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# Explaining The Factors Affecting the Quality of Therapeutic Spaces with Biophilic Architectural Approach, From the Perspective of Treatment Staff, Patients and Companions

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**ABSTRACT**

Nowadays, due to the increase in diseases, patients spend a long time in hospitals; Therefore, these centers are important as a container for the treatment and recovery of the patient. In the modern world, where most of the treatment spaces rely on technology and the advancement of medical methods, nature, an effective factor on the treatment and human health, has been given less attention, and as a result, the environment of the treatment centers has turned into dry and soulless spaces. This research was carried out with the aim of explaining the effective indicators in the quality of therapeutic spaces with the attitude of biophilic architecture from the point of view of the treatment staff, patients and companions. In the qualitative part, targeted sampling was done with 30 experts and professors of architecture and an exploratory interview was conducted with them. The quantitative part was selected by random cluster sampling of a hospital in Kerman city and the questionnaire was completed with its clients and medical staff. The minimum sample size with a variance of 1 and an error of 0.1 was considered to be 384 people. The validity of the questionnaire was confirmed by using the opinions of experts and architectural specialists, and its reliability is also based on Cronbach's alpha coefficient equal to 0.879, which indicates the high reliability and appropriateness of the tool. The results of the research show that proximity to water, landscape, thermal diversity and air flow, visual connection with nature, dynamic and diffused light are the most important characteristics of biophilic architecture to improve the quality of therapeutic spaces.

**Keywords**: *Biophilic, Biophilic Architecture, Quality of Treatment Spaces, Patients and Companions, Treatment Staff*

## 1. Introduction

Medical centers are built with the aim of treating patients and improving the health level of patients, but in most cases, especially in our country, most attention is paid to functional aspects in their design and are designed only based on spatial relationships and standards resulting from medical equipment. While nowadays, redefining health and showing the indirect effect of the physical environment on human behavior and states has created a new look at the design of therapeutic spaces. Most people get stressed when they are sick. In addition to the stress caused by the disease, the patient communicates with the environment by being in the hospital, and if there is environmental stress, his stress increases. This stage leads to the continuation of the disease and ineffectiveness of the prescribed drugs, as well as the complexity of the treatment process;

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Therefore, the presence of stress and the patient's dissatisfaction with the hospital environment will delay the healing process of the disease. In fact, special buildings built in the form of a hospital act as an element of treatment processes that play an important role both in the process of healing and recovery of patients and in the effective performance of doctors and employees of the complex.

Today, architects, doctors, nurses and environmental psychologists refer to built structures as part of the treatment process. The results indicate the effect of therapeutic environments on people's health and the process of treatment and recovery of patients. Studies show that the combination of natural environment in buildings can have a positive effect on psychological, physical and social fields. On the other hand, going to health care centers is a stressful experience for most people, and experiencing medical environments is usually associated with feelings of fear, anxiety, stress, and uncertainty. [1]

When faced with an architectural space, the feeling that is created in a person is the result of several criteria that include the nature and spatial quality of the design, the mindset of the architect at the time of creating the space, and the psychological characteristics and experiences of the visitor. Meanwhile, the only criterion for our judgment of an architectural work is its body, regardless of the mentality of the creator of the space. Our sense of space depends on the qualities that come from the type of space elements, the relationship between them and the way they are understood. In fact, the characteristics of the space create qualities that affect a person's feeling when facing the space. [2] Biophilic tries to create spaces that, in addition to the desired functions, have the potential to create motivation and happiness and increase the physical and mental health of users. Environmental psychology studies that have been done so far confirm these things. Biophilic design is a nature.oriented design that requires the use of natural materials such as natural light, natural stones, wood, water, trees, green spaces, natural colors or views of nature that creates an ideal environment for life by integrating the natural and artificial environment. [3]

Being away from nature and the density and crowding of the presence of technology has distanced man from the state of health and balance and has created a kind of chaos in the lives of societies. In addition, medical centers that are established to ensure the health of people cannot rely on physical therapy alone to treat their patients. Therefore, the approach of therapeutic spaces to the treatment process must change and follow it with a new attitude. Biophilic architecture is an approach that brings nature to humans in relation to the soul and mind along with the body. Paying attention to the flourishing of this approach and its importance in the design of treatment spaces and its effect on the quality of the space, shows its absence in the country's hospitals even more. Since the beginning of human life, therapeutic spaces have been one of the main and essential needs in society's health and treatment. In medical centers, according to their function, creating a spatial connection and perspective to different internal spaces or nature and views of their external areas in order to stimulate a sense of belonging and peace, can be effective in accelerating the healing process of patients and increasing the quality of treatment of the environment. [4] Healing is a term often applied to sights that increase comfort and help maintain health, and one of its goals is analyzing what affects the visitor. [5] Biophilic design, which adds natural elements to the man.made environment, has received more attention in the field of design and health. Research has shown that being in the natural environment has positive effects on human health and well.being. [6] The role of treatment spaces and treatment staff becomes more important when a person is physically and mentally deficient during the illness. Considering that people suffering from certain diseases deal with therapeutic spaces during treatment and after, and their return to daily life and the treatment of subsequent mental problems is the most important, there must be a space for this group that not only requires compliance with standards, but also takes care of their spiritual needs.

## 2. Research background

Different approaches can be seen in the general ranking of researchers regarding biophilic architectural components and their impact on the treatment process of patients, but by closely examining the patterns and characteristics, close similarities are found in the classifications. Ma and colleagues (2022) in research entitled "Imagination and technical application of biophilia in private space"

reached the results that biophilia stimulated human knowledge of nature with all senses, brought nature into the built environment and creates an atmosphere with a sense of comfort and well.being. [7] Zhong et al. (2022) in their research entitled "Biophilic design in architecture and its contribution to health, well.being and sustainability: a critical review" concluded that biophilic design is much more complex and richer than the simple use of vegetation in buildings. It expands diversity by including different types of nature from physical, sensory, metaphorical, material and physical to spiritual. [8] Williams (2022) in his article "The Nature Solution: Why Nature Makes Us Happier, Healthier, and More Creative?" by examining brand new research, concluded that the power of the natural world improves health, promotes thinking and innovation, and ultimately strengthens our relationships. As our modern lives change dramatically indoors, these ideas and the answers they provide are more necessary than ever. [9] Sanchez et al. (2018) in a paper entitled "Quantitative improvement in workplace performance through biophilic design: a pilot case study" concluded that daylighting and green design in the workplace, highlight biophilic design features, improvements in well.being, performance, creativity and health and it helps more to improve workplace performance compared to the existing method. [10] Kellert (2018) in his book "Nature by Design: The Practice of Biophilic Design " concluded that modern design for the man.made urban environment seeks to reconcile with nature by accepting new and different paradigms. This approach and new design have two goals, one is the strategy of small environmental effects, and the other is positive effects, restorative environmental design or biophilic design approach. [11] Pouya (2017) in an article entitled "Healing gardens in big cities; a case study of Tehran" concluded that the requirement and special place of healing gardens is not only for hospitals, but also for urban spaces and for all ages of citizens. The healing garden in the building helps the residents' health problems and ecological and ecosystem benefits. [12] Kellert and Calabrese (2015) in a book entitled "Biophilic Design" concluded that biophilic design is about creating a good habitat for people as a biological being in the built environment and seeks to satisfy the inherent adaptations to nature in the modern environment and by doing this, people's health and physical and mental fitness increase. [13] Hasani Darband et al. (1402) in their article entitled "Reducing the stress of patients in medical centers with effective components of biophilic architecture" concluded that the connection with nature, which includes things such as smell, sound, wind, light, water, vegetation cover, etc., can have a significant impact on human health and reduce the duration of the patient's recovery and the length of treatment. [14] Naqabi et al. (2019) in an article entitled "Explaining the function of patterns derived from nature in architecture in responding to human needs in the traditional and contemporary era" came to the conclusion that in the traditional era, nature played an active role in meeting human needs and in the contemporary era, with the diminution of the spiritual dimension of man, the interest in the value dimension of nature in architecture also faded and the provision of material needs was prioritized. [15] Mahmoud Nazari Takyeh and Esfandiari Fard (2018) in a research titled "Coexistence of humans and the natural environment, an analytical approach to biophilic architecture in residential complexes", concluded that if biophilic architecture is used in residential environments, in addition to meeting all the physiological and psychological needs of the residents of complex, it is possible to create more favorable living conditions and improve the quality of their living environment. [16] Pir Mahmoudi and Miraj Firouzi (2016) in research entitled "Principles of biophilic architecture with an environmental psychology approach" concluded that biophilic architecture and environments designed with the understanding of the need for solidarity and connection with the natural world increase productivity, improve mental and physical performance, ease of mind, job satisfaction, stress reduction, health and vitality. [17]

