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Adopting Biophilic Designs in Rehabilitation Centers to Promote Addict's Health

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Abstract:

A growing body of scientific study indicates that humans need daily contact with nature to be productive and healthy, human evolves as part of nature, and are interdependent and interconnected to nature and other forms of life. Biophilia also supports the proposition that urban environments need to be integrated with 'nature' for psychological health benefits as well as environmental benefits. (6) This study, explore Biophilic designs and how they can be adopted in rehabilitation centres. Rehabilitation Centre offers treatment to people suffering from addiction. It provides facilities that reinstate human health as a result of negative traits and influence or challenges that may have been imposed on them willingly or unwillingly, hence resulting to negative life style. However, this study present how biophilic elements can be maximized in rehabilitation centers as a means to help patients recuperate faster and reinstate them from physical and mental damages as well as promoting their health and wellbeing. Hence, to achieve the aim, the study seeks to identity various biophilic elements in biophilia architecture; it investigates ways biophilic design can be integrated in design of rehabilitation centers where patients will dwell during their period of stay. It also to identify how patients can consciously engage in self-healing through the influence of biophilic designs. In order to present this research, the study based its methodology on review of existing literatures and case studies. The researcher studied rehabilitation centres locally and internationally in a bid to critically analyze existing situations of rehabilitation centres and invariably compare how often biophilic elements are adopted in the design of rehabilitation centres.

Keywords: Biophilic design, Biophilic elements, biophilia, Rehabilitation centre, Drug Addicts

1. Introduction

Addiction is suffered by both young and old around the world. The rate at which most youths engage in abusive substance is alarming and defacing the society. In recent times, many have lost their lives to road accidents than sickness, as declared by the-World Health Organization. The form of addiction includes drugs, alcohol, and tobacco, among many others.. (27).

The word rehabilitation means to reinstate, restore to good health. It is the process of restoring health after a terrible occurrence or damages that has occurred in human lives. Rehabilitation Centre is a place that seeks to provide therapy to people suffering from drugs, depression, addictions, bipolar disorder, phobias, schizophrenia, and mental disorder, and so on. It offers patients opportunities to recover, learn skills, avoid being stigmatized, and prevent them from returning to their former state.

An increase in crime rate over the years has posed treat and challenges to the physical wellbeing of individuals; the reason is not far-fetched from individuals who are unable to control their minds due to the excessive substance taken in. Rehabilitating drug victims poses less threat to society and allows addicts to be dependent on the outside world. It reduces unemployment, insecurity stigma, and disengages addicts from going back to their past life. Biophilic design principles point toward creating healthy and productive habitats for modern humans. It is an innovative way of designing the place where we live, work, and learn. It provides buildings that connect people and nature, hospitals where patients heal recuperate faster. Biophilic design can be used in places of learning where students are impacted with nature to score higher in offices where productive of workers is increased (19). The biophilic design promotes healthy living, and it reduces stress, enhanced creativity, and clarity of thoughts. Hence, this study focuses explicitly on promoting the health and wellbeing of drug addicts through the use of biophilic designs. It is set to offer an environment that provides connection with nature in a rehabilitation Centre to promote a positive healing environment.

2. Biophilia

Biophilia affiliates human inclination with nature that continually related the modern world to physical and mental health and wellbeing. (12)Edward O. Wilson, an America biologist, put forward the hypothesis and postulated a human need to connect with living structures in our environment (20). Human connects naturally to the environment, and it is believed to be a significant influence on the state of wellbeing. In other words, the human mind and body were mainly

sensory world controlled by critical environmental features such as light, sound, odor, wind, weather, water, vegetation, animals, and landscape.

⁽²⁶⁾ Asserts that biophilia is beneficial to humankind and offers biological connection with nature. It describes why crackling fires, scents from a flower, and crashing waves of the ocean captivate us; it also shows why a garden view can improve our creativity; why shadows and heights instill fear and fascinate us. Biophilia influences us and shows why animal companionship and strolling through a park have restorative, healing effects. Biophilia helps to explain why some urban parks and buildings are preferred over others.

According to ⁽¹⁰⁾, the idea of biophilia originates from the understanding of human activities, where over 99% of our species history was biologically improved in an adaptive response to natural, not artificial, or human-created forces. Human has an innate nature that makes them connect to the natural environment. This combines with experiments carried out by Ulrich and other scientists, and they suggest that the living areas can be integrated with the natural environment. Hence, it induces healing and promotes positive emotional changes, which in turn have an indirect impact on stress levels and physical and emotional well-being of humankind. ⁽²⁴⁾

Biophilia as a concept does not propose that the architecture itself has the ability to heal, but that the architectural manipulation of space can provide the platform for other natural factors like sound, light, color, privacy, views, and even smell to promote a healing environment that affects the physical and psychological healing of patients. ⁽¹⁵⁾ It should be integrated into the built environment to promote wellness and physical health. Biophilic effects are measurable in un-natural environments like hospital rooms, when people are exposed to images or illusions of nature such as the artificial sky. Such illusory, or virtual, systems are part of the suite of biophilic design tools, valuable for environments – such as rooms buried deep inside large buildings that cannot comfortably accommodate real biological systems ⁽¹⁴⁾

