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Sustainable Design for Healing: Structural and Psychotherapeutic Principles in the Architectural Design of Modern Clinics

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Abstract

Modern healthcare clinics are places that significantly impact the mental and emotional states of patients during their treatment process. Poor design of these spaces, without considering the needs of patients and their companions, can increase anxiety and fear, which, if not properly managed, can jeopardize the health of patients and even exacerbate their conditions. This research, focusing on sustainable architecture, explores the structural aspects of healthcare clinics and their psychological and social impacts. The goal is to provide strategies for designing clinics that, in addition to meeting basic needs, align with the psychological and social characteristics of patients. Attention to factors such as lighting, form, color, ventilation, and visual appeal in these clinics can improve the treatment environment and enhance the feeling of tranquility. This paper adopts an innovative approach by examining the relationship between environmental psychology and architectural creativity in the design of modern clinics. The research is qualitative, with data collected through literature reviews, surveys, and interviews. The findings indicate that architectural design that addresses the psychological and social needs of patients can contribute to improved treatment outcomes and enhance their mental and social well-being.

Keywords: Sustainable design, therapeutic principles, improvement, modern clinics, Structure, social impacts

1- Introduction

With the advancement of technology and the rapid changes in human lifestyles, the need for up-to-date and efficient healthcare services has become more pronounced. The design of modern clinics should not only address the medical needs of patients but also provide a peaceful and appropriate space for delivering medical services. These clinics, by considering sustainable design principles, utilizing innovative technologies, and creating an efficient environment, can contribute to improving the quality of services and patient satisfaction. In this context, the design should pay special attention to various aspects, including treatment spaces, examination rooms, waiting areas, and auxiliary facilities. Additionally, the use of colors, proper lighting, and natural elements can positively impact the mood of both patients and medical staff. Patient-centered care and respecting patient rights are fundamental principles in the design and management of modern clinics. This approach involves placing the needs and desires of patients at the heart of healthcare services. Adhering to this principle in modern clinics not only increases patient satisfaction but also improves the quality of healthcare services. By creating an environment where patients feel comforted, respected, and supported, better health outcomes can be achieved. This paper, by examining the psychological and social impacts of modern clinics, analyzes the structural and design aspects of these clinics and offers solutions based on the integration of sustainable architecture and the psychological needs of patients. The aim of this research is to enhance the psychological and social well-being of patients and improve the quality of treatment spaces by providing architectural design solutions for modern clinics. The fundamental belief underpinning this study is that creative design solutions, focusing on factors such as light, form, color, ventilation, and visual appeal in the design of modern clinics, directly influence the improvement of patient care quality and can serve as a model for the design of future modern clinics.

2- Research Background

In the context of the present study, similar research has been conducted, one of which is *the design of a specialized therapeutic clinic with an environmental psychology approach to reduce stress*. This paper introduces trauma-informed design, which integrates aspects of interior design, environmental psychology, and clinical psychology. The aim of this approach is to create spaces that are sensitive to the needs of individuals who have experienced trauma. In this study, space design is prioritized based on the "patient-centered" approach, which incorporates humanizing principles and emphasizes a connection with nature. These

elements create a supportive environment for medical treatment, reflecting the evolution of modern clinic architecture in the ongoing transformation of China's medical system. (Malekzadeh, Fariba, and Setarzadeh, Dariush, (2022), Fifth National Conference on New Technologies in Architecture, Civil Engineering, and Urban Planning, Iran). In another study titled *Fundamental Changes in the Design of Healthcare and Medical Centers*, the author explores the major changes in the design of healthcare facilities, with the primary goal of analyzing developments in the design of modern clinics, particularly focusing on optimizing spaces and improving their functionality. The paper also addresses various aspects such as humanizing treatment spaces, facilitating communication between different departments, ensuring accessibility standards for individuals with disabilities, and utilizing energy-efficient systems. Additionally, there is a special emphasis on updating hygiene requirements, engineering equipment, and safety measures to enhance the quality of the patient and staff experience in these centers. Overall, the goal of the paper is to introduce modern approaches in the design and construction of healthcare centers to improve service quality and meet the diverse needs of users. (Zhen Li, October 21, 2016, *Fundamental Changes in the Design of Medical and Healthcare Centers*).In another study titled *How to Build a Modern Medical Center in the Current Context?*, it is mentioned that modern clinics are multidisciplinary medical centers that integrate advanced engineering and biotechnical facilities. The complexity of these centers varies based on biomedical profiles, functionality, scalability, and upgradeability. This requires precise planning and implementation to avoid misconceptions and common mistakes in constructing such centers (Pavel O. Romyantsev, December 19, 2022 - Digital Diagnosis, Improving Communication Between Doctors and Patients in Medical Clinics Using ModernCommunications).