## 3.Theoretical foundations of research

The word biophilic can be expressed as follows: (Bio) in the prefix form is used at the beginning of nouns, adjectives and adverbs that are related to living things or human life. [18] Its root is the Greek word βίος, which means human life and organic life. Bio is used in the nominal form as an abbreviation of the words of biography or biology, here the abbreviated form of biology is

considered, which means the science of biology and related to life. [19]
(philic) is a suffix form that is derived from the Greek root of fondness, and it contains the two concepts of love and desire for something, and in general, it means to love something. [20] Based on this, biophilic literally means to love life and living beings deeply. [21] Biophilic is a multi.part word that forms an adjective. The first part of this word is (Bio) and the second part in general is (philic). Since in English, bio is used both as a noun and as a suffix and philic is only used as a suffix and there is no nominative or present case [19], there are only two ways to examine this word:

1. Bio (prefix) + Philic (suffix): In this case, the word consists of only one prefix and one suffix, which from the point of view of linguistics, the word has no main body and is not possible.
2. bio (noun) + phylic (suffix): in this case (bio) is the main body and means life. (phil) adds the concept of liking and loving to the word as a suffix. Then by adding a vocabulary, the word becomes an adjective.

Based on these two cases, the word biophilic can be broken down only in the second case based on the principles of vocabulary construction. In this way, biophilic can be literally defined as to love life. [19]

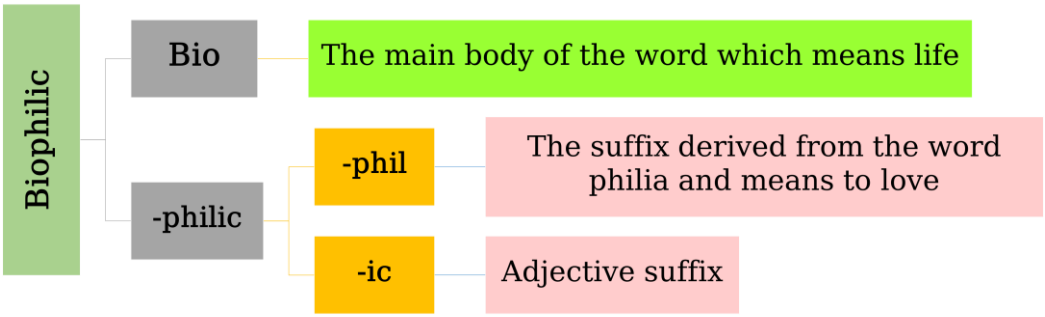



**Diagram 1.** Analysis of the word biophilic and its semantic interpretation [19]

The word biophilic is derived from the word biophilia. The term biophilia means to love life or living systems [22] and was proposed for the first time in 1963 by Eric Fromm in his scientific report entitled "War within Man: A Psychological Research on the Roots of Sabotage" to describe the psychological tendency of loving life and the continuation of life. [23] In psychology, Fromm has used the word biophilus in contrast to the word necrophilus. By using these words, he has classified people into two groups of life.loving and death.loving, respectively, in terms of personality. He also raised the issue that love for life is essential for human mental health. [21]
In 1979, Edward Wilson used the term biophilia for the first time in an article in the New York Times magazine, and in 1984, he introduced the hypothesis of biophilia with the publication of the book Biophilia. He called biophilia "an innate tendency to focus on life and living processes." [24] He says about the inherent appeal of nature: "People flock to parks to experience natural scenery and travel long distances to walk on the seashore for no reason they can put into words." [25]
Since Wilson is interested in learning about the history of human evolution, which took place in the context of multiple ecological interactions with other species of life and natural phenomena, it is possible that the concept of biophilia can be categorized as part of environmental history. [26] Wilson found that humans have inherited psychological.natural dependencies to the natural world, such as aesthetic perception, emotional and spiritual attachment, and all these dependencies have evolutionary and developmental importance. [19] In 1984, Wilson expressed the theory of "psycho.evolutionary restoration", which is the hypothesis of biophilia [9] "the inherent tendency to focus on life and living processes". Biophilia is an innate need because it is not acquired through experience and is emotional because it has the potential to affect human psychology and their emotional health. [27] What Wilson suggests as the innate desire to communicate with nature is that we connect with living beings and this desire starts from

early childhood and flows through our cultural and social patterns. [28]

The idea of biophilia is rooted in the understanding of human evolution in which, over 99% of our history, we have evolved biologically in harmony with nature and not unnatural or man.made forces. [13] The various symbols that have been formed from the fields of biology and psychology and adapted to the fields of neuroscience, architecture and beyond, all return to the desire to communicate with nature and natural systems. [29] In summary, Kellert and Wilson explained the basics of biophilia as follows:

. Biophilia is an innate biological condition.

. Biophilia is one of the elements of human evolutionary heritage.

. Biophilia is related to human competitive advantage and genetic fitness.

. The implementation of biophilia fosters individual meaning and personal satisfaction.

. Biophilia is unconsciously based on personal interest, responsible for human ethics and environmental behaviors. [30]

At this time, the issue of human life and health is discussed, and as a result, by building a building inspired by the intelligent technology of creation in nature as a part of the environment, current tensions can be reduced under the name of biophilic architecture. [31] This architecture places itself at the opposite point of traditional rectangular designs and plans by using curved shapes and surfaces that are reminiscent of the structures of biology and fractal mathematics. One of the tasks that the early pioneers of this movement had in mind was the development of aesthetics and the economic justification of their approach to architecture. [32] Environmental, ethical, social and economic benefits can be achieved in biophilic architecture. In addition to positive aspects of health, biophilic design can be combined with other building functions such as thermal comfort, acoustics, energy and water management. [33] About the interaction framework (physical.natural) in biophilic architecture, it can be said that some forms are created by separating and reducing the size of the original volume, and others are created by connecting one or more forms to the main volume. These frameworks exist in the following forms:

1. Interaction between physical and natural framework in biophilic architectural model.
2. Interaction through the space pressure model.
3. Interaction through edge.to.edge contact.
4. Interaction through face.to.face contact.
5. Interaction through connected levels.

