ISSN 2712-0554
Heritage and Sustainable Development *Original Research*
Vol. 6, No. 2, September 2024, pp.545-556
https://doi.org/10.37868/hsd.v6i2.482

A look at the link between bio-altruistic values and pro-environmental attitudes in university students

Guido Ayay-Arista[1*], Edwin Gustavo Estrada-Araoz[2], Mauro Juan Ramirez Herrera[3], River Chávez Santos[4], Jorge Antonio Malca Florindes[5], José Walter Coronel Chugden[6], Luis Alberto Pecho Tataje[7], Rosas Carranza Guevara[8]

[1,3,5] Instituto de Investigación, Universidad Nacional Intercultural Fabiola Salazar Leguía de Bagua, Perú

[2] Facultad de Educación, Universidad Nacional Amazónica de Madre de Dios, Perú

[3,7] Escuela Profesional de Economía, Universidad Nacional San Luis Gonzaga de Ica, Perú

[4,8] Departamento Académico de Educación y Ciencias de la Comunicación, Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Perú

[6] Departamento Académico de Ingeniería Económica, Contabilidad y Finanzas, Universidad Nacional de Frontera, Perú

*Corresponding author E-mail: gayay@unibagua.edu.pe

Received Mar. 20, 2024
Revised Aug. 1, 2024
Accepted Aug. 13, 2024

Abstract

The growing environmental concern has highlighted the need to adopt pro-environmental behaviors. Despite previous research on the relationship between environmental values and attitudes, the connection between bio-altruistic values and pro-environmental attitudes in university students remains to be explored. The general objective of this study was to analyze the link between bio-altruistic values and pro-environmental attitudes in university students, and the specific objectives were to evaluate the levels of these variables in different dimensions. Using a correlational design, the New Ecological Paradigm Scale (NEP) and the Multiple Motives for Environmental Protection Scale (MEPS) were administered to 706 students from three public universities in northern Peru. The results revealed that 90.5% of the students exhibited "Good" levels of bio-altruistic values, and the majority showed positive pro-environmental attitudes. The research evidenced a significant association between bio-altruistic values and pro-environmental attitudes, suggesting that as bio-altruistic values increase, pro-environmental attitudes tend to be more positive toward the environment. These findings support previous research, highlighting the positive influence of bio-altruistic values on pro-environmental attitudes. The importance of educational and psychological factors is highlighted, underscoring the need for educational strategies to foster bio-altruistic values. It is concluded that cultivating these values in students can be crucial to promoting pro-environmental behavior and attitudes and advocating their inclusion in educational programs and public policies to build a more sustainable society.

Keywords: Pro-environmental attitude, Pro-environmental behavior, Environmental education, Altruistic values, Biospheric values

1. Introduction

Sensitivity to the environment and adopting pro-environmental behaviors are topics of growing interest in today's society. Several studies have assessed the association between human values and attitudes towards the environment, with the aim of understanding the factors that influence pro-environmental decisions [1], [2]. However, there is a knowledge gap on the association of bio-altruistic values with pro-environmental attitudes in university students [3], [4]. Bio-altruistic values, defined as the willingness to act for the benefit of biodiversity and life on Earth as a whole [5], could be related to individuals' willingness to adopt environmentally friendly behaviors. The research therefore aims to address this gap and empirically examine the strength of this link.

Although some studies have suggested a positive association between altruistic values and pro-environmental attitudes [6]–[8], others have found mixed or even contradictory results [9], [10]. This variability could be due to cultural, contextual, and methodological differences in the research approaches used [11].

Bio-altruistic values encompass concerns for planetary conservation, nonhuman species, human welfare, and social justice [12], [13]. They are beliefs linked to feelings [12], transcend the specific [14], and direct choices according to their implications [15]. They influence attitudes and behaviors [4], [16], explain beliefs and attitudes, and guide pro-environmental intentions [12], [17]. The core values are biospheric, altruistic, and selfish [18]. However, in this study, biospheric and altruistic values are not distinguished, both are defined as bio-altruistic values [13].

