

Psychosocial Correlates of Plastic Bottle Handling in a Sample of Residents of Metropolitan Lima, Peru

Correlatos psicosociales del manejo de botellas de plástico en una muestra de ciudadanos de Lima Metropolitana, Perú

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Abstract: This study analyzes the correlation between the plastic bottle handling (use, reuse, and disposal) and variables such as values, environmental awareness and concern, self-efficacy, and pro-environmental behavior intention among citizens of Metropolitan Lima. To this end, 141 participants aged 18–65 years were asked about various psychosocial variables such as values, environmental concern, awareness of pollution impact, pro-environmental self-efficacy, and plastic bottle consumption habits. The results indicate that people do not integrate reuse and recycling practices into their daily lives despite a high level of daily contact with plastic bottles. Moreover, the study discusses how values of self-promotion and benevolence are related to plastic consumption patterns, while others such as universalism could reflect a greater intention

to reuse. Furthermore, self-efficacy is associated with lower consumption, although the perception that individual actions have a limited impact overall persists.

Keywords: Plastic bottle. Single-use plastic. Values. Self-efficacy. Environmental awareness. Environmental concern.

Resumen: El objetivo de este estudio es analizar la relación entre el manejo de botellas de plástico (uso, reutilización y desecho) y variables como los valores, la conciencia y preocupación ambiental, la autoeficacia y la intención de conducta proambiental en ciudadanos de Lima Metropolitana. Para ello, se contó con la participación de 141 personas entre los 18 y 65 años y se les preguntó por diversas variables psicosociales como valores, preocupación medioambiental, conciencia sobre impactos de la contaminación, autoeficacia proambiental y, finalmente, también sus hábitos de consumo de botellas de plástico. Los resultados muestran que existe un alto nivel de contacto cotidiano con botellas de plástico y que las prácticas de reutilización y reciclaje no están integradas en el quehacer cotidiano de las personas. Además, el estudio discute cómo los valores de autopromoción y benevolencia se vinculan con patrones de consumo de plástico, mientras que el universalismo podría reflejar una mayor intención de reutilización. También, la autoeficacia se asocia con un menor consumo, aunque persiste la percepción de que las acciones individuales tienen un impacto limitado.

Palabras clave: Botella de plástico. Plástico de un solo uso. Valores. Autoeficacia. Conciencia ambiental. Preocupación ambiental.

1. Introduction

Concern about human impacts on the planet and the environment has been increasing for several decades. The scientific community has made multiple efforts to warn about the discouraging future that awaits us if patterns of resource exploitation and neglect of the planet are not reversed (Diekmann & Franzen, 2019). The environmental crisis comprises a complex series of issues, among which plastic pollution stands out as one of the problems most closely linked to human consumption patterns (United Nations Environment Program [UNEP], 2021).

According to the latest report by the UNEP, humanity produces more than 430 million tons of plastic per year, and the mass of all the plastic produced thus far is already twice as high as the combined biomass of all terrestrial and marine animals (UNEP, 2023). Plastic pollution has several consequences that can affect marine wildlife, degrade soil, poison groundwater, contribute to climate change, and influence human health (UNEP, 2023).

Metropolitan Lima and Callao produced around 886 tons of plastic waste daily in 2017, representing 46% of the national total (Ministerio del Ambiente [MINAM], 2017). In Peru, disaggregated official data on plastic waste in Metropolitan Lima is scarce and not systematically updated. Thus, the scale of the problem must be estimated using general solid waste statistics. These show that the city accounts for a disproportionately large share of the national total. In fact, in 2023, Metropolitan Lima and Callao generated 2.9 million metric tons of solid waste, equivalent to 48% of the total generated in the country (MINAM, 2025). The composition of recorded household waste showed that 21% was inorganic waste, a category that includes plastic and other recyclable materials. More significantly, only 2.1% of the total waste volume was recycled (MINAM, 2025). This indicates that the proportion of plastic packaging that returns to a recycling loop is marginal.

Since 2016, Peru has a national legal framework and a comprehensive solid waste management plan to address this issue. However, the lack of effective monitoring and oversight mechanisms by authorities, together with insufficient environmental education among citizens, hinders the effective enforcement of these guidelines (MINAM, 2017). For instance, Peru has banned the consumption of single-use plastic in natural areas since 2018 (Congreso de la República del Perú, 2018); however, plastic represents the primary cause of marine pollution to date (Deville et al., 2023). This highlights the importance of addressing citizen environmental behavior and its psychosocial foundations, as part of a broader strategy to tackle plastic pollution in Peru. In this regard, scholars have attempted to identify and classify the factors that influence pro-environmental behavior, such as values, environmental awareness, environmental concern, and perceived self-efficacy (Gifford, 2008), and use this information to effectively address plastic pollution in Peru.