Therefore, the form in biophilic architecture should be innovative so that nature, life and architectural guesses appear in it. At the same time, this form of building must be habitable and energetic to meet the demands, constraints and mutual respect of humans and the environment. [34]

Biophilic design is actually an attempt to bridge the gap between modern architecture and the human need to connect with the natural world. Biophilic design is an innovative approach that emphasizes the importance of preserving, enhancing and restoring the beneficial experience of using nature in the built environment. [35] Professor Kellert considers biophilic design as a new model for green architecture that promises to reconnect humans with nature. [36] Throughout his life, man seeks to simulate the places and equipment necessary for life inspired by nature and the environment. [37] Timothy Beatley believes that ecosystems that provide access to nature help promote other values. [38]

The characteristics of biophilic design were completed and published by Stephen Kellert and Calabarese under the title " The practice of biophilic design " and by examining them, biophilic design can be seen under the title of "big design umbrella" for renewing spaces. [39] Three different models of direct experience of nature, indirect experience of nature, experience of space and place, which represent the main categories of the biophilic design framework, include 24 features of biophilic design. [13] Recent research on the biophilic theory shows how humans communicate with living organisms. The result of this type of communication between humans and biophilic patterns shows the acceleration of the healing process of patients and the reduction of drug consumption. Our innate ability to recognize the unusual things stems from the structure of our nervous system, which has brought us to our current position based on comparative evolution. Some geometric shapes, which are known as unnatural, cause tension and if we communicate with them for a long time, they have a negative effect on the human psyche. [40]

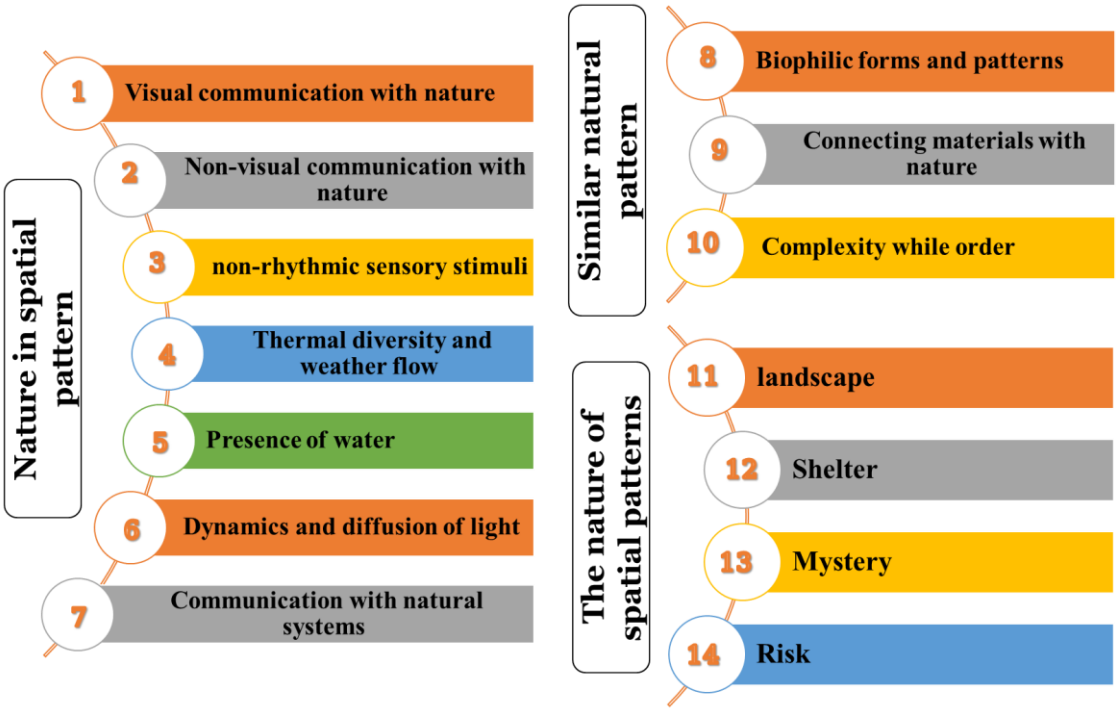



**Diagram 2.** Fourteen biophilic design patterns [41]

Considering the very important role of medical centers in maintaining and restoring the health of the society, which is vital in itself, it is necessary to pay attention to the design of these centers in terms of physical, functional and internal architecture. The mental and physical conditions and needs of the patient, and the fact that he is more at risk than a healthy person, obliges architects to strictly and scientifically observe all the principles and components of architecture. Therefore, visual elements such as moving shapes, light, color, etc., for use in different departments of medical centers, and their effects on the patient's mind and body, as well as the performance of the center's staff, must be scientifically evaluated. [42] To use the effects of nature on humans, different methods can be used, such as walking in nature, looking out through the window, watching movies or landscape photos, and the presence of plants in the space. The presence of plants inside the building is very suitable, especially in the cold seasons of the year when there are no plants outside the building. The calculated placement of plants, fountains, fish ponds, greenhouses, vertical gardens, areas for keeping animals and birds are very effective for distracting patients. [43] According to Gesler, therapeutic environments can be divided into 4 groups: man.made environments, symbolic environments, social environments and natural environments. Environmental psychologists such as Bagley, Balahan, and Rizansten believe that people's experience of the human.made environment affects their needs, feelings, and performance. In similar research, Spencer showed that building design has a direct effect on human behavior. [44] The main idea of the therapeutic community concept is to remove hierarchy and distance between patients and staff in order to increase efficient processes in the treatment process. Natural environments are one of the most important sources of healing throughout history (Greek temples). [45] Among the most important researches in the field of treatment of natural environments is research on the concept of healing environments. According to Kaplan, ecology and nature.friendliness is not an option, but an innate basis for providing peace and balanced and rational behavior for humans. Through the theory of restoring mental focus and inspiring therapeutic environments, he deals with the effect of green spaces and multiple perspectives on humans. Mental rehabilitation means the rehabilitation of mental concentration ability. [46]

## 4. Research method

The current research is descriptive.analytical with qualitative and quantitative approach in terms of practical purpose and method. In this study, in the qualitative part that includes reading books and articles, searching in reliable

databases will be done in order to gather information. Also, interviews with key informants will be conducted through the interview form and completing the information obtained from the interview. In the quantitative part of the study, the data collection tool was a researcher.made questionnaire, which was designed based on the information obtained from the qualitative part of the questionnaire. This questionnaire consisted of 27 items and 11 components. The components of the questionnaire include: visual connection with nature, non.visual connection with nature, arrhythmic irregular sensory stimulus arrhythmic irregular sensory stimulus, thermal variation and air flow, proximity to water, dynamic and diffused light, connection with natural materials, complexity and order, landscape, shelter, and mysterious environment.

