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Relationship between engagement with nature, nature–connectedness (NC), and pro–environmental behaviour (PEB) among urban park visitors

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ABSTRACT

Background: Currently, over 55% of the world's population resides in urban areas. Urban area like Jakarta is getting denser and more populated, resulting in less natural environment, leading to physical disconnection between urban residents and natural environment. **Methods:** Previous research demonstrated association between individuals' nature experiences with the feeling of nature-connectedness This connection influences individuals' Pro-Environmental Behaviour, reflected as environmentally sustainable behaviour which is essential for sustainable development. **Findings:** This study explored connection of natural experience of the visitors of urban green space to their nature connectedness and its relation on pro-environmental behavior. Data were collected from survey of 40 visitors in Taman Situ Lembang. This study found that engagement of observing butterfly was correlated to higher reported Nature-Connectedness ($p < 0.05$). **Conclusion:** Higher reported Nature-Connectedness is strongly correlated to respondents' reported Pro-Environmental Behaviour such as saving electricity, saving water, using reusable shopping bag, and garbage separation at home. **Novelty/Originality of this Study:** The novelty of this study lies in its specific focus on the role of butterfly observation in urban green spaces as a contributing factor to increased nature–connectedness and its subsequent influence on pro-environmental behavior among city residents.

KEYWORDS: nature-connectedness; pro-environmental behaviour; urban green space; urban park.

1. Introduction

Urbanization is typically associated with increases in the spatial extent of urban built-up areas (Mahendra & Seto, 2021). To date, over 55% of the world's population resides in urban areas. Amidst rapid urbanization, it is a challenge to create nature experience in urban area. There is a decline in urban green space in China's major cities between 1990-2010 where 46,9 % of original vegetation was converted to other land use (Yang et al., 2014). Similar trend also happened in 3 major cities in Southeast Asia with rapid expansions namely Jakarta, Kuala Lumpur and Metro Manila. experiencing rapid urban green space decline in the span of 25 years (1988-2014) (Nor et al., 2021). Urban green spaces offer potential benefits for environmental sustainability, health, and health equity, but face challenges from urbanization and diminishing human-nature connections (Kruize et al., 2019).

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Indonesian government implemented governments have implemented regulations to protect green spaces. According to Indonesian Law Number 26 Year 2007, a public green space is defined as green area that is owned and managed by the city government and is used for the general public's benefit. Examples of public green spaces include city parks, public cemeteries, and green belts along roads, rivers, and coastlines. The regulation mandates 30% of green space area in Jakarta by 2030. But based on satellite imagery in 2018, the area of green space in Jakarta is still far from mandate with 3,473.94 ha or 5.31% (Setiowati et al., 2021).

A study in Melbourne, Australia examined people's response of urban green and showed that modern connection to nature are personal, social and dynamic and this relationship is developed throught interaction, suggesting different approach of engagement (de Kleyn et al., 2020). Growing disconnection between urban populations and nature experiences is concerning. Urbanization is increasingly disconnecting people from nature, leading to negative consequences for both human wellbeing and ecosystems (Goswami et al., 2022). A consequence of this urban expansion is the "extinction of experience," a phenomenon of growing disconnection between humans and nature, characterized by diminishing direct contact with natural environments and wildlife in everyday life.

A study by Soga & Gaston (2016) found that the loss of nature interaction reduces health and wellbeing benefits and also emotions, attitutes and behaviours towards environments. Creating a loop of nature disaffection. Evidence in the study shows that loss of interaction with nature could change people's attitute towards nature, including the value, belief and perceived norm of environment. The effect of the lack of nature experience could be explained with biophilia hypothesis. Relationship between human and nature was based on biophilia hypothesis. The term biophilia was first used by Fromm (1973) as "the passionate love of life and of all that is alive", and then coined by Wilson (1984) to describe evolutionary trait adaptation that allows us to develop a mental link with the living world and nature.

Biophilia refers to the human tendency to seek connections with nature and other forms of life. While some evolutionary psychologists and biologists argue that biophilia is an adaptation that evolved in response to the adaptive challenges of the Pleistocene (Kellert & Wilson, 1995). It is argued that biophilia is learned and not innate (Simaika & Samways, 2010).

