Journal of Infrastructure, Policy and Development 2024, 8(13), 8341.
https://doi.org/10.24294/jipd8341

Article

Daily pro-environment behavior in a Pakistani sample: Self and collective efficacy, individual and social norms and environmental concerns

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CITATION

Maran DA, Butt MU, Innocenti M, et al. (2024). Daily pro-environment behavior in a Pakistani sample: Self and collective efficacy, individual and social norms and environmental concerns. Journal of Infrastructure, Policy and Development. 8(13): 8341. https://doi.org/10.24294/jipd8341

ARTICLE INFO

Received: 22 January 2024
Accepted: 2 September 2024
Available online: 8 November 2024

Abstract: The aim of this study was to analyze the perceived self and collective efficacy, individual and social norms and feelings related to environmental health concern among a sample of Pakistanis who are (or are not) engage in pro- environment behaviors in their daily lives. An ad hoc questionnaire with scales on pro-environmental behavior, self and collective efficacy, individual and social norms, and environmental health concerns was administered to adults in Lahore, Pakistan, and 833 respondents (62% males and 38% females) responded. Analysis of our research data shows that among those who engaged in daily pro-environmental behaviors, perceptions of individual and social norms and individual and collective efficacy were positively associated with concern for the environment and health. This study offers some interesting ideas that could be useful in developing federal, regional, local and community policies to promote daily pro-environmental behaviors. For example, in addition to advocating for environmental health and reducing one's ecological footprint, social communication could explain that caring about environmental health (and thus adopting daily pro-environmental behaviors) is a way to manage one's mental health. In this way, circular behavior is encouraged, which not only benefits the environment and the community, but also brings personal benefits.

Keywords: daily life; habits; self-efficacy; collective efficacy; individual norms; social norms; climate change

1. Introduction

Environmental health is one of the most important public and political issues that people have faced in recent decades (Romanello et al., 2021). Since one of the main purposes of research is to study and understand a phenomenon in depth, studying climate change from different angles can have a global impact on policy making and decision making. Climate change is a complex issue, both in physical (Rocque et al., 2021) and social terms (Diez et al., 2020). Climate change, pollution, resource depletion, overpopulation, and animal and plant extinction are considered environmental problems resulting from human habits related to the daily consumption of the planet's resources, both through their misuse (e.g., use of land for human activities such as extensive cultivation) and waste (e.g., use of drinking water for activities that do not require its use). In this context, individuals and households have been found to play a critical role in the transition to sustainability (Gonzàlez-Hernàndez et al., 2022). As suggested by Barth et al. (2021), promoting individual and collective pro-environmental behaviors is critical for mitigating and adapting to environmental problems. Pro-environmental behaviors have been defined as attitudes

that consciously seek to minimize the impact of one's actions on the natural and built world (e.g., minimizing energy consumption) (Wut et al., 2021).

As Geng et al. (2016), see also Wang et al. (2021) point out, it is important to focus on environmental awareness in the private sphere and to promote daily pro-environmental behaviours (DPEB, hereafter). This means that when assessing DPEB, one should focus on "daily life" rather than pro-environmental behaviors related to occasional decisions (e.g., attending a public demonstration) or infrequent decisions, such as choosing a vacation spot. Therefore, it is important to analyze the individual and social variables that influence the adoption or non-adoption of DPEB (Ballew et al., 2019) to provide policymakers and communication campaign professionals with the information they need to promote these behaviors (Huang, 2016). This study was conducted within the framework of the theory of Planned Behavior (TPB), one of the most commonly used for studying individual behavior. The TPB states that behaviors result from individual intention and perceived behavioral control. Intention, defined as an indicator of how much effort an individual is willing to invest in performing the behavior (Ajzen, 1991), in turn depends on three direct predictors: attitude, subjective norm, and perceived behavioral control. Attitude is defined as a person's positive or negative evaluation of the behavior; subjective norm refers to the perceived social pressure associated with the behavior; and perceived behavioral control is the personal assessment of the feasibility of the behavior in a given context (Ajzen, 1991). The TPB assumes that the three determinants of intention are influenced by behavioral, normative, and control beliefs, commonly referred to as indirect predictors. Behavioral beliefs refer to the perceived advantages and disadvantages of performing a particular behavior; normative beliefs are "a person's subjective probability that a particular normative referent wants the person to perform a particular behavior" (Ajzen, 2012, p. 441); and control beliefs refer to various factors (time, cost, available infrastructures, etc.) that hinder or facilitate a behavior. In this study, we also included concern for the environment and perceived well-being and quality of life as variables. For example, as Innocenti et al. (2023) note, excessive worry can be associated with various defense mechanisms; studies have identified a state in which the person feels apathy and rejection towards the environment (Pihkala, 2020). This tendency to avoid one's worries has been termed "ecoparalysis" by Albrecht (2011). Given these emotions, some people suffering from negative emotions find it easier to adopt a state of apathy towards the environment (Usher et al., 2019; Heeren et al., 2022) than to adopt DPEBs.

