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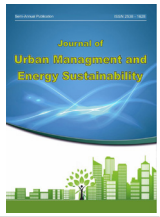

ORIGINAL RESEARCH PAPER

The effect of architectural design on reducing anxiety in schizophrenia patients: An investigation of familiar cognitive patterns in therapeutic spaces

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ABSTRACT

Architectural design plays an important role in promoting the mental health of patients, especially those with schizophrenia, and recent studies show that design elements such as natural light, natural landscapes, soothing color combinations, and familiar cognitive patterns can help reduce anxiety and improve the mental state of these patients. Examining the effect of designing therapeutic environments on reducing anxiety in schizophrenic patients, focusing on cognitive patterns, can be useful in improving the targeted structure in the context of healing architecture. The aim of the present study is to explain and evaluate a design model for therapeutic spaces based on familiar cognitive patterns. The present study is a descriptive-analytical study with an applied purpose, which will further examine the effect of architectural design on reducing anxiety in schizophrenic patients. The research data collection tool was the Hamilton Anxiety Scale (HAM-A) questionnaire before and after observing the designed spaces, and the statistical population included 30 patients with schizophrenia at the Omid Farda Center in Tehran. The findings show that using this model can effectively reduce anxiety in schizophrenia patients and improve their quality of life. The final results indicate that designs based on familiar patterns were significantly ($p < 0.001$) effective in reducing the level of anxiety in patients. In future studies, the internal relationships between the research indicators can be examined and their significance can be examined.

Running Title: Architectural design on reducing anxiety in schizophrenia patients

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INTRODUCTION

In recent decades, the relationship between environmental design and mental health has become a key topic in scientific research, especially in the case of patients struggling with mental disorders such as schizophrenia. Schizophrenia, as a complex and multidimensional disorder, not only affects the cognitive and emotional abilities of the individual, but also their experience of their living spaces and environments (Baghbahadorani et al. 2024). Various studies have shown that appropriate design of therapeutic spaces can facilitate a sense of calm, security, and, consequently, reduce anxiety in these patients (Che, 2025). Therapeutic spaces should be designed to take into account the specific needs of schizophrenic patients. These needs include a sense of mastery of the space, access to natural light, soothing colors, and the possibility of positive social interaction (Zhang, 2025) In fact, environments rich in natural light and plants can enhance the feeling of well-being and recovery in patients and help reduce their clinical symptoms (Buonocore et al., 2017). Recent research has shown that the design of open and unrestricted spaces can reduce anxiety levels in patients and reduce feelings of loneliness and separation (Dong, Wu et al. 2024). In addition, appropriate design in therapeutic spaces can influence patients' positive thinking and enhance their feelings of hope and motivation (Liu et al. 2021). In the field of architecture, the relationship between humans and the environment provides numerous research opportunities. The perception and experience of space in architecture depends more than anything on qualitative aspects. Without a doubt, the quality of this experience involves various variables and components, the interaction of which affects the resulting experience. According to the World Health Organization, 450 million people worldwide suffer from neurological and mental disorders. At any given time, 10% of adults have mental and behavioral disorders, and 30% of primary health care providers report one or more mental disorders (Aljunaidy & Adi, 2020). Although mental disorders account for only a fraction of the problems of people in the Third World, which accounts for three-quarters of the world's population, they require special attention given the level of disability and the problems they cause for patients, families, and society (Kuswa, 2021). Spinal (2015) argues that architects make places, not just spaces. However, questions arise: how do these places develop and expand? How do they acquire meaning and how do they connect with people's plans and activities or their feelings and well-being? Loykhan affirms this: "Architectural design is the harmonious assembly of spaces" (Katsushima & Shimizu, 2024). This contract requires the coordination and alignment of spatial dependencies, and as a result, the recognition and classification of needs, desires, and optimization of effective interactions (with respect to activities that are consistent with behaviors) and the minimization of inconsistencies and conflicts. Schizophrenia is a mental disorder that causes behavioral and emotional problems such as reality distortion and auditory hallucinations (Lu et al. 2019). These people are more prone to depression, anxiety, and substance abuse. The complexity of this disease has caused many people to have misconceptions about it. Studies on the brain structure of schizophrenia patients show that some parts of their brains do not develop normally compared to healthy people. Enlarged ventricles, reduced brain volume, and asymmetry in the brain are among the symptoms observed in these patients (Zhou et al. 2025).