According to Steg and Vlek (2009), pro-environmental behavior is a set of conducts intended to benefit or minimize the damage caused to the environment. This definition highlights two significant elements: people's agency to reduce environmental damage and the importance of addressing the negative impacts of human behavior on sustainability (Tian & Liu, 2022). Here, it is possible to differentiate between pro-environmental behaviors focused on mitigating impacts and those aimed at promoting environmental conservation (Tian & Liu, 2022).

Pro-environmental behavior involves conscious actions that are integrated into an individual's lifestyle. Therefore, behavioral intention seems to be a crucial antecedent to behavior (Castro, 2002). Environmental behavior intent is a person's subjective perception of their participation in pro-environmental behaviors, manifesting their willingness to engage in future environmental actions (Weimer et al., 2017). In this regard, intention would reflect the person's level of motivation, while present or past behavior is understood as a measure of the person's habitual behavior patterns, which could either facilitate or inhibit future environmental behaviors (Stern, 1992). Regarding the correlation between intention and pro-environmental behavior, studies suggest an

existing gap between intention and materialization of pro-environmental behavior (Wang et al., 2020; Zhang et al., 2023), although the relationship has been found to be positive and significant in some contexts (Liu et al., 2020). In this sense, understanding why individuals develop pro-environmental intentions requires considering deeper motivational structures, such as their personal values.

Values, defined as beliefs that guide behavior toward desirable goals (Schwartz, 2012), may also influence the intention to engage in pro-environmental behavior and the behavior itself. Schwartz (1992) understands values as principles that guide life and proposes a structure that comprises ten values: power, achievement, hedonism, stimulation, self-direction, universalism, benevolence, tradition, security, and conformity. Furthermore, these values can be grouped into four dimensions: self-promotion (power, achievement, and hedonism), openness to change (stimulation and self-direction), conservation (tradition, security, and conformity), and self-transcendence (universalism and benevolence) (Schwartz, 2012).

Universalism has been found to be a value influencing pro-environmental intention and behavior directly and significantly (Weimer et al., 2017). Several empirical studies have identified a direct correlation between pro-environmental behavior and the dimension of self-transcendence and an inverse correlation between pro-environmental behavior and the dimension of personal promotion (De Groot & Steg, 2007; Schwartz, 2012; Steg et al., 2014). In addition, values are related to other internal factors that influence pro-environmental behavior, i.e. environmental awareness, and environmental concern.

Therefore, three main concepts, understood as cognitive processes (pro-environmental awareness), affective processes (pro-environmental concern), and behaviors (pro-environmental behavior), contribute to shaping individuals' positions on environmental issues. Environmental awareness is a construct whose definition has been debated in existing research. Nevertheless, it is widely conceptualized as a set of knowledge and affects concerning the relationship between human behavior and the environment (Fu et al., 2019).

One construct conceived of as a component of environmental awareness is environmental concern (Fu et al., 2019). It is defined as a specific attitude that predisposes environmental behaviors or an overall attitude that guides broader values (Bamberg, 2003; Fransson & Garling, 1999). Moreover, it is considered an emotional expression or manifestation caused by the impact of environmental degradation on people's health and well-being; however, it does not necessarily represent a concern for the good of the ecosystem itself (Diekmann & Franzen, 2019; Lou & Li, 2021). Nevertheless, environmental concern highlights the deterioration of the environment caused by human actions (Diekmann & Franzen, 2019). Although environmental awareness and concern have been widely studied, they do not directly lead to pro-environmental behavior; instead, their effects are indirectly mediated by behavioral intention, self-efficacy, and perceived behavioral impact (Fu et al., 2019).

Existing research (Bauer et al., 2013; Chen, 2011; Klöckner, 2013) examines the factors influencing the intention to purchase pro-environmental products or the reduction in the consumption of certain products, such as single-use plastic. Such factors include attitude, subjective norms, access to eco-friendly products, availability of sustainability information and self-efficacy (Ramayah et al., 2010).

