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Architectural Paradigms: Academic Research in Pedagogy, Heritage, and Sustainability

Year: 2026

Healing Spaces Through Nature: A Biophilic Approach to Architecture

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Abstract

Biophilic architecture has become an effective tool to foster connections between people and nature in the built environment to create healing spaces. This review looks at the concepts, health impacts, uses and potential future of biophilic design to support occupant well-being. Several ideas are introduced in the review: healing spaces, the Biophilia Hypothesis, and some design considerations such as direct and indirect experiences of nature, and spatial characteristics that foster the restorative context. It further highlights the physiological and psychological benefits of biophilic interventions, such as stress reduction, improved recovery, enhanced cognitive performance, and better indoor environmental quality. The review also examines applications in healthcare, residential and working environments as well as practical design solutions regarding daylight, vegetation, natural ventilation and natural materials. Lastly, it highlights implementation barriers and avenues for further research, focusing on the need for more evidence-based designs and interdisciplinary collaboration in creating healthier, sustainable, and resilient architectural environments.

Keywords; Biophilic Architecture; Healing Spaces; Human Well-being; Nature-Integrated Design; Evidence-Based Design

* 978-93-7640-203-8

1 INTRODUCTION

Healing spaces are designed environments that are intentionally designed to help people with physical, psychological and emotional healing, with the aim of creating an environment that will help lower stress and promote restoration. In architecture, it can be applied to residential, educational, work, and public buildings in addition to hospitals, where the quality of the environment affects human health. A leading strategy for developing these spaces is biophilic design, which seeks to establish a deeper connection between people and nature by incorporating daylight, greenery, water features, natural materials and ventilation into the design of built spaces [1], [2].

The theoretical underpinning for biophilic architecture is the Biophilia Hypothesis put forward by Edward O. Wilson which suggests that humans have an inherent desire to connect with nature and living systems. The evolutionary connection indicates that frequent contact with natural environments has a beneficial impact on both physical and mental well-being. Due to the urbanisation issues, more people living indoors, and less availability of natural areas, this relationship has been diminished, and the role of natural areas and nature-inspired architectural design is gaining importance [3], [4].

The increasing focus on patient-centred and evidence-based design has made healing environments a key element in the design of modern architecture. Research shows that daylight, nature and views can help to reduce stress levels, boost well-being and mood, improve cognitive function and speed up recovery (not just for patients, but for health care professionals and the building's other occupants) [5]. Architects are thus designing more and more therapeutic landscapes, healing gardens, and nature-inspired interiors in healthcare settings and other artificial environments. In addition to health, biophilic design in urban buildings can help create more healthy, sustainable, and resilient communities, enhance building indoor environmental quality, and help occupants feel better [6]. Thus, biophilic architecture has become a vital approach to creating healing environments that are designed to meet the needs of the human body and to be environmentally friendly.

2 PRINCIPLES AND ELEMENTS OF BIOPHILIC ARCHITECTURE

Biophilic architecture is based on the idea of reconnecting human beings to nature through thoughtful consideration of natural elements and processes in the built environment. Biophilic design does not just add greenery, but evokes a multi-sensory experience that can boost physical

health, psychological wellness and environmental performance. Studies have shown that biophilic buildings can lower stress, improve cognitive function, increase indoor environmental quality and boost satisfaction. These principles have thus been adopted into the realm of evidence-based architectural design, especially in healthcare settings and educational and workplace spaces [7], [8].

3 DIRECT EXPERIENCE OF NATURE

Direct experience of nature is the integration of living and dynamic elements of nature in buildings. Indoor plants, healing gardens, green walls, water bodies, more daylight and natural ventilation establish sensory links with nature and enhance the indoor environmental quality. These elements have been shown to lessen stress, improve emotional well-being, and improve air quality and thermal and visual comfort. Daylighting and natural ventilation also help to promote energy efficiency and improve indoor air quality [9].