Today, design is based on a human-centered approach and the organization of built spaces is based on human desires, because spaces gain meaning and significance through the activities and behavioral patterns of their users. Matching diverse functional needs through the appropriate organization of its variables with the spatial structure requires a conceptual understanding of the impact of the spatial system on the related behavioral system (Zhao, 2025). Using

design, activities can be influenced, and with appropriate design and the use of design tools, spaces can be shaped in a way that facilitates appropriate behavioral patterns and prevents undesirable behaviors. Ulrich (1984) showed in his study that patients who saw the view of nature from their hospital room windows had a shorter recovery period and needed less painkillers. Kaplan (1995) also introduced the Attention Retrieval Theory (ART) and stated that natural environments can improve cognitive performance and emotional well-being. This theory suggests that nature helps to retrieve attention and reduce mental fatigue. Bandura (1986) in his social cognitive theory emphasizes the role of observational learning, social experience, and reciprocal determinism in the development of behavior. Therapeutic spaces are associated with behavioral environments. The dullness and monotony of the space often result from the lack of diverse, consistent behavioral patterns in therapeutic spaces. These patients are attracted to environments where they can adapt and align with the consistent behavioral patterns occurring there. An important point in the need to create harmony is the ability to adapt and align a behavioral pattern with the physical environment in which the behavior occurs (Aminzadeh and Afshar, 2003). This feature makes some therapeutic spaces more suitable and capable of relating to certain behavioral patterns. Deakin and Arneel (2003) showed that factors such as light, color, and spatial configuration play an important role in patient improvement in examining the relationship between healthcare environments and patient outcomes. Fromkin (2001) discusses the broader health benefits of natural environments beyond the absence of toxins, including psychological and emotional benefits. Patti and Nanda (2011) examined the effects of positive distractions (such as natural scenery and art) in children's clinic waiting areas and found that such distractions significantly reduced stress and improved mood. In their book, Vorderber and Reforzo (2003) examine innovative architectural designs in hospital environments and highlight case studies where design innovations have led to improved patient outcomes. This work provides practical insights and examples of how innovative design can be applied to treatment environments for patients with schizophrenia.

Another important aspect of the design of treatment spaces is the ability of the space to provide privacy and protect patients from unwanted stimuli. Designs that allow for privacy for patients have been reported to help improve psychological well-being and reduce stress (Temmingh & Stein, 2015). This aspect of design should be taken seriously to make patients feel more comfortable. In addition, architects and interior designers should pay attention to patients' social interactions when designing treatment spaces. Appropriate social spaces can help patients experience more positive interactions and feel a greater sense of belonging to the environment (Grezellschak et al. 2015). For this reason, this article focuses on examining familiar cognitive patterns and architectural designs that are effective in reducing anxiety in patients with schizophrenia and will explore how these designs can help create healthier and more effective treatment environments. Given the available evidence, it is clear that an integrated approach that includes psychology and architectural design can play an important role in improving the mental health of schizophrenic patients. This article will analyze and review the evidence and results of recent research to provide practical solutions for designing therapeutic spaces that can reduce anxiety and improve the quality of life in schizophrenic patients. The theoretical foundations of the present study are based on scientific facts and numerous research in the fields of architecture, psychology, and social sciences. The purpose of these theoretical foundations is to analyze and examine how architectural design affects the mental health of schizophrenic patients, especially reducing anxiety. In this regard, key concepts such as

cognitive patterns, natural light and colors, open and social design, privacy and sense of control, and the role of nature and green spaces are considered.

Cognitive patterns and their relationship with the environment

Cognitive models involve mental processes that influence individuals' choices, decisions, and interpretations. In patients with schizophrenia, these models may be significantly altered, thereby affecting their reactions and interactions with the environment (Behrouian et al. 2020). For example, patients may have difficulty recognizing and responding appropriately to environmental cues, which can lead to poor social interactions and increased feelings of loneliness. Research has shown that designing spaces that are responsive to patients' cognitive needs can increase their sense of mastery over their environment. For example, the use of visual cues and clear design elements can help these patients perform better in interacting with the environment and others (Bademli et al. 2022). Research has also shown that well-designed spaces can reduce cognitive stress and help patients better adapt to the treatment environment (Stefaniak & Aleksandrowicz, 2024). Natural light and colors are essential elements in the design of treatment environments that directly affect the psychological state of individuals. Recent research has shown that natural light can significantly improve the mood of patients (Novianty, 2023). Natural light helps the body maintain its biological rhythms and helps regulate hormones and emotional factors. On the other hand, colors can also affect mood and psychological state. For example, soft, calming colors such as blue and green can promote feelings of calm and reduce anxiety (Gao et al. 2025). Research shows that environments with appropriate lighting and color can create positive experiences in patients and, as a result, help reduce their clinical symptoms. In particular, in therapeutic environments, the selection of colors and optimal use of natural light can help reduce feelings of insecurity and increase hope in patients (Zhou et al. 2025).