⁽¹⁷⁾ Identify the stress of an unpleasant environment can cause a person to feel uneasy, sad, and helpless. These feelings, in turn, can elevate a person's heart rate, blood pressure, the tension in the muscles and can impact the immune system. Besides, Kellert ⁽²⁰⁾ noted that the physical and mental wellbeing of people remains highly relevant in contact with nature, which is a necessity rather than a luxury to promote fitness and satisfaction in our modern urban society. Furthermore, sources of biophilia instinct include instinct from inherited memory, from our evolution and development in the environment of the savannah that consists of clumps of bushes, open grassland, scattered trees, bodies of water, plenty of sunlight, grazing animals. And ~~the~~ source of biological structure itself. This structure is believed to cut across living and inanimate form. ⁽²⁰⁾ The concept of biophilia is intertwined between nature and aesthetics, and it gives a refreshing feeling in the built environment when adequately integrated.

⁽²⁴⁾ The beneficial effects provided by nature are outlined in four ways. First, we attribute nature with physical activity, which promotes health. Secondly, socializing with others around a nature-based environment is one of the most cases directly linked with nature, people can walk or sit on a bench in a park with a friend. Thirdly, nature provides a temporary escape from our everyday reality. According to Francis ⁽⁷⁾, a window is a gateway that can transport a patient from harsh reality to a place of contemplation rather than a functional necessity that provides light and ventilation. The 'power of the window' through a science experiment confirms that a direct view of the natural environment rather than a blank wall has more influence on patients recovery in hospitals. The concept of biophilia has contributed significantly to the built environment, it counters the views that building is mere machines, it symbolizes life to users, it is seen to offer recovery and health to users in the built environment as well as an architectural solution to the dying world. ⁽²⁴⁾

2.1. Biophilic Designs in Architecture (General Overview)

Natural materials, natural light, vegetation, and other experiences of the natural world are incorporated into the modern built environment, which is an extension of biophilic design. ⁽²⁵⁾ The design is essential for providing people opportunities to work in the right places and live with less stress and ensuring more excellent overall health and well-being. ⁽²⁶⁾

The application of varying design strategies that is 'experiences and attributes' is a practice of biophilic design. It should occur in a manner whereby the diverse applications mutually reinforce and complement one another, resulting in an overall integrated ecological whole rather than a piecemeal of disconnected fashion. ⁽¹⁰⁾

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

Table 1: Categories of Biophilic Designs

Source: ⁽¹⁰⁾

⁽¹⁰⁾ Further outline the basic categories of our biophilic design framework, which include the direct experience of nature that deals with actual contact with environmental features in the built environment, including natural light, air, plants, animals, water, landscapes. The pictures and artwork, natural materials such as wood furnishings and woolen fabrics, ornamentation inspired by shapes and forms occurring in nature are classified under the long experience of nature, and it refers to contact with the representation, the transformation of nature from its original condition, and processes characteristic of the natural world. These environmental processes have importance in human evolution, such as aging and the passage of time, information richness, natural geometries, and others. And lastly, the experience of space and place that include prospect and refuge, organized complexity, mobility and way finding, and more which deals with the spatial features characteristic of the natural environment that have advanced human health and wellbeing

In recent years, biophilic design has received rapid interest from the building industry around the world. The biophilic design suggests that built environments could be made more restorative by incorporating natural elements in their design. ⁽⁹⁾

Kellert et al., ⁽²⁰⁾ gave a detailed explanation of six types of biophilic design elements, highlighted below:

- Environmental features: It involves the use of relatively well-recognized characteristics of the natural world in the built environment. Which include twelve attributes.
- Natural shapes and forms: This element include building façade and interiors which are decorated with representations and simulations of the natural world.
- Natural patterns and processes: This element does not represent or simulate the environmental instead use shapes and forms to emphasizes the incorporation of properties found in nature into the built environment.
- Light and space: It analyses seven design attributes focusing on qualities of light and five attributes focusing on spatial relationships, making a total of twelve design attributes of this element.
- Place-based relationships: This element directly influences the active link of culture with ecology in a geographical context.
- Human-nature relationships: This is believed to be somewhat misleading; it reflects biologically based human affinities for the natural environment and presumably describes biophilic design elements.

Also, William et al. ⁽²⁶⁾ identify 14 patterns of biophilia design classified under three aspects, which have a wide range of applications for both interior and exterior environments and are meant to be flexible and adaptive, allowing for appropriate project implementation. These include

2.1.1. Nature in the Space Patterns

Visual Connection with Nature, Non-Visual Connection with Nature, Non-Rhythmic Sensory Stimuli, Thermal & Airflow Variability, Presence of Water, Dynamic & Diffuse Light, Connection with Natural Systems

2.1.2. Natural Analogues Patterns

Biomorphic Forms & Patterns, Material Connection with Nature, Complexity & Order

2.1.3. Nature of the Space Patterns

Prospect, Refuge, Mystery, Risk/Peril These factors above determine a successful biophilia designs to promote health and wellbeing. The patterns are identified above to be integrated into the built design. It provides solutions to challenges experienced by individuals and cuts across the physical, mental, social, aspect.