Therefore, it can be argued that, despite numerous studies on sustainable architecture and the design of modern clinics, this paper is the first to analyze the structural and psychological-social impacts in the design of modern clinics. Its aim is to provide innovative and creative solutions for designing these spaces in order to improve service quality in clinics and enhance the patient experience.

Methodology

This paper employs a data collection method based on library research, using previous studies on sustainable architecture and psychological science in the design of modern clinics for patients. Additionally, semi-structured interviews with experts and professionals active in the field of modern clinic design were conducted to gather their experiences and perspectives on this topic.

Research Implementation Steps:

1. **Library Data Collection:** This step involved reviewing available documents, journals, and specialized articles, as well as browsing websites to complete the theoretical framework of the research. It focused on examining the theoretical foundations and empirical background in the areas of sustainable architecture and the psychological impacts of treatment clinics on patients.
2. **Formulation of Hypotheses:** Based on the information gathered from library research and the empirical background, hypotheses were formulated regarding the psychological and structural impacts of modern clinics on patients.
3. **Conducting Semi-Structured Interviews:** Interviews were conducted with relevant experts and specialists, and qualitative data were collected based on the theoretical framework of the research to obtain deeper insights into sustainable architecture and the design of modern clinics.

4 .**Data Analysis:** The analysis of the findings was conducted using a deductive approach to examine the hypotheses and draw conclusions from the research results.

5 .**Providing Recommendations:** Based on the findings, suggestions have been made to improve the design of modern clinics for patients. These recommendations aim to enhance treatment quality, support the selection of the most suitable structure, and contribute to the psychological well-being of patients.

3- Discussion

Sustainable architecture, as an innovative approach in the design and construction of buildings, aims to create spaces that not only meet human needs but also minimize their environmental and economic impacts. This type of architecture emphasizes principles such as energy efficiency, optimal use of natural resources, and the reduction of pollutant emissions. Sustainable architecture goes beyond simply using eco-friendly materials; it also incorporates concepts such as designing flexible spaces, utilizing renewable resources, reducing energy consumption, and managing water and soil resources efficiently. One of the main objectives of sustainable architecture is to preserve and enhance environmental quality. This means that building designs should be carried out in a way that causes minimal harm to nature and contributes to the sustainability of natural ecosystems. Additionally, sustainable architecture seeks to create high-quality, livable spaces that provide comfort, health, and well-being for their inhabitants. It aims to strike a balance between human needs, the environment, and the economy, ensuring that the design and construction of buildings are not only environmentally friendly but also economically viable and cost-effective. Other goals of sustainable architecture include reducing energy consumption, minimizing the negative effects of climate change, creating green spaces, and improving indoor air quality. These principles are especially important in the design of healthcare and medical centers, as these facilities must be designed to provide not only a healthy and hygienic environment for patients but also to reduce environmental impact by optimizing resource use. In general, sustainable architecture seeks to enhance the quality of human life and protect the Earth by offering innovative solutions in building design. In this regard, it has positive impacts on society, the environment, and the economy. This paper utilizes the concepts of sustainable architecture and design, with consideration of psychological and psychotherapeutic factors, to propose solutions for the sustainable design of modern clinics. The main goal is to create spaces that are not only environmentally sustainable but also have a positive psychological and emotional impact on patients. In this context, the research first examines the significant

differences between domestic and international examples of modern clinics.