Urban garden provides a promising solution to solve the problem of loss of green space and nature experience in urban areas. Urban park provides 3 benefits: exposing city dwellers to diverse plants, animals, and soils; fostering understanding of natural processes affecting food production; and offering safe spaces for direct interaction with nature potentially leading to increased biophilia (Lin et al., 2018). These urban parks could offer direct exposure to biodiversity and natural processes, fostering biophilia and environmental appreciation. A study of school children in China showed that contact with nature generally improved children's propensity for biophilia, which in turn significantly enhanced children's willingness to support the conservation of animals in China (Zhang et al., 2014).

To evaluate people's perceived relationship with nature, researchers often use Nature-Connectedness (NC) as measure. NC is a concept in both cognitive and emotional engagement with nature. Nature-connectedness can be measured with Schultz's Inclusion of Nature in Self (INS) scale (Schultz, 2002). Studies have shown that INS scores correlate positively with pro-environmental attitudes, behaviors. Positive emotion towards nature and frequent engagement in outdoor activities may be predictive of a higher nature-connectedness, suggesting the significance of direct nature experiences (Bezeljak et al., 2023). INS scale measures the cognitive aspect of nature-connectedness by assessing the degree to which an individual's mental self-concept overlaps with their mental representation of nature. A greater overlap indicates that the person increasingly identifies themselves as part of the nature. NC was found to be higher among female (Hoyle et al.,

2019; Mikusiński et al., 2023) and adults than male and adolescent (Anderson & Krettenauer, 2021).

Research has consistently shown that both past and current nature experiences contribute to the feeling of nature-connectedness (Cleary et al., 2020). A meta analysis examined the effectiveness of interventions to improve NC in adults for both active and passive engagement with nature, and the timing both single visit or repeated. This study suggested that key to this is facilitation in sensory engagement, and appreciation of nature's beauty and wonder (Sheffield et al., 2022).

A study of urban park users in East and Southeast Asia found that 79% of the respondents have seen butterflies in their cities. And frequent visits to natural area in their urban neighborhood associated with greater NC. There is a positive relationship between NC and perception of butterflies (Lim et al., 2022). Pro-environmental behavior refers to individual's action that contribute to environmental preservation and sustainability (Anderson & Krettenauer, 2021). It covers a wide range of human activities to reduce negative impacts on the environment (Palupi & Sawitri, 2018) energy saving (Dewi & SawitriDian, 2018) participating in environmental movement, and recyling (Srinivasan & Borkar, 2021).

A study in China among urban consumers shows that connnectedness to nature drives love of nature and in turn positively impact Sustainable Consumption Behavior such as green purchasing and recycling (Dong et al., 2020). Nature-Connectednes influences individuals' PEB, reflected as environmentally sustainable behavior (Barrera-Hernández et al., 2020). Studies shows that NC has positive effects on well-being and pro-environmental behaviors (Barragan-Jason et al., 2022; Lahoti et al., 2024).

A study showed that PEB that is based on Value Belief Norm theory and Theory of Planned behavior in Gen Z drives intention towards tree planting (Raman et al., 2024). Pro-environmental behavior found to be mediator of Small Medium Enterprise (SME) sustainable reporting and green finance (Appiah-Kubi et al., 2024). Previous study showed that urban green spaces play a crucial role in mediating the connections between urban dwellers and nature, potentially influencing NC and PEB (Whitburn et al., 2020). Consistent research finding showed that the availability and quality of urban green space can significantly impact the perceived connection with nature and the subsequent pro-environmental behaviour among urban residents (Lahoti et al., 2024). The type and perceived quality of urban green spaces can impact the benefits to nature connectedness and well-being. Although both urban forests and landscaped parks boosted positive emotions and reduced negative ones, the extent to which people perceived these environments as wild was positively linked to their sense of nature connectedness (Samus et al., 2022). This suggests that individual perceptions of nature can influence the degree to which well-being benefits are gained in urban green spaces.