Furthermore, to ensure a successful application of biophilic design, it should embrace a broad spectrum of physical and behavioral benefits. Physical outcomes include improved physical fitness, lower blood pressure, increased comfort, and improved human health. Mental benefits vary from increased satisfaction and motivation, less stress and

anxiety, to improve problem solving and creativity. The positive behavioral change includes better coping, and mastery skills enhanced attention and concentration, improved social interaction, and less hostility and aggression.⁽¹⁰⁾

2.2. Biophilic Elements

Biophilic elements influence respectively like; frequency and duration in an environment adopting biophilic principles, health conditions, socio-cultural norms, past experiences of people. Hence, the direct experience of nature, indirect experience of nature, and experience of space and place are classified biophilic elements.

2.2.1. Direct Experience of Nature

They have recognized characteristics of the natural world in the built environment; it includes color, water, air, plants, animals, natural materials, landscape, and geology.

2.2.1.1. Natural Light

Our skin requires sunlight in order to produce vitamin D and is crucial to our metabolism. Natural light is not merely essential to perceive and then to evaluate our surroundings: We possess two organs that need sunlight: our eyes and our skin. Our circadian rhythms (our internal clocks and instinctual perception of time) are controlled by sunlight on the eye and skin, which regulates our sleep cycle via melatonin secretion.^{(18)f}

2.2.1.2. Water

Human beings love seeing water, and even better feel it. The presence of water can be healing, and this could be a vestige of the streams and lakes in our ancestral environment⁽¹⁸⁾ Similarly, Kellert (2008) added that Water elicits a strong response in people and is among the most basic human needs and commonly

2.2.1.3. Plants

Plants are an essential need of human existence as sources of fiber, fodder, food, and other aspects of sustenance and security. The integration of plants into the built environment can enhance satisfaction, well-being, comfort, and performance of a man.⁽²⁰⁾

2.2.1.4. Weather

Humans will instead choose natural ventilation over-processed and stagnant air. Necessary conditions include stimulation of other senses such as feel and smell and visual appeal despite the seeming invisibility of the atmosphere natural Landscapes and Ecosystems combined with a quality movement and flow of natural air⁽²⁰⁾

2.2.2. Indirect Experience of Nature

It includes Symbolic references to contoured, patterned, textured, or numerical arrangements that persist in nature⁽²⁶⁾. They are organic, non-living, and indirectly stipulating nature. It includes pictures and ornamentation, colors, shapes, textile with various organic shapes.

2.2.2.1. Images of Nature

This includes a pictorial representation of pictures depicting nature, abstract figures, wall paintings, use of colors in the interior and exterior spaces, and also to show beautiful images that offer inspiration for health restoration. According to⁽¹⁸⁾, pigmentation of partial intensity but overall harmony generates a sound effect. Color perception is one of our senses (including receptors in our eyes and processing pathways in our brain) that links directly with our emotions. Humans evolved in natural light that ranges in coloration from red to orange to blue, depending upon the time of day. To improve the ability to locate visual access, foster mobility, and more, color has long been serving as a means in human evolution and survival. People for good and obvious reasons are drawn to beautiful sunsets, glistening water, bright flowering colors, rainbows, blue skies, and other colorful features of the natural world.⁽²⁰⁾

In architecture, there is evidence that colors stimulate emotions. On average, with few exceptions, colors provide visual stimuli for the occupant that can elicit positive and negative emotions based on its environment. Whether the emotions one experiences are through acquired knowledge and personal history.⁽⁵⁾

2.2.2.2. Natural Materials

Comparing natural over artificial materials, People generally prefer natural materials even when the artificial are close or seeming exact copies of natural products. Part of this disinclination is likely due to the inability of artificial materials to show the organic processes of aging, weathering, and another process of features of natural materials, even inorganic forms like a stone. The movement of nutrients and energies through natural systems is linked to patina of time and may provoke an intuitive understanding among some people of the benefits flowing from nature⁽²⁰⁾ Also, many through the use of ornament, decoration, art, and in stylized and highly metaphorical disguise or animals in building interiors may typically occur in representational rather than literal form. The presence of animal forms, nonetheless, often provokes satisfaction, pleasure, stimulation, and emotional interest.⁽²⁰⁾ Chafkin⁽⁵⁾ added that Materials could affect the sound environment, circulate movement, increase /decrease comfort, and various other actions. Materiality has a direct influence on the overall sense of the environment. For instance, wood is a material that retains heat, is soft and comforting,

and can be associated with the concept of natural environments. Another material like sand has a therapeutic value to it, soft to touch, and gentle on feet. However, stone is refreshing and smooth to touch, but hard on feet. When the materials become part of the program, the quality of the materials will give a tangible vision of the space and become another measurable extent in the healing environment.