Previous research has shown that self- and collective efficacy, individual and social norms, and concern for the environment predict prolonged engagement in pro-environmental behaviors (Lamm et al., 2022). The results of this research suggest that individuals who feel that their own behavior and the behavior of others have some efficacy for improving environmental health (or reducing environmental impacts) in a community concerned about climate change are more likely to adhere to that community's behavioral norms, which may include a variety of pro-environmental behaviors (Innocenti et al., 2023).

Albert Bandura's (1982) theory of self-efficacy can be summarized as the belief that one has the necessary means and skills to perform or complete a particular task. The feeling of self-efficacy reflects people's confidence that they can perform a behavior if they want to do it (Bain and Bongiorno, 2020). Self-efficacy has been

shown to be a strong predictor of action intentions. In the case of pro-environmental behaviors, self-efficacy is the belief that we have valuable skills to contribute to the achievement of group goals. As described by Lauren et al. (2016), self-efficacy promotes the belief that one has the power to change the environment: thus, self-efficacy appears to be related to the perception that environmental health (and associated environmental risks) is more controllable. Hamann and Reese (2020) emphasized that collective efficacy is another predictor of reported pro-environmental behaviors. Perceived strong collective efficacy increases the likelihood that an individual will engage in behaviors to achieve a particular goal by reinforcing the belief that his/her actions will make a difference to the collective effort to achieve group goals (Pakmer et al., 2020).

In addition to individual and collective efficacy, recent research has linked pro-environmental behavior to individual and social norms. Social norms can be defined as expectations about how people should think, feel, or act in a given situation. Grilli and Curtis (2021) argue that the decision to engage in pro-environmental behaviors is not made in a vacuum; these types of decisions are often influenced by the expectations of important people (Silvi and Padilla, 2021). Personal norms are defined as a sense of moral obligation to do "the right thing" (e.g., change dietary habits to preserve the Earth) (Bain and Bongiorno, 2020). That is, while social norms are perceptions about how important people in your social life think or act, and provide guidelines about what is "normal", personal norms are rules or standards for one's behavior (Keizer and Schultz, 2018). Personal norms therefore act as an internal compass for moral behavior. Indeed, research shows that the stronger the personal norm for pro-environmental behaviors, the stronger the intention/behavior in relation to that norm (e.g., Perera et al., 2022).

Ojala et al. (2021) claimed that self and collective efficacy could be influenced by the negative emotions associated with concern about environmental health and human impact on it. Innocenti et al. (2023) found that concern about environmental health reduced perceived self-efficacy in pro-environmental behaviors and suggested that self-efficacy may play a mediating role in the relationship between climate change anxiety and PEB: they found that people whose self-efficacy is compromised by climate change anxiety may have more difficulty engaging in PEB and may suffer from eco-paralysis. However, other studies show that individuals who experience some level of climate worry or anxiety tend to have higher levels of self-efficacy (Clayton, 2020). This, as Lauren et al. (2016) suggest, could promote engagement in pro-environmental behaviors. This response could represent a form of harm reduction adopted by individuals who feel more able to adopt DPEB to minimize environmental impacts (Environmental Performance Index, 2022).

