

***Applying Biophilic to the Interior Design of Healthcare Facilities
With a Healing Approach***

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Abstract

This research attempts to elaborate the biophilic concept on the interior design of health service facilities. The research method involves a literature review exploring the biophilic parameter theory from Terrapin Bright Green, utilizing data sources from relevant books, scientific journals, and internet images. The findings reveal that biophilic, an evolving approach to construct environmental designs for diverse purposes, emerged in 1984 when humans recognized their inherent connection with nature. Key elements in biophilic design encompass natural lighting, open spaces, sensory engagement, organic forms, natural processes, and the repetition of natural patterns. The impactful outcome is evident in health facilities, significantly enhancing the physical and psychological well-being of patients. The interior design is also pivotal on the treatment and recovery success, such as for cancer patients. Consequently, this research suggests a design concept of mood-board highlighting aspects like the selection of elements, materials, colors, lighting, textiles, furniture, and patient-friendly accessories. Its implementation is seen in the design of communal areas, treatment rooms, patient service areas, and staff areas. To conclude, the integration of psychological and architectural principles in biophilic design facilitates a reconnection with nature for all health service users-patients, doctors, nurses, visitors, and staffs. This reconnection can create a tranquil, organized, relaxed, and prosperous milieu, preventing depressive atmospheres. Furthermore, high-quality architecture extends a positive effect on stress alleviation, and immune system strength, ultimately mitigating and controlling the development of disease.

Keywords: Biophilic, Environmental Psychology, Healing Approach

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Introduction

Biophilic design embraces a holistic approach, acknowledging the significance of living organisms and the interconnectedness of the mind and body in assessing overall well-being within a given setting. Successful implementation of biophilic design entails considering a range of factors including health considerations, societal norms, past experiences, the frequency and duration of user interactions, potential levels of engagement, as well as user perceptions and experiences. By incorporating these elements, biophilic design endeavors to create environments that not only inspire aesthetically but also promote restoration, health, and seamless integration with the functions of the surrounding location and the broader urban ecosystem it serves [1].

The theory of biophilia suggests that humans have an innate biological inclination to engage with nature on social, physical, and psychological levels. This innate connection between humans and the natural environment significantly influences productivity, personal welfare, and social interactions. Biophilia can manifest diversely, enhancing an otherwise mundane environment into a more enriching one. Such transformation may arise from interactions with nature, involvement with animals, leisurely strolls in a park, or simply observing green spaces from home or work [2].

From a psychological standpoint, biophilia is intertwined with the healing process, which seeks to reinstate harmony within an individual. This concept entails a symbiotic relationship encompassing individuals, families, communities, the environment, and the essence of life. Healing transcends mere actions; it involves the restoration of equilibrium among these interconnected elements [3]. A state of health reflects this balance within the body, whereas illness signifies its disruption [4]. Studies indicate that hospitalized patients experience specific anxiety patterns, highlighting the importance of crafting environments that alleviate stress during recovery. Hence, a healing environment emerges from design interventions that positively impact the physical and psychological well-being of patients, healthcare professionals, and visitors.



Figure 1. Architectural Quality relates to Psychology

As illustrated in Figure 1, evidence-based design, grounded in scientific validation [5], demonstrates that architectural elements can effectively mitigate stress. The manner in which patients perceive their surroundings through their five senses—touch, sight, hearing, smell, and taste—profoundly influences their well-being while coping with illness. Improvements in their psychological recovery can contribute to bolstering the immune system. In the realm of enhancing architectural standards, addressing non-medical needs involves creating a pleasant environment capable of diverting patients' attention from their ailments. This transformation fosters a welcoming atmosphere for all users, including patients, families, healthcare professionals, and non-medical staff [6].

The chosen case study concentrates on the interior design of cancer care facilities due to the distinctive needs of cancer patients, who often experience higher levels of anxiety and depression compared to those with other illnesses. The success of their healing journey

hinges not only on their physical condition but also on their psychological well-being. Biophilic design is employed as a strategy to prototype cancer care, aiming to restore equilibrium between the physical and psychological realms. The physical environment surrounding cancer patients profoundly affects their lives, emphasizing the critical role of interior design in ensuring successful treatment, recovery, and overall outcomes [7]. To define specific biophilic standards for cancer care, a qualitative methodology is adopted, drawing from the "14 Patterns of Biophilic Design" by Terrapin Bright Green, while evidence-based design principles as outlined by Sosa (2020) elucidate the healing process. A thorough literature review explores these biophilic parameters, offering valuable insights, particularly for emerging designers seeking to integrate a healing-focused approach into their interior design practices.