Self-efficacy, in particular, appears to be a determinant of the correlation between pro-environmental attitudes and behavior, and it is at the core of social cognitive theory (Bandura, 1997; Bandura, 2001). According to Bandura (2001), self-efficacy is the self-assessment of one's capacity and ability and determines an individual's ability to regulate and reflect on their behavior. It is an individual's belief about their ability to achieve a desired goal (Ajzen, 2002; Ryan & Deci, 2017).

Perceived self-efficacy reflects an individual's confidence in their ability to act effectively within a given environment. It shapes individual's efforts, directing their thoughts toward either optimistic or pessimistic patterns (Bandura, 2001). People with higher perceived self-efficacy trust in their competencies and base their actions on a clear understanding of potential outcomes. Perceived self-efficacy also helps mitigate shifts in attitudes caused by negative emotions—such as anxiety—stemming from uncertainty or obstacles encountered when engaging in pro-environmental behaviors (Qin et al., 2024). Individuals with strong perceived self-efficacy actively seek solutions to overcome such challenges, allowing them to persist in their actions despite opposing influences (Bandura, 2001; Vallacher & Wegner, 1989). Thus, self-efficacy plays a decisive role in determining whether individuals respond positively or negatively to specific pro-environmental actions, such as plastic recycling.

Social cognitive theory suggests that attitudes toward sustainable behavior are more stable when they are perceived as personally relevant and are connected to self-efficacy (Glasman & Albarracín, 2006). However, commitment to pro-environmental action also depends on the perceived impact of individual efforts. In this regard, perceiving environmental problems as highly complex or difficult to solve may undermine behavioral intentions (Glasman & Albarracín, 2006).

Saavedra et al. (2024) found, in a study conducted in Peru and Chile, that participants expressed an intention to engage in pro-environmental behaviors at an individual level (e.g., recycling and reducing plastic consumption). However, they perceived these actions as inefficient at reducing marine plastic pollution because their influence was limited to their immediate social networks. Thus, they emphasized the need for collective engagement, involving citizens, governmental and non-governmental institutions, and companies, to promote and sustain these pro-environmental behaviors at an institutional level.

These considerations suggest that pro-environmental behaviors, especially those related to the use, reuse, and disposal of plastic, seem to be influenced by a complex interaction

of psychosocial factors. Therefore, this study's general objective is to analyze the correlation between the handling of plastic bottles (use, reuse, and disposal) and variables such as values, environmental awareness and concern, self-efficacy, and pro-environmental behavior intention among residents of Metropolitan Lima. Additionally, as a specific objective, the study also seeks to describe Lima residents' behaviors regarding the obtaining, use, reuse, and disposal of plastic bottles.

2. Method

2.1 Participants

The sample size was determined through an *a priori* power analysis conducted using G*Power software. For Pearson correlation analyses, a moderate effect size ($r = 0.3$) was assumed, with a significance level of $\alpha = .05$ (two-tailed) and 80% power, yielding a minimum requirement of 84 participants. For multiple linear regression analyses (with 14 predictors), an $R^2 = 0.15$ ($f^2 = 0.177$) was specified, maintaining $\alpha = .05$ and 80% power, which resulted in a required sample of 135 participants. To ensure robustness against potential data loss or exclusions, we recruited a final sample of 141 adults aged 18–65 years (exceeding the required thresholds). Of the total participants 63.1% were women, 34.8% were men, 1.4% were non-binary individuals, and one participant preferred not to disclose their gender. To achieve heterogeneity, inclusion was limited to adults, and participants were contacted via intentional non-probabilistic sampling (social media, instant messaging, and emails).

2.2 Measurement

Plastic bottle consumption habits. Several questions were used to assess how participants used and disposed plastic bottles in their daily lives. To this end, categorical questions were used to measure three main areas: acquisition, disposal, and frequency of use. Some questions had dichotomous answers (yes or no), while others were multiple-choice. For the purposes of the study, participants were shown an image illustrating the types of plastic bottles referred to in the questionnaire (e.g., single-use beverage bottles: soda, bottled water, etc.). In addition, consumption was measured based on the number of physical units purchased (i.e., number of bottles), regardless of the volume or size of the container (individual vs. family-size), following a standard method for measuring plastic bottle consumption (Liu et al., 2025).

Environmental concern (Schultz, 2001). This scale measures people's concern for the environment, based on 11 specific environmental problems. Participants answered using a five-point Likert scale, ranging from 1 (not at all important) to 5 (very important). For the analysis, the 11 items were grouped according to their semantic relationship with the following categories: «ecosystem» ($\alpha = .79$), «industry» ($\alpha = .81$), «personnel» ($\alpha = .83$) and «other people» ($\alpha = .87$).

