

Interference Effects of Spatial Color Design in Community Healthcare Environments during Epidemic

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Abstract:

The outbreak of the new crown epidemic has brought enormous pressure on the healthcare system. Currently there is a long waiting time for big hospitals and an acute shortage of inpatient beds. Therefore, improving the community medical network so that people can enter the community for minor illnesses is one of the main means to solve the difficulties and high costs of s. At present, the environment of community medical places in China is not very satisfactory, the environments design mainly focuses on its functionality, Insufficient attention has been paid to optimizing the environmental design of community hospitals. This study summarizes the solution to improve the community medical environment simply and quickly through the transformation of environmental color by reading data, detailed analysis and field investigation. By applying color space hierarchy design, humanized color design, functional division color design, and color-oriented design, we can provide a comfortable, beautiful, efficient, safe, and convenient color scheme for the hospital environment, which will have a positive intervention effect on patients' physical, psychological, and physiological.

Keywords: *Community healthcare environments, Spatial color design, People-oriented design.*

I. INTRODUCTION

The worldwide epidemic of the new coronavirus has brought a new test to the development of human health itself [1]. No matter how rapidly our civilization has developed, a sudden epidemic can destroy all the achievements in an instant. Although China ranks first in the world in terms of the number of hospitals, in new coronavirus epidemic rampant situation, there are a series of problems., such as difficulties in accessing medical care. shortage of resources. Now 80% of China's medical resources are concentrated in large cities, most patients are going to large hospitals, so the medical resources of large hospitals are close to saturation. Improving the community medical network and bringing minor diseases into the community is one of the main means to solve the difficulty of access to medical care in China [2]. It is a more reasonable way to allocate medical and community medical institutions will become the main body of community medical services such as preventive health care, basic medical care, health education and disease control.

The community medical space is the key public place for maintaining patients' health. As soon as the word "Hospital" is mentioned, the pale environment, pungent smell come to mind, which makes many people feel fearful or even disgusted of hospitals and ignore the design of the environment. The cleverness of color is not only natural but also has a positive therapeutic effect. In order to provide a better environment for each patient and a better office space for healthcare professionals, it is important to study the use of color in healthcare spaces.

Color design is an important intervention for community health care. Color in the healthcare environment is centered on color conditioning, a technology that created the function of color and only entered the arena of human civilization in the 20th century [3]. The function of color plays a certain interventional role in the medical environment. The main hues, or base colors, in community healthcare spaces, such as walls, floors, large furnishings, and partitions and enclosing curtains are the main items that influence the base color of the space, while small furniture, greenery, lighting, small equipment, guide system signs, etc. in the space are the accent colors of the community healthcare space. The study of the psychological and physiological nature of color can help enhance the medical experience of the community healthcare environment and achieve certain intervention effects through color regulation.

II. MATERIALS AND METHODS

2.1 Reading Data Method

Through the review of color design and community medical environment related literature, network materials, libraries, papers, newspapers, monographs, etc. to collate and summarize relevant information, analyze the information, clarify the current status and progress of color design in community medicine, compare the strengths and weaknesses of domestic and foreign medical color research through the information, and strive for a multi-dimensional and all-round understanding of the psychological intervention role of spatial color in community medicine, and dig out as much as possible Highlights.

2.2 Visiting Survey Method

By interviewing the people who visit the community health service center, we understand the medical treatment and medical service needs of the people who visit community medical institutions, and make appropriate additions to the study.

2.3 Field Survey Method

Visiting community medical institutions, taking pictures of the space details, experiencing the advantages and shortcomings of color design in the community medical space, and exploring the "human-centered" color design method.

2.4 Case Analysis Method

Through the analysis of excellent cases at home and abroad, taking the essence and removing the bad, coupled with humanistic design principles, these cases will be analyzed in depth, and in the process of case analysis, the scientific and practical nature of the subject will be discovered, making a certain contribution to the reconstruction of the color system of the community medical environment.