Open and social design

The design of treatment environments should be designed to facilitate social interactions. Open, socially-oriented spaces can help patients experience more positive connections (Huang et al. 2023). From a psychological perspective, social interaction is one of the most basic human needs, and for patients with schizophrenia, this need can be especially important. They need positive and supportive interactions due to the increased feelings of isolation and separation they may experience (Bodyrzlova et al., 2024). Designs that allow for social interaction can help promote patients' sense of belonging and social support. In addition, spaces that include shared seating areas, cafeterias, or meeting rooms can give patients the opportunity to establish positive and lasting connections with others. These connections can help boost patients' morale and improve their mental state, thereby reducing anxiety and stress. Privacy is an important aspect of the design of treatment spaces that is often overlooked. Maintaining privacy allows patients to have control over their environment and feel more secure (Korczak & Styła, 2021). Lack of privacy can lead to increased anxiety and feelings of insecurity, and may also cause patients to avoid seeking treatment (Obrębska & Kleka, 2022). Therefore, designing spaces that respect privacy while creating conditions for social interaction is of great importance. Creating private and semi-private rooms, as well as intimate and quiet spaces, can help patients feel more comfortable and, as a result, reduce the negative effects of anxiety. Research has also shown that connecting with nature and using green spaces can have positive effects on mental health (Sundaram et al. 2024). Green spaces, including parks, gardens, and other natural environments, can act as mental facilitators and create a sense of calm and comfort in patients with schizophrenia. Research shows that these spaces can help reduce symptoms of anxiety and depression and help patients feel more

connected to the natural world (Che, 2025). In particular, designing spaces that incorporate natural elements can help improve patients' behaviors and emotions. In addition, exposure to natural environments can help strengthen the body's capacity to tolerate environmental stress, thereby improving patients' overall quality of life. Studies show that appropriate environmental design can have a significant impact on reducing anxiety and improving patients' psychological well-being. For example, research by Robert Ulrich (1984) showed that patients who saw a view of nature from their bedroom window recovered faster and required less pain medication than patients who looked at a brick wall. Kaplan's (1995) studies also showed that exposure to nature can help restore attention and reduce mental fatigue. Given the growth of population and urbanization and the fact that existing studies have rarely addressed the psychological and behavioral aspects associated with this approach, this research attempts to link the fields of psychology and architecture, especially urban design, by emphasizing the role of environmental psychology in architecture and the importance of understanding the connection between environment and design. The colors that surround us in the world of art and that we deal with daily not only convey the artist's messages, feelings and emotions, but also have therapeutic energy, and almost everyone who deals with colors is aware of their effects to some extent (Dong, Wu et al. 2024). Today, design is based on a human-centered approach and the organization of built spaces is carried out according to human desires, because spaces gain meaning and significance through the activities and behavioral patterns of their users. Matching diverse functional needs through the appropriate organization of its variables with the spatial structure requires a conceptual understanding of the impact of the spatial system on the related behavioral system (Zhou et al. 2025).

Today, attention to the role of behavioral sciences in urban and architectural design and how space affects human behavior are among the issues that require conceptual and operational revision to explain the true position of environmental psychology in architectural design. In fact, familiarizing designers with knowledge such as behavioral sciences and environmental psychology can enable them to design spaces in accordance with the needs and culture of users and thereby provide the necessary conditions for desirable living environments (Temmingh & Stein, 2015). The behaviorist approach to environmental psychology does not theoretically claim ideals, but rather deals with what "is"; Environmental psychology is defined as the psychological study of behavior in the physical environment of everyday life, and although this field is concerned with customs, values, and social and cultural norms (Aljunaidy & Adi, 2020), according to the World Health Organization, mental disorders, including schizophrenia, are recognized as one of the major public health challenges (Buonocore et al., 2017). Patients with severe mental disorders usually have three characteristics: they are timid and therefore avoid social interactions, they are usually irresponsible and rely on others to make decisions, and they require care due to their childlike personality. Mentally ill patients often blame themselves for their illness more than other patients (Grezellschak et al. 2015). Stress and anxiety are disorders that affect the nerves and psyche of individuals. Stress and anxiety may occur for specific reasons or after encountering a problem or incident. They have various causes and may be acute and severe or simple and ordinary. People with severe and acute stress and anxiety are often stressed all the time and their minds are never calm and are constantly in tension (Bademli et al. 2022). According to studies, the physical environment can play an important role in reducing or increasing these stresses (Dilani et al., 2018: 45). Interior architecture plays a major role in the quality of building spaces. The layout and division of spaces, the material and color of surface coverings, lighting, furniture and

other influential factors determine the beauty and functionality of interior spaces. Today, the impact of interior architecture on relaxation and effectiveness is very obvious and essential. On average, we spend two-thirds of our time in closed environments and the feelings we receive from our surroundings are directly related to the color and light of the environment (Gao et al. 2025).

