INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN BUSINESS & SOCIAL SCIENCES

Vol 15, Issue 8, (2025) E-ISSN: 2222-6990

Research Trends and Status of Color Design in Hospitals: A Thematic Analysis

Fanxuan Kong*, Qiuxia Zhu

Faculty of Art, Lanzhou University of Finance and Economics, Lanzhou 730101, Gansu, China

*Corresponding Author Email: kongfx@lzufe.edu.cn

DOI Link: http://dx.doi.org/10.6007/IJARBSS/v15-i8/26335

Published Date: 24 August 2025

Abstract

There is an increasing amount of research on the application of color design in hospital environments. However, there remains a lack of systematic review studies on the effectiveness of improving the quality of medical spaces and patient rehabilitation experiences, particularly a comprehensive analysis of past research patterns and trends. This study reviewed the literature on color design in hospital environments and patient rehabilitation experience, and conducted quantitative and qualitative analyses of a total of 21 relevant papers by searching keywords in the Web of Science (WOS) database. The qualitative analysis identified five final themes: (1) Art therapy applications, (2) Colour and light effects, (3) Paediatric environmental design, (4) Integration of cultural traditions, and (5) Multisensory spatial design. These findings offer new perspectives and frameworks to inform the future application of color in medical environments, thereby supporting the development of humanized and comfortable medical spaces.

Keywords: Color Design, Medical Environment, Hospital, Thematic Review, ATLAS.ti

Introduction

Internationally, there is a growing interest in the use of the arts in healthcare, as evidenced by the numerous studies reported in the nursing and medical literature. Boyce's article suggests that art interventions in hospital settings have a positive impact on both psychological and physical outcomes for patients (Boyce et al., 2018). Light and colour are two of the most important elements of hospital environmental architecture, and their implications for treatment and health have been considered in various ecological design studies (Rahimi-Mehr, 2021). Meanwhile, the psychological effects of colour have shown that different shades of colour and light can significantly improve a patient's mood, reduce anxiety, and, to some extent, facilitate their recovery. For example, blue can help reduce blood pressure, sciatica, headaches, diabetes, and colon irritation. Eating red fruits can purify the blood and form new blood cells. Green can help relax and relieve anxiety, as well as aid in treating heart patients (Nair et al., 2022). These findings all suggest that colour not only has a

place in spatial aesthetics but also plays a key role in healthcare environments, influencing the physical and mental health of patients.

Although a number of scholars have noted that the application of hospital colour design has become a focus of attention for both the healthcare and design industries, progress in theoretical research has been slow due to the significant intersectionality of the field, the marginal status of the discipline, and the lack of clarity in the scope of theory. While past research has focused on the practical aspects that how to improve hospital environments through colour design to enhance patient experience and therapeutic outcomes, the literature lacks a comprehensive compilation and in-depth analysis of the subject, provides limited understanding of current research developments, and provides insufficient clear guidance on future research directions. Therefore, a systematic integration and critical analysis of this literature will open up new pathways for theoretical development in this area, thereby addressing the shortcomings of existing research.

Definition and Problem Statement

Colour design is an essential aspect of the healthcare environment, defined as a comprehensive study that combines colour science, material science, psychology, aesthetics, and other multidisciplinary disciplines, aiming to achieve specific visual effects, emotional expressions, or functional objectives through the selection and matching of colours (Qiu, 2024). It not only enhances the aesthetics of the hospital environment but also serves as an invisible treatment that promotes the speed of recovery for patients.

The use of colour design in hospital environments has become a focus of attention in the healthcare and design fields; however, numerous issues and research gaps remain. And although some studies have explored the impact of colour design on hospital environments and users, overall research in this area is still in its infancy. Lindahl, for example, notes a lack of research on how care environments are perceived as supportive by users (Lindahl et al., 2023). Rahimi-Mehr highlights a gap in research on the proportionality of light and color about human differences, which limits the use of color design in personalized medicine (Rahimi-Mehr, 2021). The impact of cultural differences on color design is also an important issue, Swasty points out that the relevance of color to language and culture makes it difficult to identify universal color associations, and that there are significant differences in the significance and impact of color accross different cultural contexts (Swasty et al., 2025). This suggests that when applying color design in hospital environments, cultural considerations must be fully taken into account to ensure the design is practical and adaptable.

In practice, the application of color design in hospital environments faces several challenges. For example, Kalantari notes that despite evidence that guided interior design features with colour design can alleviate navigation problems, robust evaluation of navigation design strategies is limited by architectural uniqueness and the cost of testing different navigation aids (Kalantari et al., 2022). There is also a relative lack of research on color design in specific areas such as maternity wards and children's hospitals. As Balabanoff found, there is less research on the physical and psychological effects of color and light in maternity ward environments (Balabanoff, 2023). In the design of children's hospital environments, most existing children's hospitals lack emotional design (Zheng et al., 2024).

