

e-Proceeding

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A SYSTEMATIC LITERATURE REVIEW (SLR) ON BENEFITS OF BIOPHILIC DESIGN STRATEGIES TOWARDS OCCUPANTS' PERCEIVED PSYCHOLOGICAL PERFORMANCE IN MALAYSIA OFFICE BUILDING

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Abstract

Construction in Malaysia has been growing rapidly and constantly developing. This promotes economic growth resulting in the increase of goods prices, and competition for occupation. Thus, this requires occupants to work diligently resulting in them to spend most of their time working indoors. Due to the circumstances, occupants need to work longer hours to fulfil the expectation of the employers such as to meet the deadline and perform task requirements. Focussing on their work nonstop can develop different types of health issues such as stress, unstable emotions, and unproductive well-being. Thus, this can bring degradation of occupants' psychology. Maintaining individuals' personal psychology is very crucial to enhance their work performance. One of the ways to do so is by being closer to nature. However, the nature of their work limits their interaction with natural environments. This is where Biophilic design comes to rescue. Previous studies show that nature can help in enhancing human wellbeing and psychology. Biophilic design is a strategy to connect humans with nature into the built environment such as the application of greens, natural light and ventilation, and elements of water. There are massive benefits of biophilic design, yet there is lack of awareness and knowledge towards biophilic design in Malaysia. Hence, this paper will highlight the benefits of biophilic design strategies towards occupants' perceived psychological performance by using a Systematic Literature Review (SLR). It is hoped that the outcome of the paper will contribute to the understanding and importance of biophilic design strategies towards occupants' psychology and well-being.

Keywords: systematic literature review (SLR); benefits of biophilic design strategies; natural environment; occupants' perceived psychological performance; office building

1.0 INTRODUCTION

For over the times of the global history, it can be seen that the buildings play essential roles in human society to act as a shelter or a place to make a living. In the current year, there are a lot of expeditious organizations that have powerful impacts on the environment. This massive urbanization can result in the changing of climate change, inducing global warming, threatening the biodiversity and decreasing the access to the environment. Eventually, the present lifestyle and urban living makes people distance themselves from the natural world (Yin, Yuan, Arfaei, Catalano, Alen et al, 2018). Hence, biophilic design strategies come to the rescue. Its duty is to extinguish the void between modern design, urbanization and human

needs. Basically, human are drawn by the nature hence the biophilic design strategies function to connect and improve the relationship between nature, built environment and humans.

According to Kellert (2008), the reconnection of people with nature is considered as the main purpose of applying the biophilic design as it incorporates a strategy to connect those two elements. The biophilic design provides a connection between outdoor and indoor environments such as natural lights, natural ventilation, landscaping, water features, plants, and interior design elements that can resemble shapes and forms that are found in nature such as painting and sculpture (Gray & Birrell, 2014).

2.0 LITERATURE REVIEW

2.1 Biophilic Design Strategies

"Biophilia" is a term derived from the Greek word meaning 'love of life' (Ramzy, 2015). The first man who used the term of biophilia was Enrich Fromm in the 1960s. He used the biophilia term to describe that humans have the tendency and are attracted to everything that is alive (Totaforti, 2018). Later in 1980, a sociobiologist named Edward O. Wilson defined biophilia as "the innate tendency to focus on life and lifelike processes. He exploited the term during his exploration in the natural world as to describe his real feeling of connection to nature (Sonderlund & Newman, 2015; Totaforti, 2018). The connection with nature such as plants can boost and improve human health and wellbeing especially in the modern built environment (Gray & Birrell, 2014).

Nature should be a component of the building's design (Gautam, 2017). However, in today's architecture, we can see that designers or architects often overlook integrating the building with the natural environment. The connection is always blocked by the forms of the building (Totaforti, 2018).

Biophilic design also can be defined as healing architecture design as it usually has been applied on hospitals, schools, and workplaces in order to enhance the recovery times, improve the learning process and increase productivity. The practice and the application of the biophilic design associates with various design strategies that can refer to attributes and experiences. There are three types of biophilic design strategies framework which are direct experience of nature, the indirect experience of nature, and the experience of space and place. The direct experience is the actual connection with the natural environmental features in the built environment while the indirect experience refers to contact with the imitation of nature images from its original condition. Lastly, the experience of space and place indicates spatial features characteristic of the natural environment (Kellert & Calabrese, 2015).