Bio-altruistic values derive from the value-norm-belief theory (VBN) [19]. This theory by Karpudewan (2019) [20] analyzes environmental behavior, incorporating altruistic and biospheric versus egoistic values. VBN theory is an extension of norm activation theory (NAT) and predicts pro-environmental attitudes [18], [21].

The NCV theory incorporates attributions of responsibility and capacity to face environmental threats [18]. Adopting it reflects the worldview of the individual, conscience, and responsibility [20]. From the new ecological paradigm (NPE), it contrasts the anthropocentric and ecocentric view [22]. The VBN theory holds that altruistic values are centered on humans and biospheric values on the surrounding environment [23]. They are positively associated with pro-environmental/ecological beliefs, embracing sustainability, environmental protection, and natural balance [22].

On the other hand, a pro-environmental attitude is one's tendency to exhibit a degree of favor towards a natural surrounding [24]. The theory of planned behavior (TCP) [25] is considered a robust approach to explaining pro-environmental attitudes [13]. TCP suggests that behavior results from intentions based on attitude, subjective norms, and perceived control [25]. Attitude evaluates consequences, subjective norm reflects social pressure, and perceived control measures capability [19], [26]. These determinants are guided by behavioral, regulatory, and controlling beliefs [26].

Given the growing concern about climate change, biodiversity loss, and other environmental problems, it is imperative to understand how bio-altruistic values and pro-environmental attitudes interact and can influence the formation of sustainable behaviors [27], [28]. If we succeed in elucidating this relationship, we could design more effective educational interventions and awareness campaigns to foster greater commitment to the environment among university students [29]. Research in this direction has the potential not only to contribute to the theoretical advancement of environmental psychology but also to have a practical bearing on the promotion of environmentally friendly behaviors in future generations [30].

This study addresses the knowledge gap on the relationship between bio-altruistic values and pro-environmental attitudes among university students. The added value lies in providing a solid empirical basis for designing more effective educational interventions and awareness campaigns, promoting sustainable behaviors. The objectives of this study include analyzing the link between bio-altruistic values and pro-environmental attitudes in

university students, as well as assessing the level of these variables according to their dimensions, highlighting the growing environmental awareness and emerging pro-environmental behaviors in this demographic group.

2. Research method

2.1. Participants and design

A total of 706 university students from three institutions of higher education located in the northern region of Peru participated in the study [Universidad Nacional Toribio Rodríguez de Mendoza-UNTRM = 375 (53.0%), Universidad Nacional de Frontera-UNF =131 (18.6%) and Universidad Nacional de Jaen-UNJ = 200 (28.4%)]. These students were enrolled during the 2022-I academic semester, and 52% of them were women. It is important to note that the mother tongue of the participants was Spanish. It should be noted that the research obtained ethical approval from the Governing Committee and/or University Council of each of the participating institutions [OFICIO N° 0346-2022-UNTRM-R, OFICIO N° 046-2022-UNF-SG, OFICIO N° 552-2022-VPI-CO-UNJ]. Likewise, the informed consent of each of the participants was guaranteed as a fundamental requirement for their inclusion in the study. This rigorous ethical and consent process ensured the integrity and respect for the rights of the participants in the framework of the research.

A correlational design was used [31], whereby each sample subject had the same probability of being part of the study, obtained by stratified probability sampling by proportional allocation. The quantitative approach predominated in the research, and the hypothetic-deductive method was used for the analysis. The study variables were: V1. Bio-altruistic values and V2. Pro-environmental attitude, both with their respective dimensions.

2.2. Techniques and instruments

The scale was used as a technique, and two Likert-type scales were applied as instruments [32]. The instruments were the New Ecological Paradigm Scale (NEP) and the altruistic and biospheric values subscale of the Multiple Motives Toward Environmental Protection Scale (MEPS) [33]. The MEPS [22], [34] consists of 15 items measuring equilibrium fragility (items 1 and 11), limits to growth (items 3, 6, 7, 8, 9, and 13), anthropocentrism, human exceptionalism (items 2, 4, 12 and 14), and eco-crisis (items 5, 10, and 15). The response scale used was a five-point Likert-type scale, where 1 = strongly disagree and 5 = strongly agree. For its part, the MEPS [33] assessed bio-altruistic values. Two subscales, with 4 items assessed altruistic values (items 1 to 4) and 4 items assessed bio-altruistic values (items 5 to 8). The ratings on the scale were five points (1 = Does not correspond at all, 5 = Corresponds exactly). To read the instrument items, see Appendix 1.