III. BASIC THEORY OF COLOR

The community medical space has basic medical service areas: such as pediatrics, quinteroology, surgery and other departments and infusion rooms, drug exchange rooms, treatment rooms, disposal rooms, observation rooms, resuscitation rooms and other departments; public health service areas: such as preventive health care, pregnancy health care room, women's physical examination rooms and other colorful departments; auxiliary diagnosis and treatment services: such as medical laboratory, medical imaging, Chinese and Western pharmacy, electrocardiogram room, sterilization supply Comprehensive management service area: comprehensive office, medical department (quality control section), financial assets section, logistics management section, etc [4].

Color is perceived by people through visual organs, producing different roles and effects such as psychological and physiological, etc. The study and use of these roles and effects provide scientific basis for the color design of different spatial environments of community medical care.

3.1 The Psychological Effect of Color

The psychological effect of color refers to: the subjective psychological response caused by the objective color world. In a certain environment, the color of objects affected by the environment, human vision has also produced changes, the formation of a certain optical illusion, such as objects or space, the sense of warm and cold, distance, movement and so on produced a special visual color effect. Color is objectively a stimulus and symbol of people, color psychology through the visual beginning, when the different wavelengths of light through the visual organs to produce color sense at the same time, often unconsciously affect our emotions, temperament and behavior [5].

3.1.1 Temperature illusion

Temperature illusion is a chain reaction of the human brain, is the association of the usual life experience. For example seeing color "Yellow" some people will feel its warmth and light because they associate it with the sun, the beach or light. Because warm colors mostly give the illusion of warmth, it is a good choice to use warm colors as the basic color for spaces that are not well lit in the community healthcare space. And here we should also note that the warm color red in the medical space needs to be used with caution, red brings relatively higher temperature than other colors, in the community medical space too high color temperature feeling makes people irritable, including orange, as a space

embellishment is a good choice, but the use of large areas because of its color brightness is stimulating and give people a sense of dryness and heat. On the contrary, the blue and green colors make people think of green mountains, the sea and green plants, and the coolness feeling will born, the temperature feeling is relatively low. Space color temperature can be adjusted by the following methods [6].

3.1.1.1 Complementary color adjustment method

If yellow is the base color of the space, its complementary color purple can be used to embellish, here note that not color adjustment method should pay attention to the ratio between colors and color purity, try to avoid the collision of high-purity colors together, forming a sense of clutter, in the community medical space color design should pay more attention to this kind of situation, so as not to make patients appear irritable emotions.

3.1.1.2 Approximate color adjustment method

Such as the use of green accents in the blue-based space, so that the cold space has a hint of warmth.

3.1.1.3 White adjustment method

In the community medical space, white space is used very much, it conveys to people the color temperature is neutral, that is: not cold or warm. So in this space, embellished with warm colors tend to slightly warm color optical illusion, and vice versa, is slightly cold color optical illusion.

3.1.2 Distance illusion

Each color has its own brightness and color, color distance illusion is formed by the contrast between the brightness and color of different colors. The higher the brightness and chroma, the stronger the sense of forward, and vice versa, the stronger the sense of backward. In the community medical space, the use of brightness, color relatively low color as the base color of a small space is a good choice, such as the community medical space in a small ward, the use of low brightness, low color warm color system, both warm and spacious.

3.1.3 Movement illusion

Color also has different character traits of movement. Such as primary colors, inter-colors, complex colors, most of these high chroma colors have dynamic character, they represent the movement, intense, active, excited and so on strong emotions. This color is more suitable for young people or children, in the pediatric ward or pediatric building using such colors can divert the attention of children, so that the hospital becomes less scary, so that the atmosphere closer to the heart of children. The static character of the color is often lighter or darker, such as: blue-green, light pink, dark blue, etc. This color will bring people a sense of calm, relaxation, romance. Obstetrics and gynecology usually use pink color to create a

warm, romantic medical environment; light green-based operating room, not only on the walls can play a role in reducing stress and calming the nerves of the doctor, the patient can also relax the role of tension [7].