Table 1: The attributes and experience of biophilic design strategies

Direct Experience of Nature	Indirect Experience of Nature	Experience of Space and Place
Light	Image of nature	Prospect and refuge
Air	Natural materials	Organized complexity
Water	Natural colours	Integration of parts to wholes
Plants	Simulating of natural light and air	Transitional Space
Animals	Naturalistic shapes and forms	Mobility and wayfinding
Weather	Evoking nature	Cultural and ecological attachment to place
Natural landscape and ecosystem	Information richness	
Fire	Age, change, and patina of time	
	Natural geometries	
	Biomimicry	

Source: Kellert & Calabrese, 2015

3.0 METHOD USING THE SYSTEMATIC LITERATURE REVIEW

A Systematic Literature Review (SLR) is a type of literature review that uses systematic methods to collect secondary data. It is one of the approaches to collect, analyse, evaluate and synthesis the data to answer a specific research question (Piper, 2013). SLR was used to gain the literature on the benefits of biophilic design strategies towards occupants' perceived psychological performance. There are four phases in the SLR method.

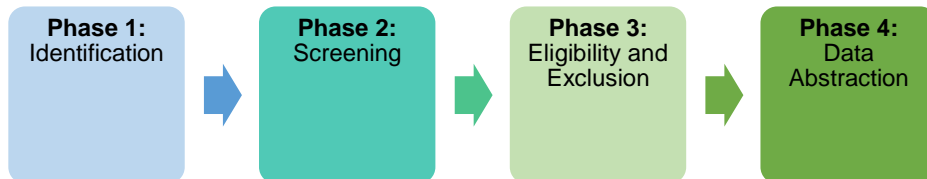


Diagram 1: Stages in SLR methods source: Tawfik et al

3.1 Phase 1: Identification of Literature Review

This phase is where researchers conduct a rigorous search of a topic that is related to the biophilic design strategies towards occupants' perceived psychological performance. It is a process to search any related words such as synonyms, related terms and variation of the main keywords. Identification of the literature review functions to gain more choice of the articles towards the topic related for the review in the established publication database. The main databases that have been used in this review paper are Scopus, Research Gate, Mendeley, and Google Scholar. Each of the databases has its own advantages.

Table 2: Result of identification process

Title	Main Keywords	Enriched Keywords
Benefits of biophilic design strategies towards occupants' perceived psychological performance	Benefits Biophilic design strategies Perceived psychological performance	Benefits = advantages, Biophilic design strategies = biophilic design attributes, biophilic design approach, biophilic design pattern, biophilic architecture. Occupants' perceived psychological performance = occupants' achievements, workers' perceived psychological performance, workers' achievements.

Source: Authors' Research, 2020

Table 3: SLR research string

Databases	Keywords
Scopus	TITLE-ABS_KEY (("Benefit* OR advantage*") AND ("biophilic design strategy*" OR "biophilic design attribute*" OR "biophilic design pattern*" OR "Biophilic architecture") AND ("Occupant* perceived psychological performance" OR "occupant* achievement* OR "worker* perceived psychological performance" OR "worker* achievement*"))
Google Scholar	TITLE-ABS_KEY (("Benefit* OR advantage*") AND ("biophilic design strategy*" OR "biophilic design attribute*" OR "biophilic design pattern*" OR "Biophilic architecture") AND ("Occupant* perceived psychological performance" OR "occupant* achievement* OR "worker* perceived psychological performance" OR "worker* achievement*"))

Source: Authors' Research, 2020

3.2 Phase 2: Screening of the Identified Literature

In this phase, the identified literature was screened according to the suitable context of biophilic design strategies, towards occupants' perceived performance in office building. From 36 literature reviews to 15 literatures that suited the topic of this paper. This screening process is to sort out the duplicate of the articles, non-relevant articles for this review paper and non-English publication.

3.3 Phase 3: Eligibility and Exclusion

Next is the eligibility and exclusion phase. The screened literature reviews were analysed thoroughly one by one. From the remaining of the 15 literature reviews, only 8 literatures were selected for the SLR. The papers that do not have the need information for the benefits of biophilic design strategies towards the occupants' perceived psychological performance.

Data gained was analysed and abstracted. A systematic review was tabulated with Item Checklist, Author(s), Title of Publication, Year of Publication, Country of the Study, Types of the Biophilic design Strategies and Benefits towards Occupants Perceived Performance.