The instruments have high validity and reliability, assessed by various techniques. The NEP scale has been used in multiple cultural contexts, demonstrating psychometric robustness (Cronbach's $\alpha = 0.83$) [34]. The MEPS scale exhibited construct and criterion validity when related to other scales. Its reliability was measured with Composite Reliability (CR), showing high values (altruistic: CR > 0.89, biospheric: CR > 0.91). Temporal stability is guaranteed with significant Pearson coefficients ($p = 0.001$), ranging between 0.81 and 0.92, and scale dimensions between 0.80 and 0.93 [33]. It is worth mentioning that the instruments were taken from their authors without modifications or adaptations. However, for their application to the Peruvian context, they were subjected to a validation process by expert judgment, and reliability was calculated by means of a pilot test. The results of the NEP scale reached a validity coefficient of 0.897 and the MEPS scale = 0.904. The reliability of the NEP scale was (α) = 0.982 and the MEPS scale reached (α) = 0.954. (See Appendix 2 on the validity and reliability of the instruments).

2.3. Procedures and statistical analysis

An online survey was applied to collect information about their bio-altruistic values and pro-environmental attitudes from a representative sample of 706 university students. Such data were collected and allowed the calculation of frequencies and percentages of responses in relation to the levels of bio-altruistic values and their relationship with specific dimensions. Similarly, the analysis was carried out for the levels of pro-environmental

attitude. Also, a Chi-square test was performed to assess the independence between the study variables, and associative measures such as Gamma and Somers' D were calculated to evaluate the strength and directions of the association. The normality of the data was also assessed using the Kolmogorov-Smirnov test and Spearman was applied to examine the association between variables ($p < 0.05$).

3. Results and discussion

3.1. Results

The analysis of the distribution of bio-altruistic values and pro-environmental attitudes in 706 university students reveals a predominant tendency toward levels considered “Good”. A total of 90.5% of the students were in the “Good” category of bio-altruistic values, while 8.4% presented a “Moderate” level. Within the dimension of bio-altruistic motives, 89.5% were evaluated as “Good” and in the dimension of biospheric motives, 89.1% obtained a “Good” evaluation.

Regarding pro-environmental attitudes, 72.2% of the students showed attitudes rated as “Good” and 10.1% as “Very good”, while the “Low” and “Moderate” levels were significantly lower. This suggests a positive correlation between bio-altruistic values and pro-environmental attitudes, since as the former increase, so do pro-environmental attitudes. Even students with “Moderate” bio-altruistic values tend to hold favorable pro-environmental attitudes, reinforcing the idea that bio-altruistic values, while not extremely high, are strongly associated with a predisposition toward pro-environmental behaviors.

Table 1. Degrees of the variables bio-altruistic values and pro-environmental attitude.

Bio-altruistic values		Pro-environmental attitudes				Total
		Low	Moderate	Good	Very good	
Bad	Count	0	8	0	0	8
	% of total	0.0%	1.1%	0.0%	0.0%	1.1%
Moderate	Count	0	37	21	1	59
	% of total	0.0%	5.2%	3.0%	0.1%	8.4%
Good	Count	1	79	489	70	639
	% of total	0.1%	11.2%	69.3%	9.9%	90.5%
Total	Count	1	124	510	71	706
	% of total	0.1%	17.6%	72.2%	10.1%	100.0%

Note: Survey applied to university students

These results suggest that a positive association exists between bio-altruistic values and pro-environmental attitudes in this group. The students with higher values of bio-altruism tend to have more positive pro-environmental attitudes.

The Chi-square test of Independence, presented in Table 2, shows that there is a highly significant association between bio-altruistic values and pro-environmental attitude. This means that pro-environmental attitudes are related to bio-altruistic values in this study population.