Given the current problems faced in the practice of hospital color design and the inadequacy of theoretical research, this paper provides an in-depth analysis of the published literature on the application of color design in the hospital environment, to explore the impact of color design on the hospital environment and the speed of recovery of patients, to provide theoretical support and practical guidance for the future development of color design in hospitals. The research questions to be answered by the analysis are: What are the current status and trends in the literature surrounding the use of color design in hospital environments?

Materials and Methods

The article used both quantitative and qualitative methods of analysis. The quantitative analysis and the qualitative part were performed using ATLAS.ti 9 software as a tool for thematic analysis. This methodology was initially implemented by Zairul (Zairul, 2021). The method aimed to capture key data relevant to the research question through thematic analysis, which suggests that there is a regularity of status or significance in the dataset. Literature was selected based on the following criteria: openly published in journals; at least the keywords 'color', 'design', and 'hospital environment' and a focus on color design and healthcare environment issues. All literature was in English.

Literature was screened using the Prisma screening process. The WOS database was searched using the subject terms “colour” or “art therapy”, “hospital environment” and “design”. The search was conducted in the WOS database, with a time frame of 2016 to 2025, and the results showed a total of 659 relevant articles, which were further screened to ensure the accuracy of the target literature. Firstly, after reading the abstracts of these 659 articles, 576 mismatched articles were excluded, and then after exclusion of 23 articles with no access to the full text, 50 articles were left, and when reading these 50 articles, 21 non-English language articles and 8 articles that did not focus on colour design were found, and finally 21 target articles were identified. The articles were then uploaded to ATLAS.ti 9 as a base document for coding and finalizing the themes (Table 1 and Figure 1).

Table 1
Search strings from Web of Science

Web of Science	Title, abstract, keywords: color , or art therapy, hospital environment, and design display	659 results