International Examples Studied:

1. Green Clinic in Hamburg, Germany
2. Sustainable Health Clinic in Sydney, Australia

These clinics were designed and implemented with a clear and predefined goal of promoting the social and psychological well-being of patients. They feature standard and appropriate spaces for psychotherapy and personal improvement. These designs not only focus on energy efficiency and environmental compatibility but also address the psychological needs of residents, providing an environment that enhances the quality of treatment and psychological well-being for patients. The interior and exterior spaces of these clinics specifically focus on creating a green and calming environment for both patients and staff. The indoor green spaces and landscaped courtyards not only help reduce air pollution and improve air quality, but they are also designed to enhance the psychological well-being of individuals. In contrast, the domestic examples studied include:

1. The Health Treatment Clinic in Isfahan,
2. The Arya Medical Center in Tehran.

In these centers, psychological considerations are still in the early stages, and their primary focus is more on addressing physical and bodily needs, with less attention given to the psychological aspects and the overall quality of patient care. This approach highlights the need for a revision in the design of modern clinics in Iran, so that the psychological and social aspects of patient treatment are more seriously addressed, thereby improving the overall quality of recovery in these centers. Therefore, based on the analyses conducted, it is recommended that the design of modern clinics in Iran be inspired by successful international examples. This approach could contribute to enhancing the quality of domestic treatment clinics and improving treatment outcomes, particularly in cases where psychological support is needed. Based on the comparisons made, it is clear that a successful design must not only address the physical and comfort needs of patients but also have a positive psychological impact on them. Therefore, the importance of considering psychological principles in the design of modern clinics seems essential. In this regard, five key factors should be taken into account: color, light, water, ventilation, form, and visual appeal.

1- Color in Architecture: Colors not only have aesthetic qualities but also have profound effects on the psychological, physiological, and emotional states of patients. The sustainable design of modern clinics should make effective use of colors to not only create a beautiful and pleasant environment but also promote the psychological well-being and relaxation of patients.

• **Calming Colors:** Studies have shown that cool colors such as blue, green, and purple can have positive effects in reducing anxiety and stress among patients. These colors stimulate a sense of calm and help alleviate psychological tension, which in turn reduces symptoms of depression and anxiety. **Blue:** The color blue, especially in rest and sleep areas, helps reduce stress and promotes mental calmness. **Green:** Green can help improve a sense of connection to nature and foster feelings of security and relaxation in patients. It is also associated with improved focus and stress reduction. **Purple:** Traditionally, purple is linked to spirituality, creativity, and tranquility. It enhances feelings of peace and relief from stress, while also being effective in reducing anxiety and psychological tension in patients

• **Bright and Cheerful Colors:** In spaces designed for social interactions, such as meeting rooms or art therapy rooms, warm colors like yellow, orange, and red can enhance feelings of energy and happiness. Yellow is useful for improving mood and alleviating mild depression. **Yellow:** A color often associated with optimism, energy, and creativity. While it is bright and stimulating, it can create positive emotions. In environments where patients may feel bored or depressed, yellow can help boost mood and motivation. **Orange:** An energetic color that can evoke feelings of warmth, vitality, and liveliness. It stimulates excitement, enthusiasm, and cheerfulness. **Red:** Due to its stimulating and energizing properties, red can sometimes induce feelings of anxiety or heightened arousal in some patients, potentially leading to an increase in heart rate or blood pressure

• **Natural Colors:** In sustainable design, the use of natural colors directly inspired by nature (such as wood or earth tones) can enhance patients' connection to the environment and nature, positively impacting their psychological well-being. **Natural Wood Colors:** Colors like light brown (cedar), oak, pine, or walnut, due to their association with nature and natural materials, create a sense of security, calm, and stability in patients. Lighter wood tones (like oak or pine) and darker wood tones (such as walnut or cedar) contribute to a soothing environment. **Earthy Colors:** Brown is a natural, warm color that, due to its association with nature, soil, and wood, conveys a sense of security, comfort, and stability to patients. **Beige:** With its characteristics of softness, warmth, and natural feel, beige can create an intimate and welcoming environment for patients.

2 - Light in Architecture: Light, both natural and artificial, has a significant impact on the perception and functionality of space. Proper lighting can help improve focus and reduce fatigue, ultimately leading to better working and living conditions.

3 - Water in Architecture: In many cultures, water symbolizes purity and rejuvenation. The use of water in architectural design, such as in fountains, ponds, or decorative elements, can create a sense of tranquility and serenity in both indoor and outdoor spaces.