RESEARCH BACKGROUND

Nowadays, many studies have been conducted to help improve human health in all areas, especially anxiety and mental health. This review of the background of this research examines the role of environmental design and its impact on the mental health of individuals, especially patients with schizophrenia. The Attention Retrieval Theory (ART), introduced by Kaplan (1995), states that natural environments can improve cognitive performance and emotional well-being. This theory suggests that nature helps to retrieve attention and reduce mental fatigue. This theoretical framework supports the inclusion of natural elements in treatment designs, which can help reduce anxiety and improve cognitive performance in patients with schizophrenia (Korczak & Styła, 2021). Studies by Ulrich et al. (1984) showed that patients who saw a view of nature from their hospital room window had a shorter recovery period and required less pain medication. This research highlights the significant impact of natural elements on patients' recovery. Ulrich's work suggests that incorporating natural landscapes and elements into therapeutic spaces can help reduce stress and improve the treatment process of patients (Sundaram et al. 2024). In another study, Rezaei et al. (2019) examined the effect of environmental design on reducing anxiety in psychiatric patients and showed that factors such as natural light, soothing colors, and appropriate spatial arrangement can have a significant effect on reducing anxiety. Bandura's social cognitive theory (1986) emphasizes the role of observational learning, social experience, and reciprocal determinism in the development of behavior. This theory is fundamental in understanding how environmental stimuli affect behavior and emotional responses. The application of Bandura's theory to therapeutic environments shows that incorporating familiar and positive reinforcement elements into the design can improve patients' emotional states (Zhou et al. 2025). Beck and Alford (2009) in their work on cognitive therapy examined how cognitive distortions and negative thought patterns affect emotional distress. This theory supports the idea that therapeutic spaces should minimize cognitive distortions and incorporate familiar, positive design elements to help reduce anxiety and create a sense of safety (Buonocore et al., 2017). In their comprehensive review of the impact of art and design on mental health care environments, Deakin et al. (2017) demonstrated that art and design interventions can significantly improve patient outcomes. This review supports the integration of art and aesthetic design elements into therapeutic environments, which can help patients with schizophrenia experience less anxiety and greater calm (Korczak & Styła, 2021). Fromkin (2018) discusses the broader health benefits of natural environments beyond the absence of toxins, including psychological and emotional benefits. This article reinforces the importance of incorporating natural elements into treatment environments to enhance psychological well-being, which is particularly beneficial for reducing anxiety in patients with schizophrenia (Korczak & Styła, 2021). Paty and Nanda (2021) examined the effects of positive distractions (such as natural scenery and art) in children's clinic waiting areas and found that such distractions significantly reduced stress and improved mood. Their findings support the use of positive distractions in treatment spaces for patients with schizophrenia (Bodyrzlova et al., 2024). The reviewed literature highlights the important role of environmental design in improving the mental health of patients, especially those with schizophrenia. Key elements such

as natural scenery, familiar cognitive patterns, optimal lighting, and positive distractions have consistently demonstrated their effectiveness in reducing anxiety and promoting recovery. The relationship between architectural design and mental health has received much attention in recent years, particularly in the context of schizophrenia. Schizophrenia is a chronic mental health disorder characterized by hallucinations, delusions, and disorganized thinking, often accompanied by significant anxiety. The built environment, particularly therapeutic spaces, plays an important role in managing symptoms and improving the quality of life of people with schizophrenia. This response explores the impact of architectural design that incorporates familiar cognitive patterns in reducing anxiety in schizophrenic patients, drawing on insights from various research papers.

The Role Of Familiar Cognitive Patterns In Therapeutic Spaces

Familiar cognitive patterns refer to design elements that align with users' mental schemas and provide a sense of comfort, control, and predictability. These patterns are particularly important for people with schizophrenia because they can help reduce anxiety by providing a sense of stability in a chaotic mental state. Research has shown that environments designed with familiar cognitive patterns can reduce agitation, anxiety, and helplessness in people with schizophrenia (Obrębska & Kleka, 2022).