Theory

Biophilic Design

Biophilic design parameters aim to alleviate stress, enhance cognitive function and creativity, promote overall well-being, and facilitate faster healing processes. In an increasingly urbanized world, these attributes become increasingly crucial. Considering the swift restorative response that nature can evoke and the substantial financial losses incurred by U.S. businesses annually due to stress-related illnesses, a design approach that reintegrates humans with nature—biophilic design—becomes imperative. It offers individuals the chance to reside and work in environments that promote health and well-being, reduce stress, and foster greater overall vitality [5].

In terms of reconnecting with nature, biophilic design encompasses several elements. These include both visual and non-visual connections with nature, exposure to non-rhythmic sensory stimuli, variation in thermal conditions and airflow, the presence of water features, dynamic and diffuse lighting, integration with natural systems, incorporation of biomorphic forms and patterns, using materials that evoke nature, and embracing complexity and order [1]. According to Sosa (2020), biophilic design manifests in architectural and physical features such as views of nature, therapeutic gardens, indoor plants, choice of materials and colors, and the integration of art within the space.

To translate the healing process, the pattern of biophilic design focuses on details such below [1]:

1. Visual Connection with Nature: Providing views of natural elements, living systems, and processes occurring in nature.
2. Non-Visual Connection with Nature: Incorporating auditory, tactile, olfactory, or gustatory stimuli that evoke positive associations with nature, living systems, or natural processes.
3. Non-Rhythmic Sensory Stimuli: Introducing stochastic and transient interactions with nature that can be statistically analyzed but not precisely predicted.
4. Thermal & Airflow Variability: Implementing subtle fluctuations in air temperature, humidity, airflow on the skin, and surface temperatures to simulate natural environments.
5. Presence of Water: Enhancing the environment through the sight, sound, or touch of water.
6. Dynamic & Diffuse Light: Utilizing varying light intensities and shadows that change over time, mimicking natural lighting conditions.

7. Connection with Natural Systems: Fostering an understanding of natural processes, particularly seasonal and temporal changes typical of healthy ecosystems.
8. Biomorphic Forms & Patterns: Incorporating symbolic representations of contoured, patterned, textured, or numerical arrangements found in nature.
9. Material Connection with Nature: Utilizing materials and elements sourced from nature with minimal processing to reflect local ecology or geology, thereby establishing a unique sense of place.
10. Complexity & Order: Providing rich sensory information that follows a spatial hierarchy akin to natural environments.

Cancer Patient' Character – Healing Approach to Interior Design

Interior design encompasses features that engage the senses of touch (somatosensory), sight (visual), hearing (auditory), smell (olfactory), and taste (gustatory). This holistic approach is crucial, especially for cancer patients who may experience varying levels of pain. Designing not just for palliative care but for a healing environment is essential. Holistic design solutions must address physical symptoms of illness, psychological well-being (including emotions such as worry, fear, sadness, and anger), social needs (such as family support, dietary requirements, work, housing, and interpersonal relationships), and spiritual concerns (including questions about life and death, and the search for peace) [8]. Interior features such as flooring, ceilings, walls/openings, materials, colors, lighting, textiles, furniture, accessories, art, and signage are all vital components in creating an environment that caters to these diverse needs [9].

Methodology

This study employs a qualitative approach to explore the concept that healing architecture can be quantified and applied in interior design. To identify relevant parameters, the author conducts a literature review drawing from the Terrapin Bright Green theory, which provides insights into interior qualities conducive to healing. Subsequently, these parameters are tested in a case study focused on cancer care facilities, which possess unique characteristics that emphasize both the psychological and physical dimensions of their design. The outcome of this research is a biophilic interior design presented in the form of a mood board, serving as a design prototype that can inform similar projects in the future.