4 - Ventilation in Architecture: Access to fresh air and high-quality indoor air is essential for maintaining both physical and psychological health. Proper ventilation can contribute to a healthy and pleasant environment by reducing pollutants and maintaining comfortable temperatures.

5 - Form and Visual Appeal in Architecture: Forms can express the emotions and ideas of the architect. Each form can evoke different emotional responses and behaviors. For example, circular forms often convey a sense of unity and softness, while angular forms can elicit feelings of power and stability. Visual appeal in modern clinics is crucial, as it can have a positive psychological impact on patients, enhancing their sense of calm and healing. The use of varied patterns and textures can make spaces more

attractive and welcoming. When these elements are incorporated thoughtfully and with attention to the needs of users in the design of therapeutic spaces, they can create meaningful and lasting experiences. Intelligent use of color, light, water, ventilation, and different forms can help create a space that is not only soothing and relaxing but also provides positive stimuli for behavioral changes and improving the quality of patients' lives. Moreover, this type of design can not only act as an effective short-term solution but can also serve as a model for the design of future modern clinics. Given the growing patient population and the increasing demand for treatment clinics, designing these care spaces with a creative and human-centered approach can be a significant step toward improving the living conditions of patients. In the design of structures for modern clinics, which should be effective both functionally and in terms of psychotherapy and mental health, several innovative elements can be focused on, combining architectural science with the principles of environmental psychology. This type of design should create a healthy and calming environment that frees patients from the daily stresses and anxieties, helping to improve their psychological state. In this regard, the following recommendations are made:

1.Use of Natural and Sustainable Materials: Wood: Characteristics**:** Renewable, lightweight, durable, and excellent thermal insulation. Applications: Construction of lightweight structures, walls, flooring, and furniture. **Natural Stone:** Characteristics: Durable, resistant to temperature changes, and aesthetically pleasing texture. Applications: Facades, flooring, and decorative details. **Natural Brick:** Characteristics**:** Durable, thermal insulation properties, and suitable for natural ventilation. Applications: Walls and flooring. **Non-toxic Paints:** Characteristics: Free of harmful chemicals, biodegradable, and suitable for interior spaces. Applications: Walls and ceilings. **Natural Insulation Materials:** Characteristics: Made from wool, cotton, or cork, non-toxic, and renewable. Applications**:** Walls, ceilings, and floors.

2. Recycled and Low-Cost Materials: Recycled Concrete: Used for structural elements and foundations. **Recycled Wood:** Suitable for flooring, walls, and furniture. **Recycled Natural Fibers (Wool or Cotton):** Can be used for insulation and decorative elements. **Recycled Tires:** Ideal for flooring or sound insulation. **Recycled Metals (Steel and Aluminum):** Used in structural components and facades.

3. Use of Renewable Energy Sources: Solar Panels: For generating electricity and heating. **Small Wind Turbines:** For on-site power generation. **Geothermal Heating Systems:** For sustainable space heating. **Hot Water Recycling Systems:** To reduce energy consumption. **Solar Skylights:** To maximize natural light and reduce the need for artificial lighting

Image 1: Application of Solar Panels and Wind Turbines

4. Modern and Smart Technologies: Smart Lighting and Light Control: Automated systems that adjust lighting based on time of day or specific needs, enhancing energy efficiency and patient comfort. **Smart Temperature and Ventilation Control:** Systems that regulate temperature and airflow for optimal comfort and energy conservation. **Smart Audio Systems and Noise Reduction:** Implementing soundproofing technologies and intelligent audio systems to reduce noise pollution, contributing to a calm, soothing environment. **Intelligent Monitoring Systems:** Security and surveillance systems designed to ensure safety while providing peace of mind for both patients and staff. **Smart Glass:** Glass panels that can change transparency and color, providing privacy or adjusting light levels as needed.

5.Sustainable Design and Connection to Nature (Biophilic Design): Biophilic Design: Incorporating biophilic design principles into modern clinic architecture can have significant positive effects on patients' mental well-being. This approach involves integrating natural elements such as light, plants, and natural landscapes, which enhance a sense of well-being and improve mental health. **Green and Natural Spaces:** Connection to nature through large windows, garden courtyards, or green roofs can help reduce stress and anxiety for patients. In natural environments, patients can engage in calming activities, such as walking in the garden, which has a positive impact on mental health.