In this research, the validity of the questionnaire was confirmed by using the opinions of experts in the field of architecture, and the reliability of the questionnaire was estimated based on Cronbach's alpha coefficient. Cronbach's alpha coefficient for the questionnaire was equal to 0.879, which indicates the high reliability of this questionnaire and the appropriateness of the tool.

**Table 1.**Cronbach's alpha level of the uestionnaire

| Cronbach's Alpha | N of Items |
|---|---|
| 0.879 | 27 |

The statistical population of this research was formed by two groups of people. The first group will be the beneficiaries of the services of designed spaces based on healing; In this regard, the target group is patients, clients, companions and treatment staff in some medical centers. Also, the second group is knowledgeable people in this field, i.e. specialists and professors in the field of architecture and architectural engineers. In this study, in the qualitative part, the research samples were formed by informed people, and the best choice in this part were experts and professors in the field of architecture and architectural engineers. Completion of information was done through targeted sampling with 30 experts and professors in the field of architecture and architect engineers, and an exploratory interview was conducted with them. In the quantitative part of the research, in order to select the sample, a cluster sampling method was used. For this purpose, a medical service center was randomly selected from all the regions and medical centers of Kerman city, and a questionnaire was completed with its clients and treatment staff. Due to the extent and lack of information from clients, the minimum sample size with a variance of 1 and an error of 0.1 was considered to be 384 people which is the sample floor for infinite communities in Cochran's formula. Therefore, 384 patients, clients, companions and treatment staff were selected as samples based on Cochran's sampling formula and in a simple random manner.

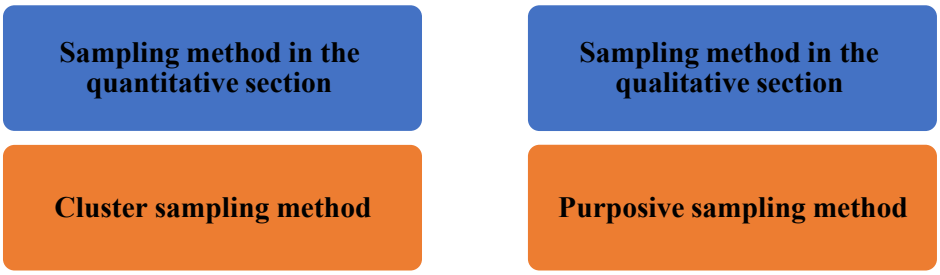


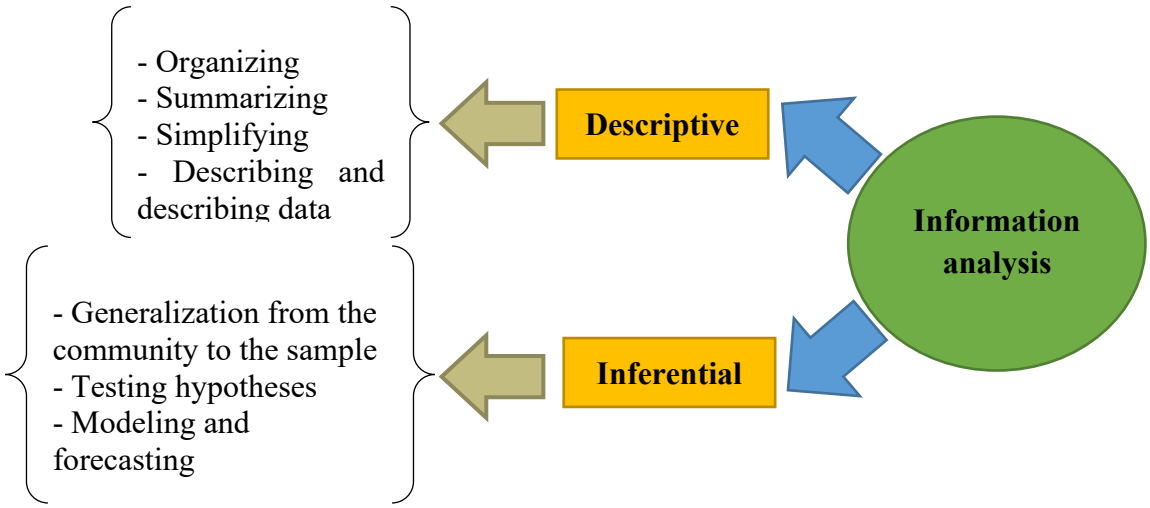

**Diagram 3.** Sampling method used in the research

treatment staff and patients' companions, and Friedman's test was used to prioritize the influence of biophilic design components on the quality of space in healing. Also, in order to summarize and draw the pattern, Edraw Max software was used.

In order to perform statistical operations, SPSS 24 and NCSS softwares were used to test hypotheses. In order to influence the components of biophilic design on the quality of space in healing, statistical T tests were used. Anova test was used to compare patients,

**Diagram 4.** Information analysis

## 5. Analysis and findings




### 5.1.Respondents' specifications

### 5.1.1. Gender of the respondents

**Table 2.** Frequency distribution of the respondents according to the gender of the respondents

| Valid percentage | Frequency | Option |
|---|---|---|
| 00/50 | 192 | Female |
| 00/50 | 192 | Man |
| 0/100 | 384 | Total |

Among the respondents, 50% were women and 50% were men. The questionnaire was completed equally from the respondents.

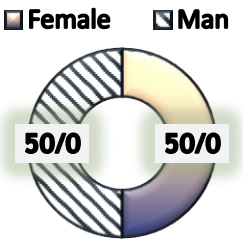



**Diagram 5.**Frequency distribution of respondents according to respondents' gender

**Table 3.** Frequency distribution of the respondents according to the age of the respondents

| Age average | Valid percentage | Frequency | Option |
|---|---|---|---|
| 44 years | 12/5 | 48 | 20.30 years |
| | 27/3 | 105 | 31.40 years |
| | 28/6 | 110 | 41.50 years |
| | 31/5 | 121 | More than 50 years |
| | 100/0 | 384 | Total |

### 5.1.2. The age of the respondents

Most of the respondents (31.50%) were over 50 years old. 28.6% were in the age range of 41.50 years. The youngest person was 21 and the oldest respondent was 78 years old. The average age of the respondents was 44 years.

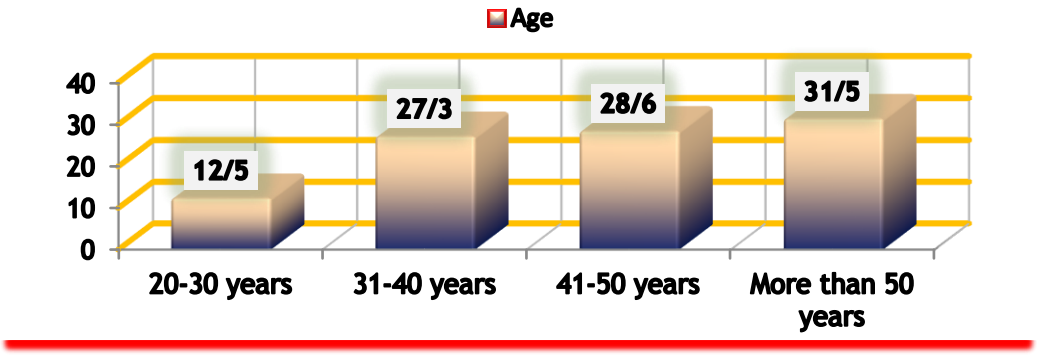



**Diagram 6.** Frequency distribution of the respondents according to the age of the respondents

### 5.1.3. Respondents' education

**Table 4.** Frequency distribution of respondents according to respondents' education

| Valid percentage | Frequency | option |
|---|---|---|
| 7.3 | 28 | Less than a diploma |
| 21.4 | 82 | diploma |
| 12.0 | 46 | Associate degree |
| 39.3 | 151 | bachelor's degree |
| 20.1 | 77 | Masters and above |
| 100.0 | 384 | Total |

Among the respondents, 39.3% (151 people) had a bachelor's degree and 21.4% had a diploma.