Implementation of Biophilic Parameter in Interior Design

Generally, cancer care facilities comprise four primary areas: a common area, treatment spaces, patient services, and a staff area (see Figure 2):

Common Area	Treatment Spaces	Patient Services	Staff Area
Main lobby	Infusion bays	Resource library	Nurse' station
Corridors	Consultation rooms	Retail pharmacies	Pharmacies and laboratories
Waiting rooms	Exam rooms	Appearance boutiques	Intravenous room
	Change rooms	Wellness rooms	Offices
			Staff lounge

Figure 2. Cancer Care Facilities

The initial step involves pinpointing the biophilic parameters within the healing process, particularly in the architectural aspects accessible to patients within healthcare facilities. Despite the importance of sound architectural design, the emphasis on biophilic parameters suggests a need for a comprehensive development of this concept. While technical features are valuable for healthcare practitioners, it's equally essential to focus on the thoughtful development of interior design elements such as materials, colors, lighting, textiles, furniture, accessories, art, and signage [9]. Integrating biophilic principles into these elements can significantly enhance the healing environment for patients.

Table 1. Mapping of Interior Qualities and Biophilic Parameters

Interior Qualities (John Pile, 2007)	Biophilic Parameters (Terrapin, 2014)	Mapping Results (Interior-Biophilic Parameters)
Elements: Floor, ceiling, wall/opening	Visual Connection with Nature	A view of elements of nature, living systems, and natural processes. Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem.
Material	Non-Visual Connection with Nature	Stochastic and ephemeral connections with nature may be analyzed statistically but may not be predicted precisely. Symbolic references to contoured, patterned, textured, or numerical arrangements that persist in nature.
Color	Non-Rhythmic Sensory Stimuli	A condition that enhances the experience of a place through seeing, hearing, or touching the water. Subtle changes in air temperature, relative humidity, airflow across the skin, and surface temperatures that mimic natural environments.
Lighting	Thermal & Airflow Variability	Leverages varying intensities of light and shadow that change over time to create conditions that occur in nature.
Textiles	Presence of Water	Auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems, or natural processes.

Furniture	Dynamic & Diffuse Light	Materials and elements from nature that, through minimal processing, reflect the local ecology or geology and create a distinct sense of place.
Accessories, Art, Signage	Connection with Natural Systems Biomorphic Forms & Patterns Material Connection with Nature Complexity & Order	Rich sensory information adheres to a spatial hierarchy similar to those encountered in nature.

From the mapping of interior qualities and biophilic parameters, we have identified specific details regarding the interior appearance that should be implemented. These include:

Table 2. Implementation of Biophilic to Interior Design

Rooms	Elements	Material	Color	Lighting	Textiles	Furniture	Accessories
Main Lobby	Noise barrier by nature	Durable and safe flooring: Vinyl	Representation of color' water, vegetation color	Representation of daylight, enhance the warm light	More textiles as a noise control	Clustering furniture layouting	Apply the artwork related to the nature
Corridors	Hard flooring, pattern by nature	Wall and ceiling finishes	Darker-hued floor	Representation of daylight, enhance the warm light	Wallpaper-		Sorting artwork
Waiting Rooms	Soft flooring	Vinyl floor	Darker-hued floor	Representation of daylight, enhance the warm light	View to nature	Soft seating, carpeted flooring	Nature as an art
Infusion Bays	Wall and ceiling should maximize patients' exposure to outside view	Vinyl floor	Different colors to define each room	Maximize patients' exposure to natural light	Soft textiles, view to nature	Built-in furniture	Nature as an art
Consultation Room	Carpeted flooring	Contoured, patterned, textured or numerical arrangements that persist in nature.	Representation of plants	Soft lighting	More textiles in furniture	Soft seating, carpeted flooring	Contoured, patterned, textured or numerical arrangements that persist in nature.
Exam Room	Soundproofing wall	Artificial nature ambiance	Warm color, wood-grain look	Soft lighting	Curtain to divide each room	Soft bed, chair	Wall-mounted artwork
Change Room	Soft wall covering	Artificial nature ambiance	Warm color	Soft lighting	Carpet	Soft chair	Wall-mounted artwork

Resource Library	Wall and ceiling should maximize patients' exposure to outside view	Vinyl floor	Representation of water color, vegetation color	Soft lighting	Soft textiles view to nature	Clustered-seating artwork related to the nature
Retail Pharmacies	Soft wall covering	Artificial nature ambiance	Warm color	Warm light	View to nature	Clustered-Nature as an seating art
Wellness Rooms	Carpet/wood flooring	Contoured, patterned, textured or numerical arrangements that persist in nature.	Representation of water color, vegetation color	Warm light	Carpet	Folding tables Apply the artwork related to the nature

Based on the details provided, the author has proposed several mood boards for interior design, focusing on rooms primarily accessed by patients, including the Common Area (Main Lobby, Corridors, and Waiting Rooms); Treatment Spaces (Infusion Bays, Consultation Rooms, Exam Rooms, and Change Room); and Patient Services (Resources Library, Retail Pharmacies, and Wellness Rooms).