6. Adherence to Ergonomics and Physical Comfort Principles: These designs, aimed at reducing fatigue and physical strain for patients, should be structured in a way that facilitates easy movement and comfortable use of spaces. Ergonomic principles include aspects such as appropriate furniture height, comfortable chair and bed designs, wide, unobstructed corridors, proper lighting, and optimal temperature settings. These principles can be applied in the following areas: **Open and Unobstructed Spaces, Wide Hallways, Ergonomic and Comfortable**

Furniture. In the design of elder care homes, various spaces must be designed to be both functionally efficient and psychologically beneficial for residents. These spaces may include the following:

1- Reception Area: The first point of contact for a patient with the clinic environment is the reception area, where a pleasant and calming atmosphere should be conveyed. Minimalist design, soft lighting, neutral colors, and plants contribute to this goal. Key features of this space include: an open and bright design, a welcoming atmosphere, wayfinding systems, modern technology, and easy accessibility.

Recommended Colors: Neutral colors like white, light gray, or beige: These colors help create a clean, bright, and calming environment. **Light green or sky blue:** These colors convey feelings of peace, trust, and security.

2- Waiting Areas: The waiting area in modern clinics is a space where patients and their companions wait before receiving medical services. This space should be designed to provide a sense of comfort, relaxation, and security for visitors. Key considerations include cozy seating, soft lighting, calming colors, and appropriate acoustics to reduce noise and promote a peaceful atmosphere. Additionally, the use of natural elements such as plants and access to natural light can enhance the overall sense of well-being and relaxation in the waiting area. The key features of this space include: attractive interior design, appropriate lighting, comfort facilities, and the use of natural plants.

Suggested Colors: Green: The color of nature, symbolizing calmness and growth. **Light Blue:** The color of the sky and sea, evoking a sense of tranquility, trust, and security. **Soft Colors such as Light Pink, Purple, or Yellow:** These create a feeling of gentleness and relaxation.

3- Room Name: Examination Rooms: In modern clinics, these spaces are designed for medical examinations and treatment consultations. They should be designed in a way that maximizes functionality while providing comfort and security for patients.

Suggested Colors: Light Blue: Known as a calming color, it can provide a sense of peace and tranquility to patients. This color is ideal for examination rooms. **Soft Green:** Symbolizing nature and freshness, this color can evoke feelings of calm and healing, helping patients feel more comfortable. **Soft Orange:** This color can transmit feelings of happiness and positive energy. Used in moderation, it creates a friendly and optimistic atmosphere.

4- Room Name: Treatment Rooms: Treatment rooms in modern clinics are spaces designed for providing medical and therapeutic services to patients. These rooms typically have specific features and equipment depending on the type of services they provide.

Suggested Colors: Blue: Known for its calming and peaceful qualities, blue can help reduce patient anxiety and create a serene environment. *Usage:* Various shades of blue can be used on walls or as accent colors in the decor. **Green:** A color representing nature and health, green evokes freshness and vitality, potentially improving patients' spirits. *Usage:* Light greens or natural shades like olive can be used. **White:** Symbolizing cleanliness and simplicity, white promotes a sense of order and neatness. *Usage:* Typically used as the main color for walls or in combination with other colors. **Orange:** A warm, energetic color that can boost feelings of joy and optimism. *Usage:* Orange can be used as an accent color or in small decor details.

5- Room Name: Private Spaces: In modern clinics, private spaces are designed to ensure patient comfort, security, and privacy. These areas provide patients with the opportunity to undergo treatment or consultations in a calm and undisturbed environment.

Suggested Colors: Soft Blue: Known for its calming and soothing effects, soft blue helps reduce anxiety and stress while enhancing a sense of security. **Soft Green:** Symbolizing nature and freshness, soft green promotes feelings of calm and balance. **Beige or Cream:** Neutral colors that convey warmth and comfort, these shades help create a pleasant and inviting atmosphere. **Soft Grey:** A neutral color that contributes to a tranquil environment. It blends well with other colors, enhancing the overall peaceful ambiance.

6- Room Name: Physical Therapy Room: The physical therapy room in modern clinics is designed to provide rehabilitation services and physical treatments to patients. This room typically includes specialized equipment and tools that help improve motor function, reduce pain, and accelerate the healing process.