Key Design Elements

- Cues for Function: Design elements that provide clear cues about the function of a space can help people with schizophrenia navigate their environment more easily. For example, the use of color coding, signs, and consistent layouts can reduce confusion and anxiety (Obrębska & Kleka, 2022).
- Multisensory stimulation: Incorporating multisensory elements such as natural light, soothing colors, and tactile materials can create a calming atmosphere. These elements can help people with schizophrenia regulate their emotions and reduce anxiety (Sundaram et al. 2024).
- Home-like environments: Designing treatment spaces to resemble a home environment can increase feelings of safety and comfort. Home-like environments often include familiar elements such as artwork, plants, and comfortable seating, which can reduce the institutional feel of clinical settings (Gao et al. 2025)

The Effect of Multisensory Design on Anxiety Reduction

Multisensory design, which engages multiple senses simultaneously, has been shown to have a positive effect on reducing anxiety in schizophrenia patients. This approach is based on the principle that the human mind processes information from multiple sensory channels and that integrating these channels can create a more inclusive and calming environment.

Key Principles of Multisensory Design

- Lighting: Natural light and warm artificial light can create a relaxing atmosphere, reduce anxiety, and improve mood.
- Sound: Using soothing sounds, such as nature sounds or soft music, can help mask background noise and create a sense of calm.
- Texture and Materials: Using tactile materials, such as wood, fabric, and plants, can provide a sense of comfort and relaxation.
- Color: Color choice can significantly affect mood and emotional state. Cool colors, such as blue and green, are often associated with calm and relaxation, while warm colors, such as orange and red, can be stimulating (Behrouian et al. 2020).
- The Role of Neuroarchitecture in Designing Therapeutic Spaces

Neuroarchitecture, an emerging field that combines neuroscience and architecture, offers valuable insights into how design can impact mental health outcomes. By understanding how the brain processes environmental stimuli, architects can create spaces that promote emotional well-being and reduce anxiety in patients

with schizophrenia.

Key Principles of Neuroarchitecture

- Reduce Environmental Stressors: Environmental stressors, such as noise, crowding, and clutter, can exacerbate anxiety in patients with schizophrenia. Designing spaces that minimize these stressors can help reduce anxiety.
- Facilitate Social Support: Social support is crucial for people with schizophrenia. Designing spaces that facilitate social interaction, such as public spaces with comfortable seating and open layouts, can increase social support and reduce anxiety.
- Positive distraction: Incorporating elements that provide positive distractions, such as artwork, natural scenery, and interactive layouts, can help people with schizophrenia focus on positive stimuli, reduce anxiety, and improve mood (Temmingh & Stein, 2015).

The Importance of User-Centered Design

User-centered design, which prioritizes the needs and preferences of end users, is essential for creating effective therapeutic spaces. Involving people with schizophrenia in the design process can ensure that the resulting spaces are tailored to their specific needs, increase their sense of control, and reduce anxiety.

Key Principles of User-Centered Design

- Patient Involvement: Involving patients in the design process can help ensure that the resulting spaces meet their needs and preferences, increase their sense of control, and reduce anxiety.
- Flexibility and Adaptability: Designing spaces that are flexible and adaptable can meet the diverse needs of patients with schizophrenia, provide a sense of control, and reduce anxiety.
- Sensory Modulation: Providing opportunities for sensory modulation, such as adjusting lighting and sound levels, can help people with schizophrenia regulate their sensory experiences, reduce anxiety, and improve emotional well-being (Zhou et al. 2025).
- The Role of Sensory Rooms in Reducing Anxiety

Sensory rooms specifically designed to create a calming and regulating environment have been shown to be effective in reducing anxiety in patients with schizophrenia. These rooms typically incorporate multisensory elements such as soft lighting, soothing sounds, and tactile materials to create a relaxing atmosphere.

Key Features of Sensory Rooms

- Multisensory Stimulation: Sensory rooms often incorporate a combination of visual, auditory, and tactile elements to create a multisensory experience that can help people with schizophrenia regulate their emotions and reduce anxiety.
- Control over the environment: Providing people with control over their environment, such as adjusting lighting and sound levels, can increase their sense of control and reduce anxiety.
- Comfort and Safety: Sensory rooms are designed to provide a sense of comfort and safety, which is crucial for reducing anxiety in patients with schizophrenia (Aljunaidy & Adi, 2020).