Figure 3 displays the mood board for the Main Lobby, Corridors, and Waiting Room. Aligned with the room requirements and informed by biophilic parameters, the mood board incorporates the following elements: noise control material, safe flooring, artwork, clustered furniture, soft seating, and darker-hued color (blue, green, yellow-brown) [10]. These elements are carefully curated to create a welcoming and soothing atmosphere, conducive to the well-being and healing of patients accessing these spaces.

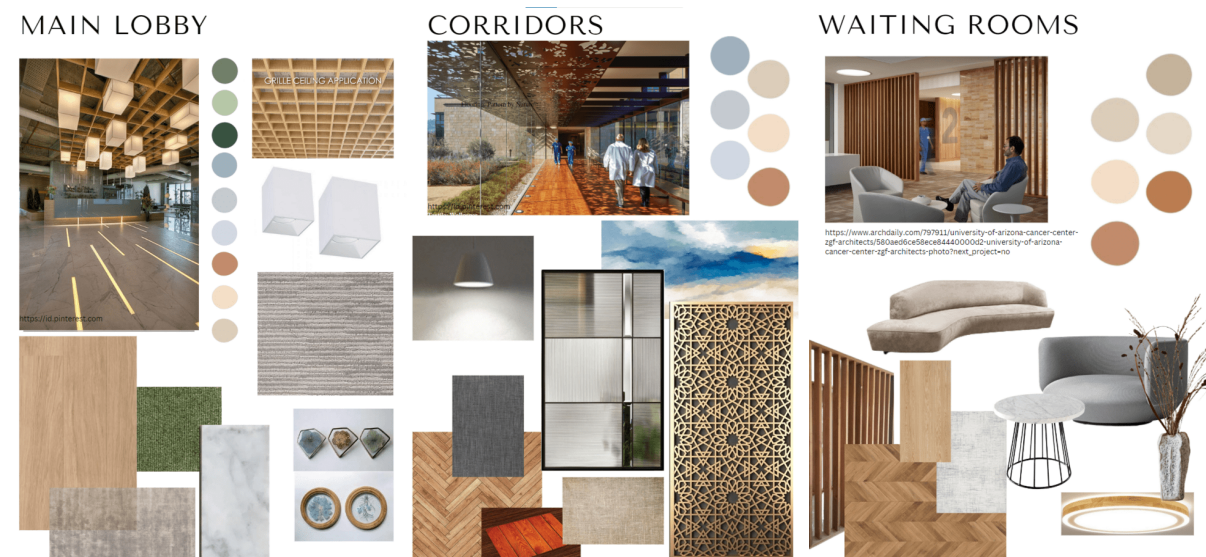


Figure 3. Mood Board: Main Lobby, Corridor, Waiting Room



Figure 4. Mood Board: Infusion Bays, Consultation Room, Exam Room

In contrast to the previous mood boards, the design for the Infusion Bays, Consulting Room, and Exam Room (Figure 4) opts for softer colors with a greater emphasis on textiles. Textiles play a prominent role, appearing on the carpet, cushions, curtains, and sofa upholstery. These rooms, being more personal for patient care, require an interior design that is highly responsive to their somatosensory, visual, auditory, olfactory, and gustatory needs.

The design incorporates private, semi-private, and open bays arranged around windows to maximize patients' exposure to natural light and outdoor views. Each space may feature a different pattern and color floor, with privacy curtains serving as a convenient solution for existing spaces. Warm colors and a wood-grain aesthetic contribute to a cozy ambiance, complemented by clutter-free counters and wall-mounted artwork. This design approach aims to create a comfortable and soothing environment, enhancing the overall experience for patients receiving treatment in these spaces.