A study of online survey (n=321) and walking intervention (n=72) found a few key predictors of the pathway to foster nature-connectedness; contact with nature, emotional engagement, finding meaning and appreciation of natural beauty. The study found that knowledge based activities were not predictive of nature-connection. There is a need to move beyond a superficial contact with nature or focussing exclusively on knowledge and identification, when fostering a relationship with nature (Lumber et al., 2017). Mateer (2022) argued that outdoor leisure experience in urban park could foster NC through the psychological construct of awe and solitude. The study differentiate between goal-oriented outdoor recreation and outdoor leisure that emphasize eudaimonic wellbeing. The study suggested park managers to facilitate awe and solitude experience in urban park to create a urban space that enhance NC.

Study found that citizen science project could enhance NC in urban green space. An active and participatory activity can foster an awareness to natural environment (Willis & Gupta, 2023). Participating in simple nature-based activities—closely tied to nature connectedness—proved to be the most influential factor in promoting pro-environmental conservation behavior. Commonality analysis indicated that the variables operated in

synergy, with nature connectedness and simple activity engagement accounting for the greatest share of the explained variance (Richardson et al., 2020).

A study among English adults shows that nature contact of weekly visit to park were positively linked to household pro-environmental behavior. Nature connectedness works as a mediator between nature contact and pro-environmental behavior. The study suggest to intervene in increasing nature contact to archieve improvements in planetary health (Martin et al., 2020).

A study shows a more complex relationship between NC and PEB. In a comparation study between adolescent in China and Canada, PEB was inversely associated with age in Canada but not in China. The research suggested that the development of pro-environmental behaviour is culturally spesific (Krettenauer et al., 2020). A global synthesis suggests that there have been a general trend in declining human-nature connection over time. The dynamics were different among geographic and socio-economic factors. The study suggest our lacking of knowing in human-nature relationship in global south (Soga & Gaston, 2023).

These studies provide insights to the relationship between engagement with nature, NC, and PEB. But we want to look further into the relationships in the context of Jakarta, in particular Central Jakarta, where it has exceeded the urban green space target (Setiowati et al., 2021). The objective of this study is to investigate the scale of natural connectedness and engagement in activities related to pro-environmental behavior among urban park visitors. We analyze questionnaire data in order to understand how urban park visitors engage with nature in park and how they perceive their connection to nature, and how NC correlates to concrete environmentally conscious actions as PEB. This study seeks to examine the relationship between engagement in urban parks and nature-connectedness among urban park visitors, as well as the relationship between nature-connectedness and pro-environmental behavior in the same group.

This study is limited by factors such as cultural context of the visitors, and the probability of bias result caused by overestimation in self reporting. The scope of urban green space in this study is limited specifically to urban park. Studies concerned about the extinction of nature experience and the impacts on human well being and behavior towards environment. Urban green space have the potential as a leverage as a place to engage with nature, foster NC and promote PEB. By analysing the relationship, this study may offer findings for future study in urban development planning and promoting environmental sustainability efforts. This study could be informative for managing urban green space that could provide proper facilities to facilitate meaningful nature experience that could encourage PEB.

This paper is structured as title, abstract, introduction, methods, result and discussions, conclusion, acknowledgement, author contribution and references. This study is conducted in Lembang Lake Park/*Taman Situ Lembang* in Central Jakarta. With the size of 11.150 m2. The park facilities are jogging track, outdoor gym, playground, bench and lake with ducks. Field work was undertaken on 9-10 November 2024. For this study we used cross-sectional study with quantitative method approach with random sampling. Data collection were conducted face to face with google form. Survey were conducted to random sample of 40 adult park visitors.

2. Methods

This study is conducted in Taman Situ Lembang in Central Jakarta. With the size of 11.150 m2. The park facilites are jogging track, outdoor gym, playgound, bench and lake with ducks. Field work was undertaken on 9-10 November 2024. For this study we used cross-sectional study with quantitative method approach with random sampling. Data collection were conducted face to face with google form. Survey were conducted to random sample of 40 adult park visitors.

