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Original Article

Explaining the role of physical components of architecture in medical centers on the reduction of stress in patients before surgery

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Abstract

Introduction: Environmental physical factors affecting the treatment process of patients generally include light and color of the environment, design of treatment centers, sound intensity, quality of temperature and ventilation. The present study aims identify the physical components of the architecture of medical environments and then to explain the role of each in reducing patients' stress and making the health centers more efficient in Birjand.

Methods: This research was conducted based on a descriptive-analytical approach. The study population consisted of candidates for surgery at Razi Hospital and Imam Reza Hospital in Birjand in 2022. Using Cochran's formula, each group included 93 patients, resulting in a total participant size of 186 patients. Simple random sampling without replacement was employed as the sampling method. Data was collected using a research questionnaire. To analyze the impact of each of the physical components on the reduction of patients' stress, the Smart PLS3 software was utilized.

Results: Two dimensions of physical and subjective components which themselves include social components of space and semantic components were extracted by reducing stress. It was found that in physical components with the coefficient of 0.579 and mental components with the coefficient of 0.515, respectively, had the greatest effect on reducing stress in patients.

Conclusion: The most important aspects of the research were found in sensory components, which include layout, light, sound, temperature, ventilation, and smell. Therefore, it is suggested to focus on the sensory components of space with the approach of reducing patient stress in medical centers.

Key words: Perioperative Care, Surgery, Hospital Design and Construction, Architecture, Stress

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Introduction

The hospital is a place where the process of patient care and treatment is carried out, and in its architecture, human personality and responding to his needs is a priority (1). direct treatment environment with physical aspects suitable for others. (for example, by reducing the length of the patient's stay in the hospital, reducing stress, increasing patient satisfaction), it is one of the important factors of creating therapeutic environments with the help of architecture (2). In recent years, paying attention to the condition of the patient and examining his needs from the mental and physical point of view, considering that he is more vulnerable than a healthy person, has led architects and contractors to find new solutions to changing the style of architecture and design. The interior of the hospitals should be for the improvement and health of the patients. All the necessary physical and mental dimensions in the hospital should be in a suitable and harmonious way to achieve a better and faster acceptance of the patient's treatment. In order to design and build useful therapeutic environments, we must first understand the physical and perceptual characteristics that have the greatest impact on optimizing the physical, mental and emotional health of an individual with a stress reduction approach (3). Hans Selye, whom some consider to be the father of stress research, has defined stress as follows: stress is the physiological reaction of the human body to any change, threat, or external or internal pressure that disturbs the psychological balance of a person. He defines stress as a wide range of strong external, physical and mental stimuli that can cause a physical reaction, which he called "general adaptation syndrome". General adaptation has three distinct parts: Alarm response: the body recognizes external stimuli. Adaptation: the body performs defenses against the stress factor. Fatigue: the body begins to terminate its defenses (4). In another approach, how the person perceives the situation is emphasized. In this view, the situations are not stressful in themselves, but the stress is caused by the lack of balance between the person's perception of the requirements of the surrounding environment and his evaluation of his ability to respond to them. Therefore, only when a person cannot deal with the requirements of the surrounding environment, or in other words, when there is a discrepancy between the requirements of the environment and human capacities, stress is created (5). In this research, due to the importance of the role of architecture in the design of the interior spaces of the hospital, the effect of these factors on reducing stress and increasing patient satisfaction is examined. According to the mentioned materials and also according to recent research, to create a favorable treatment environment, it is very important to pay attention to and use the opinions and experiences of patients (4). Therefore, investigating the needs and interests of patients to obtain solutions to improve the environment and reduce the stress of patients forms the main goal of this research. Today, architects, doctors, nurses, and environmental psychologists talk about built buildings as a component of the therapeutic process; So that the findings indicate the effect of therapeutic environments on people's health, the process of treatment and recovery of patients (5). Recently, much research has been conducted on the relationship between human health and the physical elements of the environment around him, which shows the effect of the environment on physical and mental health. Among the environmental characteristics that have positive results on the health of inpatients. things like sound, windows, sunny and single bedrooms, type of flooring and furniture, music, art, nature, air quality, and ventilation can be mentioned. Therefore, it is very important to pay attention to the design and architecture of hospitals and treatment centers in order to improve the treatment process of patients. According to the conducted research, in order to reduce the mental stress of patients, it is suggested that the design of hospitals should be such that the bed rooms have more height than other rooms, bigger windows, and proper ventilation and natural light in the rooms (6). Environmental physical factors affecting the treatment process of patients generally include light and color of the environment, design of treatment centers, sound intensity, quality of temperature and ventilation (7). Light and color can be two important