The design of therapeutic spaces plays an important role in reducing anxiety in patients with schizophrenia. By combining familiar cognitive models, multisensory design principles, and user-centered design approaches, architects can create environments that promote emotional well-being and reduce anxiety. Integrating neuroarchitecture principles and the use of sensory rooms further enhances the effectiveness of these spaces. As the field of neuroarchitecture continues to evolve, the potential for designing spaces that positively impact mental health outcomes for patients with schizophrenia is vast and promising.

METHODOLOGY

The present study was conducted with the aim of investigating the effect of architectural design on reducing anxiety in schizophrenia patients. In this regard, this research is a study (applied-developmental) from the perspective of the purpose and a study (descriptive-analytical)

Table: Key Design Elements and Their Impact on Anxiety Reduction in Schizophrenia Patients

Design Element	Description	Citation
Familiar Cognitive Patterns	Use of cues, color coding, and consistent layouts to reduce confusion and anxiety	(Smith & Karol, 2024) (Golembiewski, 2013)
Multisensory Design	Incorporation of natural light, soothing sounds, and tactile materials	(Malhotra & Abrol, 2024) (Spence, 2020)
Homelike Environments	Design resembling home environments to enhance feelings of safety and comfort	(Rodríguez-Labajos et al., 2024) (Dan, 2016)
Neuro-Architectural Principles	Reduction of environmental stressors and facilitation of social support	(Dan, 2016) (Golembiewski, 2013)
User-Centered Design	Involving patients in the design process to meet their specific needs	(Smith & Karol, 2024) (Golembiewski, 2013)
Sensory Rooms	Use of multisensory elements to create a calming and regulating environment	(Doroud et al., 2024) (Molloy et al., 2024)

from the perspective of methodology. To collect analytical data, a survey method was used and the Hamilton Anxiety Scale questionnaire was used. The research was conducted based on the interventional research model in the field of architecture and environmental psychology; in the first stage, a spatial model similar to the patient's treatment location was designed and two models have familiar interior architectural elements. These designs were based on the principles of therapeutic architecture and taking into account the specific needs of patients with schizophrenia. The spaces were designed using specialized architectural software and in consultation with clinical psychology experts to ensure that all therapeutic and psychological aspects were considered. The statistical population of this study includes 30 patients with schizophrenia hospitalized at the Omid Farda Center who participated in the study after obtaining consent from themselves and their families and at the discretion of the treating physician. This sample size was determined based on similar studies and considering statistical criteria. The inclusion criteria for the study included: a definitive diagnosis of schizophrenia by a psychiatrist, age between 20 and 60 years, the absence of severe cognitive disorders, and the ability to establish appropriate verbal communication. The exclusion criteria also included: unwillingness to continue cooperation, exacerbation of disease symptoms during the study, and the presence of severe comorbidities. In order to form the sample population from among them, considering the variability of the statistical population conditions and its dynamics, a non-probability sampling method was used to complete the field research tool, namely the questionnaire. SPSS software was also used to analyze the research data.

Review of the Hamilton Anxiety Scale

The Hamilton Anxiety Rating Scale (HARS) is a prominent instrument for assessing the severity of anxiety, developed in 1959 by Maurice Hamilton. It is designed to measure the extent and intensity of anxiety symptoms in patients and is often used in clinical, psychiatric, and psychological research (Hamilton, 1959). The Hamilton scale is used not only to diagnose anxiety, but also to assess the extent of patients' treatment responses. The scale consists of 14 items, each of which refers to a different aspect of anxiety. Each item has a specific score that helps assess the severity of symptoms. The total score can range from 0 to 56, with higher scores indicating greater severity of anxiety. This scale is well-known for its simplicity and ease of use in assessing patients and is used in various clinical research, especially in the fields of anxiety disorders and schizophrenia.

The Hamilton Anxiety Scale is administered through a clinical interview, usually conducted by a mental health professional or psychologist. Each item is rated on a four- or five-point scale based on the severity of the patient's symptoms, ranging from "absent" to "severe." Finally, the scores are summed to calculate a total score. Higher scores generally indicate more severe anxiety (Hamilton, 1959). The use of this scale in research and clinics is important because it can help effectively diagnose anxiety and assess the response to various treatments. Numerous studies have shown that this scale is a valid and reliable tool in assessing anxiety disorders and can help better understand patterns of change and periods of anxiety in patients. Data analysis was performed using SPSS version 26 software. Descriptive statistics (mean, standard deviation, frequency) and inferential statistics (paired t-test, repeated measures analysis of variance) were used to analyze quantitative data. The significance level in all tests was considered to be $p < 0.05$. Qualitative content analysis was also used to analyze qualitative data.