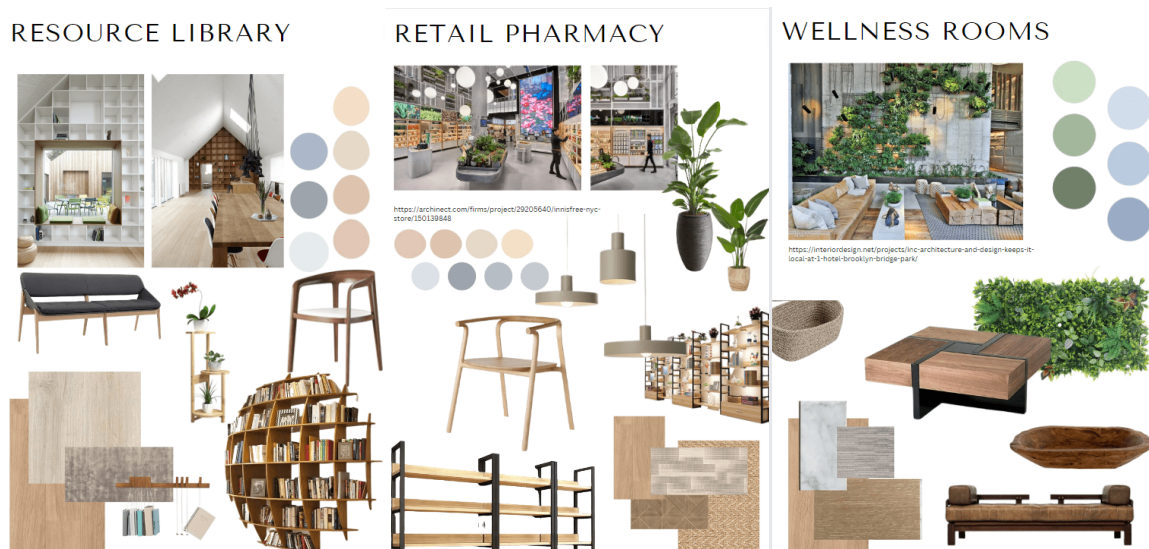


Figure 5. Mood Board: Resource Library, Retail Pharmacy, Wellness Room

The final set of mood boards depicts the Resource Library, Retail Pharmacy, and Wellness Room (Figure 5), comprising the Patient Service area, which supports the patient's primary activities. While the colors used remain consistent with the overall space, the focus in this

area shifts to detailed accessories. Patient comfort remains a priority, achieved through wide openings to the outside to prevent patients from feeling fatigued while in the room. This design approach ensures that patients can access necessary resources and services in a comfortable and inviting environment, contributing to their overall well-being and satisfaction during their healthcare experience. Biophilic design is evident in the use of plants dominating the walls of the room, providing patients with a positive view and access to nature within the interior. Colors inspired by nature are utilized to uplift spirits during treatment, particularly in stressful conditions.

The Resource Library features various seating options, including clusters of club chairs, a small conference table, and individual workstations, catering to different user needs. In contrast, the Retail Pharmacies offer private counseling areas for patient education on safe medication use. The Wellness Room is designed to be a patient's favorite gathering place, facilitating discussions with family, relatives, and medical personnel while providing palliative facilities and educational sessions. Its attractive design incorporates floor, wall, and ceiling elements representing nature, including a woody floor layered with carpet and stackable chairs for versatile layouts. The green wall serves as a focal point, further enhancing the room's appeal and connection to nature.

Conclusion

Biophilic design offers a plethora of benefits by aiming to reestablish the connection between humans and nature, leading to positive behavioral, mental, and physical outcomes. This design approach is exemplified by incorporating elements such as natural lighting, ventilation, water features, and plants into spaces. These natural elements can be integrated using genuine materials and imitations of natural forms through design, patterns, and interior finishes. The fundamental concept of biophilic design is to create environments that nurture a connection with nature, fulfilling a basic human need. This is particularly crucial for cancer patients, as it contributes to their sense of calm, order, and well-being, which are vital for their recovery.

In interior spaces, enhancing visual design can be beneficial, making the environment appealing to both patients and their visitors while avoiding a sense of depression. Interior qualities, including materials, colors, lighting, textiles, furniture, accessories, art, and signage, can be strategically employed to address both architectural and non-architectural factors. Consequently, biophilic design in interior spaces is best achieved by tailoring the experience to each typical user, whether they be a patient, doctor, nurse, visitor, or another staff member. This personalized approach ensures that the space effectively supports the needs and well-being of all occupants.

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