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OPTIMISATION STRATEGIES AND DESIGN OF LIGHT ENVIRONMENTS IN DENTAL CLINICS

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This paper centers on the light environment of dental clinics. It delves into the optimization of biological adaptability and visual comfort, discussing natural and artificial light, and how to create a good visiting environment, highlighting the importance of light environment optimization.

Key words: *dental clinic, light environment, natural light, artificial light, visiting experience*

INTRODUCTION

In the overall environment of the dental clinic, the design of the light environment is crucial. It is not only about the patient's experience but also has a profound impact on the efficiency of medical staff and the quality of the medical environment. With the continuous improvement of people's requirements for the comfort of the medical environment, how to create a light environment that meets both biological adaptability and visual comfort has become an important research topic in the field of dental clinic design. A good light environment can ease the tension of patients, enhance the enthusiasm of medical staff, and then promote the quality of medical services.

PURPOSE

The aim of this study is to comprehensively analyse the optimization strategies of biological adaptability and visual comfort of the light environment in dental clinics, to provide scientific and systematic theoretical basis and practical guidance for the design and renovation of dental clinics, in order to achieve the best experience of patients and healthcare workers in the light environment, and to improve the overall quality of the environment and the level of healthcare services in dental clinics.

RESULTS AND DISCUSSION

Dental clinic light environment mainly contains natural light and artificial light two parts, they cooperate with each other, together shaping the ideal lighting conditions of the dental clinic.

Natural light has a significant impact on human physiology and psychology. In modern fast-paced life, people's exposure to natural light is reduced, but the human biological clock and physiological rhythms are closely related to it [1]. Natural light is spectrally rich and has complex regulatory effects. For patients, it can regulate the biological clock, relieve tension, reduce the body burden, improve

the psychological state, enhance the degree of cooperation with the treatment, and also accelerate postoperative recovery [2]. For healthcare professionals, natural light reduces visual fatigue, improves diagnostic accuracy, maintains good physical condition, enhances job satisfaction and efficiency, reduces stress, maintains mental health, and promotes teamwork.

In the design of dental clinic space, it is extremely critical to make full use of natural light resources. Increasing the natural lighting area is the foundation, and setting large floor-to-ceiling windows can significantly improve indoor lighting. When designing floor-to-ceiling windows, use large-size glass panels to reduce window frame shading, select high transmittance glass to reduce light transmission loss, distribute light, reduce artificial lighting, and reduce energy consumption [3]. Clinics with high space, reasonable skylights are also a good idea, sunshine on sunny days and diffuse light on cloudy days can make the space more comfortable.

Waiting area as the first space for patients to stay when they enter the clinic, natural light has a significant effect on patients' emotional regulation. Adequate natural light can make patients change from nervousness to relaxation and calmness, and patients can look at the outdoor landscape through the window, distracting their attention from the clinic, relieving anxiety, and creating a good psychological foundation for the diagnosis and treatment. In the diagnosis and treatment area, soft natural light can reduce patients' fear and resistance during treatment, enhance the sense of security and comfort, weaken the unfamiliarity and coldness of the diagnosis and treatment space, which is conducive to the construction of a harmonious doctor-patient relationship, and enhance the degree of cooperation and satisfaction of patients.

In the artificial light design of dental clinics, light color temperature, illuminance, and color rendering are vital. Warm - tone light (below 3000K) suits the waiting area, creating comfort, while cold - tone light (above 5000K) is fit for treatment areas like the dental surgery room. Illuminance varies: 200 - 300lx for the waiting area and 1000 - 1500lx for the treatment area. Color rendering is crucial too. The CRI should be over 80 generally, and over 90 in key areas for accurate diagnosis and better treatment.

Intelligent lighting systems also offer significant advantages. It can be automatically adjusted according to time and demand, reducing the brightness of artificial lighting during the day when there is enough natural light, and increasing the brightness and adjusting the colour temperature in the evening or on cloudy days. During diagnosis and treatment, it can provide accurate and appropriate lighting and also supports personalised settings and scene modes. Patients can adjust the light according to their needs, and healthcare workers can switch scene modes with a single click, improving efficiency and focusing on medical work.

The clever use of light colours, shapes and arrangements give the clinic an artistic charm and a warm atmosphere. Warm lighting eases patients' tension, while cool lighting shows the clinic's rigour. Unique lighting shapes, such as wall sconces and chandeliers in the waiting area, attract patients' attention and distract them. Reasonable lighting arrangements create unique light and shadow effects, enhances the sense of space, and makes patients more comfortable and relaxed.