Current study

The purpose of this study was to analyse perceived self and collective efficacy, individual and social norms, and feelings related to environmental health concerns in a sample of Pakistanis living in Lahore, Pakistan, who declare to adopt (or not) the DPEB. In 2018, the federal government launched the Clean Green Pakistan Program, which focuses everyone's responsibility on behavioral change to create demand for

better environmental services. Through this measure, the government is raising awareness among urban communities, including schools, about the value of natural resources in the urban environment and the importance of protecting existing natural resources. The program promotes several measures, including raising awareness among citizens. Thus, Pakistan has the opportunity to promote PEB at multiple levels, focusing on actions to be taken by citizens and communities, as well as policies to be promoted at the federal level (Acerbi and Ambrosi, 2019). Based on the Environmental Performance Index (2022), Pakistan ranks 176th out of 180 countries, indicating environmental health at risk, with the city of Lahore scoring near the bottom. Depletion of water resources and drying up of wetlands and lakes, air pollution in many major cities, heavy dust, and deforestation are critical environmental problems. Many environmental problems require community and individual participation to prevent an even more complex situation and to reduce or solve environmental problems. On this topic, several studies have been conducted in Pakistan to analyse the factors that lead to pro-environmental behaviours among workers (Ahmad et al., 2021; Faraz et al., 2021; Latif et al., 2022; Maqsoom et al., 2020; Nisar et al., 2021). However, the relationship between environmental health concerns and DPEB has not been adequately studied. In this regard, a study conducted by Ogunbode et al. (2022) in 32 countries shows that climate anxiety has no significant positive relationship with pro-environmental behaviors in Pakistan, where the weakest relationship between climate anxiety and pro-environmental behaviors was observed. To better understand the relationship between DPEB, environmental and health concern, perceived self and collective efficacy, and individual and social norms, a comparison was made between individuals who have adopted DPEB ($DPEB_{YES}$) and those who have not ($DPEB_{NOT}$):

- $DPEB_{YES}$ are more inclined than $DPEB_{NOT}$ to perceive higher self-efficacy, collective efficacy, and individual and social norms (Hp1);
- $DPEB_{YES}$ are more inclined than $DPEB_{NOT}$ to be more concerned about environmental health and to feel less comfortable (Hp2).

Perceived individual and social norms, individual and collective efficacy are positively related to environmental concern and well-being for both $DPEB_{YES}$ and $DPEB_{NOT}$. Because we do not know whether the strength of the relationships differs between the two groups, we take an exploratory approach to this item.

To the best of our knowledge, this is the first time that a comparison has been made in this country between people who have adopted the DPEB and those who have not. The innovative aspect lies in the fact that within a continuum (those who adopt/do not adopt the DPEB) we have identified only the extremes. In this way, it is possible to identify the factors that play a role in the adoption of the DPEB: research has shown that environmental problems are also the result of human behaviour (Barth et al., 2021; Stern, 2000; Wut et al., 2021) and that situations such as air pollution, increases in greenhouse gases, deforestation, and water pollution are direct consequences of human impacts on nature (Innocenti et al., 2023). While in the past there was less awareness of environmental issues, today more and more people are choosing to change their daily lifestyle and become environmentally conscious (Lamm et al., 2022). However, despite the great interest that this topic generates, not everyone shares the need to change their habits and engage in DPEB (Innocenti et al., 2023).

2. Materials and methods

2.1. Participants

833 adults from different provinces such as KPK and Punjab who were pursuing Master's degree in Lahore, Pakistan participated in the survey (62% males and 38% females). The mean age of participants is quite low; this is consistent with data on the Pakistani population, which has a mean age of 22.8 years and a life expectancy of 67.8 years (https://www.worldometers.info/). 70% of participants were single and 30% were married. Participation in the study was voluntary, and there was no compensation (or additional benefits) for participation.

2.2. Measures

An anonymous paper and pencil questionnaire, designed specifically for the purpose of the study, was distributed to the sample between March and July 2022. The questionnaire was designed in English, then the back translation procedure was applied to achieve semantic equivalence (Klotz et al., 2023). The first part of the questionnaire contains the sociodemographic data (gender, age, marital status).

The DPEB were examined using 12 items selected from a list of 14 items (Ashwell, 2018, 2020). Participants were asked to indicate how often they engaged in certain behaviors or activities to protect or minimize negative impacts on the environment in the past year. For example, "Used alternative or public transportation (e.g., bus, train, bicycle, scooter, etc.)"; "Consciously reduced waste" The two items removed from the original scale related to environmental activism and discussions about environmental issues. Response options ranged from "Never" (coded as 1) to "Always" (coded as 5). Range: 12-60. Cronbach's alpha: 0.89.

