

## *Original Paper*

# The Effect of Biophilic Design in Interior Spaces to Reduce the Stress of Patients in Medical Centers

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### ***Abstract***

*Architecture can play a very important role for the return of man to nature, among which biophilic architecture and design seeks to reconnect man with nature. Relying on biophilic design in order to increase environmental quality and psychologically affect patients can be necessary in therapeutic environments, because as the design of these spaces is very important in terms of functionality, it has always been studied by researchers in terms of spatial quality, psychological dimensions and physical impact on the process of treatment and recovery of patients. This study was carried out aimed to determine the effective components of biophilic design in therapeutic environments in order to improve the health of patients, and according to the results, communication with nature, which includes things such as sunlight, water, vegetation, etc., can have a significant impact on human health and reduce the duration of the patient's recovery and reduce the duration of treatment.*

### ***Keywords***

*Biophilic, architecture, nature, medical center*

## **1. Introduction**

Medical centers in the world are changing to meet the needs of today and the future, and the signs indicate that it is necessary to revise the medical system (Hamzeli & Sonboli, 2019) because it is very important to design medical centers due to its significant impact on treats clients, patients and staff, and it should be designed in a way that reduces human stress and anxiety and provides a calm and hopeful atmosphere for all users. Undoubtedly, the quality of the treatment environment affects the treatment. The design of the healthcare environment is very important in terms of functionality, these environments include hospitals, clinics, health centers, emergency rooms, doctors' offices, specialized and psychotherapy clinics, and are always studied by researchers in terms of spatial quality,

psychological dimensions and physical impact on the treatment and recovery process as well. Green spaces in these environments are among the most basic design factors, and there is a direct relationship between the design of therapeutic environments and human health, as far as spaces with the name of healing gardens are designed and implemented in hospitals in recent decades (Bandarabaad & Shahcheraghi, 2025).

Responding to one of the most essential human needs (biophilia) is the main reason for the healing of green space and interaction with nature. Nowadays, the lack of attention to this natural human need and the disconnection between man and nature has endangered human health and well-being. Therefore, you should think of a solution for the reconciliation between man and nature in the man-made environment and especially in therapeutic environments, to prevent physical and mental problems caused by the destruction of nature and to improve the treatment process. For example, today architects, doctors, nurses and environmental psychologists, they mention the buildings built as a component of the treatment process, so that the findings indicate the effect of the treatment environment on the health of people, the treatment process and the recovery of patients. According to the results of the studies, the composition of the natural environment in buildings can have a positive effect on the mental, physical and social aspects (2001, Hase & Heerwagen). Therefore, architecture, as a field that defines the quality of space and environment for us, is able to achieve an idea and implement it in the form of a suitable and creative design by correctly dealing with the subject and considering the conditions of the users and can be the creator of a work whose most important advantage is to create a calm and intimate environment for the patient's life and regain his health. Therefore, the main goal of this research is to explain the components of biophilic architecture in the direction of healing therapeutic spaces.

## **2. Background Research**

Stress Reduction Theory (Note 1) has been proposed as a branch of psychology by Ulrich and states that the level and extent of stress in people when they are in contact with nature and being in nature decreases unconsciously and spontaneously) (2012, Others & Bratman) It is the main cause of many abnormalities and diseases, reducing the amount of stress in people has a significant impact on health. Nightingale was one of the first people who investigated the environmental elements that are effective in accelerating recovery and reducing the stress and mental pressure of patients in medical centers, and in this regard he suggested ventilation and natural light and large windows facing the green space. According to Edward Wilson, the most positive effects of biophilia can be observed in the functioning of care and treatment spaces in order to improve emotional and physical health. The physical environment of a treatment centers has a fundamental and central effect on the successful treatment of the patient. Some factors of intellectual-mental growth and development and mental health of a person include controlling nature, determining the territory, etc., by creating a sense of security, and also establishing a logical relationship 4 (wisdom) with the natural environment. Quoted from Nielson et al. "Communication with the natural environment can act as an antidote to the unhealthy aspects of urban

life, which should affect the design, planning and management of our surroundings (Nilsson & Others, 2011).