Awareness of pollution impacts. This scale was adapted from the one above and used to assess participants' awareness of environmental pollution impacts. Responses were recorded using a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Similarly, the same four categories were identified: «ecosystem» ($\alpha = .82$), «industry» ($\alpha = .76$), «personnel» ($\alpha = .86$) and «other people» ($\alpha = .85$).

Pro-environmental self-efficacy. This *ad hoc* scale was used to determine the extent to which individuals perceive their ability to influence environmental issues. The scale comprises two dimensions: perceived self-efficacy (two items) and perceived effectiveness of action (three items). These assess whether participants believe they could act in an eco-friendly manner and whether they believe their actions can have a meaningful impact on the world. Responses were recorded using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability of the first dimension was acceptable ($\alpha = .65$), while that of the perceived effectiveness of action was high ($\alpha = .92$). The total scale also showed a high level of reliability ($\alpha = .88$).

Social values (Oceja et al., 2019). A reduced version of Schwartz's values scale was used, with each item representing one of the ten values in the model. Participants were asked indicate how similar they were to the person described in each item, using a five-point Likert-type scale, ranging from 1 (not at all like me) to 5 (very much like me). Cronbach's alpha coefficient was not reported for this scale because the analysis focuses on individual items rather than on the scale as a whole. Additionally, two of the broader dimensions of Schwartz's model have only two items each, which limits the interpretation of reliability in terms of internal consistency.

2.3 Procedure

The scales used in this study were adapted, and questions on plastic consumption habits were prepared, considering the relevant literature on the subject. The application protocols on the Qualtrics platform were then digitized. Subsequently, a pilot test was conducted to verify that all items in the questionnaire were clear and understandable. The data collection process took place virtually, with the survey disseminated through social media, instant messaging applications and email. Recruitment continued until power analysis requirements were exceeded ($n = 141$ vs. minimum $n = 135$). At the beginning of the survey, participants were presented with an informed consent form, which briefly explained the study objectives, voluntary participation, confidentiality, anonymity, and their right to withdraw at any time. An email address was also provided so that participants could contact the research team if they had any questions. Participants were then asked to provide sociodemographic information and answer questions about their plastic consumption habits. Finally, the psychosocial scales mentioned above were presented. Fieldwork was conducted between May and July 2023.

2.4 Data Analysis

Collected data were processed using the IBM SPSS Statistics software, version 27. First, the database was cleaned up, removing participants who failed to respond to several questions on the scales, or whose responses were considered highly extreme. With the final sample, descriptive analyses, correlations, and regression models were conducted to examine plastic consumption and psychosocial variables. Parametric statistics (e.g., Pearson) were used for all statistical procedures because univariate normality was found using the Shapiro-Wilk test, asymmetry, and kurtosis, except for correlations involving dichotomous variables, where Biserial Point was used.

3. Results

3.1 Description of Specific Behaviors on the Use and Consumption of Plastic Bottles

Participants were asked about three specific aspects: acquisition, disposal, and frequency of use.

First, participants were asked if they had consumed at least one plastic bottle the previous day. The vast majority answered yes (75.9%, $n = 107$), while a smaller percentage said no (24.1%, $n = 34$). Specifically, of those who had consumed a bottle the previous day, 48.6% reported having consumed only one bottle, 35.5% had consumed two bottles, and 11.2% had consumed three or more bottles.

Participants were then asked where they had obtained the bottles. Participants most commonly mentioned commercial establishments (33.3%), followed by their own homes (32.6%). Lower scores were also given to their workplaces and public streets (9.2% for both). Other reported places were recreation centers (6.4%) and study centers (4.3%).

Afterwards, participants were asked whether they had discarded any bottles the previous day. Thirty-four participants indicated that they had not discarded any plastic bottles (31.8%), 38 reported having discarded only one (35.5%), and 26 reported having discarded two bottles (24.3%). In addition, those who answered yes to the previous question were asked where they had discarded the bottle(s). The vast majority indicated having done it at home (53.2%), followed by their workplace (14.2%). Other locations included commercial establishments and recreational centers (5%).

Specifically, we also wanted to know how plastic bottles were disposed of. The most common method was throwing the bottle in a general waste bin at home (31.2%), followed by placing it in a recycling bin at home (24.1%). Less frequently, participants reported having done it at their workplace or place of study, either in a recycling bin (10.6%) or a general waste bin (6.4%). Another reported method was placing it in a general waste bin on the street (5%).