4 INDIRECT EXPERIENCE OF NATURE

Indirect experiences are gained via architectural elements which call up nature without contact. Natural materials like wood and stone, natural colours, natural textures, and biomorphic shapes are used to convey natural pattern and processes. Overall, these design elements make spaces more visually and mentally pleasing and help to foster a sense of comfort, familiarity, and calm in spaces, even in high-density urban environments [10].

5 SPATIAL EXPERIENCE AND BIOPHILIC DESIGN FRAMEWORKS

Another quality of biophilic architecture is the impact of spatial organisation on human experience. Prospect (open views), refuge (protected spaces), and connection to place (place attachment) are all design strategies that evoke feelings of safety, orientation and belonging. These spatial characteristics are often aspects of a healing space that are designed for relaxation and recuperation. There are several widely-used approaches and frameworks which offer guidance for how best to apply these principles in the architectural context, but without offering rigid formulaic solutions, such as Stephen Kellert's Biophilic Design or Browning et al's 14 Patterns of Biophilic Design.

6 HEALTH AND WELL-BEING BENEFITS OF BIOPHILIC HEALING SPACES

Biophilic healing spaces are designed to promote health for humans by using natural elements in the built environment. The science of nature-based design is increasingly showing benefits for physical health, mental health and recovery following contact with nature in the built environment, from architecture and environmental psychology research, to healthcare research. The use of daylighting, greenery, natural ventilation, and restorative greenscapes all contribute to a biophilic approach that helps to promote holistic healing and maximize occupant comfort and satisfaction. All of these have led to biophilic design being widely adopted in healthcare facilities and other building types.

7 PHYSIOLOGICAL BENEFITS

Biophilic environments play a critical supporting role in the wellbeing of the body, in terms of stress reduction and the body's ability to recover. Lower blood pressure, reduced heart rate, decreased cortisol levels and improved immune response are all associated with exposure to natural elements. In a hospital environment, patients exposed to daylight and natural views have been reported to have a shorter hospital stay and reduced level of pain, and also have a quicker postoperative recovery. Furthermore, natural ventilation and the presence of vegetation inside the building help to promote better indoor climate through increased airflow, control of indoor pollution and thermal comfort [11].

8 PSYCHOLOGICAL BENEFITS

Nature-integrated environments offer significant psychological advantages, and improve psychological health and well-being. Exposure to plants and nature lowers anxiety, depression and mental fatigue, and increases relaxation and positive feelings. Biophilic design also enhances cognitive function with regard to attention, memory, creativity, and concentration. The benefits are not limited to patients, but include healthcare professionals, students and office workers, leading to improved productivity, decreased burnout and overall better satisfaction of indoor spaces [12].

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9 ROLE OF DAYLIGHT, GREENERY, AND VIEWS OF NATURE IN HEALING

Elements of healing environments that have the greatest impact include daylight, vegetation and visual connections to nature. Enough daylight helps to regulate our circadian rhythms, promotes better sleep and a better mood, and it also offers a calming experience with plants and healing gardens in the indoor environment to help reduce stress. Likewise, there is evidence that patient recovery is speeded up and perceived pain and anxiety reduced when patients are viewing natural landscapes. These factors, when combined, enhance the therapeutic nature of health care facilities and other built structures by creating comfort, strength and wellbeing [13].

Table 11: Health and Well-being Benefits of Biophilic Healing Spaces

Biophilic Element	Health and Well-being Benefit	Mechanism/Explanation	Typical Applications
Natural Daylight	Improves mood, sleep quality, and recovery	Regulates circadian rhythm, reduces stress, and enhances visual comfort	Patient rooms, waiting areas, offices, classrooms
Indoor Plants and Greenery	Reduces stress and anxiety; improves emotional well-being	Provides visual connection with nature, improves air quality, and creates restorative environments	Hospital wards, lobbies, residential interiors, workplaces
Views of Nature	Accelerates healing and reduces perceived pain	Promotes psychological restoration and lowers physiological stress responses	Patient rooms, rehabilitation centres, healthcare waiting spaces
Natural Ventilation	Enhances indoor environmental quality and occupant comfort	Improves fresh air circulation, reduces indoor pollutants, and maintains thermal comfort	Hospitals, residential buildings, educational institutions
Water Features	Promotes relaxation and stress reduction	Provides calming visual and auditory stimulation, creating restorative experiences	Healing gardens, courtyards, wellness centres