Zare et al. during a research entitled "Explanation of biophilic design strategies effective on the health of hospitalized patients", concluded that communication with nature in an artificial space has a significant effect on human health and reducing the recovery time of patients, and since biophilic design seeks to create a connection between man and nature in the man-made environment, it can provide healing solutions for the architectural design of hospitals, and have an impact on the treatment and recovery time of patients.

### **3. Research Method**

This study is considered as an applied research in terms of its purpose, and presents the criteria and solutions of biophilic design in medical centers by descriptive-analytical method and using library studies with the aim of improving the performance and psychological correction of the internal spaces of medical centers.

### **4. Biophilic**

Wilson, the author of the book "Biophilia", defines biophilia as "the phenomenon of people's desire for organisms and living things, plant or animal". He believes that humans are naturally attracted to the green colors of plants and the blue color of water in contrast to the gray color of concrete and cement and other unnatural materials. The word biophilic is derived from biophilia. The word biophilia consists of two components, bio and philia. The prefix bio refers to living things or human life. Philia refers to the attraction and positive feeling that people have towards the habits and activities and all the things in nature around us (Wilson, 1984). As a result, biophilia refers to the inherent and genetic dependence of humans with the natural world (Ulrich, 1993). This word entered Webster's dictionary in 1979, and its literal meaning is love of life and living organisms or systems.

### **5. Biophilic Design and Architecture**

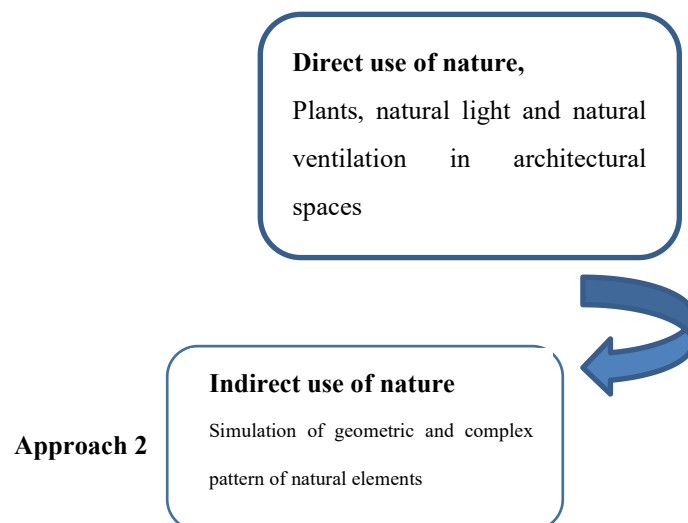
At a glance, biophilic design and architecture refers to the recognition of the natural human need to establish a connection with nature along with sustainability and global design strategies to create environments that can really increase the quality of life. In 2005, biophilic design was proposed as the second dimension of environmental restoration design, and it pursued the goal of achieving a positive and valuable experience of nature in the man-made environment (Kellert, 2005). Kellert in 2008 in another definition of biophilic design, Tarjoman, understand the natural need of humans to establish a relationship with natural systems and processes (biophilia) in the human-made environment, and also the main goals of Tarjoman are to find the basis of the lost circle in the common approach of sustainable design, achieving long-term sustainability and increasing the positive interaction between humans and nature in the built environment (2008, Kellert), Biophilic architecture is considered as a

part of an innovative vision in architecture, and nature, life and architectural conjectures are found in it to create a habitable and lively building that can meet the requests, limitations and mutual respect between humans and the environment (Briggs, 1987). The principles of biophilic architecture are based on the attitude towards humans and the surrounding space as a living and interacting organism, and its focus is on creating a feeling of desire and interest towards the space in humans. Biophilic architecture, by honoring the long-standing relationship between man and the natural environment, tries to recreate this relationship in the most constructive and useful way possible in order to create peace, comfort and a sense of belonging in humans and provide the conditions of well-being and comfort in the inhabitants of the space or landscape (Briggs, 2015). A good experiment was published in 1984 by Roger Ulrich from a hospital center, Ulrich tested the therapeutic effects of windows and the healing process of patients. Some patients had a window that was against a brick wall. And the other half saw green spaces with trees, an age and gender group that underwent the same operation was selected to increase the accuracy of the patients. The patients who saw the natural landscape stayed in the hospital for a shorter time than the patients who saw the brick wall, or in other words, they recovered faster (Hervagen, 2014). Biophilic principles can be crystallized in the design using different methods, but generally it includes two main approaches:

**Approach 1:** Direct use of nature, that is we can use nature and the natural environment in the construction space, use plants, natural light and natural ventilation in architectural spaces, replace natural materials such as: stone, wood for made Let's use photos of natural landscapes, symbols and signs of nature in interior architecture and decoration of facades and spaces. In all these cases, nature is understood directly and without mediation. (Kellert, 2008)

**Approach 2:** Indirect use of nature; in this approach, the features and properties found in nature are used in the design. For example, in the beginning, the geometrical and complex pattern of natural elements are investigated, and then create the complexity that people are interested in in the natural environment in the architectural space. Such cases are understood indirectly and subjectively. (Ibid)

### Approach 1



**Figure 1. Biophilic Fundamentals Approach**

## 6. Nature and Plants

Researchers believe that nature as a real distraction reduces anxiety and distracts patients from pain, and makes them feel calm and reduce anxiety (Alitajer & Mostaghimi, 2016). According to the results of several studies collectively, different effects of nature such as observing nature from the window, pictures of nature and plants in indoor spaces, can have a positive effect on the outcomes of patients, including reducing pain, anxiety and depression and the duration of their hospitalization. (2020, Others & Jamshid).

The results of a similar study on the design of medical centers show that factors such as patients' visual connection with nature have been evaluated to improve their performance. (2016, Najafi). According to the results of other researches, exposure to green space causes positive effects on human health and well-being, increasing physical activity and the absence of nature has consequences such as mental distress, stress-related and cardiovascular disease (Yin et al., 2018). Accordingly, experience has proven that the presence of three to five minutes in nature and interacting with it reduces stress, and has a significant effect on reducing anger, stress and fear of patients. According to the results of the study of Ulrich and his colleagues, when people are exposed to watching the natural environment, they experience faster improvement compared to when they watch urban elements (Others & Ulrich, 1991). Another study investigated the recovery of patients in the hospital as a result of attention to vegetation outside the building. In this study, those who showed interest in viewing natural scenery had a faster recovery. Likewise, those who participated in gardening activities showed positive changes in mood (Barnes & Marcus, 1995).

## 7. Natural Light

Sunlight is one of the most important factors in maintaining human health. Richard Wortman believed that light after food is the most important internal factor of the environment, which plays an important role in controlling the body, and in fact the psychological effect of light depends on the full spectrum of light that hits the eye, and this light spectrum affects the work and process of neurotransmitters. In addition to physical health, lack of sunlight can also cause some mental disorders. (2011, Humphreys). Because light has a direct effect on the activity of the internal parts of the brain and the desire and interest in light or the fear of darkness is not just an imaginary or psychological or social issue, but the optimal effectiveness of light in mental health and its effect on the mood of behavior has been proven. In the end, the human being can improve the quality of his ethics in various researches as well (2008, Nayebi)

Light is not only a physical necessity, but its psychological value is one of the most important factors in human life in all fields. According to the mentioned cases, the importance of light is very necessary in a therapeutic environment where most patients come with physical or mental discomforts caused by their physical problems.

## 8. Water

The sound of water, its color and transparency, its movement and content are considered important aspects of understanding and recognizing the physicality of the water space. Humans admire the sound of water and prefer it to all kinds of natural and special sounds. Hearing the sound of water and even the sound of rushing water create a sense of peace and security in people, as well as rejuvenating and relieving mental pressure and energy in a person. A person's emotional reaction to water is due to its coldness, which induces a sense of freshness and coolness, and these perceptual factors increase energy and reduce human stress (Volker, 2011).