As shown in Figure 1, Latvia's LAVA Dental Studio has unique lighting. Green wall gradients match light colour temperature for a warm feel. Neon-tube-marked room numbers, mirror-fitted light strips, and different lighting in waiting and treatment areas create charm and meet needs.

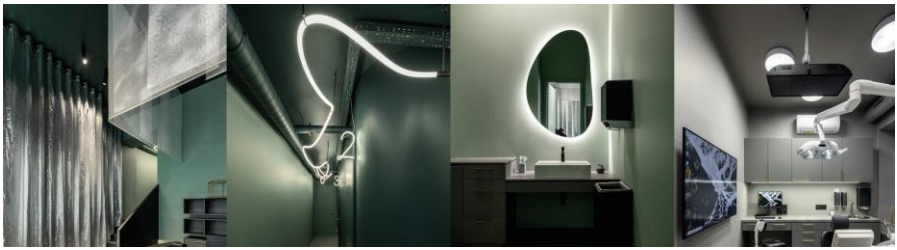

Fig.1. Latvia's LAVA Dental Studio

In the design of the dental clinic space, the integration of lighting and architectural elements is the key to improving quality. Embedded lamps are embedded in the ceiling to meet the lighting and make it simple and regular, which fits the image of hygiene; light strips are set on the walls to highlight the sense of space hierarchy through light and shadow and create an artistic atmosphere; lighting and partitions are used in conjunction with each other to subtly divide the space, enhance the functionality and practicability, and improve the efficiency of space utilisation, so as to satisfy the needs of both aesthetics and practicability. The Generación Dental Clinic in Málaga, Spain, as shown in Figure 2, has a professional, hygienic, welcoming and relaxing atmosphere with a predominantly white colour palette and soft warm or neutral lighting. Delicate chandeliers in the waiting and reception areas serve as visual focal points, while triangular light markings on the corridor floors are directional and decorative. Spotlights on the top of the bathroom, uniform lighting in the corridor, and changes in the brightness of the lights in different areas combine with the architectural structure to create a rich sense of spatial hierarchy, and the interaction between the glass partitions and the light creates an open and orderly spatial atmosphere.

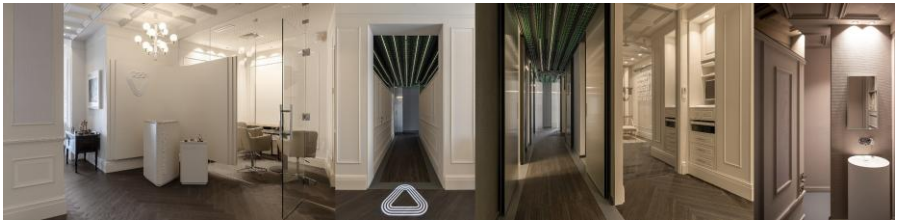

Fig.2. Generación Dental Clinic

CONCLUSIONS

The optimisation of the light environment is the key to the creation of environmental comfort in the dental clinic. Natural light is good for the body and mind, and can be fully utilised by increasing the lighting area and setting up skylights. Artificial light has both illuminating and decorative functions, so it is necessary to choose light colours and set up lamps according to the functions of the area, to meet the lighting standards and to ensure a soft light. To enhance visual comfort, we need to plan illumination and consider colour rendering. Intelligent lighting can be automatically adjusted on demand to provide personalised scenes. Lighting can also create an atmosphere, and the integration of architectural elements to enhance the quality of space, to create a comfortable environment for doctors and patients, and help improve the level of dental medical services.

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ЧЖАО Ке, КОСЕНКО Д.

СТРАТЕГІЇ ОПТИМІЗАЦІЇ ТА ПРОЕКТУВАННЯ СВІТЛОВОГО СЕРЕДОВИЩА В СТОМАТОЛОГІЧНИХ КЛІНІКАХ

Ця стаття присвячена світловому середовищу стоматологічних клінік. Вона заглиблюється в оптимізацію біологічної адаптивності та візуального комфорту, обговорюючи природне та штучне освітлення, а також способи створення сприятливого середовища для відвідування, підкреслюючи важливість оптимізації світлового середовища.

Ключові слова: *стоматологічна клініка, світлове середовище, природне освітлення, штучне освітлення, досвід відвідування*