2.2.2.3. Natural Geometries

Curved forms are found everywhere in nature, where it is challenging to find a straight line. Again, curves arise from the biological structure of animals and plants, and also from natural inanimate environments where the matter is shaped by tectonic forces. ⁽¹⁸⁾

2.2.3. Experience of Space and Place

The significance of the place is tied to meaning: historical, cultural, geographic, spiritual, or ecological. With more in-depth understanding, we can honor and evoke those relationships within the built environment. ⁽²⁵⁾

2.2.3.1. Prospect and Refuge

The ability to provide a secure and protected setting is explained in Refuge which reflects a structure or natural environment. In the built environment, this often occurs through the design of comfortable and nurturing building interiors and secreted landscape places. Prospect, on the other hand, emphasizes discerning distant objects, habitats, and horizons, evolutionarily instrumental in facilitating movement, and identifying sources of danger. ⁽²⁰⁾

2.2.3.2. Cultural and Ecological Attachment to Place

This element accomplished its purpose through a thriving link of culture with ecology in a geographical context. The relationship of people to places reflects an inherent human need to establish territorial control, which during the long course of our species' evolution facilitated control over resources, attaining safety and achieving security. ⁽²⁰⁾ Furthermore, it explains why a generally enhanced by the utilization of local and indigenous materials is dependent on positive relationships to place. Natural resources can require less energy for manufacture and transport as well as provide a vivid and resonant reminder of local culture and environment.

2.3. Adopting Biophilic Elements in Rehabilitation Centres

In rehabilitation centers, biophilic elements should not create the notion of long-term absence from real life but should be considered as a home away from home, a road that leads to social inclusion and individual control. A healing center located within the heart of a depressed socio-economic community will not just serve as a rehabilitation center but also as a public psychological retreat from the reality of our everyday urban conditions. The therapeutic effects of an environment should outweigh any other concerns. ⁽¹⁶⁾ Various experts including architects, therapists, and sociologists, have, throughout the years argued about the healing capacity of place and the physical qualities of its spaces having the ability to induce healing. These elements are vital to individuals that receive long term care, particularly to recuperate from exposure to social, physical, and emotional volatility as a latent defect of drug addiction ⁽³⁷⁾—We need to integrate rehabilitation into our city's fabrics to be part of society, generating community interaction and promoting a social environment. These transitory social spaces should not promote the feeling of exclusion, but rather imitate a society that embraces individuals through an environment that fosters measured community interaction and gradual reintegration. ⁽³⁾

2.4. Biophilic Design in Planning in Rehabilitation Spaces

In planning spaces, there should be a quality effect of biophilic designs reflecting within and outside the rehabilitation Centre. Windows should provide direct Daylight, and a proper landscape environment should not be denied, the presence of greenery, plants, trees, water, ponds, colors, abstract shapes, forms can be exhibited in the interior and exterior part of the building. Proper orientation of buildings should maximize the effect of daylight and a reduced effect of adverse weather on users. The use of ornamentation, abstract figures, paintings, material finishes that reflect nature can also be used in the building interiors.

The quality of light can be manipulated and adapted to ultimately create the ability to transcend individuals into an alternate state of consciousness that could essentially be recollected in memory after its lived experience ⁽¹³⁾. According to ⁽²²⁾ study on the effect of hospital windows on patients, he began a pioneering study of the effects of hospital window views on patient's recovery from abdominal cholecystectomy surgery. Ulrich's study focused on patients who could see trees, rather than a brick wall through their patient-room window. The study found that these patients subsequently required less narcotic pain medication, experienced a shorter hospital stay, and had fewer negative evaluative comments in nurses' notes

The architecture of a healing environment can take on the qualities of natural conditions through imitation in form. While one might feel constrained and boxed in rectilinear spaces, the fluidity of an organic space creates no such feeling. Without the right angles, the spaces become seemingly less harmful and comforting to the human eye. ⁽⁵⁾

2.5. Impact of Biophilic Elements on Addicts

The process of healing is permitted by specific brain molecules formulating our 'internal perception', through a combination of signals that enable our senses to perceive our environment. Our emotional reactions to our surrounding

unconsciously stimulate our immune systems that substantially improve the process of healing ⁽¹⁾. According to ⁽³⁾, our human senses can be perceived as the portal linking our emotions with our perceived reality. Architecture can be described as the tailor of our sensual experience of space, possessing the ability to deprive or stimulate the human senses. Also, ⁽⁴⁾ Proved that patients exposed to an amplified concentration of sunlight perceive less stress, require less medication, and even experience minimal pain. Sunlight can be perceived as a form of psychological motivation in its utilization in the creation of a healthy, therapeutic environment — effects of greenery, Effects of light, shadows, color and images.