Table 2. Association between bio-altruistic values and pro-environmental attitude by Chi-Square test

Test	Valor	gl	Significance (bilateral)
Chi-square X^2	133.163	6	0.000**
Likelihood ratio	101,811	6	0.000**
Valid cases	706		

Note: (**) Significance of the test. gl: degrees of freedom.

Similarly, the Gamma test statistic was calculated and its value was 0.557. This indicates a positive and moderately strong association between bio-altruistic values and pro-environmental attitudes. Also, the value of the Somers' D test statistic is 0.374, which indicates a positive, but slightly less strong association compared to Gamma. However, both Gamma and Somers' D have a very high statistical significance (p-value of 0.000). The findings from the symmetric and directional measures support the presence of a positive and statistically significant correlation between bio-altruistic values and attitude towards the environment in the university.

In addition, Figure 1 shows the cumulative probability plot of the variables studied. The purpose of this graphical representation was to evaluate whether the scores follow a normal distribution. The results obtained for the Kolmogorov-Smirnov statistic (Ks) for the pro-environmental attitude were 0.064, and for the bio-altruistic values it was 0.150. Both Ks values are accompanied by a p-value of less than 0.01 ($p<0.01$). This explains that the values do not have a normal distribution.

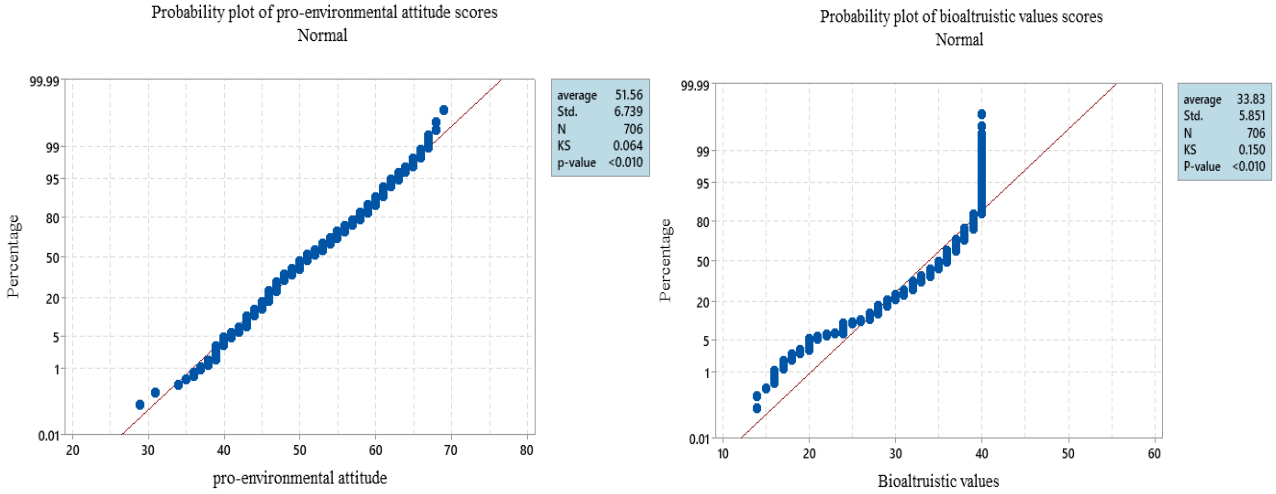

Figure 1. Assessment of the normality of environmental attitude and bio-altruistic values scores; KS: Kolmogórov-Smirnov

Finally, Figure 2 illustrates the correlation between pro-environmental attitude scores and bio-altruistic values. To evaluate the association between these variables, the nonparametric Spearman correlation statistic was applied. The value of Spearman's correlation coefficient (Rs) is 0.448, indicating a positive association. Furthermore, the p-value of 0.000 is less than 0.05, suggesting a statistically significant correlation.