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factors in the environment It is widely known that it has a great effect on human behavior and it is also effective in the recovery process of patients. In addition, the quality of lighting and arrangement of equipment in medical centers has a great impact on the behavior of patients and visitors (8,9). In the research of Dalke and colleagues, the effect of color and light in hospital design on the recovery process of patients was studied. They found that the design and the presence of uniform color and lights in different parts weakens the recovery process, as well as the balance of design and attractiveness. The combination of colors is the most important factor in the mental health of patients (10).

Noise pollution is one of the environmental factors that, in addition to having a negative effect on patients' conditions, has a negative effect on medical staff and staff and causes increased stress in patients and doctors. The presence of many noises affects the quality of sleep of patients and disrupts their recovery process (11).

Also, noise pollution causes an increase in errors by medical staff and employees due to their lack of concentration, which is also a negative factor in the process of treating patients (12). The feeling of comfort is a factor that depends on the physical and psychological conditions of the surrounding environment, such as the temperature of the incoming air, body metabolism, the moisture exchange ability of the clothes worn, etc. (13). The effect of physical characteristics the environment related to temperature comfort is more for buildings with natural ventilation compared to buildings with fully automatic ventilation (14).

Therefore, the issue of ventilation and temperature control is considered an important factor for hospitals to treat patients. As it is clear, the trend of conducting research on the design of hospitals in order to reduce the psychological pressure of the patient and improve the treatment process is increasing (15).

In the research of Curtis and colleagues, various environmental and design factors on the health of patients were investigated. They came to the conclusion that with the change of environmental conditions, the type of patient care should also change and also, environmental changes such as changes in the interior design of the hospital, sometimes have bad consequences on patients (15). In the conducted researches, effective factors on the improvement process of hospitalized patients in hospitals have been identified, but no specific comparison has been made between these factors and the type of hospital design. The process of the present study was carried out using field research on the patients of Imam Reza and Razi hospitals in Birjand. Finally, by using the obtained results and comparing the results of the patients' questionnaire, it was tried to identify the architectural factors effective on the process of reducing the patients' stress and provide a solution for the better design of hospitals.

Materials and Methods

The current research is practical and falls within the scope of descriptive-analytical studies. Initially, theoretical concepts were described to clarify the research problem, and then a coherent and efficient discussion and analysis of architectural components in reducing patients' stress were conducted.

These components were collected based on the literature, theoretical foundations, and the opinions of experts, in the form of final criteria for the research. Subsequently, a research questionnaire was designed, and its validity and reliability were assessed using Cronbach's alpha, composite reliability, and Average Variance Extracted (AVE) statistics, which yielded acceptable results.

The study population consisted of non-emergency and elective surgical candidates at Razi Hospital and Imam Reza Hospital in Birjand. The sample size, determined using Cochran's formula, included 93 patients in each group, resulting in a total of 186 patients. Informed consent was obtained from the patients and their companions to complete the questionnaire. Simple random sampling without replacement was used as the sampling method. The analysis was based on the existing and evident variables. Smart-PLS software was used to analyze the collected data.

The research protocol was approved by the ethics committee affiliated with Birjand University of Medical Sciences with the identifier IR.BUMS.