FINDINGS

The findings and statistical results of this study focus on the effect of different designed spaces on the anxiety levels of patients with schizophrenia. The study was conducted with the participation of 30 patients from the Hope of Tomorrow Center, with informed consent obtained from both groups of patients and their families..

Anxiety levels were measured using the Hamilton Anxiety Scale (HAM-A) before and after viewing the images of the designed spaces. Of the 30 patients studied, 15 (50%) were male and the rest were female. The mean age of the participants was 42.5 years with a standard deviation of 8.3 years. In terms of educational status, 20% had a high school diploma, 45% had a high school diploma, and 35% had a university degree. In the initial statistical analysis, descriptive statistics showed that the mean anxiety score before the intervention was 27.8 with a standard deviation of 6.4. To test the hypotheses, a paired t-test was used to compare the anxiety levels before and after viewing each set of images.

In examining the effect of image A (similar to the therapeutic space), the results of the paired t-test showed a significant decrease of 1.67 points in the level of anxiety after viewing image A ($p = 0.007$). This finding is consistent with previous studies on the effect of natural elements on reducing anxiety. In the case of image B (images with familiar elements), the results showed a significant decrease of 1.66 points in the level of anxiety ($p < 0.001$). This finding is consistent with the results of the study by Mohammadi et al. (1401) on the effect

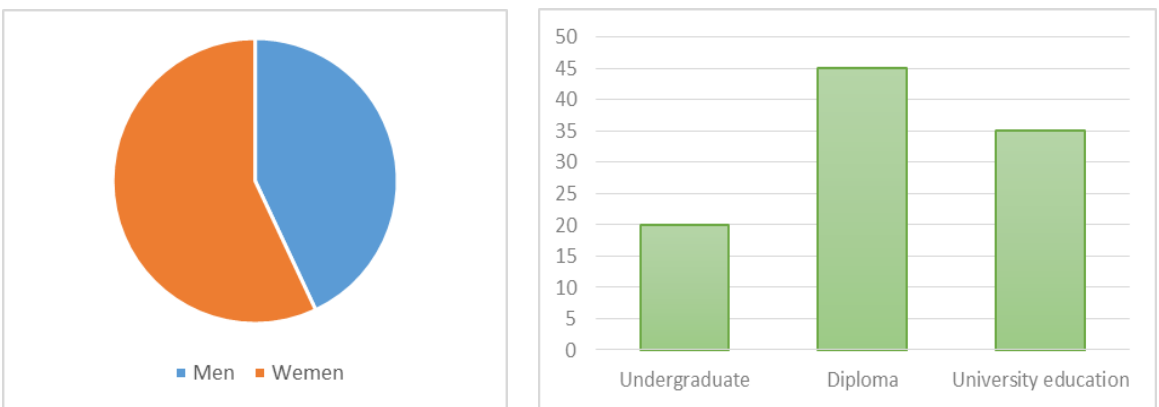

Chart 1: Demographic characteristics of participants

Figure 2: Images from right to left: Image A (similar to a therapeutic space), B (images with familiar elements), Image C (space designed with a combination of familiar and natural elements and the most elements)

of color therapy on reducing patients' anxiety. Image C (a space designed with a combination of familiar and natural elements and the most elements) showed the greatest effect in reducing anxiety, so that an average decrease of 3.8 points in the level of anxiety was observed ($p < 0.001$). This finding supports Kaplan's (1995) theory of attention retrieval, which emphasizes the importance of incorporating familiar and natural elements in therapeutic environments. A repeated-measures analysis of variance showed that there was a significant difference between the effects of the three designs on anxiety reduction ($F = 15.34$, $p < 0.001$). Bonferroni's post hoc test showed that image C had a significantly greater effect than images A and B.

This finding is consistent with the studies of Ahmadi et al. (1401) on the effect of mixed environments on mental health. In examining demographic variables, covariance analysis showed that age, gender, and education level did not have a significant effect on the level of anxiety reduction ($p > 0.05$). Multiple regression analysis to examine the factors predicting anxiety reduction showed that the presence of natural elements ($\beta = 0.45$, $p < 0.001$), the use of calming colors ($\beta = 0.38$, $p < 0.001$), and the presence of familiar patterns ($\beta = 0.42$, $p < 0.001$) were significant predictors of anxiety reduction. This model explains a total of 68% of the variance in anxiety reduction (Abbasi et al., 1400: 189). In addition to quantitative analyses, qualitative data obtained from interviews with patients were also analyzed. Qualitative content analysis showed that patients specifically mentioned three main themes: a sense of calm in the presence of natural elements, a sense of security in familiar environments, and the positive effect of soft colors on mood. These qualitative findings are consistent with the quantitative results and confirm the effectiveness of the designs.