Architecture should also integrate the power of color into modern healing environments to evoke and stimulate specific emotional responses and use it as a tool to manipulate and control the experience of space as desired. ⁽³⁾ Color psychology has also been identified as a tool capable of improving human behavior, moods and emotion have discovered that both architecture and color can visually stimulate patients; this can provoke and elevate positive or negative emotions. ⁽⁸⁾

2.5.1. Use of Biophilic Design in Treatment of Drug Patients

The spaces provided in rehabilitation center and the mentally home a patient is coming from are comparatively a dramatic difference. Consciously or unconsciously, patient begins to associate their “healed self” with the facility and their “old self” with their home. The shift sets a possibility of imbalance and even relapse of the issues treated. ⁽²¹⁾ Careful consideration of the health benefits of the drug addicts offers comfort and promote healing. The biophilic design approach should be optimally considered in health institutions. Asides the fact that medical solutions may be provided, applying biophilic designs will also speed up the healing process in individuals. It reconnects the mind and soul through biophilic benefits in the environment and fosters beneficial contact between people and nature in the built environment. Also, Natural factors present distract the mind of patient off their present situation and reminds them that they are active participants in environment they live in.

Ulrich also introduces the concept of ‘framing of views,’ engaging patients with specific elements like a water feature or a tree in the landscape, which allows for a moment of self-awareness, that serves as a distraction from pain and suffering. This concept also generates comfort and relaxation, which allows a patient to heal faster by creating the perception of an environment, where patients view the external world rather than being viewed by others, thereby moving away from the inherent qualities of institutionalization ⁽²³⁾

Healing environments where patient seek to promote their health, should stimulate positive awareness of ourselves, allow for privacy; do no physical harm; provide meaningful, varying stimuli; encourage times of relaxation; enhance our connection with nature, culture, and should offer opportunity for people to interact with nature productively, it should also, balance constancy and flexibility; and be beautiful ⁽²³⁾. The process of healing scientifically noted that specific brain molecules formulating our ‘internal perception’, through a combination of signals, enables our senses to perceive our environment. Our emotional reactions to our surrounding unconsciously excite our immune systems that substantially improve the process of healing. ⁽³⁾

2.5.2. Biophilic Design Considerations in Patients Space

Biophilic design in practice could be seen to involve the application of varying design strategies, which have been referred to like experiences and attributes by Stephen Kellert. The choice of the design applications to employ inevitably varies depending on a project’s constraints as:

2.5.2.1. Identifying the Patient’s Desired Responses and Outcome

In planning, the practice of biophilia architecture involves the application of varying design strategies, which have been referred to like experiences and attributes by ⁽²⁰⁾. A designer must understand the project intent and performance needs of the targeted population.

2.5.2.2. Diversity of Design Strategies

Various user groups from differing cultures and demographics can create an environment that is psychophysiological and cognitively restorative. It involves, incorporating a diverse range of design strategies that can accommodate the needs of users

2.5.2.3. Quality over Quantity of Attributes

In planning, the designer should focus on having a good design that defines richness of biophilic content in the environment, user accessibility, and diversity of strategies. High quality and sustainable intervention can offer therapeutic potential than low-quality interventions.

2.5.2.4. Duration of Exposure and Frequency of Access

The design should allow for maximum exposure of the principles adopted to the building users. Empirical evidence Indicates a guideline that shows positive emotions and mental restoration, and other benefits can occur in as little as five to twenty minutes of immersion in nature. The ideal exposure time is likely dependent upon the user and desired effect ⁽²⁾

2.5.2.5. Scale and Feasibility

Size and availability of space are two of the most common factors influencing the feasibility of biophilic design patterns. The project size is determined by the size of the design attributes that could be applied. The attributes of biophilia to be adopted are to be scaled to fit into the surrounding environment and the predicted user population of the space.

2.5.2.6. Climatic Factors

The strength of biophilic architecture is that it blends buildings into distinct settings so that there is a natural harmony between climate, architecture, and people. The main goal of climatic design, on a macro and micro level, is to reduce uncomfortable conditions created by extremes of cold, heat or dryness. In the hot climate regions, biophilic attributes adopted should protect users from the intense radiation from the sun, ground, and surrounding buildings, from dust, sandstorms, and insects. Also, the soil type and capacity for supporting plant growth should be considered.

2.5.2.7. Wholeness of design

Most important, the biophilic design should be in a manner whereby the diverse applications mutually complement one another, resulting in an overall integrated ecological whole rather occurring in a piecemeal or disconnected fashion

3. Methodology

A case study proposes an in-depth, multi-faceted understanding of a complicated issue in its real-life context. Case studies give information about existing designs, patterns, and methods. It helps to learn best practices to imbibe and those to eliminate from the examples of others. For a better understanding of this research, collection of data and relevant information were sought locally and internationally on existing rehabilitation centers to support the study on this research. In the case study, necessary data were gathered to sustain the study of biophilic elements in rehabilitation centers. A descriptive analysis was done to know the present condition of facilities available at existing rehabilitation centers in Nigeria and internationally. Photo documentation was also done to attest to its present condition.

The aspect of case studies analysis to be discussed include the following;

- Architectural description and general overview
- Facilities and services provided
- Biophilic designs adopted based on the following
 - Direct contact with nature: Natural Features that include plants, animals, ponds and pools, natural daylight
 - Indirect contact with nature: Natural Materials, Natural
 - Natural Shapes, Forms and Patterns, Images of Nature.
 - Experience of space and place: Transitional and Bounded Spaces, spatial harmony and spaciousness, Security and Protection, Connection to Place, Mobility and Way-finding, Attraction to Beauty.

