



## ARCHITECTURAL BIOPHILIC PRINCIPLE THAT STIMULATES PSYCHOTHERAPY OF NEUROLOGY PATIENTS IN KANO

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### ABSTRACT

Biophilic design suggests that incorporating natural elements in the design of built environments could make it more restorative. Strong connections have been found by studies on restorative environments and stimulation of health and wellbeing as benefits of Biophilic design. Biophilic design elements that promote health and wellbeing were found not to be universal. Geographical locations, ailments, culture, orientation, among other factors are found to influence the level of impact of the elements. Using mixed method approach this study explored the stimulating effect of Biophilic design elements in three foremost hospitals in Kano; Aminu Kano Teaching Hospital, Murtala Muhammad General Hospital and Abdullahi Wase specialist Hospital. Data was collected through Questionnaire survey (139 respondents) and interview. The data was analysed using Relative Importance Index (RII) and content analysis. The result shows that Landscape and vegetation, Natural ventilation and Natural lighting with relative importance Index of 0.819, 0.812 and 0.745 respectively are the most outstanding elements of Biophilia that are found to stimulate restoration of neurology patients in Kano. Furthermore Natural materials and Natural forms and shapes (with 0.591 and 0.568) respectively are found to be the elements that have less impact in promoting restoration. Therefore achieving effective restorative environment that aids restoration especially to neurology patients requires serious consideration for Landscape and vegetation, Natural ventilation and Natural lighting.

**Keywords:** Biophilia, Neurology, Design principles, Restoration, Psychotherapy.

### INTRODUCTION

Association of human with nature can be drawn back to how our ancestors survived, and hanged deeply on natural environment for survival (Kellert et al., 2011). It was established in health and psychological research that contact with nature in the built environment is beneficial to man (Kaplan & Kaplan, 1989). Therefore, the idea of bringing back the evolutionary affinity of man to natural world is termed as 'Biophilia'. The concept of biophilia therefore implies that humans hold a biological need for interaction with nature on physical, mental, and social levels, and that this connection affects our personal wellbeing, productivity, and societal relationships (Zhong et al., 2022a)

Treating patients suffering from neurology diseases is not the same as treating other kind of patients. This is because neurological disorders are not restricted only to physical effects; it also evokes emotional chaos that influences person's relationship and patients' ability to live and work properly (Flinsenberg et al., 2012). Previous studies suggested that, psychotherapy have the potential in stablizing the Neurology patients thereby giving them reassurance (Chen & Hemmen, 2020; Łabuz-Rozsak et al., 2020). An effective Neurological hospital that provides not only the needed medical service, but also the much needed healing potentials of nature requires an environment that speaks to the minds of its users. Then, Biophilia design can be seen as

the best option (Adams, 2019; Flinsenberget al., 2012).

According to Zhong et al., (2022b), Biophilic elements can be incorporated in our buildings through strategies such as addition of indoor plants, or large well-placed window which can provide visual connection to the outdoors, designing buildings with porches, covered walkways, deck or patios that can provide access to outdoor spaces, local views, natural materials, large plants, water, natural light and ventilation, fences, gazebos or gliders in the backyard to create enjoying outdoor spaces and also create extension of the interior. In addition, outdoor spaces such as playing ground, relaxation, meditation and dining etc can be used to promote connection to the daily and seasonal changes in the natural world (Umar, 2014). However, geographical locations, ailments, culture, orientation, gender among other factors are found to influence the level of impact of such elements (Kellert et al., 2011). Infact Individuals may be found to respond differently to Biophilic elements, this cannot be undermined in Biophilic design. For instance, Van den Berg & Heijne, (2005) found that the way male individuals and those that are higher sensation seeker respond differently to threatening encounters in nature than females and those that are lower sensation seeker. They as well found that fear can be due to any form of nature. When translated into the built environment, the environments that have high prospect may likely cause some phobia to people who are fearful of heights.

Studies by Söderlund & Newman (2017) posits that there is limit to which these elements enhances psychotherapy especially to patients suffering from Neurology disorder. In particular there seems to be little consideration for incorporating such elements in design of healthcare facilities with neurology patients in Nigeria (Wakawa, 2015).

Therefore, this study seeks to appraise the elements of Biophilia that stimulates restoration of Neurology patients within tertiary hospitals in Kano..

## LITERATURE REVIEW

### The Concept and Hypothesis of Biophilia

Humans are nature, and as living beings, there is a need to be connected to nature as part of the greater process of life. The term biophilia according to New Oxford American dictionary was coined from a combination of two Greek word: “Bio” that means life and “Philia” meaning love of a specified thing. Therefore, biophilia can be referred to as the love of life. Thus, people have been intuitively aware of it since the ancient times, where natural shapes, patterns, and objects have been often acted as source of inspiration for architects all over history.