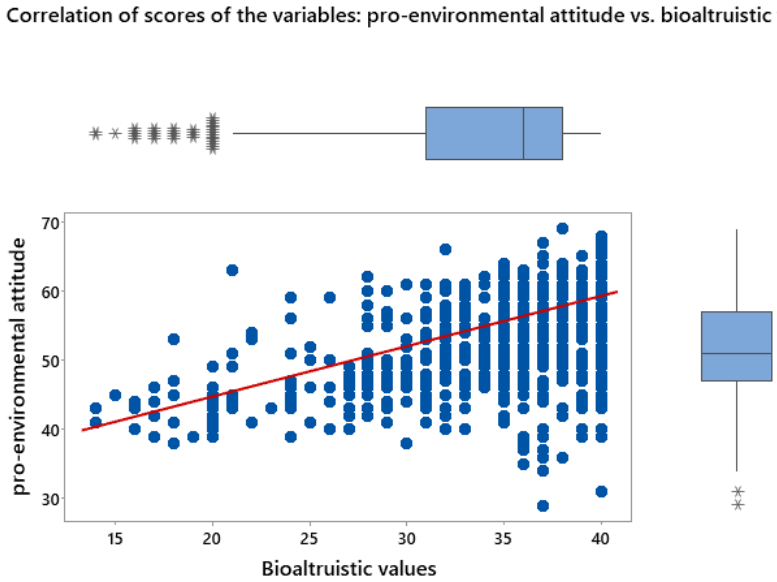

Figure 2. Spearman correlation of bio-altruistic values scores and pro-environmental attitude

These results allow us to conclude that there is a moderate and positive association between the variables pro-environmental attitude and bio-altruistic values, and this association is statistically significant. In other words, as pro-environmental attitude scores increase, bio-altruistic values scores likely increase, and vice versa. The magnitude of the correlation (Rs=0.448) suggests that this relationship is not extremely strong, but it is statistically relevant.

3.2. Discussion

The aim of this study was to analyze empirically the relevant correlation between bio-altruistic values and pro-environmental attitudes in university students. The data obtained in this study provide relevant evidence that there is a significant and moderate correlation in contrast with bio-altruistic values and pro-environmental attitudes in university students. These data are related to previous studies, such as Evert et al. who found a positive relationship between bio-altruistic values and pro-environmental attitudes in college students [35]; research by Chen et al. [9] and Sugiarto et al. [36] in Taiwan, Li et al. [37] in China, Ban et al. [38] in Croatia and Italy, and Činjarević et al. [3] in Bosnia and Herzegovina, also support the positive relationship between these two constructs.

The observed correlation between bio-altruistic values and pro-environmental attitudes ($Rs = 0.448$, $p < 0.05$) suggests that as bio-altruistic values increase, pro-environmental attitudes also tend to be more positive [39]. This result is consistent with studies linking internalization of bio-altruistic and altruistic values with greater pro-environmental awareness and behavior [6], [40]. Furthermore, the findings support previous research highlighting the importance of these values in promoting positive environmental attitudes [41], [42]. The prevalence of bio-altruistic "Good" values and positive pro-environmental attitudes in the majority of participants reinforces the idea that these values are significant predictors of pro-environmental behaviors [43]–[45].

Arya & Kumar [4] and Mouchrek et al. [46] highlight that people with strong bio-altruistic values are more likely to engage in pro-environmental behaviors, demonstrating an intrinsic connection between prioritizing the well-being of others and the intention to engage in pro-environmental behaviors. As such, the evidence gathered underlines the essentiality of this connection in fostering pro-environmental behaviors and sustainable development [47]. Furthermore, the mediation of pro-environmental attitudes in relation to personal values and sustainable consumption practices, as indicated by Demir and Tatar [48] and Zeng et al. [49], underlines the relevance of attitudes in the materialization of environmentally responsible behaviors. This finding underlines the importance of cultivating bio-altruistic values as an effective strategy to promote both positive attitudes and pro-environmental behaviors among university-level students.

Similarly, the influence of various factors in correlation with bio-altruistic values and pro-environmental behaviors is also evident in the research. The national higher education system, according to Ban et al [38], may moderate this relationship, contributing to similarities in students' cognition. Furthermore, the presence of psychological barriers, such as resistance to habit and lifestyle transformation, highlights the complexity of the connection and the need to address psychological aspects in environmental promotion programmes. According to Zehui [50], these behaviors are influenced by individual, social, and situational aspects, as well as personal values, concern for the environment, social norms, and self-efficacy.

