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ARTICLE

The Factor that Affects Biophilia Application at the Workplace

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ABSTRACT

Many theories in sociology and psychology encourage people to maintain and contact with nature. Biophilia, for instance, examines the connection between humans and nature within the built environment. It is considered one of the solutions to human isolation from nature, especially in the workplace. This study examined the factors of employee's awareness and preference that affect biophilia application at the workplace. This study's primary data collection method is a survey questionnaire through which responses from 167 employees at the International Islamic University Malaysia (IIUM) were collected. The findings show that employee's awareness and preference have a significant positive effect on the biophilia application. Further research on this topic is necessary to understand other factors that may affect human's connection with nature at the workplace.

1. Introduction

The term biophilia, highlighted by E.O. Wilson, is defined as "innate tendency to focus on life and lifelike processes", "innately emotional affiliation of human beings to other living organisms" [33], a form of humans' deep intimacy with nature that originates from biological production [20]. Biophilia aims to create places saturated with positivity, emotional experience, and life enjoyment [13]. Biophilia creates an escape from the concrete jungle and a better balance between humans and nature. Modern urban areas often isolate people from nature. The workplace has become a virtual environment due to the significant global shift in industrialisation and the economy [3]. According to Kellert, it is essential to understand the workplace environment and the effect of nature on occupant productivity [4,18]. Employees and employers should have crucial roles in the comprehensive view of the work environment [7].

According to Nieuwenhuis and Haslam, workers who work in a green workplace are happier and more satisfied than those who do not [25]. The Human Space Survey revealed that almost 47% of workplaces worldwide lack natural light, and 58% lack green spaces [7]. Workers are affected by the work environment the most because they spend approximately 90% of their time indoors [27]. As a result, they are exposed to many detrimental effects of the work environment, including mental health and occupational stress [16]. Many workers also complain of job depression and sick building syndrome in the workplace. According to the AIA Malaysia Survey in 2018, 50.2% of workers became stressed or depressed, and the number of days off due to occupational sickness increased to 73.1 days per employee per year [1]. Furthermore, 98% of Malaysian workers are at risk of bed trauma and long-term

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mental health issues [1]. Biophilic designs are known to achieve "inner sustainability", which seek to restore nature's elements for humans to create a higher perception.

There is a widely-held belief that the triumph of sustainable design is linked to conscious user behaviour rather than the building's intelligent structures. Based on the users' sense of confidence, approval, and happiness, it is undoubtedly possible to grasp users' behaviour in the desired direction. The biophilic tendency in architectural engineering and the built environment draws attention to space, which have recently been discussed in greater depth [17]. Biophilic interventions should consider the social nature of people's behaviour, which is explored mainly by environmental psychology [14]. Kellert and Calabrese mention that some factors affect biophilia design in the built environment, such as culture, project size, varying economic, and logistical [19]. In particular, this study focuses on the impact of awareness and preference of employees on the biophilia application.

2. Literature Review

Biophilia Application

Biophilia application is applying principles and processes of biophilia to build environmental design. Cooper and Browning argue that biophilic design can be organised into three categories: nature in the space, natural analogues, and nature of the space [7]. These categories can facilitate the implementation of biophilic. Nature in the space includes plant life, animals, water, sounds, scents, and other natural elements into the built environment, which means the direct physical, and ephemeral presence of nature in space. Natural analogues are found in objects, materials, colours, shapes, sequences, and patterns, focusing on the organic, non-living, and indirect evocations of nature. The nature of the space is the innate human desire to see beyond immediate human surroundings and have visual exit opportunities [6].

Biophilia Theory

Biophilia is against old tendencies such as isolation from nature. In addition, biophilia theory believes that humanity could not ignore the inborn tendencies to natural ecosystems and should instead consider them [21]. Landscape architecture is one of biophilia's interest. It evaluates natural and cultural resources that make biophilia part of sustainability [22]. However, there are contradictions between biophilia and sustainable architecture. Unlike sustainable architecture, biophilia is interested in human emotional and psychological well-being. In a sense, biophilia can be considered the missing piece in current sustainable design [8]. Biophilia has a relationship with the environmental psychology theory, such as restorative environment, prospect-refuge, etc.

Browning and Cooper outline three benefits of biophilia at the workplace [7]: 1) Well-being: reducing stress is crucial in keeping positive well-being. Some countries, including Canada, provide green space to increase the worker's well-being. Natural landscapes have a more positive impact than urban landscapes. 2) Productivity: there is a positive relationship between well-being and productivity. A good mood equates to doing more. 3) Creativity: the surrounding environment influences creativity. A working environment with natural elements such as plants and daylight would increase employees' creativity. Several studies show that biophilia benefits employees in terms of mental health and economics [2].