The scale developed by Doran and Larsen (2016) was used to measure individual and social norms. Perceived individual norms related to environmental health were measured with two items. Participants were asked the extent to which they perceived concern for the environment as an important part of themselves and their existence. Response options ranged from "strongly disagree" (coded as 1) to "strongly agree" (coded as 5). Range: 2–10. Cronbach's alpha: 0.70. Perceived social norms were measured using four items. Participants were asked to what extent the four status items applied to people of the same age regarding concerns and fears about environmental health and its future impact. Possible responses ranged from "strongly disagree" (coded as 1) to "strongly agree" (coded as 5). Range: 4–20. Cronbach's alpha: 0.75.

To examine perceived self and collective efficacy, the Perceived Climate Self-Efficacy Scale was used (Doran and Larsen, 2016; Doran et al., 2015, 2017). Participants were asked to indicate the extent to which they agreed with a series of statements, 5 of which related to individual self-efficacy and 5 of which related to collective efficacy. For example, "I trust that I can do my part to solve the climate crisis" (for individual self-efficacy); "Through our efforts to influence climate legislation (e.g., petitioning local politicians, participating in demonstrations), we can help protect the environment" (for collective efficacy). Possible responses ranged from "strongly disagree" (coded as 1) to "strongly agree" (coded as 5). Range of each scale: 5–25. Cronbach's alpha: 0.80 and 0.85, respectively.

Concern about environmental health was measured using the Climate Change Anxiety Scale developed by Clayton and Karazsia (2020). The scale consists of 13 statements in which the respondent indicates the frequency with which he or she experiences the phenomenon described by the item. Response options ranged from "Never" (coded as 1) to "Almost always" (coded as 5). Range: 13–65. Cronbach's alpha: 0.90. the scale is divided into two subscales: cognitive-emotional impairment and functional impairment. The cognitive-emotional impairment subscale consists of 8 questions such as "When I think about climate change, I find it difficult to concentrate" or "I go off by myself and think about why I feel this way about climate change." This subscale refers to difficulty remembering, learning new things, concentrating, or making decisions about daily life. Range: 8–40. Cronbach's alpha: 0.84. The second subscale consists of 5 items and examines functional impairments using questions such as "My concerns about climate change make it hard for me to have fun with my family or friends" or "My friends say I think about climate change." Functional impairments refer to disease-related limitations because people with a disease cannot perform certain functions in their daily lives. Range: 5–25. Cronbach's alpha: 0.77.

The short form of the Psychological General Well Being Index - A (PGWBI-A) (Testa et al., 2016) was used to assess perceived well-being and quality of life. Six questions cover the following domains: Anxiety, Depression, Positive Well-Being, Self-Control, General Health, and Vitality. The possible responses to each question vary from 0 to 5 points. Higher scores between 0 and 30 indicate better psychological well-being.

2.3. Procedure and data analysis

The ethics committee of the Department of Business and Economics (Lahore), which included the department chair and academic director, approved this research project (prot. n. 1402/20220126). Data were completed and collected by undergraduate students who had been specially trained by one of the researchers involved in the study. Economics students (from Lahore University) were involved in the administration of the questionnaire. To increase the number of participants, the snowballing method was used. Students were asked to indicate 2/5 possible participants each from their circle of acquaintances aged between 18 and 65 years. Those who agreed to participate were given the questionnaire. Furthermore, these additional participants were asked to in turn name 2/5 other acquaintances to ask about their willingness to complete the questionnaire. The inclusion criterion was the age range of 18–65 years. The survey took place over a period of four weeks. In accordance with the Declaration of Helsinki (World Medical Association, 2013), an information letter and informed consent form were given to the participants along with the questionnaire. Completion of the questionnaire took approximately 15 minutes. There were no grades, credits, or money for this activity, so it was voluntary.

Data were processed using SPSS version 28 (IBM Corp., Armonk, NY, USA). Reliability of measurements was assessed with Cronbach's alpha. Chi-square test and *T*-test were used to compare the sociodemographic characteristics of the sample. To measure differences between the two groups (who adopts or doesn't adopt DPEB) one-

way ANOVA analyses were performed, while to estimate effect size eta squared was calculated. Correlations were calculated to examine relationships between variables. Simple linear regression was used to analyze which variables were the best predictors of wellbeing and quality of life among participants. To perform the analyses, PGWB scores were considered as dependent variables, while concerns about environmental health were used as independent variables. Statistical significance was set at $p < 0.05$.