**Table 1. The Crystallization Method of Biophilic Architecture with Direct Use of Nature**

| General category                     | Effective biophilic measures on promoting mental health   |
|--------------------------------------|---|
| Visual communication with nature     | Seeing flowers and plants   |
| Proximity to water                   | Seeing snow and rain  |
| Proximity to water                   | The possibility of touching water and accessing running water (river, stream, etc.) or seeing a fountain, aquarium.                                       |
| Non-visual communication with nature | Smelling the scent of flowers and aromatic plants   |
| Non-visual communication with nature | Hearing the sound of water, wind and rustling leaves sounds   |
| Non-visual communication with nature | Hearing the sound of birds  |
| Connection with natural systems      | Seeing environmental changes (such as changing the color of tree leaves throughout the year, shedding leaves with the change of season and their blooming |
| Dynamic and diffused light           | The use of sunlight in indoor spaces and changing it from morning to night  |
| Connection with natural materials    | The use of natural materials (including wood, stone, etc.) in interior spaces   |
| Non-visual communication with nature | Gardening and planting edible plants  |

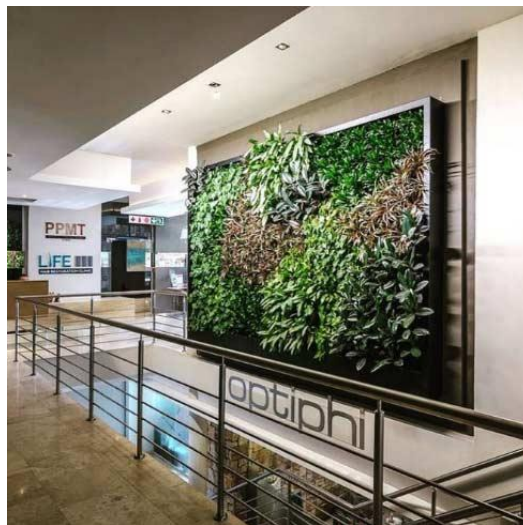
## 9. Conclusion

Architectural space is considered as an important platform for human activities and has deep effects on mental health, and without a doubt, the quality of the treatment environment has a significant effect on treatment. Stress is considered as one of the important factors preventing the patient from fighting the disease. Also, this factor has a significant impact on the medical staff and clients. Therefore, it is obvious that the therapeutic space is considered as a tension-generating space, therefore, designing based on the biophilic model is one of the methods of designing the therapeutic environment to reduce the level of tension and stress.

Implementing biophilic design strategies has a positive effect on symptoms and health disorders and reducing the recovery and treatment time in hospitals, and biophilic design should be considered by designers and architects, the ultimate goal of biophilic design is the welfare of the people. Therapeutic environments where health recovery is the main task of the collection, which requires examining the relationship between nature and human health characteristics, as well as the healing strategies of biophilic design in architecture.

In the following, the following strategies are suggested to achieve this goal:

1. Designing a central courtyard or a green roof on the floors to create direct access to nature and make maximum use of it.
2. The use of the element of water in interior spaces, which is one of the most healing elements of nature.
3. It is recommended to use natural color and, if possible, some natural materials such as stone.
4. In order to establish a connection with nature in the interior space, focusing on the use of reviving elements of nature and images representing nature on the bodies.



**Figure 1. Green Wall**

5. The use of transparent materials to reveal natural spaces



**Figure 2. The use of All-round Glass**

6. The use of photos of nature in the interior environment
7. Arrangement of interior space using natural elements and materials
8. Planting and using shrubs and natural plants in interior design



**Figure 3. The Use of Natural Plants in Indoor Spaces**

9. Although the interior furniture is artificial, it should be made in the form of natural spaces
10. The use of natural light as much as possible by using openings and glass walls
11. The use of semi-open spaces (balconies) and transparent materials in the walls for visual communication with the surrounding environment and for air conditioning of the building, a good view of the green space
12. Avoiding the design of closed spaces
13. Designing the greenhouse space to take advantage of natural light and green scenery
14. The use of natural sounds and smells in spaces



## Postscript

1-Ulrich 2- Nightingale 3- Edward Wilson 4- Nilsson 5- Biophilic 6- Webster 7- Kellert

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## Note

Note 1. Ulrich's theory proposes that natural environments promote recovery from stress, while urban environments tend to hinder the same process.