extracted from a One-way analysis of variance test, d: Extracted from the Kruskal-Wallis test, e: Faculty location in Zanjan, f: Faculty location in Abhar, g: Pro-Environmental Behaviors, h: Environmental Identity

4. Conclusion

The present study revealed that the mean scores of EID were at a moderate level, while PEB among students was relatively favorable. A significant positive correlation was observed between these two variables. Female students generally scored higher in both EID and PEB compared to male students, with age and the faculty of study identified as influential factors. These findings highlight the importance of EID in promoting PEB and emphasize that gender, age, and faculty of study can be influential factors in these behaviors. Therefore, it is recommended to design and implement educational programs and workshops aimed at increasing environmental awareness and strengthening environmental identity, particularly for male students and in various faculties, especially for clinical students further research is needed to explore other influencing factors, such as the impact of family, culture, field of study, and marital status on students' environmental identity and behaviors.

Authors' Contributions

Elham Mohammadi: Data collection. **Khadijeh Hajimiri:** Project administration; Conceptualization; Supervision; Writing-original draft. **Zohre Farahmandkia:** Project administration; Conceptualization; Supervision; Writing-original draft.

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Conflicts of Interest

The authors declare no conflict of interest.

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Ethical considerations

This study was approved by the Ethics Committee of the Vice-Chancellor for Research and Technology at Zanjan University of Medical Sciences. Before data collection, the researchers fully explained the study's purpose to the participants, assuring them that their participation was entirely voluntary, their data would remain confidential, and informed consent was obtained. ID code: IR.ZUMS.REC.1403.015.

Using artificial intelligence

Artificial intelligence is not used in this research.

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