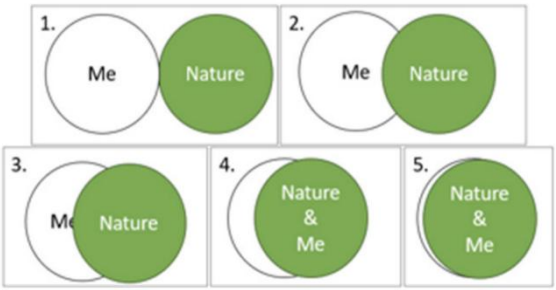
2.1 Measures and data variables

Survey was to assess (1) how visitors engage with nature in urban park (2) nature-connectedness (3) pro-environmental behaviour and (4) demographic related questions such as : gender, age, education and work status. Engagement with nature is measured with 'yes' or 'no' answer to biophillic values (Kellert & Wilson, 1995) with modified statements from (Richardson et al., 2020).

Nature-connectedness is measured with 5 steps visual representation of INS scale (Schultz, 2002). Respondents were asked to choose a picture which best describes their relationship with nature in order to gauge the perceived nature-connectedness. Pro-environmental behavior was measured through 4 questions with 'yes' or 'no' answer modifed from (Purba & Kusumawardani, 2023). Demographic questions are used to explore potential relation between demographic and pro-environmental behavior.

In this study we utilize self reporting method to assess Engagement with nature, Nature-Connectedness, and Pro-Environmental Behavior. Self reporting was used in assessing NC and PEB (Anderson & Krettenauer, 2021; Lahoti et al., 2024; Richardson et al., 2020).

Table 1. Categories used in the survey

Variable	Question	Category
Engagement with nature	Do you relax at the park?	Yes/No
	Do you observe the clouds?	Yes/No
	Do you hear the bird sing?	Yes/No
	Do you observe butterfly?	Yes/No
	Do you observe trees and plants?	Yes/No
Nature-Connectedness	How is your connection with nature? 	1 separate 2=somehow connected 3=connected 4=close connection 5=human and nature are inseparable
Pro-environmental behavior	Do you save electricity usage?	Yes/No
	Do you save water usage?	Yes/No
	Do you use reusable shopping bag?	Yes/No
	Do you sort garbage	Yes/No
Demographic	Gender	Male, Female
	Age	18–29, 30–39, 40–49, 50–59, over 60
	Education	Primary school, middle school, high school, higher degree
	Work Status	working, studying, unemployed, retired

2.2 Statistical analysis

Descriptive statistics was used to analyse engagement with nature, nature-connectedness, pro-environmental behavior and demographic and provide data overview. Shapiro-Wilk test was used to reliably test normality distribution in samples less than 50 ($p<0.10$) (Andrade et al., 2022). To analyse correlation between Engagement in Nature, NC and PEB if the data is normally distributed, Pearson test is used. If the data is not normally distributed, Spearman test is used.

3. Results and Discussion

3.1 Demographics

In total there are 40 survey respondents. Most of the respondents are female (57.5%) and male (42.5%). With the most age group 18-29 (77.5%), "30-39" (7.5%), "40-49" (5%), and over 60 (5%). 52.5% are high school graduate, and 47,5% are higher degree graduate. 47.5% reported their work status as working, 32.5% are studying and 15% retired (Table 2).