3.1. Case Study One: Ekiti State Government Relief and Rehabilitation Center. Nigeria

The Centre caters to the following category.

- Children: Physically handicapped, Imbecile (moron), Epileptics, Deaf and dumb
- Adult: Mentally disabled, Drug addict, Epileptics, Physically challenged

There are significant structures in the facility that includes the administrative and residential block, the kitchen and store, the dining hall, the relaxation shed, the kitchen, and the toilet. The compound is fenced with sufficiently high walls. The institution offers Free Shelter and feeding, Basic education, Relation and communication skills, Medical diagnosis.



Figure 1: Building Surrounding of Ekiti State Government Rehabilitation Centre.
Source: Author's Fieldwork, 2018.

3.1.1. Biophilic Designs Application in the Facility

3.1.1.1. Direct Contact with Nature

- These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight
- Plants and greenery: Sparse vegetation features in and around the rehabilitation center no façade greening features. The use of greenery in the facility is present only in the exterior part of the building. Trees and shrubs fairly used as a landscape element outside the building.
- Animals, ponds, and water bodies are very much absent in the facility as none were found in the facility exhibiting biophilic designs
- Natural daylight is absent. The primary function of the openings in the building is to serve as a means of ventilation. It is not solely designed to access views of the exterior building since there is little or no captivating views on the exterior of the building. Therefore, there is a limited and reduced influx of daylighting in the building facility.

3.1.1.2. Indirect Contact with Nature.

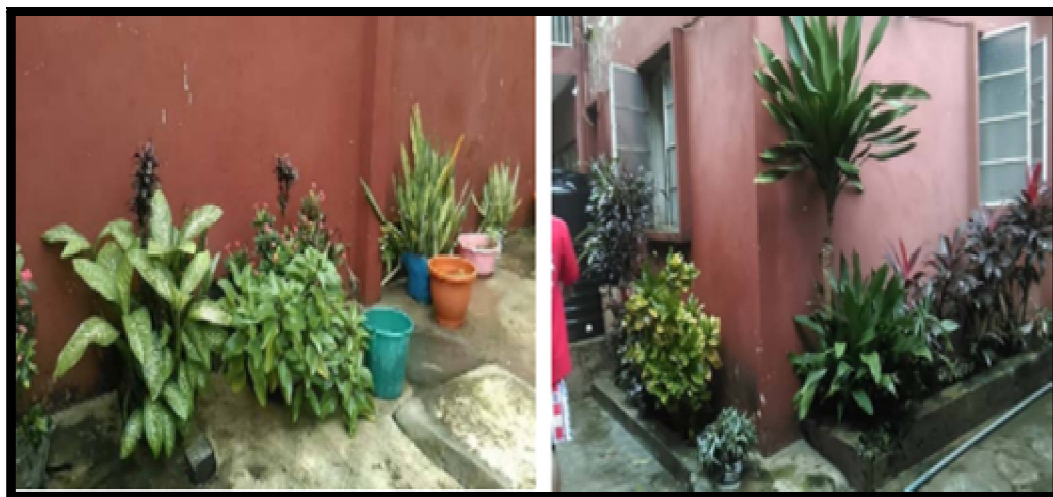
- Natural materials: Natural materials such as woods, stones, and marble are not used. All buildings are made from concrete blocks and cement plasters with aluminum roofs, which in this region increases room temperature.
- Natural colors: Natural hues of colors are not used in the patient-based spaces. Colors used in the interior and exterior spaces are not attractive
- Natural shapes, forms, and patterns, Images of nature are not used in the facility that promotes healing inpatient. The buildings are rectangular
- Absence of pictures, paintings, ornaments and abstract drawing in the building spaces

3.1.1.3. Experience of Shape and Space

The design does not take advantage of the exterior views. The spaces provided are captivating, not that evoke positive emotions and feeling a. It offers no connection to users of the building. These may include feeling attributed to spaces, spaces that bring hopes and reduced fears and anxiety

3.2. Case Study Two: Wellspring Rehabilitation Centre Isheri Berger Lagos, Nigeria

It is a Christian based center that is established to cater for victims of Drug Abuse. It is a temporary building that offers three-month rehabilitation plan for both male and female addicts where they are rehabilitated and reintegrated into society, after undergoing vocational training designed to empower them.



*Figure 2: Biophilia Element Adopted in the Wellspring Rehabilitation Centre.
Source: Authors Fieldwork, 2018*

3.2.1. Biophilic Designs Application in the Facility

3.2.1.1. Direct Contact with Nature

These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight.