Finally, to assess the frequency of plastic bottle use, participants were asked how many bottles they had used during the previous 7 days. Participants reported using an average of 4.73 plastic bottles, although considerable variation was observed in the reported frequency. Most common responses were 1 or 2 bottles (14.2% each), followed by 3 or 4 bottles (13.5% each) and 5 bottles (10.6%). In addition, some people reported having used 10 bottles (9.9%), while others mentioned 6 or 7 bottles (5.7% each). A smaller group of participants reported not having used any plastic bottles (5%).

3.2 Correlations between Plastic Bottle Consumption Habits and Psychosocial Variables

For this analysis, four specific questions on the consumption and use of plastic bottles were asked to establish their correlations with the variables of pro-environment behavior, values, environmental awareness and concern, self-efficacy and intention. These questions aimed to determine whether participants had at least one plastic bottle in their hand the previous day, the number of bottles they had in their hand, the number of bottles discarded, and the number of bottles obtained during the previous seven days.

First, a correlation analysis between these variables and pro-environmental behavior intention was conducted. Only one variable correlated: the number of bottles used during the previous seven days, $r(141) = -.242, p < .01$ —the more bottles people consume, the less they are predisposed to sustainable behaviors.

Then, the correlations between plastic consumption variables and values were assessed. The analysis first considered the dimensions proposed by Schwartz (1992; 2012): personal promotion, openness to change, conservation, and self-transcendence. Statistically significant correlations were found only for the personal promotion dimension. Specifically, this dimension was related to having used a plastic bottle the previous day, $r(141) = .247, p = .003$, and the number of bottles used in the previous seven days, $r(141) = .195, p = .021$. Thus, values of personal promotion are associated with greater possession (consumption) of plastic bottles on a daily and weekly basis.

Additionally, a correlation analysis was conducted specifically with each one of the 10 values of the model. Table 1 shows the results.

Table 1. Correlations between Plastic Bottle Consumption Patterns and Values

	Univer- salism	Benevo- lence	Confor- mity	Tradi- tion	Security	Power	Achieve- ment	Hedo- nism	Stimula- tion	Self- direction
Bottle in hand	.067	.105	.083	.081	-.052	.160	.266**	-.036	.032	.059
Number of bottles in hand	-.089	.188*	-.040	.177	-.126	.164	.078	.053	.074	-.191*
Number of bottles discarded	-.168*	-.036	.031	.010	.056	.092	.102	-.059	.025	-.136
Number of bottles used in the previous 7 days	-.137	.053	-.044	.083	-.129	.180*	.152	.034	.061	-.093

Note. * $p < .05$, ** $p < .01$

Next, correlations between environmental awareness and concern were examined. Table 2 shows the main results.

Table 2. Correlations between Plastic Bottle Consumption Patterns and Environmental Awareness and Concern

	Awareness				Concern			
	Ecosystem	Industry	Personnel	Other people	Ecosystem	Industry	Personnel	Other people
Bottle in hand	-.039	.093	-.047	.003	-.006	.180*	-.055	.031
Number of bottles in hand	.058	.026	.053	.035	-.210*	-.160	-.089	-.059
Number of bottles discarded	-.204*	-.191*	-.208*	-.201*	-.153	-.151	-.066	-.147
Number of bottles used in the previous 7 days	-.188*	-.086	-.244**	-.219**	-.081	.023	-.031	-.074

Note. * $p < .05$, ** $p < .01$

Finally, correlation analyses were conducted for the environmental self-efficacy variables: perceived self-efficacy and behavioral efficacy. Table 3 indicates that significant correlations were found only for perceived self-efficacy—people who consume fewer bottles and, therefore, discard less perceive themselves as more capable of engaging in sustainable behaviors. However, no significant correlations were found with their perceptions of the impact of their actions on the real world.

Table 3. Correlations between Plastic Bottle Consumption Patterns and Perceived Self-Efficacy and Effectiveness of Action

	Perceived self-efficacy	Effectiveness of action
Bottle in hand	.031	.092
Number of bottles in hand	-.114	.041
Number of bottles discarded	-.201*	-.082
Number of bottles used in the previous 7 days	-.250**	-.084

Note. * $p < .05$, ** $p < .01$

Considering the previously reviewed correlations, we wanted to determine to what extent psychosocial variables, such as values, environmental awareness, environmental concern, and perceived self-efficacy, could serve as general indicators for plastic consumption. To this end, we used the «number of bottles used in the previous 7 days» as the output variable and considered all dimensions of the previously mentioned variables as predictor variables.