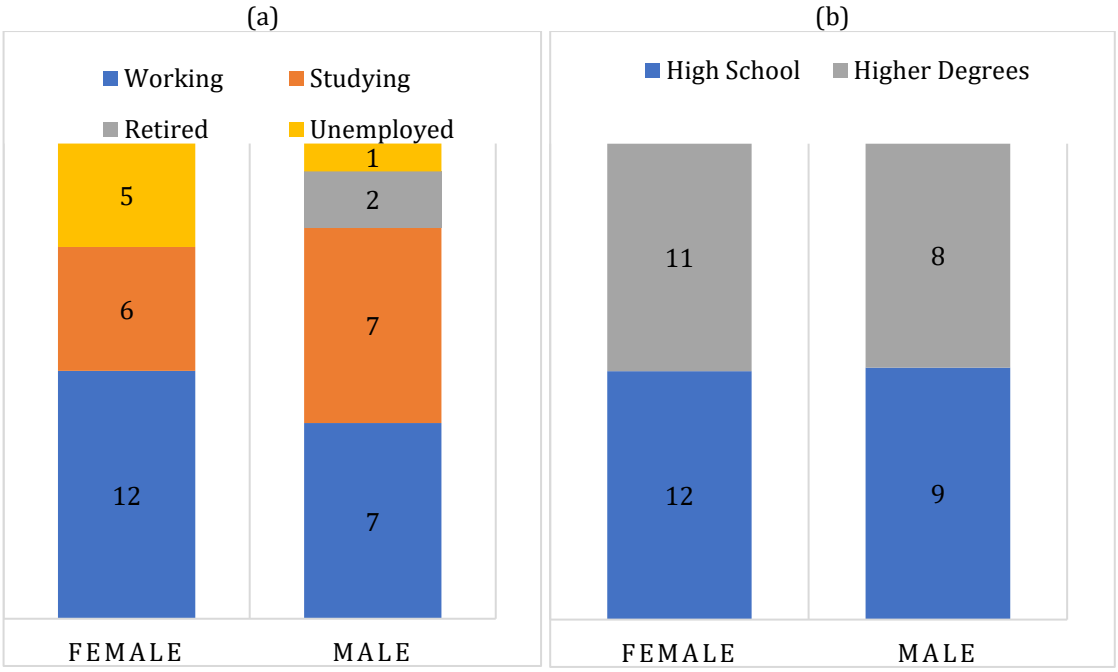


Fig. 1. (a) Respondents' gender against work status. (b) Respondents' gender against education.

Table 2. Demographic characteristics of respondents

	N	%
Gender		
Female	23	57,5%
Male	17	42,5%
Age Group		
18–29	31	77,5%
30–39	3	7,5%
40–49	2	5%
50–59	2	5%
over 60	2	5%
Education		
Primary school	0	0%
Middle school	0	0%
High school	21	52,5%
Higher degree	19	47,5%
Work Status		
Working	19	47,5%
Studying	13	32,5%
Unemployed	2	5%
Retired	6	15,0%

3.2 Engagement with Nature and NC

Engagement with nature was assessed activities parameters. Observing trees and plants (100%) and relaxing at the park (100%) were the most common activities. Observing clouds (72.5%) and butterflies or bees (55%). While hearing bird songs (12.5%) was the least reported activity.