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Results

This study, 66.7% male and 33.33% female and 0.15% 24-25 years old and in the field of education: 10.8% below diploma, 11.3% is a diploma, 8.6% is a master's degree, 48.4% is bachelor and 0.21 is a master's degree. After reviewing the descriptive statistics of the research: Now it is time to analyze the final components that were extracted from the theoretical bases and based on the viewpoint of experts. For this purpose, after entering latent variables (main variables and related criteria for each) and explicit (indicators or questions) and drawing the model in Smart-PLS software, the final model was analyzed in two modes of estimating standard and significant coefficients which indicate the extent and significance of the independent variables affecting dependent change, respectively (Figure1).

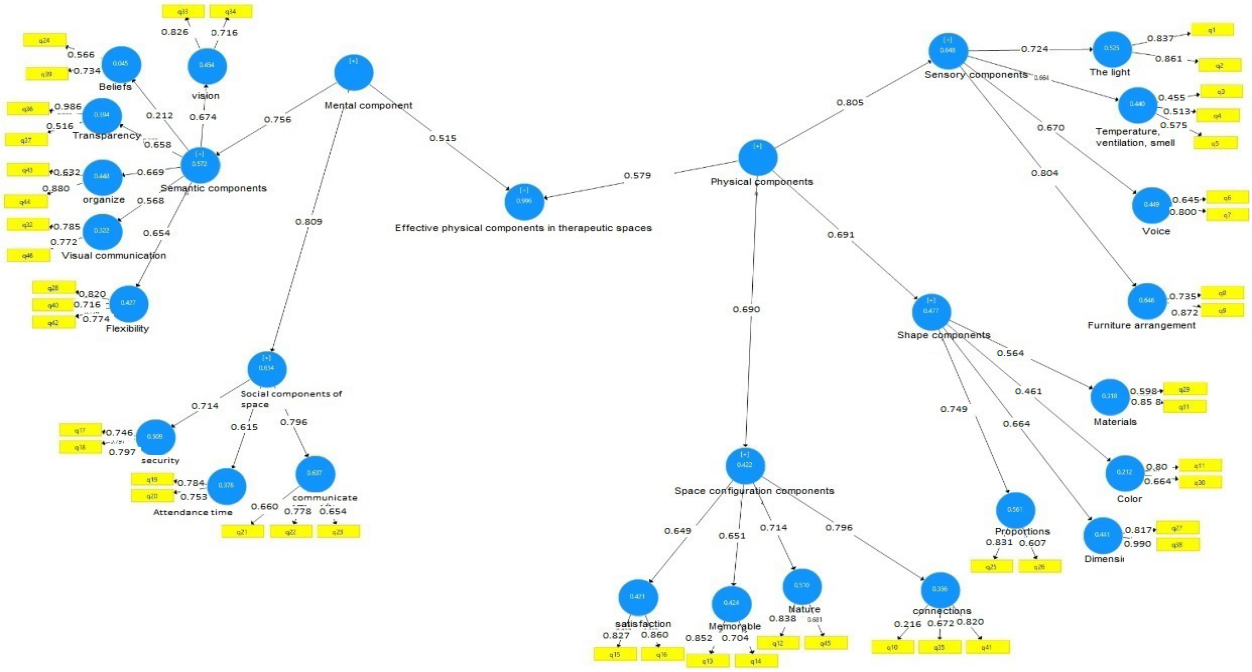

Figure 1. Model in estimating standard coefficients

After implementing the model in the related software, it is necessary to check the reliability and validity of the model which was done in the form of Cronbach's alpha test, joint reliability test (Delvin Goldstein), Spearman correlation reliability of questions (rho-a) and finally co-reliability test. The results are presented in the Table 1.

According to experts, including Johnson, Cronbach's alpha value, Spearman's combined reliability and correlation should be high (16).

The value of the joint reliability is 0.7 and the value of the joint reliability is more than 0.5, accordingly and according to the results obtained from Table1 of all coefficients The obtained conditions and according to the four reliability tests, the model is the holder of reliability. Also, in accordance Ringle and Henseler agree that if the AVE>CR condition is met, the validity of the model is also confirmed. According to Table 1 It is seen that the model has a validity as well. Fornell and Locker tests were used to evaluate divergent validity and the results of which were presented Table 2.