3. Results

3.1. Descriptive statistics

Because we were interested in comparing subjects who habitually engage in pro-environmental behaviors with those who never engage in it, we chose to consider only the two extreme groups, rather than including the entire sample and considering pro-environmental behaviors as a continuous spectrum. This decision was made with the goal of not flattening the data and capturing possible differences between individuals with extremely different environmental orientations. To this end, we divided participants into two subgroups based on the DPEB scale. The first (denoted as $DPEB_{YES}$) consisted of participants who reported a score greater than or equal to the mean (40.16) plus standard deviation (9.86) on the DPEB scale. The second group (indicated as $DPEB_{NOT}$) consisted of subjects who reported a score less than or equal to the mean (40.16) minus standard deviation (9.86) on the DPEB scale. The two groups were mutually exclusive and did not overlap. Subjects who were in the middle range of the DPEB scale were screened out ($N = 544$).

The final sample consisted of 289 subjects evenly divided between $DPEB_{YES}$ ($N = 146$; 50.5%) and $DPEB_{NOT}$ ($N = 143$; 49.5%). 60% of $DPEB_{YES}$ were male and 40% were female. Their mean age was 26.38 years (s.d. = 6.10). 74% of them were single and 26% were married. 63% of the $DPEB_{NOT}$ were male and 37% were female. Their mean age was 27.28 years (s.d. = 7.00). 66% of them were single and 34% were married (see **Table 1**).

Table 1. Socio-demographic characteristics of the sample ($N = 289$).

	$DPEB_{YES}$ ($N = 146$)	**$DPEB_{NOT}$ ($N = 143$)**
	mean (s.d.)	**mean (s.d.)**
Mean Age	26.38 (6.10)	27.28 (7.00)
t (283) = 1.169; p = 0.237 (n.s.)		
	N (%)	*N* (%)
Female	59(40%)	53(37%)
Male	87(60%)	90(63%)
Chi-Square = 1.461; p = 0.482 (n.s.)		
	N (%)	*N* (%)
Single	108(74%)	95(66%)
Married	38(26%)	48(34%)
Chi-Square = 1.964; p = 0.161 (n.s.)		

Note. s.d. = standard deviation; p = p value.

As can be seen in **Table 1**, no significant differences between $DPEB_{YES}$ and $DPEB_{NOT}$ were found based on age, gender or marital status.

One-way Anova analysis were performed to compare $DPEB_{YES}$ and $DPEB_{NOT}$ on perceived individual and social norms, individual and collective efficacy, environmental health concerns (total scale, cognitive-emotional impairment, functional impairment) and well-being. For results see **Table 2**.

Table 2. Perceived individual and social norms, individual and collective–efficacy, environmental health concerns and well-being: comparison between $DPEB_{YES}$ and $DPEB_{NOT}$ (One-way Anova).

	$DPEB_{YES}$ (N = 146) M (SD)	**$DPEB_{NOT}$ (N = 143) M (SD)**	***F***	***p***	η^2
Perceived individual norms	8.15 (1.50)	5.97 (2.29)	92.23	0.001	0.24
Perceived social norms	15.95 (2.62)	11.45 (3.66)	143.77	0.001	0.34
Individual self-efficacy	20.69 (2.83)	16.04 (4.65)	102.86	0.001	0.27
Collective efficacy	20.88 (3.31)	16.19 (5.31)	80.31	0.001	0.22
Environmental health concerns	49.87 (9.54)	32.98 (10.77)	186.49	0.001	0.41
C-E impairment	30.89 (5.79)	20.35 (6.57)	201.40	0.001	0.42
FU impairment	19.02 (4.15)	12.72 (4.62)	144.43	0.001	0.34
Well-being	16.37 (4.12)	16.53 (4.66)	0.096	n.s.	0.001

Note. C-E = Cognitive-Emotional; FU= functional; M = mean; SD = standard deviation; F = Fisher's ratio; p = p value; η^2 = eta squared.

As presented in **Table 2**, $DPEB_{YES}$ showed significant greater values than $DPEB_{NOT}$ in all the variables considered, except for well-being.