3.2 The Physiological Effect of Color

The physiological effect of color is reflected in the human visual adaptation, the adaptability of human eye is very strong, which can automatically select the main color in the light source as the basis to measure other colors. One of the principles of color adaptation is often used in medical settings. Simply put, it is the visual change caused by the stimulation of color. The complementary color of the artifact is used as a background in the community medical environment to avoid the visual stress caused by the residual image of the complementary color in order to eliminate visual interference, reduce visual fatigue, and allow the visual organs to balance and rest from the background. In the operating room, a large number of green is used as the indoor base color, such as: walls, surgical gowns and surgical towels. During the operation, doctors will face the red blood for a long time, If suddenly turn their eyes away, the phenomenon of complementary color residual image in the brain will appear, the complementary color of red is green, green complementary color if it stays on other colors will interfere with the doctor's vision, making it impossible to concentrate, choose a large area of green environment The choice of a large area of green environment color effectively solves this problem [8]. Using the principle of color adaptation, when red blood is wiped on a green surgical towel, the visual organ will process it as black, avoiding the horrible atmosphere brought by the bloody red.

W. Gerber, an American colorist, considers color to be a complex artistic tool and even concludes that "color can cure disease" [9].

Community medical space in the color of the base color should be unified and change, large areas of color to white or light colors, high brightness, low color is more suitable for the wall and the color of large furnishings, such as ward walls, partitions, curtains, beds, etc. are light colors can make patients and family members feel stable and relaxed. And some small furnishings, such as: small furniture, lighting, greenery, etc., you can choose complementary colors or relatively low brightness or relatively high color as an accent TABLE I.

TABLE I. Color effect and application area

Main color	Effect	Application area
Pink	Relaxation, warmth, comfort, romance	Obstetrics and gynecology, pediatrics, wards
Green	Reduces stress, visual fatigue, stabilizes emotions, slows down breathing, reduces heart burden, and	Operating room, corridor, lounge, treatment room, endocrinology

	lowers blood pressure.	
Blue	Slows down the pulse, relaxes the emotions, and reduces the body's sensitivity to pain.	Surgery, emergency, department, counseling room, quintessential medicine.
Yellow	Stimulates the nervous system, improves brain function, warmth and appetite.	Gastroenterology, psychology, pediatrics, geriatric ward, outpatient lobby
Purple	Slows down pulse, relaxes mood, regulates insomnia and nervous disorders	Maternity ward, neurology department
Brown	Promotes cell growth and faster recovery of patients after surgery	Rehabilitation departments and wards

IV. COLOR DESIGN INTERVENTION METHODS

4.1 Design Principles

4.1.1 Color design should be in accordance with the human-centered design principles

The concept of "people-oriented" needs to be integrated into the color design of the community medical space. As the name implies, the so-called "people-oriented" is from the human point of view, the design for serve people, we should emphasize all the services for patients' physiological and psychological needs. Science and "such as people-oriented" concept is the combination of the current community medical space color design imperative [10].

4.1.2 Focus on the patient's emotional experience of color

Different patients have different feelings about the hospital color. Most people are nervous and insecure about the hospital, and the effective matching of color can help people eliminate this psychological emotion, the use of good color psychological intervention, from the "people-oriented" starting point, the scientific use of medical color can effectively create a comfortable, warm medical environment.

4.1.3 Combining regional cultural characteristics

The use of regional colors is also a reflection of the concept of "people-oriented", each city has its own color, black and white ink color represents the Jiangnan region, white and yellow represents the north, which is caused by the cultural and climatic characteristics of the region. Combining regional colors in the design of medical space environment can give patients a sense of affinity and pride in the regional culture.