Natural Materials (Wood, Stone, Bamboo)	Increases comfort and reduces mental fatigue	Creates warm, familiar, and nature-inspired interiors that enhance psychological well-being	Healthcare interiors, residential buildings, offices
Healing Gardens and Therapeutic Landscapes	Supports physical recovery and emotional restoration	Encourages outdoor activity, social interaction, and contact with living ecosystems	Hospitals, rehabilitation centres, elderly care facilities
Green Walls and Vertical Gardens	Improves indoor air quality and aesthetic value	Filters airborne pollutants while providing continuous visual exposure to vegetation	Hospital atriums, office buildings, public facilities
Prospect and Refuge Spaces	Enhances feelings of safety and relaxation	Combines open views with protected spaces, reducing anxiety and improving comfort	Patient lounges, meditation rooms, healthcare waiting areas
Biomorphic Forms and Nature-inspired Patterns	Improves cognitive performance and emotional comfort	Mimics natural geometries and patterns that are visually restorative	Healthcare interiors, educational buildings, workplaces

10 APPLICATIONS AND DESIGN STRATEGIES FOR HEALING SPACES

Biophilic design application has evolved beyond the traditional healthcare sector and has been adopted in a range of building types where health and well-being of occupants are a concern. Natural elements and evidence-based design strategies can be used to enhance recovery and reduce stress in an environment, resulting in an overall improvement in quality of life. This demands suitable applications in various environments and practical architectural measures which can enhance the relationship between people and nature and help to achieve sustainable building performance.

11 APPLICATIONS OF BIOPHILIC HEALING SPACES

The biophilic design is used in various sectors such as healthcare, residential, workplaces, and public spaces to enhance the health and well-being of occupants. These uses incorporate nature into the architectural environment to establish a healing environment, which can lower stress

levels, improve comfort and promote physical and psychological healing, while also contributing to sustainable building design.

i. **Hospitals and healthcare facilities**: Daylight, views of nature, indoor greenery, and therapeutic gardens in patient rooms are associated with decreased stress, increased patient satisfaction, and better healing times. The well-being of healthcare professionals is also enhanced by nature integrated waiting areas and staff spaces.
ii. **Residential and workplace environments:** Biophilic elements like indoor plants, balconies, natural light and green terraces will contribute to healthier living and working environments. These interventions can enhance the mental health, productivity, comfort and satisfaction of the occupants.
iii. **Healing gardens, courtyards, and therapeutic landscapes:** Outdoors green spaces offer a place to rest, engage in activity, and socialize. These landscapes are used as a restorative environment to calm, soothe, reduce anxiety and mental fatigue and promote emotional healing for patients, visitors and staff.

12 DESIGN STRATEGIES FOR HEALING SPACES

Architectural strategies that enhance the link between people and nature can create effective healing spaces. The sensitive use of daylight, greenery, natural ventilation, water features and natural materials optimises the indoor climate, creates better user experience and contributes to a healthier and more restorative built environment [14].

i. **Maximise daylight:** Large windows, skylights, and appropriate building orientation improve natural illumination and regulate circadian rhythms.
ii. **Integrate vegetation**: Indoor plants, green walls, and landscaped courtyards enhance air quality and provide visual and psychological restoration.
iii. **Promote natural ventilation:** Cross-ventilation and operable windows improve indoor air quality, thermal comfort, and occupant health.
iv. **Incorporate water features and natural materials:** Water elements, timber, stone, and other natural materials create calming sensory experiences while strengthening the connection with nature.