Likewise, individual values, including altruistic, selfish, and biospheric values, play an important role in influencing pro-environmental behavior [4], [51]. The model based on the value-behavior norm (VBN) theory, according to Činjarević et al. [3], suggests that personal level norms and environmental consciousness, also influence pro-environmental behaviors. These factors, together with an orientation towards biosphere values, influence the intention to participate in environmental volunteering activities among university students.

The practical implications derived from these results highlight the need to direct educational strategies towards the cultivation of bio-altruistic values among university students as an efficient approach to fostering pro-environmental attitudes and behaviors. The positive correlation between bio-altruistic values and pro-

environmental attitudes, supported by previous research [3], [52], [53], supports the efficacy of this approach. The final results of this study have relevant implications for both environmental education and pro-environmental policymaking.

At the educational level, programs can aim to promote bio-altruistic values through hands-on activities, research projects, and the promotion of empathy [54] and responsibility towards the welfare of living beings [55], thus facilitating the progress of pro-environmental attitudes in students. Furthermore, the results indicate that policymakers can use the understanding of the correlation in both bio-altruistic virtues and pro-environmental attitudes to design effective strategies to encourage sustainable behaviors at the societal level, including incentives and community projects [56], [57]. However, it underscores the need to further investigate the impact of environmental education on the development of bio-altruistic virtues and pro-environmental qualities over time and in diverse cultural contexts.

The importance of these values in shaping university students' behaviors towards sustainability and their willingness to collaborate in environmentally friendly practices [58], underlines the relevance of this understanding as a basis for educational techniques to encourage pro-environmental behaviors. Therefore, fostering bio-altruistic values among university students can be an effective way to promote pro-environmental attitudes and behaviors.

3.3. Limitations of the study

One of the main limitations of the study is its correlational design, which prevents establishing causal relationships between bio-altruistic values and pro-environmental attitudes. Although a significant association is observed, it cannot be concluded that one is the cause of the other [39]. The study was conducted with university students from northern Peru, which could limit the generalizability of the results to other regions or populations. The restricted geographic representativeness could influence the external validity of the findings. Also, the reliance on self-report instruments, such as the NEP and MEPS scales, introduces the possibility of socially desirable response biases, where participants may have exaggerated their pro-environmental attitudes.

3.4. Areas for future research

To overcome the limitations of the correlational design, future studies could employ longitudinal designs to observe how bio-altruistic values and pro-environmental attitudes evolve over time. Future research should include more diverse and representative samples, both geographically and in terms of other demographic factors, to improve the generalizability of the results. Finally, it would be valuable to develop and evaluate educational interventions that promote bio-altruistic values, observing how they influence change in pro-environmental attitudes and behaviors in different contexts.

4. Conclusions

The results obtained in this study support the existence of a positive and significant correlation between bio-altruistic values and pro-environmental attitudes in university students. This correlation, although moderate, suggests that promoting bio-altruistic values may be an appropriate strategy to foster pro-environmental attitudes in this population. In this sense, the practical implications of the findings highlight the importance of including the promotion of bio-altruistic values in university curricula as an integral part of students' education. In addition, it is suggested that educational institutions adopt strategies that promote environmental conscience and concern for the well-being of others, thus contributing to the construction of a more sustainable society.

It is essential to consider that factors such as the educational system and psychological barriers can modulate the association between bio-altruistic values and pro-environmental attitudes. Future research could therefore delve deeper into these aspects to gain a more comprehensive understanding of the factors influencing this relationship in specific contexts.

The findings of this study align consistently with the accumulated evidence in the scientific literature, supporting the idea that the promotion of bio-altruistic values emerges as a valuable approach to cultivating pro-

environmental attitudes and behaviors. This support reinforces the importance of incorporating educational strategies that actively promote these values as fundamental components of academic training. Ultimately, these initiatives not only strengthen the positive connection between bio-altruistic values and pro-environmental attitudes but also contribute significantly to the construction of a society that is more aware and committed to environmental sustainability.

Declaration of competing interest

The authors declare that they have no financial interest in any of the topics covered in this article.

Funding information

This research has not received funding from any financial institution or organization.

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