The term “biophilia” has lso been seen to be as a human evolution research that was formulated to describe humans’ inherent affinity for the living things in the natural world (Katcher & Wilkins, 1993). The reason of preference for nature have been attributed to deep instinct rooted in the human brain (Berman et al., 2012). Based on the further understanding and the experience-based examination of “biophilia”, the “biophilia hypothesis” (Wilson, 1984) was first proposed in 1993 to emphasize that the relationship between human and nature is significant in human brain evolution (Crawford & Krebs, 1997; Irons, 1998) as well as physical (Salonen et al., 2013) and psychological health (Crawford & Krebs, 1997; Gillis & Gatersleben, 2015). This initiated the quest to investigate the postulated tentative responses that seek to the reasons for peoples’ love for nature and why nature positively affects physical and psychological wellbeing (Wilson, 1984).

The moves by scholars to explore how biophilia principles are employed in design practice was based on premise that health influences of biophilia are supported by robust empirical evidence (Katcher & Wilkins, 1993; Kellert et al., 2011; Söderlund & Newman, 2017; Wilson, 1984). This concept generated a design activity that was aimed at rebuilding positive relationship between the natural environment and human in the modern built environment. This gave birth to the the phenomenon “biophilic design” (Gillis & Gatersleben, 2015; Kellert et al., 2011). The innovative approach in Biophilia sparked the transition from basic research to practical design application thereby reflecting in sustainable design strategies. Some scholars summarized and classified the natural design features into biophilic design frameworks to guide design activities (Kellert et al., 2011; Sharifi & Sabernejad, 2016; Söderlund & Newman, 2017; Zhong et al., 2022a)

### **Architecture and Biophilic Design**

Recently, designers and researcher with majors in the built environment have shifted their attention toward biophilic design (Kellert et al., 2011). Although the importance of biophilic design seems to be well-acknowledged. Because of the understanding of the health benefits of adopting biophilic design principle, its reflection have been seen in various building typologies such as commercial (Guzzo et al., 2022), healthcare (Sal Moslehian et al., 2023), and urban designs (Carmona et al., 2010).

Due to advancement and more specialization in medical technology, connection between healing and nature was slowly displaced (Davidson, 2013). New advanced treatments that concentrated more on physical well-being and less on psychological were giving more attention, while the all-inclusive natural method to medicine was pushed aside (White,

2011). Today, hospitals turn into what others consider as cold, sterile institutions that take over the healthcare industry. However, since 1990’s there has been resurgence in nature based care, and professionals are beginning to once again focus on the whole person; the mind, the body and spirit connection in healthcare settings that makes it a Healing Environment (Davidson, 2013).

Biophilia has many application that help transform ordinary setting into stimulating environments; whether one is engaging with nature by walking through a park, by interacting with animals, or simply by having a view of greenery from home or place of work (Umar, 2014). The presence of flowers and other aesthetically appealing vegetation has a calming and healing effects on the sick and disabled (Heerwegen, 2008; Yudelson, 2007).

### **Healing Environment**

Optimal Healing Environment (OHE) have been envisaged to be one in which the social, psychologic, spiritual, physical, and behavioral components of health care are oriented toward support and stimulation of healing and the achievement of wholeness.

Accordingly, the above literature shows that nature of environment of a healthcare facility influences healing process of patients. Biophilia in particular which is the subject matter of this research have provided a broader explanation and principles for achieving such a healing environment. Below is a clear image of what biophilic design is all about.

Biophilic design is an approach to design, which accentuates importance of maintaining connection with natural world through the built environment (Kellert, 2005). The term biophilic design emerged from the translation of the concept of applying biophilia into

design and as well-built environment (Ojamaa, 2016). Biophilic design is referred to as the incorporation of natural elements into the context that is necessary to support human connection with nature (Gillis & Gatersleben, 2015). The target was to create an environment imbued with positive experiences that can promote human health and well-being through interaction of people with nature (Kellert et al., 2011; Zhong et al., 2022b).

Researchers argues that human brain is constantly reverting back to its survival such as food, shelter, water, light and fire (Crawford & Krebs, 1997). It is therefore important to understand what attracts people to this features so that they can be introduce into the built environment (Heerwagen & Mador, 2009). Therefore, within this context, Kellert (2008) defines biophilic design as “the expression of the inherent human need to affiliate with nature in the design of built environment”.