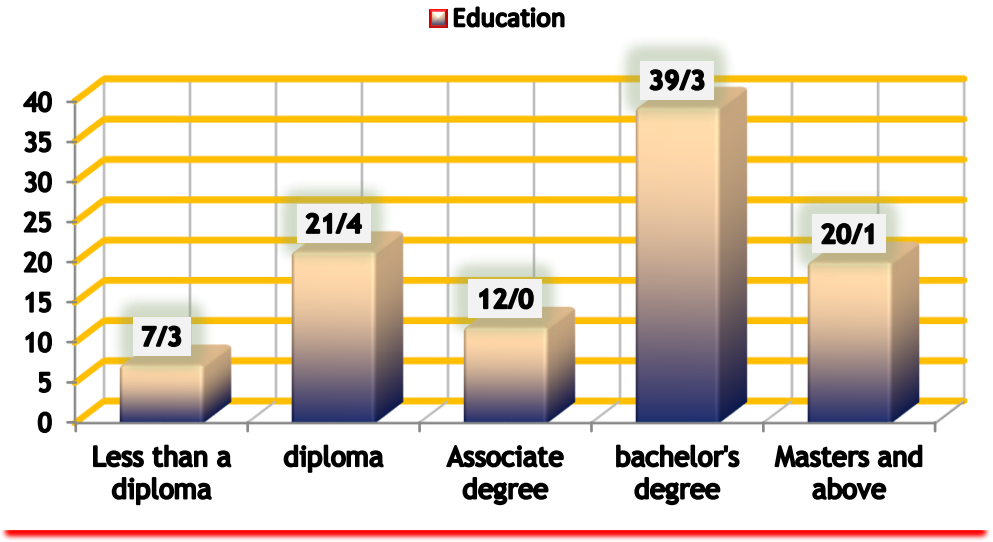



**Diagram 7.**Frequency distribution of respondents according to respondents' education

### 5.1.4. Type of respondents

**Table 5.** Frequency distribution of respondents according to the type of respondents

| Valid percentage | Frequency | option |
|---|---|---|
| 33.3 | 128 | Patient |
| 33.3 | 128 | companion |
| 33.3 | 128 | Treatment staff |
| 100.0 | 384 | Total |

The respondents of this research consisted of patients, patient companions and treatment staff. Due to better comparison in statistical tests and obtaining more accurate results, questionnaires were completed equally from each group of respondents. 33.3% (128 people) of the sample size were separated by patients, patient's companions and treatment staff.

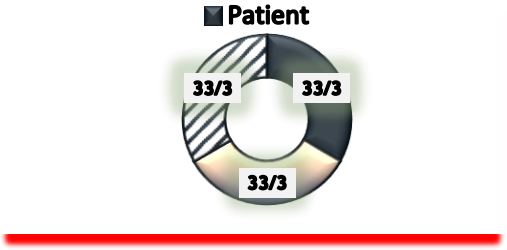



**Diagram 8.** Frequency distribution of respondents according to the type of respondents

### 5.2. Comparison of average biophilic architecture indicators in medical centers, between treatment staff, patients and companions

According to the results of the Anova test and the comparison of the treatment groups, it can be said that the opinions of the treatment staff and patients and their companions regarding the effect of biophilic architecture components in the design of treatment centers are close to each other and according to the significance level of each component, which is less than 0.05, there is no significant difference between the averages of each component. The only component that shows different opinions of the respondents is related to the "non.visual connection with nature" component, which according to the treatment staff group, compared to other groups, this component has a greater impact on improving the quality of spaces in improving the health of patients

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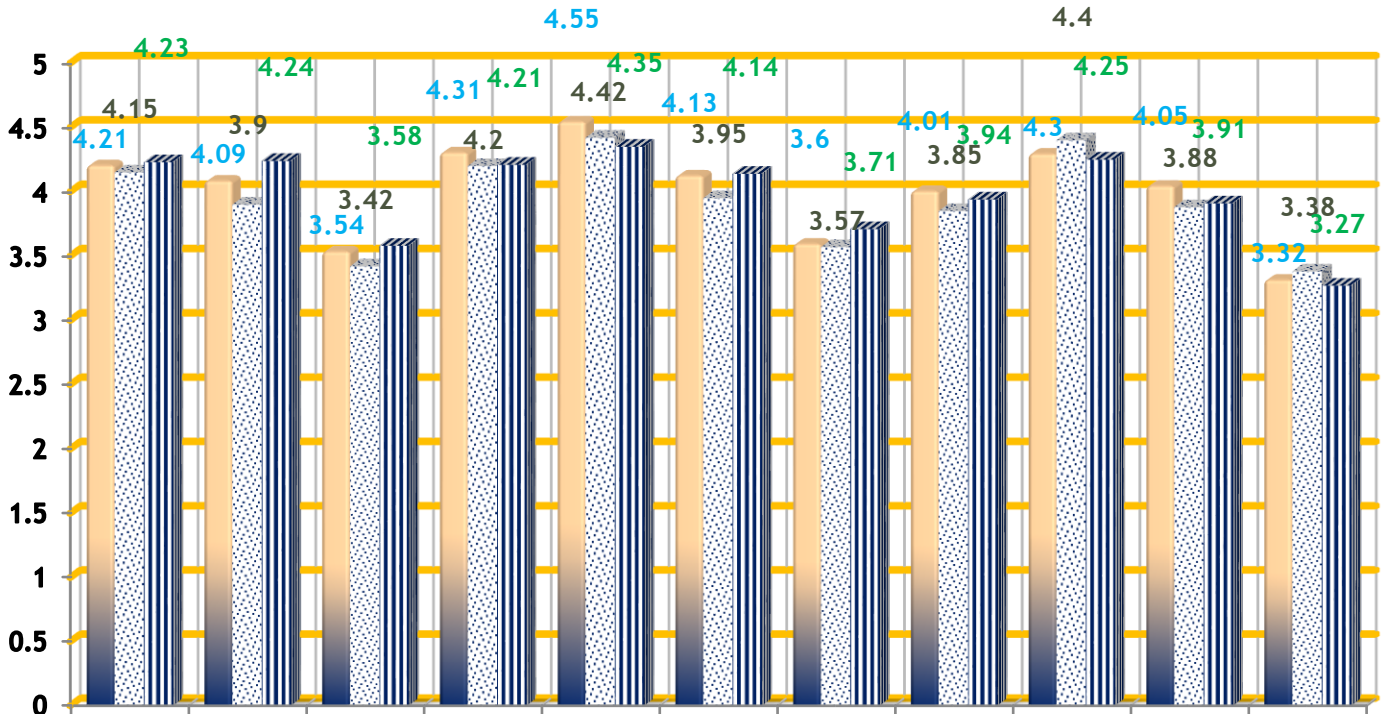
**Table 6.** Comparison of average biophilic architecture indicators in medical centers, between medical staff, patients and companions