3.2. Correlation analysis

In order to find out how perceived individual and social norms, individual and collective efficacy are related to environmental health concerns and well-being in $DPEB_{YES}$ and $DPEB_{NOT}$, correlation analyzes were performed separately in the two groups. **Tables 3** and **4** report the results for $DPEB_{YES}$ and $DPEB_{NOT}$ respectively.

Table 3. Correlation analysis in $DPEB_{YES}$.

	PIN	**PSN**	**ISE**	**CE**	**EHC**	**CEI**	**FUI**	**PGWBI-A**
PIN	-							
PSN	0.19*	-						
ISE	0.30**	0.23**	-					
CE	0.38**	0.23**	0.69**	-				
EHC	0.21*	0.33**	0.27**	0.20*	-			
CEI	0.24**	0.32**	0.23**	0.22**	0.96**	-		
FUI	0.14	0.31**	0.28**	0.15	0.93**	0.79**	-	
PGWBI-A	0.02	−0.04	0.08	0.13	−0.32**	−0.29**	−0.32**	-

**Correlation is significant at 0,01. * Correlation is significant at 0,05;
Note. PIN = Perceived Individual Norms; PSN = Perceived Social Norms; ISE = Individual Self-Efficacy; CE = Collective Efficacy; EHC = Environmental Health Concerns; CEI = Cognitive-Emotional Impairment; FUI = Functional Impairment; PGWBI-A = Well-Being and quality of life

Table 4. Correlation analysis in $DPEB_{NOT}$.

	PIN	**PSN**	**ISE**	**CE**	**EHC**	**CEI**	**FUI**	**PGWBI-A**
PIN	-							
PSN	0.57**	-						
ISE	0.56**	0.64**	-					
CE	0.58**	0.70**	0.87**	-				
EHC	0.40**	0.36**	0.31**	0.27**	-			
CEI	0.43**	0.37**	0.29**	0.27**	0.97**	-		
FUI	0.32**	0.31**	0.27**	0.25**	0.94**	0.82**	-	
PGWBI-A	0.04	0.20*	0.18*	0.20*	−0.19*	−0.16	−0.23**	-

**Correlation is significant at 0.01. * Correlation is significant at 0.05.
Note. PIN = Perceived Individual Norms; PSN = Perceived Social Norms; ISE = Individual Self-Efficacy; CE = Collective Efficacy; EHC = Environmental Health Concerns; CEI = Cognitive-Emotional Impairment; FUI = Functional Impairment; PGWBI-A = Well-Being and quality of life.

In **Tables 3** and **4**, the correlations between all variables included in the study are reported separately for $DPEB_{YES}$ and $DPEB_{NOT}$. More specifically, for $DPEB_{YES}$, perceived individual and social norms and individual and collective self-efficacy were positively related to environmental health concerns (total scale and cognitive-emotional impairment subscale); perceived social norms and individual self-efficacy were also positively related to the functional impairment subscale.

In the case of $DPEB_{NOT}$, perceived individual and social norms and individual and collective self-efficacy were positively related to environmental health concerns (total scale and both cognitive-emotional and functional impairment subscales) and to well-being (except for perceived individual norms).

In general, correlations were particularly strong in the case of $DPEB_{NOT}$. Although $DPEB_{YES}$ had higher scores on all variables considered (see **Table 1**), the relationship between them were particularly strong for $DPEB_{NOT}$.

A linear regression analysis was conducted to predict the wellbeing and quality of life in $DPEB_{YES}$ and DPEBNOT (**Tables 5** and **6**). The PGWB scores were dummied in two categories (wellbeing and quality of life: high/low) using the cut-off based on mean scores (= 16.72).

Table 5. Predictors of wellbeing and quality of life in $DPEB_{YES}$.

	DPEBYES *n* = 146			
	B	***P***	**95% CI (Lower Upper)**	
CEI	−0.01	n.s.	−0.03	0.02
FUI	−0.32	0.030	−0.00	0.07

Note: β = Unstandardized (B) coefficient; CI = confidence intervals; n.s. = not statistically significant; CEI = Cognitive-Emotional Impairment; FUI = Functional Impairment.

The findings showed that $DPEB_{YES}$ wellbeing and quality of life were negatively associated Climate Change Anxiety functional impairment (**Table 5**).

Table 6. Predictors of wellbeing and quality of life in $DPEB_{NOT}$.