However, in order to assist architects and developers in the practical application of biophilic design, it was broken it organic and vernacular dimension (Kellert et al., 2011). The Organic Dimension of Biophilic Design includes the shapes and forms which are found in the building environment that directly, indirectly, or symbolically reflect the inherent human affinity for nature. The second basic dimension of biophilic design is a place-based or vernacular dimension, defined as buildings and landscapes that connect to the culture and ecology of a locality or geographic area. Vernacular design enables a satisfying connection to the place where people live; it refers to buildings or landscape features that foster the distinctive culture and spirit of a place. It is a design that connects people to particular cultural and ecological setting.

## Neurological Disorders

Neurological disorder is a large group of diseases (over 100). Many bacterial (i.e. myco bacterial tuberculosis, Neisseria, Meningitides), viral (i.e. human immune deficiency virus (HIV), Enteroviruses, West Nile virus, Zika), and parasitic (i.e. malaria, chagas) infections can affect the nervous system. Neurological symptoms may occur due to infection itself, or due to an immune response. Neurological disorders according to World Health Organisation (WHO) are diseases of the central nervous system and peripheral nervous system. It involves the brain and the spinal cord, cranial nerves, peripheral nerves, nerves root, autonomic nervous system, neuromuscular junction, and muscles etc. this results to: stroke, paralysis, migraine, traumatic disorder, memory loss, multiple sclerosis, Parkinson’s disease e.t.c. (W.H.O, 2016).

According to world health organization W.H.O, (2016), “Hundreds of millions of people worldwide are affected by neurological disorders. More than 6 million people die because of stroke each year; over 80% of these deaths take place in low and middle income countries. More than 50 million people have epilepsy worldwide. it is estimated that there are globally 47.5 million people with dementia, with 7.7 million new cases every year”. “Alzheimer disease is the most common cause of dementia and may contribute to 60-70% of cases. The prevalence of migraine is more than 10% worldwide (Disabled world, 2019).

Neurological disorders pose a large burden on worldwide health. The most recent estimates shows that the neurological disorders included in the global burden of disease (GBD) study are: Alzheimer and other dementias, Parkinson’s disease, multiple sclerosis, epilepsy, headache disorders etc. represent



3% of worldwide burden of disease. Dementia, epilepsy, migraine and stroke rank in the top 50 causes of disability-adjusted life years (DALYs), (Murray, Vos, Lozano, Naghavi, Flaxman, 2012),

## MATERIALS AND METHODS

To achieve valid and reliable data mixed methods was adopted in studying the Biophilic design principle that stimulates psychotherapy of neurology patients. Quantitative method using survey and Qualitative method using Interview was used for triangulation.

The limitations of Biophilic design was the concentration of the study on the individual elements of Biophilic design (e.g., Plants, images of nature, and natural light). However, the combination of the elements has received little attention in research (Zhong et al., 2022a).

Therefore Natural ventilation, Natural Lighting, Natural Materials, Prospects and refuge, Land forms and Vistas, Landscape & Vegetation, Water bodies and Natural Forms

and Shapes are considered as the variables for the study.

For the purpose of triangulation, descriptive non-experimental study in addition to interview approach was adopted for this research in neurology centers of Aminu Kano Teaching Hospital, Murtala Muhammad General Hospital Kano, and Abdullahi Wase specialist Hospital Kano. The case studies were purposefully selected on the basis that, the cases all have a Neurology department buildings that depict significant features of biophilic architectural elements (Curry et al., 2009).

Questionnaires prepared based on 5 points Likert Scale were administered to healthcare personnel and neurology patients of the three hospitals. Purposive sampling was used and where total of 139 respondents (Table 1). They comprised of 27 medical personnel (11 medical doctors and 16 nurses) and 112 patients (inpatients and outpatients) in all the three hospitals were selected. Relative Importance Index was used in analyzing the data.

**Table 1:** Case studies and the of category of the respondents.

Case	Healthcare Personnel		Patients		
	Doctors	Nurses	Outpatients	Inpatients	Total
Aminu Kano Teaching Hospital	3	9	41	12	65
Abdullahi Wase specialist Hospital Kano	3	6	27	9	45
Murtala Muhammad General Hospital Kano	2	4	20	3	29
TOTAL	8	19	88	24	139

Source: Authors fieldwork (2023)

As for the interview, the respondents are 3 patients and 2 healthcare personnel from the Neurology departments in the three different hospitals, thereby making the participants of each Neurology Center to be 5, and so a total

of 15 participants. The data was analysed using content analysis.

## RESULTS

In this section, the data was analyzed based on their relative importance in stimulating

restoration. The result shows that Landscape and vegetation, Natural ventilation and Natural lighting are the most outstanding elements of Biophilia that are significant in

stimulating restoration of neurology patients with relative importance Index of 0.819, 0.812 and 0.745 respectively as shown in Table 2.