| Significance level | F statistic | Average | groups | Index |
|---|---|---|---|---|
| 0.646 | 0.438 | 4.21 | patients | Visual communication with nature |
| | | 4.15 | Companions of the patient | |
| | | 4.23 | Treatment staff | |
| 0.000 | 7.959 | 4.09 | patients | Non.visual communication with nature |
| | | 3.90 | Companions of the patient | |
| | | 4.24 | Treatment staff | |
| 0.394 | 0.933 | 3.54 | patients | Irregular arhythmic sensory stimulation |
| | | 3.42 | Companions of the patient | |
| | | 3.58 | Treatment staff | |
| 0.340 | 1.081 | 4.31 | patients | Thermal diversity and air flow |
| | | 4.20 | Companions of the patient | |
| | | 4.21 | Treatment staff | |
| 0.070 | 2.684 | 4.55 | patients | Proximity to water |
| | | 4.42 | Companions of the patient | |
| | | 4.35 | Treatment staff | |
| 0.191 | 1.661 | 4.13 | patients | Dynamic and diffused light |
| | | 3.95 | Companions of the patient | |
| | | 4.14 | Treatment staff | |
| | 0.787 | 3.60 | patients | |

| Significance level | F statistic | Average | groups | Index |
|---|---|---|---|---|
| 0.456 | | 3.75 | Companions of the patient | Connection with natural materials |
| | | 3.71 | Treatment staff | |
| | | 4.01 | patients | |
| 0.238 | 1.443 | 3.85 | Companions of the patient | Complexity and order |
| | | 3.94 | Treatment staff | |
| | | 4.30 | patients | |
| 0.202 | 1.608 | 4.40 | Companions of the patient | landscape |
| | | 4.25 | Treatment staff | |
| | | 4.05 | patients | |
| 0.213 | 1.551 | 3.88 | Companions of the patient | shelter |
| | | 3.91 | Treatment staff | |
| | | 3.32 | patients | Mysterious environment |
| 0.783 | 0.244 | 3.38 | Companions of the patient | |
| | | 3.27 | Treatment staff | |




| | Visual communication with nature | Non-visual communication with nature | Irregular arhythmic sensory stimulation | Thermal diversity and air flow | Proximity to water | Dynamic and diffused light | Connection with natural materials | Complexity and order | landscape | shelter | Mysterious environment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| patients | 4.21 | 4.09 | 3.54 | 4.31 | 4.55 | 4.13 | 3.6 | 4.01 | 4.3 | 4.05 | 3.32 |
| Companions of the patient | 4.15 | 3.9 | 3.42 | 4.2 | 4.42 | 3.95 | 3.57 | 3.85 | 4.4 | 3.88 | 3.38 |
| Treatment staff | 4.23 | 4.24 | 3.58 | 4.21 | 4.35 | 4.14 | 3.71 | 3.94 | 4.25 | 3.91 | 3.27 |

**Diagram 9.** Comparison of average biophilic architecture indicators to improve the quality of treatment spaces, between patients, patients' companions and treatment staff

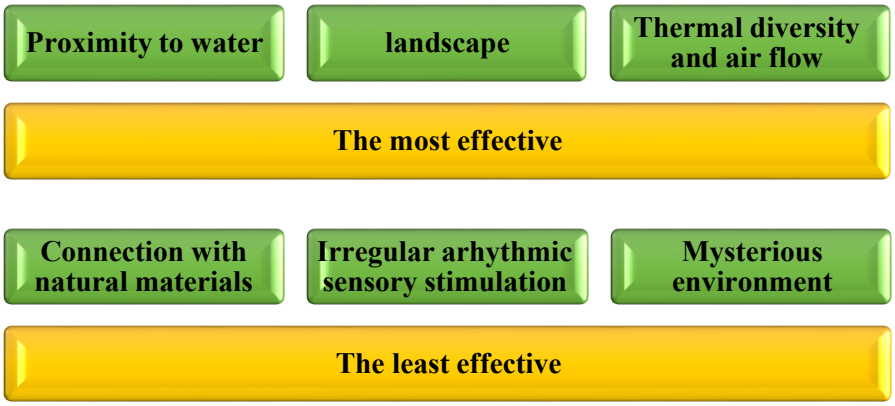



**Diagram 10.** The most effective and least effective features of biophilic architecture in the design of therapeutic spaces

## 6. Discussion and conclusion

Undoubtedly, the quality of the treatment environment affects the treatment. Types of treatment environments include: hospitals, clinics, health centers, emergency rooms, doctors' offices, specialized and psychotherapy clinics. As the design of these spaces is very important in terms of functionality, in terms of spatial quality, psychological dimensions and physical impact on the treatment and recovery process are always studied by researchers. The experience of nature by humans, in the form of walking in nature, looking at nature from the window and even watching pictures of nature, affect human feelings and perception. A research published in 2015 indicates that experiencing nature on the one hand reduces anxiety, mental conflict, negative emotions and increases positive emotions and on the other hand, it improves complex cognitive functions, such as verbal memory function, problem solving ability, and reading comprehension process. One of the main goals of biophilic architecture is to return man to nature. This architecture tries to eliminate the conflict between man and nature. Not only biophilic architecture aims to physically and outwardly connect man to nature, but one of the big goals of biophilic architecture is to connect man to nature mentally and psychologically as well. It is actually designed and built, considering the nature in mind. In fact, biophilic architecture is the recognition of the inherent needs of humans to establish a relationship with nature along with sustainability and global design strategies to make environments that are truly able to increase the quality of human life and create an environment that meets the physiological and psychological needs of humans.

The results of the research indicated that the most important components of biophilic architecture to improve the quality of therapeutic spaces are proximity to water, landscape, thermal diversity and air flow, visual connection with nature, and dynamic and diffused light.