4.2 Design Methods

4.2.1 Color space hierarchy design

4.2.1.1. Development of the main color of the community medical environment space

The establishment of color tone is the basis of the color design of medical space, because the medical space as a special public space, functional zoning is more complex, there are different nature of the single area, in order to make the color is not cluttered, it is necessary to establish a color system, not only can each functional area orderly link and can meet the psychological needs of patients and medical staff, to establish an orderly and harmonious medical environment. In the indoor space, the ceiling, ground, wall area is relatively large, we tend to use the method of light on the top and dark on the bottom, such as the ceiling only with a higher brightness of color, to enhance the sense of extension of space, so that the space looks more open and bright, followed by the wall brightness is lower than the ceiling, the use of comfortable and light colors and not suitable for bright colors, the ground color is the deepest color of the space, which can play a balancing The role of space, so that the overall color looks more stable and safe.

4.2.1.2 Enrich the community medical space furnishing hues

Medical furnishings mainly refers to medical equipment and facilities, in people's impression of medical equipment are raw metal, can make people nervous, uncomfortable psychological emotions, but in fact, as long as these accessories color use to get, will play a role in enriching the space color, relieve people's anxiety psychology [11].

4.2.1.3 Enhance the community medical space embellishment color

The accent color of community medical space mainly comes from small furnishings, in addition to raw equipment, lighting equipment, decorative furnishings, such as greenery, photo walls and so on. These accent colors adjust the atmosphere of the space under the background of the base color of the environment, and play the role of the finishing touch.

4.2.2 Humanized color design

Combined with the characteristics of color expression, the following kinds of common colors of medical space for a brief analysis: red gives people a physiological feeling of excitement, enthusiasm, can effectively treat depression, reduce the symptoms of headache, and the treatment of the circulatory system and the nervous system are very helpful. Green is close to the natural color, can relieve visual fatigue, can make people relax, reduce the heart burden has the effect of lowering blood pressure, suitable for use in the operating room and treatment room, not only can stabilize the mood of patients can also relieve the long-term work of medical staff caused by visual fatigue. Purple can effectively treat human brain diseases and mental illness and has a certain female color, can be used in obstetrics and gynecology, can stabilize the

mood of pregnant women. Yellow and orange can bring a happy and positive psychological feeling to people, have a stimulating effect on the digestive system and nervous system, and help in the treatment of stomach and liver, suitable for gastroenterology and psychiatry. The properties of blue and green are similar, the difference is that green is more relaxing and blue is more calming, so most hospital gowns are made of blue, which has the psychological effect of analgesia [12].

4.3 Functional Division of Color Design

Hospital is a relatively complex functional indoor space, the distribution of different functional areas, in the face of a large number of personnel flow, how to make different groups of people in the complex space to avoid cross-infection, and quickly locate to their own need. We can adopt different colors to differentiate.

4.4 Information Visualization Design

Community medical space also has some warning role or guidance of color, this color area is small, but the color is eye-catching, combined with the icon prompt, guide the action of medical personnel. For example, the hospital's visual guidance system is unified into orange, which plays an eye-catching role and forms a unified color design concept. Another example, the color of the corridor signs of different departments can also be designed in accordance with the different sections of different colors. Color divided into functional areas, according to the color of the wall signs people can quickly find the required orientation. There are also many cases of community medical space using color to play a warning role, such as the epidemic, the waiting lobby seating area often see a yellow background sign with large black letters prompting "epidemic prevention and control, sit apart". For example, the warning sign of "medical waste" also has a yellow background with black letters [13].

V. CONCLUSION

Among the five types of human perception of the world, the most direct way is visual, and color is the most direct factor in the visual experience, and its impact on human psychology cannot be ignored. Color therapy has an impact on the physical health of community healthcare workers, meeting both the special psychological requirements and emotional demands of medical patients, and working to solve the problem of unreasonable color that is detrimental to the physical and mental health development of medical patients. For the community medical space, in addition to having cold medical equipment, the correct use of color places can show the humane healing space and the hospital's unique cultural and spiritual connotation, but also can make the condition better healing. For a special space design like a hospital, it is necessary to consider various factors and be able to reasonably and effectively apply color to the design of it, reflecting the characteristics of medicine itself on the one hand, and focusing on people's psychological research on the other. Only the perfect combination of the two can reflect the value of medical space, which can effectively reduce the anxiety of hospital personnel and improve the efficiency of the fight against the epidemic.

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