- Plants and greenery: the use of greenery in the facility is present only in the exterior part of the building. Flower pots are used as a landscape element outside the building.
- Animals, ponds, and water bodies are very much absent in the facility, as none were found in the facility exhibiting biophilic designs. Natural daylight is absent. The primary function of the openings in the building is to serve as a means of ventilation. It is not solely designed to access views of the exterior building since there is little or no

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3.3. Case Study Three: Spaulding Rehabilitation Hospital, Boston

The facility is designed to focus on the therapeutic process as a means of promoting a rehabilitative environment through the synergy of the relationship of bed areas. Therefore, creating a strong exterior/interior relationship to outdoor spaces, the ground floor contains uses that are both community and hospital-related. Extensive use of glass curtain walling eludes transparency, with the curves and grey exterior elements intended to stimulate the military battleships and aircraft carriers that used to dock the building environment. Reclaimed timbers are extensively used throughout the site, referencing the dock's first incarnation as a timber receiving basin. The Hospital aims to create space for patients that promotes healing and addresses the needs of the broadest possible audience.

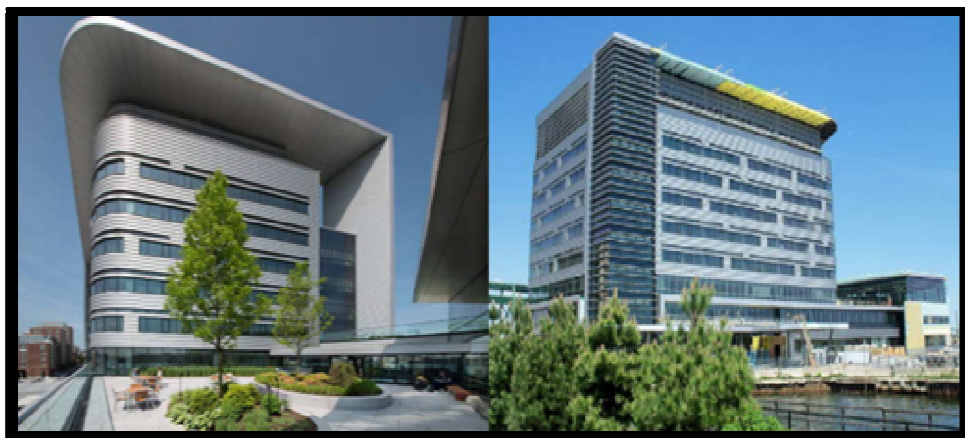


Figure 3: Approach View of Spaulding Rehabilitation Hospital, Boston with Greenery, Large Windows and Water Body

Features provided in Spaulding Rehabilitation Hospital Boston include an aquatic center, Conference room, Meditation room, Constitution café, Therapy gym, Therapy garden, Private patient rooms, s security room, Inpatient and outpatient facilities

3.3.1. Direct Contact with Nature

These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight.

- Plants and greenery: the use of greenery in the facility is extensively in the exterior and interior space of the building.
- The aquatic center provided within the building facilities offers restoration to the patient
- Natural daylight is used in the building. Use of curtain walls on the building exterior. Use of average level windows glazing in treatment rooms and wards.

3.3.2. Indirect Contact with Nature

- Natural materials: Natural materials such as woods and marble are extensively used in the interior spaces as finishes
- Natural colors: Natural hues of colors are used in the patient-based spaces.
- Natural shapes, forms, and patterns, Images of nature are used in the facility.

3.3.3. Experience of Shape and Space

The design promotes views of the city as well as providing much needed natural light into every space available. The design connects patients to the environment through the use of nature. The wards and treatment spaces of different

types give patients a sense of security and privacy as well as protecting them from the spread of diseases. Well-articulated and spatially planned spaces are preventing congestion and clumsiness. Well zoned spaces help achieve particular harmony.

3.4. Case Study Four: Rehabilitation center Groot Klimmendaal Netherland

The rehabilitation center Groot klimmendaal is Located in the heart of a Dutch forest, outside Arnhem. The structure is the first phase of a three-stage plan to consolidate and rejuvenate the Rehabilitation Centre Groot Klimmendaal (providing care for children, adolescents, and adults who have had an illness or accident).



Figure 4: An Approach View Showing Extensive Use of Greenery.
Source: (European Health Property Network, 2013)

Features provided in Rehabilitation center Groot klimmendaal Netherland include Sports facilities, Administrative office Clinic facilities, Swimming pool, Restaurant, Theatre, Accommodation, Fitness center, and gymnasium

3.4.1. Biophilic Designs Application in the Facility

3.4.1.1. Direct Contact with Nature

These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight.

- Plants and greenery: the use of greenery in the facility is extensively in the exterior and interior space of the building. It projects a productive environment that expedites healing inpatient.
- Presence of water bodies like swimming pools and ponds in the building offers restoration to the patient

Natural daylight is used in the building: The use of curtain walls on the building exterior. Use of average level windows glazing in treatment rooms and wards that enhance views of the natural environment.

3.4.1.2. Indirect Contact with Nature

- Natural materials: Natural materials such as woods and marble are extensively used in the interior spaces as finishes
- Natural colors: Natural hues of colors are used in the exterior and interior space of the building.
- Natural shapes, forms, and patterns, Images of nature are used in the facility.

3.4.1.3. Experience of Shape and Space

The design promotes views of the city as well as providing much needed natural light into every space available. The design connects patients to the environment through the use of nature. The wards and treatment spaces of different types give patients a sense of security and privacy as well as protecting them from the spread of diseases — well-articulated and spatially planned spaces preventing congestion and clumsiness. Well zoned spaces help achieve particular harmony.