According to the results, "proximity to water" was the component with the greatest impact on improving the quality of spaces in the improvement of patients. The average of this component between 1 and 5 was obtained as 4.4. Water has played an important role in the formation of different habitats. The place of water in human life is somewhat artistic and is something more than building construction. Water, having an unchanging nature and existing in any field, reflects the perception of designers and builders about nature and its elements. Before the advent of Islam, architecture presented itself next to it and in the lap of nature, in such a way that its role was more celibate and lonelier. For example, most temples, fire temples and places of worship were formed by the water. Water has a spiritual role in architecture to a great extent, which maintains its position well. Water is manifested in many ways in architecture, in different scales and forms, from small scale to urban scale. This may be artificial or natural water surfaces that may also convey architectural purposes. This may be artificial or natural water surfaces that may also convey architectural purposes. In the built environment, water can perform various functions, whether it is agricultural, commercial, military, medical, engineering,

decorative, spiritual, or even as an energy source. In the ranking of the components, " landscape " was ranked second, and the average of this component is 3.4 between 1 and 5, which shows the high effectiveness of this component in improving the quality of spaces in healing. After landscape, the component of "thermal diversity and air flow" was identified as the third most effective factor in improving the quality of spaces in healing, with an average of 4.2 in the range of 1 to 5. In line with the importance of landscape as well as thermal diversity and air flow, it can be said that architecture does not end within walls and structures; Architecture is an art that starts from the sky, originates from nature, and is the external expression of the architect's feelings and the influence of the environment on his imagination. Architecture is defined as the art of shaping space. From the distant past, the construction of buildings was influenced by the environment in which they were built. The wooden structures in the forests, stone buildings in the mountains, adobe houses in the heart of the desert all indicate that architecture is a technique and art that the environment has a significant influence on its formation. This coordination of structures with their surrounding environment shows a special style in architecture called climate architecture. In climate architecture, the issue of weather and its effect on buildings is considered. Whatever the weather conditions are, they will have their effects on the structures. Buildings can be very vulnerable in different weather conditions. Therefore, thermal diversity and air flow are very important in the field of architecture, and according to the findings, this affectability, effects the promotion of treatment and healing. In the ranking of the components, "Visual connection with nature" has taken the fourth place in improving the quality of spaces and promotion the health of patients. The average of this component between 1 and 5 was obtained as 4.2. In the explanation of this variable, it can be said: After creation, man was placed in an environment so that all his material and spiritual needs are fulfilled. Meanwhile, in addition to water and food, nature brought peace to humans. Green nature has a great effect on human relaxation due to being free from any sound pollution and having soft colors and rhythmic sounds (sound of water). Perhaps this feature is the first reason for people to escape from polluted urban environment to nature. Unfortunately, in today's societies, the most important human needs have given way to secondary needs and less attention is paid to them. One of the most important needs of humans is peace, and one of the important factors to achieve it is to standardize the environment in which humans live. The standard word finds its own meaning in any time and place. Today, the population density and increasing apartment living have deprived people of access to nature, especially the use of materials with textures and colors that are more industrial, unfortunately, the use of these materials (aluminum facade) has become very common in our country. Bringing nature to buildings, especially medical buildings, can be effective in maintaining the peace of the environment. A warm and attractive environment makes the soul fresh and the behavior sincere, on the contrary, if the environment is arid, it makes the soul and behavior cold and devoid of life. It cannot be denied that buildings are a part of the environment and even in urban spaces they cover most of it. Therefore, this special component should be carefully considered. In the ranking of components, "dynamic and diffused light" was ranked fifth. Natural lighting plays a very important role in our life and especially in architecture. In urban design or in the design of a closed environment, we need lighting, because when light shines on an object, it makes that space and object visible and beautiful, otherwise beauty has no meaning in a dark environment. Light becomes meaningful when it is placed next to materials, objects, colors and textures. From the past to the present, sunlight is of particular importance. Among the biophilic components, the least effective are "connection with natural materials" with an average of 3.6 in the range of 1 to 5, " arrhythmic irregular sensory stimulus " with an average of 3.5 in the range of 1 to 5 and "mysterious environment" with an average of 3.3 in the range of 1 to 5. Therefore, it can be concluded that these three components are not the priority for the improvement of therapeutic environments and healing spaces due to their effectiveness, and there is no need to focus on them. It is better to put energy, cost and time on the components that have a higher position in the ranking.

All the effective indicators of biophilic architecture on improving the quality of treatment spaces were tested and compared between patients, patients' companions and treatment staff. The results indicated that in terms of perspective, these three groups are close to each other and all three of these groups considered the components of " proximity to water" and " landscape " to have the greatest impact on improving the quality of spaces and healing and three components, "mysterious environment", " arrhythmic irregular sensory stimulus " and "connection with natural materials" were considered the least effective.

## 7. Suggestions

• Since the most important effective factor in promotion the health of the patients is proximity to water, it is suggested to use fountains, aquariums and, if possible, swimming pools inside the premises in medical centers and hospitals.

• The analytical results of this research show that the presence of nature in the man.made environment has a greater effect, and it indicates a positive relationship between the patient and nature, due to which the biological qualities of the treatment environment and the compliance of the patient's health indicators are promoted. Therefore, in designing a biophilic treatment environment, it should be prioritized.

• In order to have a suitable landscape, it is suggested to design semi.open spaces in treatment centers and hospitals (especially for patients who have a long hospitalization and treatment). Also, the use of windows with a wide view is helpful in this regard.

• Since the component of "thermal diversity and air flow" was one of the most important factors affecting the improvement of the quality of spaces in healing, it is suggested to pay attention to the air conditioning of medical centers and for proper air conditioning, use the balcony and window or suitable ventilators and fans.

## 8. Research limitations

• One of the problems of the research was completing and collecting information from three groups of respondents including: patients, patients' companions and treatment staff. Because of the dispersion of these three groups, the impatience of some patients due to the disease, the busyness of the patients' companions as well as the treatment staff, time was hardly available to fill the questionnaire.

• Searching for people to cooperate in completing the questionnaire was another limitation of the research.

## Reference:


1. Mousavi, S.M, Mirzaei, R, Heydari, A, Asaadi, S.N, 1400, measuring the effectiveness of biophilic design components on improving the health indicators of patients in medical environments (case study: city of Mashhad), Health and Treatment Management Quarterly, 12(40), 45.55
2. Ghafouri, A, 2009, comparing the sense of space in FinKashan garden with Khodja Abdi Darun Shrine in Samarqand, Manzar magazine, 2(6), 78.79
3. Kalantari, Z, 2016, investigating the impact of using biophilic architecture principles on human existential dimensions in the design of buildings (case study: Farahabad, Sari city), the 4th international conference on modern researches in civil engineering, architecture and urban planning, Barcelona
4. Abkar, A, Zamani, S, 2013, investigating the effect of color and light on the interior design of therapeutic spaces from the perspective of the healing quality of the environment, the third national conference of interior architecture and decoration, Isfahan
5. Hashmin, A, Kazemi, A, Bamanian, M, 2018, Investigation of the effect of the healing garden on the mental health of patients with an emphasis on reducing anxiety, Environmental Science and Technology Quarterly, 21(12), 263.276
6. Yin, J., Zhu, S., MacNaughton, P., Allen, J. G., & Spengler, J. D. (2018). Physiological and cognitive performance of exposure to biophilic indoor environment. Building and Environment, 132, 255.262.
7. Ma, X., Shao, N., & Yin, Y. (2022). Embodiment and Technical Application of Biophilia in Private Space. Highlights in Science, Engineering and Technology, 10, 209.214.
8. Zhong, W., Schröder, T., & Bekkering, J. (2022). Biophilic design in architecture and its contributions to health, well.being, and sustainability: A critical review. Frontiers of Architectural Research, 11(1), 114.141.