**Table 2:** Computed values of Relative Importance Index

Item	<i>Computed values, given the 5 frequency entries:</i>				
	Total respondents (N)	Weighted total	RII	Ranking	Item Mean
Natural Lighting	137	510	0.745	3	3.723
Natural ventilation	137	556	0.812	2	4.058
Natural Materials	137	405	0.591	7	2.956
Prospects and refuge	137	406	0.593	6	2.964
Land forms and Vistas	137	491	0.717	4	3.584
Landscape & Vegetation	137	561	0.819	1	4.095
Water bodies	137	486	0.709	5	3.547
Natural Forms and Shapes	137	389	0.568	8	2.839

Source: Authors fieldwork (2023)

The result indicates that the highest score on Landscape and vegetation cannot be disconnected from the fact that the respondents appreciate the serene environment around the hospital premises. This corroborates the principles of 'Healing Garden' as demonstrated by the Kaplans (Kaplan & Kaplan, 1989) and Roger Ulrich (Ulrich, 2001) have on how a landscape can be restorative. The belief is that landscape in a healthcare environment provides a sense of fascination as well as a greater extent, separating users from distraction (Kaplans, 1998), reducing negative emotions, holding a person's attention, and blocking stressful thoughts (Ulrich, 1981). The study of Ulrich has also shown that patients with views of nature have significantly less post-operative stay times, less medication use and experienced fewer minor post-operative complications (Ulrich, 2000).

Even though Natural ventilation became second most important Architectural Biophilic feature according to the ranking, but there is

very slight margin between it and the first item Landscape and Vegetation. This indicates that they have almost equal importance when it comes to an effect on healing. The importance of natural ventilation as a biophilic design element according to the study cannot be overemphasized. The preference for natural ventilation relates well with the circumstances of epileptic power supply and overcrowding of healthcare facilities (Wali, 1999). The results corroborate the studies on relationship of natural ventilation and indoor environmental quality (Salonen et al., 2013; Skoog, 2006) and infection control (Atkinson, 2009; Rao, 2004).

The third element according to the study is Natural Lighting. Even though it is the third in ranking, but the margin between it and the other two leading elements is so small that it is as well significant. The result shows that the respondents consider it among the very influential and outstanding element. This upholds the opinion of scholars promoting the use of natural lighting in buildings especially

healthcare facilities for its benefit in patients restoration and post operative recovery.

The result further shows that, Natural materials and Natural forms and shapes are the lowest elements in the ranking with 0.591 and 0.568 respectively. This suggests that they have little impact on the patients psychotherapy. Many studies relating to this elements suggests that these attribute has received limited attention in academic research from a psychological perspective (Gillis & Gatersleben, 2015). This is not surprising as hardly you see use of natural materials, forms or shapes in institutional buildings such as hospitals in Nigeria.

The results obtained from the interview after thematic analysis indicates that medical personnel are well informed about the stimulating effects of the Biophilic features in a healthcare setting. Majority of the them have preference for natural ventilation as they belief that it refreshes the environment and reduce the risk of infection. One of them said that *“the mechanical means of ventilation is always not reliable thereby making the environment stuffy when there is no light”*. They belief that this concepts dated back to Florence Nightingale Era when natural ventilation was use as a salutegenic restorative approach and is till effective. The patients' response was also inclined towards Natural ventilation. According to one of them *“muna fitowa mu sha iska in aka dauke wuta”* Meaning that we stays outdoor to refreshen up especially when there is no light.

The second most popular opinion is the Landscape and vegetation. This as well was considered among the top most important features that is relevant to restoration of neurology patients. some of them belief that the presence of serene environment make the patients refreshed. *“you will see many of them hanging around the vegetations before or*

*after the clinical hours. They stay there for very long time before leaving”*. For the patients, the beauty of the scenery fascinates them the more. They appreciated the landscape and vegetation around the hospital. Some of them said that they spend a good time under the tree shades during for leisure.

By way of triangulation, the findings from both the quantitative and qualitative approach do not seem to differ, this strengthen the findings that the most effective Biophilic architectural elements for effective neurology healing environment suitable for healthcare institutions are landscape and vegetation, natural lighting and natural ventilation.

## CONCLUSION

Considering the peculiarity of neurological disorder, the environment by which they are treated ought to be designed such that it supports the psychotherapy required for such ailment. To this end Biophilic design principle provides the required salutogenic medication in this regard. However a blanket application of these principles is usually applied in healthcare facilities design without giving recourse to the peculiarity of the ailment. This study was able to establish the ideal Biophilic design indices suitable for neurology hospitals in Kano. It recommends that priority be given to landscape and vegetation, natural lighting and ventilation at the design stage of neurology hospitals so as to have a healing environment that excite restitution of neurology patients..

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