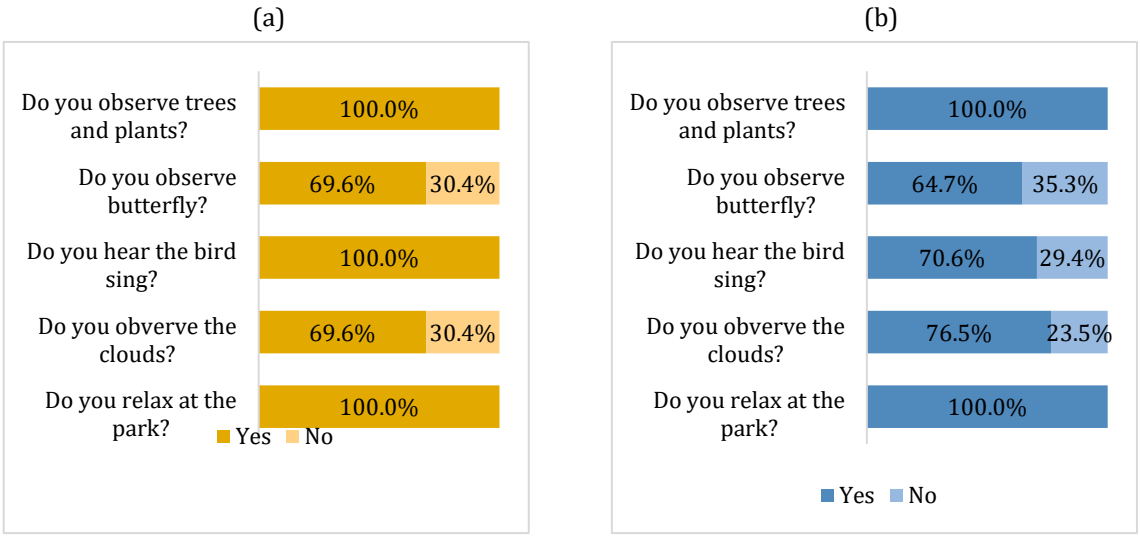


Fig. 2. Engagement with Nature of (a) Female (b) Male

Wilson's biophilia hypothesis proposes that humans possess an inherent tendency to seek connection with nature, a trait shaped by thousands of years of evolution within natural surroundings (Kellert & Wilson, 1995). The types of simple activities that promote Nature Connectedness are categorized into five pathways: sensory contact, emotional engagement, appreciation of beauty, finding meaning, and expressing compassion toward nature (Lumber et al., 2017).

Table 3. Engagement with nature characteristics

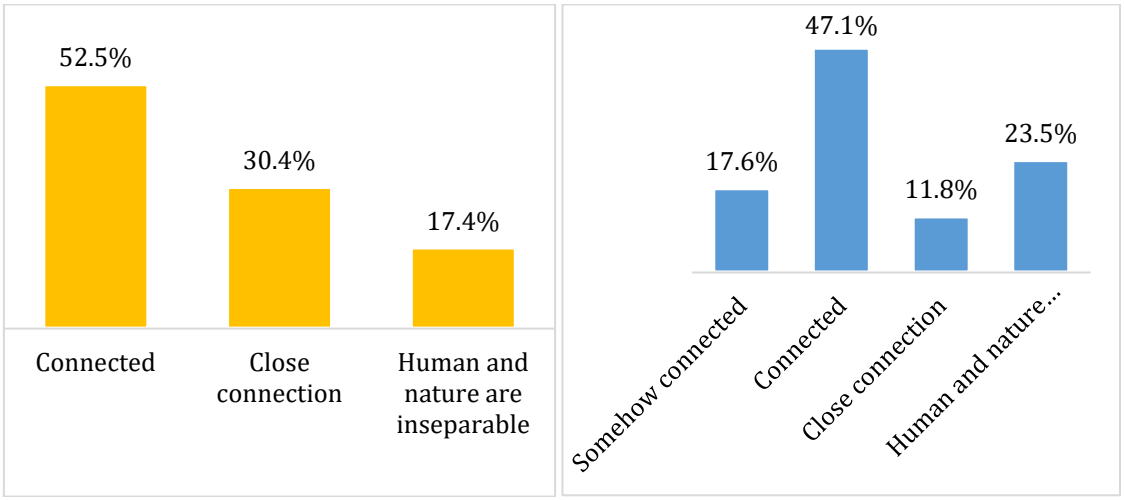
	N	%
Engagement with Nature		
Relaxing at the park		
Yes	40	100%
No	0	0%
Observing cloud		
Yes	29	72.5%
No	11	27.5%
Do you hear the bird sing?		
Yes	5	12.5%
No	35	87.5%
Observing tree and plant		
Yes	40	100%
No	0	0%
Observing butterly and/or bee		
Yes	22	55%
No	18	45%

Half of the respondents reported feeling connected to nature, followed by 22.5% feeling close connection, 20% reported human and nature are inseparable, 7.5% reported somehow connected and no one reported feeling separated from nature (Table 4).

Table 4. Nature-Connectedness Characteristics

Nature Connectedness	N	%
Separate	0	0%
Somehow connected	3	7.5%
Connected	20	50%
Close connection	9	22.5%
Human and nature are inseparable	8	20%

No female and male respondents reported feeling separated from nature. No female respondents reported feeling somehow connected to nature. This aligned with the findings that Nature-Connectedness was found to be higher among females (Hoyle et al., 2019; Mikusiński et al., 2023).



(a) (b)

Fig. 3. Nature-Connectedness of (a) female and (b) male.