9. Williams, F. (2022). The nature fix: Why nature makes us happier, healthier, and more creative. WW Norton & Company.
10. Sanchez, J. A., Ikaga, T., & Sanchez, S. V. (2018). Quantitative improvement in workplace performance through biophilic design: A pilot experiment case study. Energy and Buildings, 177, 316.328.
11. Kellert, S. R. (2018). Nature by design: The practice of biophilic design. yale university press.
12. Pouya, S. (2017). Healing Gardens in The Megacities; an Example Of Tehran. Journal of urban academy, 10, 139.156.
13. Kellert, S. R., & Calabrese, E. F. (2015). The Practice of Biophilic Design. [online] biophilic.design. 1.25.
14. Hasani Darband, S, Valipour, A, Sharif Khaje Pasha, S, 2022, reducing the stress of patients in medical centers with the effective components of biophilic architecture, the second international conference of Iranian students of architecture and urban planning, Tehran
15. Naqhabi, M, Hashempour, P, Asefi, M, 2019, Explaining the function of patterns derived from nature in architecture in responding to human needs in the traditional and contemporary periods, Islamic Architecture Research Quarterly, 8(2), 113.129
16. Mahmoud Nazari Takyeh, N, Esfandiari Fard, E, 2018, Coexistence of man and natural environment, analytical approach to biophilic architecture in residential complexes, 8th International Conference on Civil Engineering, Architecture and Urban Economy Development, Shiraz
17. Pirmahmoudi, F, Miraj Firouzi, R, 2016, principles of biophilic architecture with environmental psychology approach, National Conference on Civil Engineering, Architecture and Sustainable Urban Development, Tehran
18. Nouhi Bezenjani, M, Nikpour, M, 2020, Recognizing the impact of biophilic architectural principles on people's sense of satisfaction, National Conference on Architecture, Civil Engineering, Urban Planning and Horizons of Islamic Art in the Declaration of the Second Step of the Revolution, Tabriz
19. Zare, Gh, 2019, Ecophilic architecture: a new approach to biophilic design in architecture (compilation and application of ecophilic design components in the process of architectural design), PhD dissertation in architecture, Islamic Azad University, Khorasgan branch, Faculty of Architecture and Urban Planning
20. Shahcheraghi, A, Bandarabad, A, 2019, Surrounded by the environment: Application of environmental psychology in architecture and urban development, Tehran, Academic Jihad Organization, 4th edition
21. Zare, Gh, Feizi, M, Baharand, M, Masnavi, M.R, 2020, Explanation of biophilic design strategies effective on the health of patients hospitalized in hospitals, Journal of Iranian Architecture and Urbanism, 12(1), 78.59
22. Bitaraf, E, Habib, F, Zabihi, H, 2017, Localization of ecological and biophilic architectural principles in the design of residential complexes in Iran to improve their quality, Urban Management Journal, 17(52), 205.218
23. Fromm, E. (1963). War Within Man: A Psychological Enquiry Into The Roots of Destructiveness. A Study and Commentary in the Beyond Deterrence Series. National Peace Literature Service (AFSC). Philadelphia. Pennsylvania.
24. Wilson, E. O. (1984). The human bond with other species. Cambridge, MA, USA: Harvard.
25. Simaika, J. P., & Samways, M. J. (2010). Biophilia as a universal ethic for conserving biodiversity. Conservation Biology, 24(3), 903.906.
26. Krčmářová, J. (2009). EO Wilson's concept of biophilia and the environmental movement in the USA. Klaudyán: Internet J Histor Geogr Environ History, 6(1/2), 4.17.
27. Totaforti, S. (2018). Applying the benefits of biophilic theory to hospital design. City, Territory and Architecture, 5, 1.9.
28. Kellert SR, Wilson EO. )1993(. The Biophilia Hypothesis. Soule M.E. Chapter 15.Biophilia: Unanswered Questions. 1st edn, Washington, DC 20009: Island Press, 441.454.
29. Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). Biophilic design patterns: emerging nature.based parameters for health and well.being in the built environment. ArchNet.IJAR: International Journal of Architectural Research, 8(2), 62.76
30. Harris, J. (2012). Fractal architecture: organic design philosophy in theory and practice. UNM Press.
31. Khodavrdi.Jafari, N, Yousefi, A, 2016, Biophilic architecture and sustainable development, Tehran, Simaye Danesh, first edition.
32. Monfared, M, 2019, the application of biophilic architectural climate characteristics in the design of a high.rise residential complex with an emphasis on improving the quality of the living environment (a case study of Mashhad), Master of Architecture thesis, Salman Institute of Higher Education, Faculty of Arts and Architecture
33. Nouhi Bezenjani, M, Ghasemi, M, 2021, design principles of biophilic architecture in a

specialized cardiovascular hospital from the perspective of the quality of patients' health, Journal of Urban Design Studies and Urban Research, 5(1), 27.39

34. Mohammadkhani, S, 2012, Biophilic Architecture Theory, International Conference on Civil Engineering, Architecture and Sustainable Urban Development, Tabriz
35. Ghorbani Param, M.R, Bavar, S, Mahmoudinejad, H, 2019, Evaluation of the impact of biophilic architectural principles on the quality of housing design in the northern region of Iran (case study: Gorgan city), journal of new attitudes in human geography, 12(2), 405.424
36. Bitaraf, E, Habib, F, Zabihi, H, 2016, biophilic attitude, an approach to improving the quality of the living environment of residents of residential complexes, Urban Management, 16 (49), 331.349
37. Golparvar fard, N, 2017, Man, Nature, Architecture, Tehran, Tahan, 11th edition
38. Pourahmad, A, Kechoi, N, 2019, the place of nature in city sustainability, based on the approach of planning and designing biophilic cities, with a look at Torghabeh city, Green Architecture Quarterly, 6 (1), 1.18
39. Movahed, Kh, Azimaei, H, Azimaei, H, 2020, Analyzing the relationship between biophilic architecture and spiritual well.being among office workers (case example: Shiraz City Offices), Journal of Architecture, 3(1), 1.8
40. Sabzipour, H, Shabani, Sh, 2020, Bionic architecture and the way to get inspiration from nature, the fourth national conference of new technologies in architectural, civil and urban engineering of Iran, Tehran
41. Nazeemi, E, Ghasemi, E, 2016, explaining the strategies for promoting the compatible interaction between architectural buildings and nature with the approach of biophilic architecture, biannual society and contemporary architecture conference, Isfahan
42. Amirshahbandeh, S, Tazikeh Lemski, I, 2016, Designing healing gardens and its effect on therapeutic environments, the third annual international conference on civil engineering, architecture and urban planning, Shiraz
43. Montazer Al Zohour, A, Shahedi, B, 2014, Healing Gardens in Hospitals to Achieve Peace and Rehabilitation of Veterans and Disabled, International Conference on Civil Engineering, Architecture and Urban Infrastructure, Tabriz
44. Gharipour, M, 2003, Healing gardens: investigating the relationship between healing and the natural environment, Environmental Sciences Quarterly, 1(4), 35.48
45. Kreitzer, M., & Zborowsky Larson, J. (2010). What Impact Does the Environment Have on Us? Available onhttp. takingcharge. csh. umn. edu/explore.healing.practices/healing.environment/what.impact.does.environmenthave.us.
46. Metlabi, Gh, Vojdanzadeh, L, 2014, the effect of the physical environment of therapeutic spaces on reducing the stress of patients (case *study: dental office), Quarterly of Fine Arts: Architecture and Urban Development, 2, 35.46*