Fornell Velarcher test, which in 1986 stated that in addition to the questions of a variable that should

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Fornell Velarcher test, which in 1986 stated that in addition to the questions of a variable that should diverge from the questions of the variable, the variables of the research should not be critically correlated based on their concepts (17).

Variables correlations table and extracted mean variance were used to create a table named Fornell and Locker Table. The number over the main diameter of the square root is AVE which if it is greater than its correlation with other variables, divergent method is confirmed by this test.

Table 1. Model Reliability Test

Variables	Shared Reliability (AVE)	Combined Reliability (CR)	Spearman Solidarity (RHO-A)	Cronbach's alpha
Dimensions	0.782	0.743	0.783	0.779
Visual Communication	0.706	0.755	0.751	0.750
Communication	0.891	0.715	0.761	0.725
Beliefs	0.730	0.897	0.743	0.837
Security	0.896	0.847	0.825	0.823
Flexibility	0.777	0.785	0.728	0.790
Communicate	0.749	0.706	0.716	0.795
Proportions	0.582	0.734	0.798	0.787
Memorable	0.590	0.741	0.819	0.810
Temperature, ventilation, smell	0.899	0.753	0.881	0.834
Satisfaction	0.712	0.831	0.799	0.795
Color	0.848	0.706	0.884	0.879
Time of Attendance	0.895	0.746	0.819	0.718
Organize	0.787	0.735	0.862	0.717
Transparency	0.808	0.760	0.740	0.735
Sound	0.729	0.690	0.717	0.813
Nature	0.783	0.735	0.807	0.792
Materials	0.756	0.707	0.744	0.816
Social Components of Space	0.773	0.720	0.764	0.847
Sensory Parameters	0.772	0.760	0.883	0.745
Mental Parameters	0.853	0.764	0.713	0.783
Shape Parameters	0.708	0.664	0.869	0.841
Semantic Components	0.715	0.736	0.643	0.811
Parameters of Space Configuration	0.734	0.720	0.703	0.867
Effective Physical Components in Medical Spaces	0.819	0.845	0.841	0.816
Physical Parameters	0.737	0.784	0.747	0.721
Light	0.782	0.834	0.803	0.889
Outlook	0.799	0.749	0.745	0.736
Furniture Layout	0.750	0.787	0.703	0.872

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Table 2. Larker's Fornell Divergence Test

Variables	Social Components of Space	Sensory Parameters	Mental Parameters	Shape Parameters	Semantc Components	Parameters of space configuration	Effective Physical Components	Physical Parameters
Socia Components of Space	0.522							
Sensory Paraeters	0.377	0.521						
Mental Prameters	0.809	0.440	0.891					
Shape Parameters	0.381	0.422	0.486	0.556				
SemanticCoponnts	0.361	0.232	0.756	0.385	0.863			
Parameters of space configuration	0.356	0.264	0.593	0.254	0.525	0.684		
Effective Physical Components in Medical Spaces	0.710	0.687	0.900	0.647	0.697	0.703	0.845	
Physical Parameters	0.524	0.805	0.665	0.691	0.542	0.650	0.921	0.970

According to the obtained results, the numbers on the main diameter of the root of AVE are greater than the correlations of the variable with other variables, so not only the questions of one variable are not correlated with another variable, but also the variables of the research do not have critical correlation.

In order to investigate the significance of the pathways, three cases of path coefficients or β, value-T and Sig should be investigated that the coefficient of path, amount and direction of effect and value-T should be in the range of -96.1 and 96.1 and Sig value less than 0.05, then it can be said that at the confidence level of 95% and 99% of hypotheses H0 rejected and H1 are significant, respectively.

This means that a causal relationship is confirmed in a larger sample of the same society.

Table 3 shows results of Path Analysis Significance Test.

Table 3. Results of Path Analysis Significance Test. Larker's Fornell Divergence Test

Path	Path coefficient (amount and direction of direct impact) β	T-Value	Sig	Results
Subjective Components Affecting Therapeutic Spaces ⇨ Reduce patient stress	0.515	3.794	0.001	Meaningful
Physical Components Affecting Therapeutic Spaces ⇨ Reduce patient stress	0.579	3.808	0.001	Meaningful

The path of subjective components on the physical components affecting the therapeutic spaces, which in fact indicates the effect of subjective components on the dependent variable of reducing the patient's stress due to the T-value which is outside the range of -1.96 and -1.96 and the value of Sig<0.01 is significant at 99% confidence level.