Factors Affect Biophilia Application

A healthy environment seeks to renew the resources needed to maintain and promote health, well-being, and biophilia by connecting humans with nature. Restorative environment design requires a balance between culture, history, preference, and awareness. Some theories study preference and awareness and focus on human behaviour toward nature. This study focuses on the employee' preference and awareness of the biophilia application, as shown in Table 1.

Table 1. Factors extracted from psychology and sociology theories related to biophilia.

Theories	Construct	Factors
Pro-environment behaviour	Taking the initiative [5,26,31]	Awareness
Environmental awareness Nature awareness Biophilia	Attitude Perception [12,18]	
Attention restoration Directed attention theory Environment preference Biophilia	Attracted Interest Affective reaction [15,32]	Preference

Employee's Awareness on Biophilia Application

The concept of biophilia explains the depth of the relationship between human and nature. Wilson argues that there is an innate tendency within the human being toward nature [33]. In agreement, nature awareness (NA) supports an emotional attachment within the human to nature [11,23]. Furthermore, the theory of nature awareness suggests a cognitive effect on people who live around nature [10]. On the other hand, people living in an urban area tend to experience many environmental problems due to a lack of nature. Environmental awareness theory encourages

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sustainability awareness through three variables, i.e., emotional, attitude, and practice [12]. Environmental awareness leads humans to protect natural environments. Nature is necessary for human emotional gratification as well as improved knowledge and cognitive capacities. Kellert suggests that a person's aggressive behaviour against nature may manifest as early as childhood [18]. The theory of Pro-Environmental Behaviour (PEB) demonstrates that the individual has a role in protecting nature and reducing any harm that threatens it. There are five factors related to PEB, i.e., conserving, avoiding harm, transforming, influencing, and taking the initiative [5,26,31].

Employees' Preference on Biophilia Application

Humans have different preferences towards nature. The environmental preference theory explains that humans like the attractiveness of nature and environmental aesthetic [32]. Humans prefer space that include natural elements such as daylight and water [30]. The Prospect-Refuge Theory further supports the idea of different preferences towards nature. Some factors are affecting individual preferences, including social, history, and culture. Nasar asserts that successful design requires understanding the visual environment and the humans affected by it [24]. The human sense can feel attracted or repulsed by aesthetic qualities [15].

3. Methodology

Data were collected from administrative employees at the International Islamic University Malaysia (IIUM) using a survey questionnaire. The total number of employees working indoors was 339. After deducting the outliers and missing data, the total number of respondents gathered was 167. This sample size was adequate to address the research objectives [29]. The gender composition of the sample was typical of the administrative employee population in IIUM Malaysia, with 71% being female. The age bracket groups are as follows: 21-30 (29.3%), 31-40 (31.1%), 41-50 (23.4%), and 51-60 (13.8%). The majority (61%) of the sample live in urban areas.

This study used a 13-item questionnaire that measures the awareness and preference of employees at the workplace. The items were extracted from the attributes of biophilia theories, shown in Table 1, and verified by four experts in landscape architecture. The questionnaire was divided into two sections. The first section was on respondents' demographics information, and the second section covered biophilia application. There are 22 items divided into three parts, all of which uses a 5-point Likert scale format (1 = strongly disagree to 5 = strongly agree).

The collected data were analysed using SPSS version 25, in which descriptive statistics analysis was to determine individual and group mean and percentage.

Table 2. Items measured

Code	Items	Mean	SD	Alpha
	Awareness			.878
AWQ1	Employers should take the initiative to provide plant at the workplace.	3.96	.806	
AWQ2	Staff should take the initiative to provide plant at a workplace	3.89	.779	
AWQ3	Staff should take the initiative to provide water element at a workplace	3.76	.808	
AWQ4	Plants inside the workplace can increase oxygen	4.26	.678	
AWQ5	Plant at the workplace can reduce stress	4.15	.758	
AWQ6	Plant at the workplace can adjust your negative mood	3.98	.795	
AWQ7	Plant at the workplace can clean air	4.21	.657	
	Preference			.872
PRQ1	I prefer having a green plant at my workplace.	4.00	.736	
PRQ2	I prefer having a flowering plant at my workplace	4.01	.728	
PRQ3	I prefer having an aquatic plant on my desk	3.59	.886	
PRQ4	I prefer having a plant in a pot on my desk	3.74	.843	
PRQ5	I prefer having a fountain at my workplace	3.51	.917	
PRQ6	I prefer having a fountain at my workplace	3.52	.962	
	Biophilia application			.895
BAQ1	The plants should be close to the window to have sunlight.	3.96	.763	
BAQ2	The plant should be on the table because it does not need high light.	3.49	.870	
BAQ3	The plant should be hung on walls so that it does not take up space in the workplace.	3.41	.989	
BAQ4	The plant should be in any area of the office. It does not matter.	3.39	.884	
BAQ5	The water elements should be a fountain.	3.49	.904	
BAQ6	The water elements should be an aquarium.	3.49	.863	
BAQ7	The water elements should be a wall fountain so that it does not take up space.	3.38	.846	
BAQ8	The water elements should be a table fountain so that it gives an aesthetic look.	3.50	.863	
BAQ9	The water elements should be a giant aquarium in the reception hall.	3.29	.912	