13 CHALLENGES AND FUTURE DIRECTIONS

While the positive impact of biophilic architecture on human health and well-being has been shown, the application has been limited by technical, economic and practical challenges. To realize the large-scale application of healing spaces in future architecture, it is important to respond to these issues and promote research and interdisciplinary collaboration.

14 CHALLENGES

There are a number of design and operational challenges to consider when creating a biophilic healing space that is actually implemented. The growing use of a natural element, like green walling, indoor vegetation, water features, and therapeutic landscapes can add to the complexity of building, as well as the tasks involved in maintaining it over time. The operation of these features requires periodic replacement of plants, irrigation, management and environmental monitoring. The scarcity of land in built-up urban areas and the cost of land further reduce the space to introduce extensive green spaces or courtyards. Additionally, architects need to integrate biophilic design elements with sustainability goals, choosing materials that are sustainable and resource-efficient, and ensuring that natural elements enhance rather than strain building systems. These factors must be taken into account in an integrated way across the building life cycle [10].

15 FUTURE DIRECTIONS

Better evidence-based design and interdisciplinary cooperation between architects, healthcare professionals, environmental psychologists, landscape architects, and engineers are critical to future advances in healing architecture. More research is required to measure health, economic and environmental effects of biophilic interventions in different types of buildings in various cultural settings. The use of emerging digital technologies, such as Building Information Modelling (BIM), environmental simulation and smart building systems, can help optimise daylight, ventilation and green infrastructure as a design process. Further studies are also needed to include at least climate-responsive biophilic approaches, NbS solutions in high-density urban settings, and standardised assessment tools to quantify building performance and occupant health. These advancements will help to establish the scientific support for biophilic architecture and catalyse greater uptake of the concept in the design of resilient, sustainable and restorative built spaces [15].

16 LITERATURE REVIEW

(Miola et al., 2025) [6] examines contemporary research on the application of biophilic design in healthcare facilities, focusing on the positive benefits it has on both individual and social well-being. A summary and description of the fundamental ideas of biophilic design are provided. Biophilic principles increase patient well-being, aid in recovery, and raise the standard of healthcare facilities, according to recent systematic and comprehensive reviews. Higher levels of biophilic integration, such as virtual nature encounters, are more helpful in lowering stress and improving perceived care quality, according to experimental investigations. Furthermore,

the research has emphasised the advantages of healthcare and biophilic settings for the social aspects of wellbeing. Subsequent research endeavours ought to delve deeper into the ways in which biophilic design impacts social interactions and overall wellbeing for both patients and healthcare providers.

(Du et al., 2026) [16] summarises research on nature-integrated design interventions in hospital settings and assesses how they affect patient outcomes. According to convergent evidence, biophilic interventions, such as indoor plants, green views, natural materials, optimised daylight, healing gardens, and nature-themed digital media, improve stress recovery, reduce pain, improve emotional well-being and sleep quality, and increase satisfaction with care. Direct exposure to real nature has the strongest effects, whereas virtual nature has somewhat stronger effects. Attentional restoration, stress reduction, favourable environmental assessments, and increased perceived control are some of the suggested processes. Cross-study comparability is hampered by methodological variability, and there is still no evidence for long-term clinical results. All things considered, this analysis highlights potential design approaches and emphasises the need for more thorough transdisciplinary and longitudinal research to promote biophilic healthcare design.