A multiple regression analysis was performed with the stepwise method to identify a suitable model to predict bottle consumption during the previous seven days. Of all the variables entered, a significant model was found, which explained 11.6% of the variance, $F(3, 137) = 7.119$, $p < .001$, $adjusted R^2 = .116$. Only three predictor variables were obtained: perceived self-efficacy, $B = -1.04$, $EE = 0.42$, $\beta = -.20$, $t = -2.47$, $p = .015$, CI 95% [-1.87, -0.21]; self-promotion, $B = 0.89$, $EE = 0.36$, $\beta = .20$, $t = 2.49$, $p = .014$, CI 95% [0.18, 1.59]; self-awareness, $B = -0.85$, $EE = 0.38$, $\beta = -.19$, $t = -2.24$, $p = .027$, CI 95% [-1.61, -0.10].

4. Discussion

Overall, the results indicate that participants had a high level of daily contact with plastic bottles, which demonstrates the prevalence of this material in their everyday lives. Despite growing awareness of the environmental impacts of plastic, reported use remains widespread, with participants using an average of nearly five bottles per week.

This level of consumption can be better understood by comparing it to reported consumption in other cities. Using an equivalent self-reported measure (bottles per week), Liu et al. (2025) reported average weekly consumption of 4.52 bottles in Hanoi, 7.64 bottles in Depok, 15 bottles in Shanghai, 15.17 bottles in Harbin, and 16.5 in Phnom Penh. Thus, the average observed in Lima (4.73 bottles) is comparable to the lower end of this range and considerably lower than the averages reported for megacities such as Shanghai and Harbin.

Furthermore, although 31.8% of the participants indicated that they had not disposed of any bottles on the previous day, most of those who had done it did so in general waste containers rather than in containers intended for waste segregation or subsequent recycling. This reveals that recycling practices are not yet sufficiently integrated into daily behavior. Moreover, even when opportunities for reuse existed, most participants did not report making significant efforts to reduce their consumption or dispose of bottles in a more environmentally responsible fashion.

This contrast suggests that the problem in Metropolitan Lima is defined less by an exceptionally high level of consumption than by the limited integration of reuse and waste-sorting practices into daily life. This pattern is also consistent with findings reported in other cities. For example, in the five Asian cities mentioned before, more than half of single-use plastics were discarded without prior segregation (Liu et al., 2025). Furthermore, in a comparative analysis of six cities in Asia and Latin America, Panama City was the only one where plastic bottles ranked among the five most common types of waste found in public spaces, against a backdrop of low recycling rates (Maddalene et al., 2023).

Another relevant factor is insufficient government action to reduce plastic pollution, especially due to the lack of incentives and regulatory practices that promote responsible use and consumption of plastic. In Peru, for example, only 33% of the measures established under Law No. 30884, which regulates single-use plastics, have been implemented (Pizarro, 2022). Furthermore, insufficient oversight by regulatory bodies and local governments responsible for certification, incentives, and sanctions further limits compliance. This institutional inaction represents an obstacle to developing and maintaining pro-environmental practices, as their effective implementation usually requires additional individual efforts and financial resources.

These findings suggest that, despite widespread awareness of plastic pollution and its impacts, practical barriers and limited sustainable alternatives hinder the adoption of pro-environmental behaviors, reinforcing the idea that measures are ineffective, which delays action. Thus, coordinated efforts between consumers, businesses, and governments are necessary to improve plastic consumption habits by promoting feasible reduction and reuse alternatives.

Although recycling remains an important waste management strategy, reducing plastic consumption should be prioritized, as it is more effective in the long term, even if it requires greater resources at the individual and social levels. Indeed, reducing plastic consumption involves significant changes in use and purchasing habits (Mego, 2025). Evidence also suggests that environmentally favorable attitudes are more strongly related to recycling plastic than to reducing its consumption. This emphasizes the need for strategies that integrate both recycling and reduction as effective complementary approaches to mitigate plastic pollution.