	DPEBNOT *n* = 143			
	B	***P***	**95% CI (Lower Upper)**	
CEI	−0.33	n.s.	−0.03	0.02
FUI	−0.28	n.s.	−0.00	0.06

Note: β = Unstandardized (B) coefficient; CI = confidence intervals; n.s. = not statistically significant; CEI = Cognitive-Emotional Impairment; FUI = Functional Impairment.

4. Discussion

The main objective of this work was to compare some individual characteristics in two groups: subjects who adopted the DPEB and those who did not. As described above, this was the first study aimed at analyzing the different perceptions of self- and collective efficacy, individual and social norms, and feelings related to environmental health concerns. In our opinion, the most interesting aspect of this work is the focus on daily adoption of behaviors, i.e., those behaviors that Lange and Dewitte (2019) believe can lead to better conservation of natural resources and reduction of individual and community ecological footprints. Another interesting point of this study is that it was conducted in Pakistan, a developing country that is one of the most affected by global warming (Gul et al., 2022) and where the issue of DPEB plays a central role in the country's policies. The results of this study are particularly interesting because they provide us with information about some characteristics that distinguish those who do or do not implement DPEB in this Pakistani sample. Given the future scenarios of climate change and its impact especially on the population in the countries that are more affected by climate change (both in terms of health and lifestyle, due to depletion of water resources and drying up of wetlands and lakes, air pollution in many big cities, heavy dust pollution and deforestation (Environmental Performance Index, 2022) than other countries (Europe for example), understanding the adaptation mechanisms will provide better guidance to promote DPEB. In Pakistan, the National Environmental Policy (Government of Pakistan Ministry of Environment, 2005) proposes to promote behavior change communication that supports environmentally friendly consumption patterns. The results of this research could help to better understand the variables that could support DPEB.

To better understand the variables under study, two groups of individuals were compared: those who engage in daily pro-environmental behaviors ($DPEB_{YES}$) and those who do not ($DPEB_{NOT}$). The first hypothesis was that $DPEB_{YES}$ tend to perceive higher self-efficacy, collective efficacy, and individual and social norms than $DPEB_{NOT}$. The results show that $DPEB_{YES}$ report higher scores on almost all variables examined, including the concern that the perception of mental health deteriorate when they are too high. An interesting fact relates to perceptions of general well-being: for $DPEB_{YES}$, worries about the environment that affect functional impairment influence perceived well-being and quality of life. This result partially confirms the second hypothesis. It would be worthwhile to investigate this in further studies looking at how participation in pro-environmental activities increases or decreases perceptions of mental and general health in relation to the emotions this behavior triggers. For example, Coelho et al. (2017) argue that environmental concern and perceived efficacy

increased with positive mood (respectively, by promoting cognitive engagement and by increasing perceived agency), thereby promoting DPEB. In general, the evidence suggests a reciprocal causal relationship between well-being and DPEB.

Analysis of our research data shows that in $DPEB_{YES}$, perceptions of all individual and social norms and individual and collective efficacy are positively related to concern for the environment and health (total scale and cognitive-emotional subscale). These data seem to confirm that those who embrace DPEB and have a non-paralytic concern for climate change are able to act by perceiving a sense of self-efficacy that relates not only to the individual but also to the community (Hamann and Reese, 2020; Jain and Jain, 2022; Agoston et al., 2022). This finding, in our opinion, needs to be deepened by further research to better understand whether there is a mediating effect determined by the level of concern about climate change that can explain the adoption of DPEB or the so-called eco-paralysis (i.e., the determination not to act due to fear). The correlation results in $DPEB_{YES}$ also show how perceived social norms and individual self-efficacy are positively related to the functional impairment subscale. The risk for $DPEB_{YES}$ appears to be the perception that one's behaviour is not sufficient to effect a change in ecological footprint. Again, we cannot describe the outcome in causal terms, but we can suggest that future studies examine how mental health status and concern lead to the doubt that DPEB is insufficient. Thought should be given to this question, to the type of communication that is proposed about the environment, the health of the environment, its use and consumption, and to what we can actually do to reduce the ecological footprint. Another study that could be conducted is to measure how perceived environmental health relates to perceived individual health and how that relationship relates to seasonal conditions (e.g., period when temperatures are normal or outside the norm). Given the close relationship between physical and mental health, physical harm caused by environmental factors or exposure to environmental toxins, as well as illnesses or health conditions caused by climate and environmental stressors, may increase susceptibility to the development of mental illness and influence the adoption of DPEB (Innocenti et al., 2023).