3.5. Case Study Five: Narconon Drug Rehabilitation Centre Canada

Narconon drug rehabilitation and educational center officially opened in 1972, the center begins with a drug-free, non-medical withdrawal process designed to assist the patients. The center offers educational programs and prevention services plus professional training as part of its network of drug and alcohol rehabilitation. It provided significant facilities that include a male dormitory, female dormitory, recreation facilities, office, and psychiatrist room,

Counseling room, sauna, dining room, gym, an indoor sport that promotes healing inpatient. The program at Narconon includes eight different steps which help a former user recover by helping the patient deal with both physical and emotional aspect



Figure 5: Proper Landscape and Use of Greenery at the Narconon Drug Rehabilitation Centre Canada

3.5.1. Biophilic Designs Application in the Facility

3.5.1.1. Direct Contact with Nature

These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight. These include natural Features that include plants and greenery, animals, ponds and pools, natural daylight.

- Plants and greenery: the use of greenery in the facility is extensively in the exterior and interior space of the building. It projects a productive environment that expedites healing inpatient.
- Absence of water bodies like swimming pools and ponds in the building that offers restoration to the patient.
- Natural daylight is used in the building: Absence of curtain walls, green facade on the building exterior that enhances views of the natural environment — use of average level windows that provide direct lighting into the room.

3.5.1.2. Indirect Contact with Nature

- Natural materials: Natural materials such as woods and marble are partially used in the interior spaces as finishes
- Natural colors: Natural hues of colors are used in the patient-based spaces.
- Natural shapes, forms, and patterns, Images of nature are not used at the exterior of the facility that promotes healing inpatient.

3.5.1.3. Experience of Shape and Space

The regular box-shaped design promotes place-based relationship. There is no flexibility in the design space and reduced coordinated floor plan. The environment offers greenery and well-planned landscape that can improve health of patients.

3.5.2. Deduction from Case Studies

Having carried out the case studies, Findings from the case studies have shown the use of biophilic designs at a high percentage at the international rehabilitation centers compared to the local case studies. The biophilia elements provided in the case studies have helped to access the level at which biophilia designs are used in the studied rehabilitation centers. It has also identified some healing spaces that can fulfill the patient's needs and expedite healing. Studies from the local studies indicated shallow use of biophilic designs in promoting healing in the rehabilitation Centres, and it. That biophilia design was not a conscious effort in the building design. Designers of the facilities have failed to reckon the benefits of nature as a solution to speedy recovery of patients.

The international case studies carried out adopted biophilic designs at the interior and exterior spaces. They were purpose-built designs that exemplified the importance of biophilic designs to patients suffering from addiction.

The following are noted in the local case studies

- Natural elements like plants, trees and water bodies, gardens were absent
- Insufficient daylight effect in the interior space to enhance healing
- Small openings and windows that do not promote views of the natural environment
- Unattractive colors at the interior and exterior space were used
- Absence of ornamentation, pictures, painting that showcase nature, natural materials were not used in the interior space in the building.

The following are noted in international case studies.

- Provision of exterior views from interior spaces.

- The vast use of daylighting.
- Incorporating images of nature in hospital spaces.
- Use of atriums
- Proper facility zoning and spatial relationship.
- The natural elements around the site were utilized correctly. It features green areas, water bodies, color, and natural materials and so on.

4. Conclusion

This research reveals local case studies carried out reflect little or no impact of biophilic features. The use of nature was not planned into the existing rehabilitation centers. This dissertation focuses on providing facilities that promote patient health and wellbeing as well as getting them out of their present condition to promote a sane free environment. This research promotes a restorative environment by adoption of biophilic design principles to improve patient's health and wellbeing. The biophilic design offers the use of nature-based elements in treatment of patients suffering addiction. Facilities like vocational training, recreation, and sporting facilities should be provided alongside to actively engage patients during their period of stay in rehabilitation centers. Building designers should also focus on nature's grandeur as a means to recuperate patients healing.

5. Recommendations

To justify the impact of biophilic elements in rehabilitation centers, the following recommendations can be considered;

- Biophilia should be adopted as a design principle for the design of health and rehabilitation institutions and as government policy for better results in the recovery and rehabilitation process.
- Health institutions need to be designed to incorporate those features of biophilia that make the environment livelier and more interactive to aid healing and recovery processes. Features such as façade greening, open gardens that allow a patient to have direct contact with plants, water bodies, animals, colors, daylight are provided in the proposed rehabilitation center.
- Space common usage like indoor sports, gyms, lounge, meditation rooms, pools, mediation areas, outdoor areas, and gardens should be provided in rehabilitation centers to improve satisfaction in users as well as offering homely feeling to speed up healing.
- The design of window openings should be maximized to allow for view healing gardens and the surrounding environment. It reduces stress and anxiety in patients.
- Rehabilitation designs should also focus on proper building orientation to maximize daylighting, sun path, natural air, and nature's views.

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