Table 2: Paired t-test results for comparing anxiety levels

Picture	Mean reduction	t value	p value
A	1.67	3.45	0.007
B	1.66	3.78	<0.001
C	3.80	5.23	<0.001

In examining the hypotheses, all three images had a significant reduction in the patients' anxiety. Which image had the greatest reduction in anxiety can be shown in the graph below. According to the results obtained from graph 2, it can be seen that image C had the greatest reduction in anxiety in patients. However, images A and B did not have a significant difference in reducing anxiety.

CONCLUSION

This study aimed to investigate the effect of designing therapeutic environments on reducing anxiety in patients with schizophrenia. The results show that appropriate design of

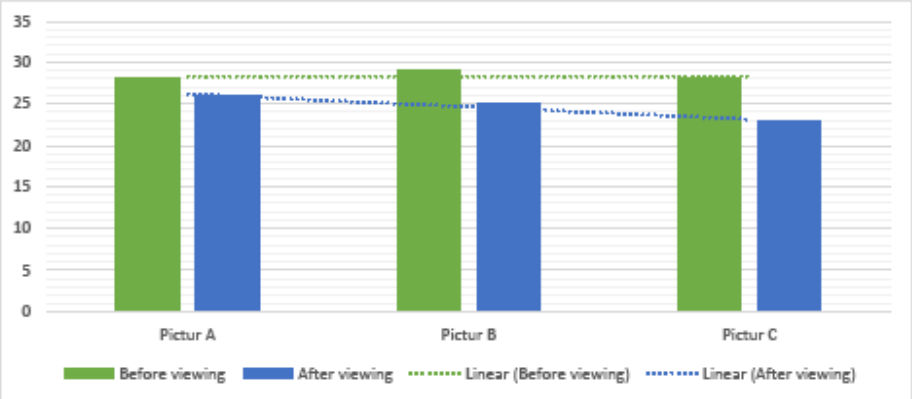

Chart 2: Comparison of anxiety levels before and after viewing images

therapeutic environments can have a significant effect on reducing the level of anxiety in these patients. The findings of the study showed that the use of natural elements, soothing colors, and familiar patterns in environmental design can significantly reduce the level of anxiety. These results are consistent with previous studies on the impact of the environment on mental health. As Kaplan (1995) suggests in his attention retrieval theory, natural environments can help restore attention and reduce mental fatigue. The findings of this study have important practical applications in the design of therapeutic environments. Architects and interior designers can design more effective therapeutic environments for patients with schizophrenia by utilizing the principles presented in this study. These principles include the use of natural light, creating a visual connection with nature, the use of soothing colors, and the design of flexible spaces. Also, the results show that combining familiar elements with natural elements can have a greater effect on reducing anxiety. This finding is consistent with previous studies on the effects of mixed environments on mental health. In the field of designing therapeutic spaces, this study suggests that special attention be paid to the psychological needs of patients. The use of natural elements such as plants, water features, and natural landscapes can help reduce anxiety. Also, the use of relaxing colors such as light blue, soft green, and neutral colors in interior design is recommended. These findings are consistent with the theory of color therapy in architecture. Designing flexible private and public spaces that allow for controlled social interaction is also another suggestion of this study. Limitations of this study include the relatively small sample size (30 people) and the study being limited to one treatment center. It is suggested that in future studies, a larger number of samples be examined and the study be conducted in several treatment centers. Also, examining the long-term effects of environmental design on patients' mental health can be the subject of future research. It is also recommended to study the effect of other environmental factors such as noise, temperature, and air quality on patients' anxiety. One of the important findings of this study is the significant effect of familiar patterns in reducing anxiety. This finding is consistent with Bandura's social cognitive theory (1986), which emphasizes the role of previous experiences and social learning in shaping behavior. It is suggested that familiar elements and symbols that are consistent with the culture and previous experiences of patients be used in the design of treatment environments. This could include the use of familiar materials, architectural patterns, and decorative elements that enhance the sense of security and calm in patients. Future research could investigate the interaction between en-

vironmental factors and drug treatments. Also, studying the effect of environmental design on other mental disorders and comparing the results with the findings of this study could help to better understand the role of the environment in the treatment of mental disorders. The use of new technologies such as virtual reality to simulate treatment environments and examine their effects on patients could also be the subject of future research.

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