In the case of $DPEB_{NOT}$, individual and social norms, individual and collective efficacy correlated positively with environmental health concerns (total scale and the two subclasses of cognitive-emotional and functional impairment) and well-being (except for perceived individual norms). In general, the correlations were particularly strong in the case of $DPEB_{NOT}$. This result is very interesting from our point of view: despite the caution that must be exercised when analyzing correlations that cannot provide causal results, we can make some considerations. For these individuals, there seems to be an emerging concern that is inconsistent with the implementation of DPEB, leading to negative feelings that affect the quality of perceived health in terms of cognitive-emotional and functional impairments. While these individuals are concerned, they do not use DPEB on a daily basis. Considering that DPEB use has been shown in previous research (Innocenti et al., 2023) to be an element that can reduce the state of concern about environmental health, it could be hypothesized that these individuals use DPEB to reduce their concern about environmental health. One possible explanation could be the sociodemographic characteristics of the sample. For example, further research could shed more light on educational level, quality of life,

economic status, and social status, which could explain whether or not DPEB was adopted.

Inevitably, this study has some limitations. The first is the fact that it is a cross-sectional study, so the results should be viewed with caution and not generalized. The second limitation is the fact that this is a quantitative study, so some variables were not examined in depth. For example, we did not analyze the issue of concern in depth. There could be aspects related to, for example, exposure to extreme natural events that could lead to greater concern about environmental health. Further research could consider a qualitative study with in-depth interviews to better understand what variables might influence PEB adoption. In addition, we did not consider sociodemographic variables such as gender in our study. In the study by Vicente-Molina et al. (2018), gender and education level were identified as variables that could explain the willingness to adopt DPEB. In addition, there may be bias associated with participation in the study. Specifically, a bias related to social desirability, in which participants convey a more positive image of themselves (Vesely and Klöckner, 2020). Future studies could consider the sociodemographic variables and include a social desirability scale. Furthermore, we did not collect additional socio-demographic and socio-cultural data, such as income and education level. These data could help to better understand the propensity for DPEB and provide useful guidance on how to communicate the need for DPEB adoption. Such guidance could also be useful for new policy initiatives promoted under the National Environmental Policy program (see also Sumaira Siddique, 2023). Future research could shed light on whether policies adopted at the federal, regional, local and community's levels have an impact on DPEB and how these policies could be improved. Finally, other theoretical models could be used, such as the Civic Community theory (Prasetiyo et al., 2019; Dewantara et al., 2023). Further research could use a different theoretical framework to better understand the influence of the target community on DPEB adoption.

5. Conclusion

The results of this study indicate that $DPEB_{YES}$ rate individual and collective norms and individual and collective efficacy higher than $DPEB_{NOT}$. At the same time, $DPEB_{YES}$ are more concerned about environmental health and show greater cognitive and emotional and functional impairment than $DEPB_{NOT}$. Despite the above limitations, we believe that this study offers some interesting ideas that could be useful in developing policy to promote PEB. For example, in addition to advocating for environmental health and reducing ecological footprint, social communication could explain that caring about environmental health (and thus adopting DPEB) is a way to manage one's mental health. In this way, a circular behavior is promoted that not only benefits the environment and the community, but also brings personal benefits. In addition, psychosocial programs can be effectively used by managers or professionals to promote DPEB. For these tools to be effective van Valkengoed et al. (2022) (see also Grilli and Curtis, 2021) describe that both the characteristics of the targeted behavior and the characteristics of the target population must be considered. In this work, the primary goal was to describe some characteristics of the target population.

The resulting suggestions can then be used by policy makers to implement, for example, communication campaigns to promote DPEB.

Author contributions: Conceptualization, DAM, MUB and TB; methodology, MUB and TB; formal analysis, DAM and TB; investigation, MUB; data curation, TB; writing—original draft preparation, DAM, MUB, MI and TB; writing—review and editing, DAM, MUB, MI, GS and TB; supervision, DAM; project administration, MUB. All authors have read and agreed to the published version of the manuscript.

Acknowledgments: DAM and TB wish to thank Thea Balugani for his support in collecting references. DAM thanks Rouge Colucci for the time spent together.

Conflict of interest: The authors declare no conflict of interest.

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