Urban areas showed varied levels of Nature-Connectedness (NC). Declining NC may reflect adaptation to modern urban environments, where low-NC individuals perceive less contrast between green and gray spaces and show reduced sensitivity to biodiversity. Urban green spaces could serve as an emotional "shelters" for high Nature Connectedness individuals, offering relief from urban noise and a lack of natural elements. For these individuals, greater biodiversity in UGS enhances their well-being. These findings highlight the need to consider both subjective such as Nature-Connectedness and objective parameter such as biodiversity (Soga & Gaston, 2023).

All respondents reported to be relaxing at the park and observed trees and plants, therefore these variables are omitted. Correlation at 0.05 significance showed that respondents who observed butterfly and/or bees reported higher Nature-Connectedness. Given the cross-sectional study design, and using bivariate Spearman analysis, it is not possible to determine the direction and causality of engagement with nature and Nature-Connectedness.

Table 5. Association between engagement with nature and nature-connectedness

	Do you relax at the park?	Do you obverve the clouds?	Do you hear the bird sing?	Do you observe butterly and/or bees?	Do you observe trees and plants?
How is your connection with nature?	-	0.494	0.432	0.047*	-

Note : Correlation is significant at the 0.05 level.

Study by Cleary et al. (2020) (N=1000) in Australia found that current nature experiences are associated with high levels of nature connection. This promotes the importance to promote nature experiences at any life stage to increase Nature Connectedness. Participants who had been randomly assigned to notice everyday nature and note what emotions were evoked, reported significantly higher levels of positive affect, feelings of elevation, and a general sense of connectedness at the end of two weeks compared to those in control groups (Passmore & Holder, 2017).

A study Lumber et al. (2017) provides evidence that contact with nature which are enhanced by sensory and emotional activities are able to be the pathway to NC. One way to address the extinction of experience is by increasing green infrastructure in urban areas where the majority of people live and work (Soga & Gaston, 2016). Mateer (2022) suggested that outdoor leisure that give exposure to natural sights and sounds could facilitates both awe and solitude to urban park visitors, which may serve as a pathway to connect individuals with nature.

The findings that demonstrate correlation between observing butterfly and/or bees aligned with the study of Richardson et al. (2020) that shows the importance of sensory nature engagement in promoting NC. The finding also aligned to a study of park users of megacities in East and South East Asia. Individuals who have seen butterflies in their cities had higher perceptions of butterflies. Consequently, higher perception of butterflies had a significant relation to Nature-Connectedness.

It is likely that the majority of human–butterfly interactions in cities take place in urban parks. 70% of the respondents reported that they liked butterflies because they were beautiful with a range of color characteristics as their preferred traits of butterflies. This suggests butterflies may be particularly suited as ambassadors of urban wildlife through exploiting their aesthetic appeal (Lim et al., 2022).

3.3 Relationship between nature-connectedness (NC) and pro-environmental behavior (PEB) Analysis

This study assessed 4 Pro-Environmental Behaviors: energy and water conservation, reusable shopping bag usage and garbage sorting at home. 85% of respondents reported saving electricity and water usage. 80% reported using reusable shopping bag and 42.5% reported garbage sorting at home.

Gender differences were found, particularly in the use of reusable shopping bags, where 90.9% of females reported this behavior compared to 66.7% of males. This finding is consistent with prior research indicating that women are more likely to adopt behaviors aligned with environmental sustainability (Anderson & Krettenauer, 2021).

Table 6. Demographic Characteristics of Pro-Environmental Behavior

Pro-Environmental Behavior	N	%	N Female (%)	N Male (%)
Do you save electricity usage?				
Yes	35	85%	19 (86.4%)	16 (88.9%)
No	5	15%	3 (13.6%)	2 (11.1%)
Do you save water usage?				
Yes	34	85%	19 (86.4%)	15 (83.3%)
No	5	15%	3 (13.6%)	3 (16.7%)
Do you use reusable shopping bag?				
Yes	32	80%	20 (90.9%)	12 (66.7%)
No	8	20%	2 (9.1%)	6 (33.3%)
Do you sort garbage at home?				
Yes	17	42,5%	11 (50%)	6 (33.3%)
No	23	57,5%	11 (50%)	12 (66.7%)

Spearman test showed strong correlation ($p<0.01$) of respondents' perceived Nature - Connectedness and Pro-Environmental Behavior.