3.4 Phase 4: Data Abstraction

The last phase is the data abstraction. To conclude, there are many benefits of biophilic design strategies towards the occupants' perceived psychological performance. Each of the strategies have their own benefits. Many of the researches cover the benefits only on the direct experience of nature as it is the main element in the biophilic design.

4.0 ANALYSIS AND DISCUSSION

Table 4 below shows the analysis from the literature review of the biophilic design strategies, and benefits of biophilic design strategies towards the occupants' perceived psychological performance.

Table 4: Benefits of biophilic design strategies towards occupants' perceived performance

	Authors	Terrapin Bright Green LLC	Kellert, S. R. & Calabrese, E. F.	Gillis, K. & Gatersleben, B.	Soderlund, J. & Newman, P.	Sharifi, M. & Saberejad, J.	Lerner, A. & Stopka, M.	Totaforti, S.	Topgul, S.	Frequency
	Year	2014	2015	2015	2015	2016	2016	2018	2019	
Biophilic Design Strategies	Benefits	Checklist								
Plants	Calming		√	√			√		√	4
	Reduce Stress	√	√	√	√				√	5
	Positive Emotions	√		√						2
	Improve Productivity		√				√		√	3
	Improve		√	√	√	√	√	√	√	5

	Health									
	Improve Concentration	√			√		√		√	4
	Improve Wellbeing			√					√	2
Light	Positive Emotion		√	√		√			√	4
	Improve Concentration			√		√	√		√	4
	Better Communication			√						1
	Improve Health	√	√			√	√			4
	Improve Wellbeing		√							1
	Improve Productivity			√			√		√	3
	Air	Calming	√	√			√		√	
Improve Wellbeing		√						√		2
Improve Concentration		√						√		2
Positive Emotion					√					1
Improve Productivity		√	√							2
Water	Reduce Stress	√	√			√		√		4
	Calming	√	√	√		√		√		5
	Improve Health		√			√				2
	Improve Concentration	√				√				2

Table 5: Frequency of each benefits

Benefits of Biophilic Design Strategies	Frequency
Calming	13
Improve Health	11
Reduce Stress	9
Improve Productivity	8
Positive Emotions	7
Improve Concentration	6
Improve Wellbeing	5
Better Communication	1

Based on Table 5, many of the researchers highlighted the direct experience of nature as it is the main element in biophilic design strategies. Furthermore, direct experience of nature is also the basic element in a built environment. From all of these strategies, plants provide more benefits compared to other strategies. Among its benefits are calming, reducing stress, providing positive emotions, improving productivity, health, concentration, and wellbeing. Therefore, all of these benefits can increase occupants' perceived psychological performance. Beside, it was found that, many researchers highlighted on the calming ($f=13$) and improving health ($f=11$), reducing stress ($f=9$), improving productivity ($f=8$), and positive emotions ($f=7$) as benefits of the biophilic design strategies. All of these benefits play a crucial role toward occupants' performance to ensure production of the organization to flow smoothly.

From the observation it can be seen that the application of biophilic design into the office building can contribute to positive organisational, especially for occupants' psychological and health. Therefore, the bare minimum for someone to apply the biophilic design strategies are by planting the plants on their individual's desk. Thus, biophilic design can bring office to life.

Integration of the natural elements into the built environment not just leads to the occupants' psychological benefits but also can bring the aesthetically pleasing to the office environment. The office environment can be bright, positive, and comfortable which will make the occupants more energized.

5.0 CONCLUSION

The application of biophilic design strategies can provide so many benefits towards the environment, economy, social and psychology. However, this systematic literature review (SLR) of biophilic design strategies, only focuses on the benefits towards the psychological scope. There is rationalisation to connect human and nature towards human psychology. Each of the strategies may provide the same or different benefits. Based on this SLR, the top five benefits that researchers highlight are on calming ($f=13$), improving health ($f=11$), reducing stress ($f=9$), improving productivity ($f=8$), and positive emotions ($f=7$). Moreover, the biophilic design strategies can be used in the future as a ground rule to design office spaces to increase occupants' psychological performance as it can create a liveable and aesthetic office. It is also one of the ways for the occupants to feel relaxed, calm, and energized from the hectic task.

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Tarikh : 20 Januari 2023

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Sekian, terima kasih.

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Saya yang menjalankan amanah,

SITI BASRIYAH SHAIK BAHARUDIN
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Setuju.

27.1.2023

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