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Individual items were combined to determine an overall score for each dimension. During data analysis, summated scales were created to determine the relationship between the variable. According to Sekaran, for the value of Cronbach's alpha, ≥ 0.70 is acceptable [28]. The alpha of the items was between .872 and .901. Hypothetically, the independent variables, namely awareness and preference, influence biophilia application as the dependent variable. The regression analysis demonstrates how a change in independent variables is related to change independent variables. In other words, it indicates employees' awareness and preference for biophilia application.

4. Results

This section presents the results of the multiple regression that addresses the objective of the study. First, the Pearson moment correlations were used to determine the coefficient of relationship between the variables, followed by the tested coefficients and hypotheses.

1) Adequacy of the measure of factors

Table 2 shows the descriptive statistics of the items. The mean score of all items was above the hypothetical mean of 3.0. The minimum value of the reliability index was .87, and it satisfied the cut-score of .70 deemed critical for a reliable measure. Cronbach's alpha indicates that the internal consistency index of the employees' responses to the related items was reasonable.

2) Adequacy of the factors model.

Simultaneous multiple regression was conducted to investigate the best predictors from the variables to achieve the biophilia application. The means, standard deviations, and inter-correlations are shown in Table 3. The average mean of awareness was 31.90 (standard deviation= 31.90), and the standard deviation was 3.71for preference (standard deviation =.766).

Table 3. Biophilia application and predictors variables

Variable	M	SD	Application	Awareness	Preference
Application	35.05	6.60	1.000		
Awareness	31.90	5.18	.595	1.00	
Preference	3.71	.7661	.656	.581	1.00

The beta coefficients are also presented in Table 4. The combination of variables to predict the biophilia application from awareness and preference was statistically significant, F= 88.1, p<.001. The result suggests that awareness and preference significantly predict the biophilia application. The adjusted R^2 value is 49, indicating that the model explains 49% of the variance in biophilia application.

Table 4. Simultaneous multiple regression analysis for awareness and preference

Variable	B	SEB		T	P
Constant	6.922	2.260		3.663	.0003
Awareness	.411	.683	.322	4.92	.000
Preference	4.042	.564	.469	7.17	.000

R = .49 F= 88.1 P<.001.

5. Discussion

This study examined the factors that affect biophilia application at the workplace. Specifically, it tested the influence of employee's awareness and preference on workplace biophilia application. Fatoki asserts that environmental knowledge has no significant effect on the employees' pro-environmental behaviour [9]. However, the findings suggest that the first factor of employee's awareness can affect biophilia elements (plants and water) at their workplace. They appeared to know about the initiative. The question "*Staff should take the initiative to provide plant or water at a workplace*" emphasised the importance of having plants or water elements at their workplace. The findings indicate that there is a positive effect of awareness on biophilia application. The findings also show that the second factor, which is the employee's preferences to have plant and water at their workplace, also affect biophilia application. As revealed by the descriptive statistics analysis, the respondents had different choices when it came to plants, such as green and flowering, or the water elements, such as fountain and aquarium. Similarly, Wilke and Stavridou (2013) found that employees prefer waterscapes. There is a positive perception among the respondents on the visual and auditory waterscape that are laden with rich greenery and surrounded by vast open water bodies.

6. Conclusions

Many theories focus on human behaviour to nature. Biophilia is different from other theories because of its focus on human emotion. This theory views that humans have an innate emotional affiliation with nature. The concept of biophilia also appears to have a positive effect in the workplace. Biophilia at the workplace can be achieved in various ways by using two main elements, i.e., water and plants. This study focuses on the factors related to the employee's behaviour toward nature and demonstrates the connection between nature and nature protection. In this regard, this study examined two factors that affect the application of biophilia at the workplace, namely awareness and preference. Further studies should be conducted to identify other determinants of biophilia at the workplace.

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