The path of physical components on the effective physical components on the therapeutic spaces, which in fact indicates the effect of physical components on the dependent variable of reducing the patient's stress due to the T-value, which is outside the range of -1.96 and -1.96 and the value of Sig<0.01 is significant at 99% confidence level.

Discussion

In this research, the effect of the physical environment of the therapeutic space on the reduction of patients' stress is investigated. The results of the studies conducted in the field of physical factors of the environment on the reduction of people's stress point to the direct effect and significant relationship

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between the two components. As in the findings of this review, it can be concluded that the present result is consistent with the results of the research that examines the effects of physical factors of the environment in therapeutic environments on reducing the stress of patients (18). Salehinia and Ahadzadeh to this They concluded that the physical conditions of the treatment and hospital environment, such as the color of the walls and rooms, lighting, the appearance and atmosphere of the hospital, the condition of the ventilation of the inpatient rooms and corridors, being equipped with modern and advanced equipment, etc. can have an effect on the attitude and behavior of patients (18). Saidi et al.in their study came to the conclusion that having beauty and proportion, having special rooms with enough space for equipment and personnel, communication and internal order of the space, controlling pollution and noise, having comfort and safety facilities, achieving Other units are one of the most important criteria of the physical environment affecting effectiveness (19).

Also, based on the results of the study by taking advantage of the interior architecture of therapeutic spaces and paying attention to physical factors such as color, lighting, solitude, etc., it is possible to create suitable and valuable spaces based on the principles of aesthetics and functionality of architecture. A space to address the stress and anxiety of patients, which is caused by being in the hospital for treatment or illness (20, 21). The result of the research also showed that environmental characteristics such as sound level, proper lighting, color quality, green space and furniture have a significant effect on the satisfaction and rehabilitation of patients (22). The mentioned results in similar studies, it has also been confirmed that the physical conditions of the treatment environments are perceived as one of the most important factors in bringing patients' satisfaction and in their studies, they concluded that having suitable physical conditions not only brings comfort and comfort to the recipients. It also causes comfort and convenience in the working environment of the employees and ultimately leads to the provision of working conditions and the way to provide better service to their patients. The results of the present study show that physical factors are one of the most important effective factors in reducing the stress of patients in therapeutic spaces and can be of great help to the effectiveness of such spaces. With It seems that today more attention is paid to the functional aspects of this type of spaces and less attention is paid to the role and relationship of physical and perceptual factors on their efficiency and appropriate response. They are not the same. In this research, it was observed that among the physical factors, there is a significant difference in the two dimensions of physical components and mental components, which include: social components of space and semantic components, with the stress reduction approach. Today, the design of built therapeutic environments relies on the knowledge and awareness of the designers before it relies on the personal feelings and attitudes of the designers. The environment has been able to significantly increase the quality of perception or intuition that is the result of the person's presence and his experience of the environment in which he is placed (23-26).

Conclusion

According to the results obtained, it was determined that sensory components and social components of the environment have a significant and positive impact on reducing patients' stress in Imam Reza and Razi hospitals in Birjand.

The highest impact was attributed to furniture arrangement with a coefficient of 0.804, lighting with a coefficient of 0.724, and in the social components of the environment, establishing communication with a coefficient of 0.798 and security with a coefficient of 0.714, all contributing to the reduction of patients' stress. These results indicate the importance of the integration between physical and psychological components in achieving a greater reduction in patients' stress.

Moreover, the greatest contribution to reducing patients' stress was attributed to the implementation of sensory components, which include variables such as light, temperature, ventilation, smell, and sound. In the social component dimension, the variables of establishing communication, presence time, and security were found to have the greatest impact.

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Finally, it is recommended to use these findings in the design of healthcare facilities to effectively reduce patients' stress.

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Conflict of Interest

All authors declare that they have no conflicts of interest.

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