Table 7. Association between nature-connectedness and pro-environmental behavior

	Do you save electricity usage?	Do you save water usage?	Do you use reusable shopping bag?	Do you sort garbage at home?
How is your connection with nature?	0.01**	0.002**	0.006**	0.014*

Note :
Correlation is significant at the 0.05 level *
Correlation is significant at the 0.01 level **

Meta-analysis by Whitburn et al. (2020) found a moderate positive link between human–nature connection and pro-environmental behavior (PEB), emphasizing the importance of deepening people's connection to nature to encourage environmentally responsible actions. The level of nature connectedness also influenced key relationships between nature experiences, well-being, and PEB.

The meta-analysis results show that knowledge, situational factors like physical conditions, and government incentives can affect household waste sorting behavior in developing countries. Among the most influential factors, a moderate correlation was observed for attitude, moral norms, subjective norms, and perceived behavioral control, suggesting that individuals' perceptions play a key role in motivating participation in waste sorting (Rousta et al., 2020). The result supported Whitburn et al. (2020), indicating that individuals with a stronger connection to nature are more inclined to engage in pro-environmental behaviors (PEBs) such as conserving energy and water. Supporting this, a nationwide study in England found that those who value the natural environment and spend more time in nature for recreation are more likely to report higher levels of PEB (Alcock et al., 2020).

Building on this conceptual foundation, the discussion explores how fostering human–nature reconnection can serve as a remedy for the global environmental crisis. Using a social–ecological systems perspective, it highlights the concept of 'leverage points'—strategic areas within complex systems where interventions can drive significant change—and illustrates how reconnecting people with nature can contribute to societal transformation toward sustainability (Ives et al., 2018). This study aligned with Martin et al. (2020) in England which showed that regular park visits mediated by Nature Connectedness leads to higher PEB. Therefore, conserving and restoring lightly managed green spaces in urban areas—even those with limited size or connectivity—can provide dual benefits by supporting biodiversity and helping to prevent the extinction of nature experiences among local residents (Soga & Gaston, 2016).

The findings underlined the potential of urban parks like Taman Situ Lembang to enhance NC and PEB among urban dwellers. Park managers could implement biodiversity-focused initiatives, such as butterfly gardens or bird habitats, to encourage sensory engagement. Programs promoting environmental education, such as guided tours or citizen science projects, could further strengthen NC (Willis & Gupta, 2023).

The findings the potential of urban parks to counterbalance the disconnection from nature associated with urbanization. As urbanisation increased, ensuring the availability and quality of urban green spaces is important. Policies promoting green infrastructure could help mitigate the negative impacts of urban sprawl on biodiversity and human well-being (Soga & Gaston, 2023). The relationship between Nature Connectedness and PEB can be understood through theoretical frameworks such as the Value-Belief-Norm (VBN) theory and the Theory of Planned Behavior (TPB). VBN theory explained that values were shaped by beliefs about the environment, eventually drive norms that influence behavior. Higher NC fosters PEB values and beliefs, which lead to sustainable actions (Raman et al., 2024). Individuals with higher NC are more likely to perceive themselves as capable of contributing to environmental sustainability and feel a stronger sense of obligation to act responsibly (Dong et al., 2020).

This study is limited to small sample size (N=40) and using self reported data which may result in bias. Binary response format in engagement with nature and PEB questions simplified complex reality. The causality of engagement of nature, NC and PEB cannot be concluded using non-parametric method. Future research could be improved with expanded sample size, qualitative method to explore subjective experience and more engagement with nature activities parameters.

4. Conclusions

This study found that engaging in butterfly observation is positively correlated with higher levels of reported Nature Connectedness. Additionally, respondents' pro-environmental behaviors—such as saving electricity and water, using reusable shopping bags, and separating waste at home—are all strongly linked to their reported connection with nature. Urban parks serve as valuable leverage points to foster greater engagement with the natural environment.

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