Suggested Colors: Blue: Calming and soothing. *Use:* Ideal for reducing stress and anxiety, especially in treatment rooms. **Green:** Represents nature and freshness. *Use:* Creates a sense of calm and balance, perfect for therapeutic spaces. **Soft Yellow:** Uplifting and energizing. *Use:* Boosts happiness and motivation but should be used in moderation to avoid overstimulation. **Soft Orange:** Warm and friendly. *Use:* Can enhance a sense of sociability and cooperation but should be used cautiously to prevent excessive stimulation. **Soft Purple:** Represents creativity and calmness. *Use:* Suitable for spaces that require focus and tranquility. **White:** Purity and simplicity. *Use:* Creates a bright and open atmosphere but should be balanced with other colors to avoid a cold feeling.

7- Room Name: Minor Surgery Room: The minor surgery room in modern clinics is a space designed for minimally invasive surgeries, medical treatments, and specific procedures. These rooms, typically smaller in size, are equipped with specialized tools and an efficient design that facilitates various types of operations.

Suggested Colors: Soft Blue: Known for its calming effect, blue can help reduce patient anxiety. It also promotes a sense of cleanliness and professionalism. **Soft Green:** As a natural and calming color, green creates a sense of tranquility and comfort, contributing to stress reduction. **White:** White symbolizes cleanliness and hygiene. Using white on walls and equipment can instill a sense of safety and trust in patients, though it should be paired with other colors to avoid a cold feeling. **Soft Gray:** A neutral and modern color, gray helps create a sleek, calm environment and pairs well with other hues. **Soft Yellow or Cream:** These colors can bring a sense of joy and positive energy to the room, helping to create a pleasant and welcoming space. **Soft Orange:** While orange is a vibrant color, using its softer shades can add warmth and happiness to the space. **Soft Purple:** Purple conveys creativity and calmness but should be used in lighter shades to prevent any heavy or overwhelming sensations.

8- Room Name: Consultation Room: The consultation room in modern clinics is designed to offer counseling services to patients. This room is designed to ensure comfort and tranquility, facilitating effective communication between the doctor or counselor and the patient.

Suggested Colors: Blue: Known for its calming effect, blue can reduce anxiety and increase a sense of tranquility. *Suggestion:* Use soft shades of blue, such as sky blue or turquoise. **Green:** Symbolizing nature and growth, green can bring a sense of calm and freshness. *Suggestion:* Choose soft green or olive green for a pleasant atmosphere. **Orange:** A warm, energizing color, orange can evoke happiness and vitality. *Suggestion:* Use orange in details or as an accent color to create balance. **Yellow:** A bright and cheerful color, yellow can boost feelings of happiness and energy. *Suggestion:* Use soft yellow or cream yellow to prevent visual fatigue. **Beige or Light Gray:** Neutral colors like beige and light gray can create a calm and balanced environment. *Suggestion:* Combine these with other colors to add depth and variety. **Pink:** Known as a soft and soothing color, pink can enhance feelings of warmth and support. *Suggestion:* Use soft shades of pink to create a friendly space. **Purple:** Associated with calmness and spirituality, purple can contribute to a peaceful ambiance. *Suggestion:* Use soft purple or lavender for a unique and distinct atmosphere.

4- Conclusion

This paper examines the importance of integrating sustainable architectural principles and environmental psychology in the design of modern clinics to enhance patient treatment quality. By taking an interdisciplinary approach to the design of these spaces, each area is crafted to address the psychological and social needs of patients. The use of architectural elements such as form, water, ventilation, and the intelligent application of color in these therapeutic environments plays a crucial role in reducing anxiety and fostering a sense of safety and healing. This study demonstrates that focusing on both structural and psychological aspects in clinic design not only meets the physical needs of patients but also improves treatment quality by considering their psychological and social well-being, thereby providing a sense of security. Sustainable methods used in constructing these spaces not only reduce costs and enhance efficiency but also, through the integration of natural elements and thoughtful design, create a soothing and stimulating environment that aids in improving mental health. Overall, this paper emphasizes that combining sustainable architecture principles and psychological impacts in the design of modern clinics serves as an effective solution to increase the quality of treatment. This approach makes it possible to improve patient care conditions by creating a safe, calming, and supportive environment.

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