4.1 Plastic Consumption and Individual and Environmental Values

Values seem crucial in people's relationship with the environment, as demonstrated by previous literature (De Groot & Steg, 2007; De Groot & Steg, 2010). The findings suggest a direct correlation between the consumption of plastic bottles and self-promotion values, also known as «selfish values.» In contrast, an inverse correlation exists between this consumption and transcendence values. This makes sense because people oriented toward self-transcendence tend to be more concerned about social and environmental well-being, while those focused on self-promotion are less likely to adopt pro-environmental behaviors (De Groot & Steg, 2010).

The association between plastic bottle consumption and self-promotion values demonstrates the existence of a set of beliefs and attitudes that prioritizes consumption over environmental care to obtain power and success. According to Schwartz (1994), self-promotion values are aligned with the sociocultural values of autonomy, hierarchy, and competence, which are reflected in the pursuit of social status and control over resources. In the Peruvian context, the neoliberal economic and socio-political system adopted in recent decades may have contributed to the prioritization of resource accumulation and social status (Rottenbacher, 2010).

In this regard, self-promotion values could be considered the result of a neoliberal system that has fostered ideologies and institutions that promote attitudes and practices oriented towards individualism, materialism, selfishness, the desire for financial success, and hedonism (Rottenbacher & Schmitz, 2012). Thus, people oriented toward self-promotion will evaluate pro-environmental behaviors by prioritizing the costs and benefits they may generate to them (Steg & De Groot, 2013). This could explain why, despite the prohibition on plastic bottles in natural areas in Peru (Congreso de la República del Perú, 2018), they remain one of the most common pollutants in Peruvian seas (Deville et al., 2023).

Additionally, no technical regulations have been developed to enforce the prohibition of plastic bottles in natural areas (Sociedad Peruana de Derecho Ambiental, 2024). Therefore, although restrictions of plastic consumption at beaches are intended to address the problem of marine plastic pollution, such restrictions does not impose a tangible cost on individuals. Consequently, people oriented toward selfish values will not

perceive the consumption of plastic bottles as sufficiently detrimental to their personal interest to motivate changes in their consumption patterns.

Concerning transcendence values, despite the absence of a significant correlation with the overall self-transcendence orientation, significant correlations were identified for specific values. Greater acquisition of plastic bottles was associated with a greater tendency toward benevolence, while a lower willingness to discard bottles was associated with greater universalism. Although transcendence values prioritize nature, society, and other people, benevolence is more specifically oriented toward seeking the well-being of people in one's immediate social environment, while universalism emphasizes the protection of all humans and nature (Dursun et al., 2017). Following this logic, people inclined to benevolence may be more likely to replicate the purchasing patterns that prevail in their immediate social environment, which in a neoliberal country may tend toward a culture of consumption. Those inclined toward universalism may be less likely to discard their plastic bottles because they plan to reuse or recycle them out of concern for the effects of plastic on society and nature.

Overall, the results suggest that pro-environmental behavior stems from value-based cost-benefit assessments, whether oriented toward individual benefits (self-promotion) or toward altruistic or collective benefits (self-transcendence). Therefore, the greatest challenge in promoting pro-environmental behavior would be to encourage individuals to progress to the next immediate level of environmental values by using arguments that resonate with their personal values. Thus, people who currently gravitate toward universalism could be motivated to direct their concern toward the effects of plastic on nature to generate actions aimed at protecting nature, as universalism is associated with biospheric values (Steg & De Groot, 2013; Schwartz, 2012). Similarly, people who gravitate toward benevolence could be informed of the effects of plastic pollution on their closest circle, considering they comprise a consumer-oriented society that does not perceive the environmental issue as a threat to the economy and public health.

For those who prioritize self-promotion and selfish values, being persuaded of the effects of plastic pollution on individual and societal well-being may pose more complex challenges and lead to a less efficient path in the promotion of changes in their plastic consumption patterns. People with this axiological profile tend to deny the effects of environmental problems on society and their lives (Geiger et al., 2022). Therefore, it is necessary to explore initiatives to raise awareness on plastic pollution and its impacts on the quality of life and lifestyle of individuals: for instance, not being able to enjoy a clean beach and constantly ingesting microplastics.

4.2 Pro-Environmental Awareness and Plastic Consumption

The results suggest a complex relationship between awareness of plastic pollution and consumption behavior. Despite a correlation between awareness of the impacts of plastic pollution and pro-environmental behavior (Soares et al., 2021), the results indicate that

awareness alone is insufficient to reduce plastic consumption. People continue to consume plastic, despite widespread recognition of the environmental and health risks associated with its use, due to existing barriers to change, such as the inertia of established consumption habits and a low perception of control over their behavior (Menzel et al., 2021). This phenomenon reveals a disconnect between negative attitudes toward plastic and concrete actions to reduce its use.