(Özeren, 2026) [17] summarises research on nature-integrated design interventions in hospital settings and assesses how they affect patient outcomes. Additionally, it explores the interpretation of biophilic strategies in early-stage projects when construction limitations have not yet influenced conceptual aspirations. By fostering a closer bond between humans and the natural world, biophilic design improves both psychological and physical well-being. A standardised grading matrix based on pre-existing frameworks was used to evaluate each project. The projects showed excellent performance in key biophilic elements, such as the use of natural materials, integration with natural systems, visual connection to nature, and shelter. The majority of designers intentionally or inadvertently used nature-based techniques, even if biophilic strategies were not required. There was less representation of experiential and symbolic patterns like mystery and sensory variety. The results demonstrate that a comprehensive approach that takes into account psychological requirements, spatial organization, and sensory experience is necessary for biophilic design. According to the report, Turkish architectural competition culture is starting to adopt biophilic principles. To support generalisation, more study across other building types is required. These findings represent tendencies seen in a specific competitive environment.

(Tacanahui et al., 2024) [18] Examine and summarise the connection between biophilic design and human well-being in built settings, emphasising the value of using natural elements to

enhance user comfort and quality of life. The article's technique is a narrative review that examines academic articles' intellectual output on biophilic architecture. The article's findings demonstrate that including natural elements improves users' emotional, mental, and physical health. Numerous studies show that biophilic design may lower anxiety, enhance cognitive function, and encourage relaxation. In order to enhance human well-being, biophilic architecture is promoted as a useful strategy that combines nature with architectural design. The authors stress that occupant comfort and health may be enhanced by adding natural elements into built environments. Along with addressing issues with upkeep and extra expenses, they also emphasise the necessity of more study and the creation of best practices in this area to optimise its impact.

(Khajehpasha et al., 2024) [19] Man's return to nature may be greatly aided by building, and biophilic architecture and design aims to do just that. Because the design of these spaces is crucial in terms of functionality, researchers have always studied it in terms of spatial quality, psychological dimensions, and physical impact on the process of treating and recovering patients. In therapeutic environments, relying on biophilic design to improve environmental quality and psychologically affect patients may be necessary. Communication with nature, which includes things like sunlight, water, vegetation, etc., can have a significant impact on human health and shorten the time it takes for patients to recover and receive treatment, according to the findings of this study, which was conducted to identify the effective components of biophilic design in therapeutic environments to improve the health of patients.

(Usip et al., 2026) [20] Synthesises data on theoretical underpinnings, design strategies, human welfare results, and environmental performance in an integrated assessment of biophilic architectural research published between 2005 and 2024. The results show that, in a variety of settings, biophilic design is consistently linked to favourable human and environmental outcomes. Reductions in physiological stress markers, improvements in attention and cognitive function, slight increases in post-operative recovery rates, and increased productivity at work are examples of human-centered impacts that have been reported. Biophilic surroundings may affect cerebral stress responses, according to new neurophysiological investigations employing quantitative electroencephalography, which sheds light on possible underlying processes. Direct natural integration, biomorphic and fractal shapes, material authenticity, spatial arrangement, and climate responsiveness are all included in the review's critical evaluation of biophilic strategies. African and Global South vernacular structures, which exhibit long-standing nature-integrated design principles with minimal embodied energy and deep cultural roots, receive special attention. Evidence from the examined research indicates that long-term operational,

health-related, and socioeconomic benefits can outweigh implementation hurdles, such as greater initial costs and regulatory restrictions.

17 CONCLUSION

Biophilic architecture offers a comprehensive design approach for creating environments that promote recovery, improve physical health, mental wellness, and environmental sustainability, by purposefully incorporating nature into the built environment. The literature reviewed confirms that natural features like daylight, vegetation, water, natural ventilation and restorative landscapes have beneficial impacts on stress reduction, recovery, cognitive functioning, and healthier indoor environmental conditions. The use of biophilic principles in non-healthcare contexts such as residential and workplace buildings can also contribute to a sense of comfort, productivity, and quality of life. However, challenges in implementation costs, maintenance needs, urban space requirements and integrating the sustainability agenda are still very relevant. Success will rely on evidence informed design, inter-disciplinary partnerships and the use of digital technologies to optimise NbIs. Ongoing studies into long-term health impacts and the evaluation of performance will advance science and inform the use of biophilic design to build resilient, restorative and human-centred built environments.

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