This discrepancy could be attributed to several factors. First, available information tends to focus on the problem (the what), instead of on the solutions (the how), prioritizing behaviors that mitigate the problem but do not solve it, such as recycling (Sitadewi et al., 2021). Second, reducing plastic consumption requires coordinated efforts between companies and consumers, which makes it difficult to change individual consumption habits (Menzel et al., 2021).

Furthermore, plastic consumption is related to personal attitudes and values. Heidbreder et al. (2023) found that people with more favorable attitudes toward plastic packaging had a greater intention to buy these products. This suggests that if people have favorable attitudes toward plastic and values related to immediate gratification, they will likely continue consuming this product due to its affordability, practicality, and portability.

4.3 Self-Efficacy and Plastic Consumption

This study indicates that self-efficacy is inversely related to plastic consumption. This finding suggests that a greater belief in one's ability to engage in sustainable behaviors is associated with a lower tendency to consume plastic and, therefore, to generate waste. In other words, people who feel more capable of practicing pro-environmental behaviors tend to consume less plastic, which contributes to reducing their environmental impact (Gao & Shao, 2022). This relationship is consistent with previous studies that have found that self-efficacy encourages green drinking behaviors (Gao & Shao, 2022).

The correlation between self-efficacy and pro-environmental behavior can be explained by Bandura's (2001) social cognitive theory, which postulates perceived self-efficacy as a determining factor or predictor of behavior. In the context of plastic consumption, participants who perceive themselves as able to engage in sustainable behaviors seem more likely to reduce their plastic consumption after assessing their behavior and capabilities.

However, despite feeling capable of practicing sustainable behaviors, participants perceive that these actions will not have a significant impact on the environment. This finding aligns with a study by Saavedra et al. (2024), who considered individual pro-environmental behaviors of Peruvian and Chilean citizens to be insufficient to address marine plastic pollution. One possible explanation for this perception is that the perceived level of difficulty in addressing environmental problems exceeds individual capacities (Gifford, 2011).

Two main limitations of the study are noted. The first limitation relates to the composition of the sample. Sampling was non-probabilistic and intentional, resulting in a gender imbalance. This overrepresentation is significant because the literature indicates that women may exhibit more favorable pro-environmental attitudes and behaviors than men (Zelezny et al., 2000). Consequently, it is possible that average levels of environmental concern, awareness, and self-efficacy observed in this study are higher than those in the broader population of Metropolitan Lima. Future studies using probability-based samples with proportional representation should examine gender as a potential moderating variable.

The second limitation relates to the operationalization of plastic bottle consumption. Behaviors were recorded in physical units (i.e., number of bottles possessed, disposed, or reused), without accounting for container volume. Therefore, the associations reported here should be understood as reflecting the frequency of contact with and handling of plastic bottles, rather than as estimates of participants' plastic material footprint. Future research should record both the number of plastic bottles and their capacity.

5. Conclusion

This study highlights the complexity of plastic consumption behaviors and the importance of psychological factors such as personal values, pro-environmental awareness, and self-efficacy. Despite increased awareness of the negative environmental impacts of using plastic bottles, consumption remains widespread due to barriers such as accessibility, convenience, and limited sustainable alternatives. In this context, self-promotion values are associated with higher levels of plastic bottle consumption, while self-transcendence values are associated with more environmentally responsible and conscious consumption practices.

These findings suggest that strategies based solely on increasing environmental awareness may be insufficient to produce sustained behavioral change. Instead, strategies should adopt a comprehensive approach that integrates value-oriented messages, reinforces perceived self-efficacy, and addresses structural and institutional barriers that limit sustainable behavior. In this regard, it is important to understand that although psychological processes play an important role in pro-environmental behavior, they should not be analyzed in isolation, but rather studied in combination with the cultural, political, and institutional dimensions of each context for a better understanding of this phenomenon.

Future research could explore ways to increase perceived self-efficacy and the effectiveness of pro-environmental actions when engaging in pro-environmental behaviors. Moreover, further research should examine how public policies and business practices can create an environment that facilitates reductions in plastic consumption by addressing the gap between environmental awareness and actual behavior. Therefore,

addressing plastic consumption requires coordinated efforts that combine individual-level interventions with systemic changes at the policy-level.

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