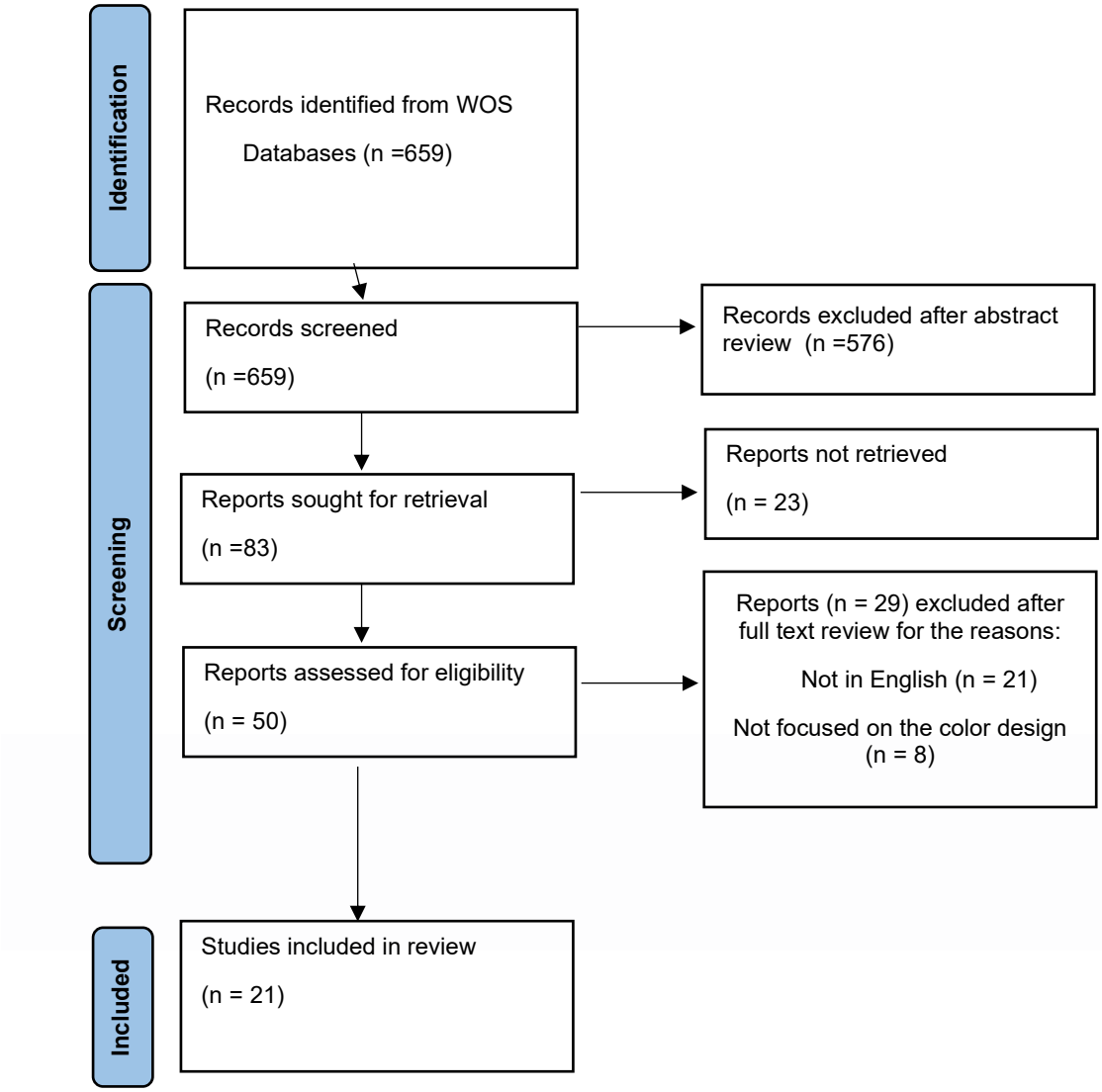

Figure 1. Inclusion and exclusion criteria in the thematic review

Results and Discussion

The results are presented in both quantitative and qualitative sections. The quantitative results analysed 21 primary documents on the WOS webpage, generating a word cloud map, as well as information such as year of publication, place of study, publication source and subject to reflect the current status of the research topic.

Quantitative Findings

Firstly, a word cloud was generated in the quantitative section based on the analysis of the source documents (Figure 2) The word cloud showed that the most frequently occurring words were 'art', 'design', 'color', 'treatment', 'patient', 'pain', 'research', and 'hospital' in order of frequency. 'patient', 'pain', 'research', 'hospital', and these words have a high word frequency in the article. As mentioned earlier, this article focuses on color design in hospitals. The word cloud presents the core vocabulary of the topic, with 'art' mentioned 1,222 times, 'design', 'color', and 'therapy'. 'Design', 'color', and' treatment' 1,019,910 and 833 times, respectively. In contrast, 'patient', 'pain', 'research', and 'hospital' were mentioned 788, 761, 702, and 690 times, respectively. It is clear from the word cloud that the use of color design

in hospital environments encompasses not only elements of art and design but is also closely linked to the patient's treatment and recovery process. In addition, the word cloud also revealed that the existing literature focuses mainly on how colour design can be used to enhance patient experience and treatment outcomes.

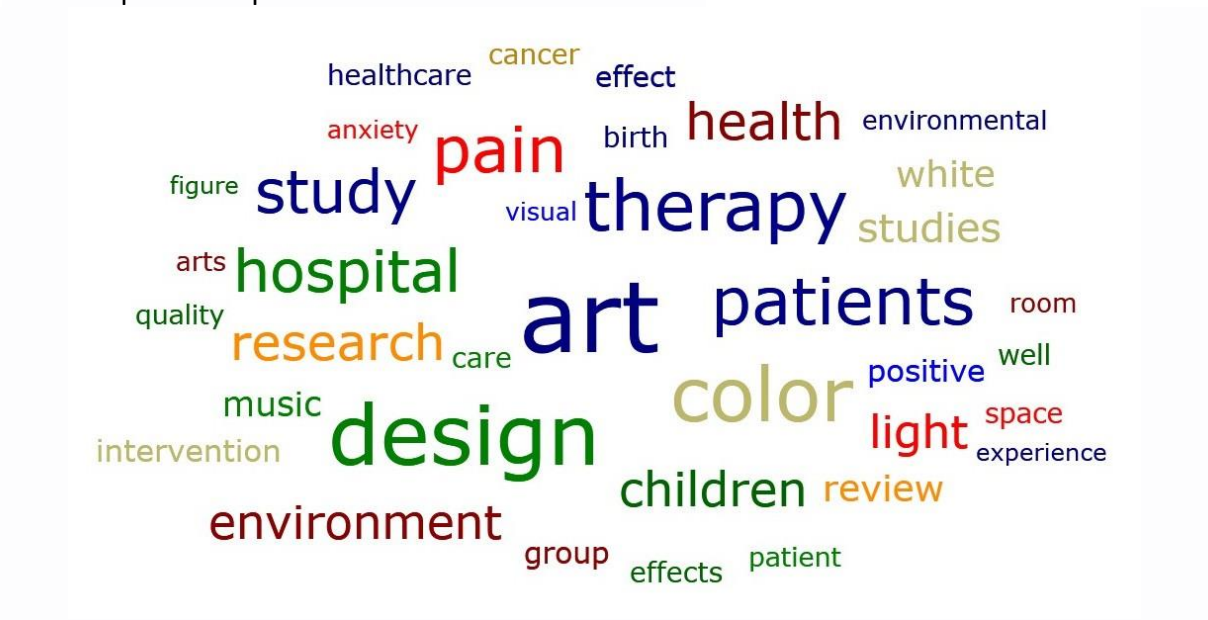

Figure 2. Word cloud on word frequencies from 21 documents

Figure 3 illustrates the number of publications related to this topic, as can be seen from the chart, the number of publications on color design in hospitals was relatively low in 2017 and 2019, both at one, and then increased in 2021 and 2022, both at 3, reaching a high point in 2023 with 7 publications, showing a significant interest in this area of research in this year and growth, however, the number dropped back to 4 in 2024 and then further reduced to 2 in 2025, which may indicate that the research fervor in this area has declined after the peak in 2023, but still maintains a certain level of research activity overall.

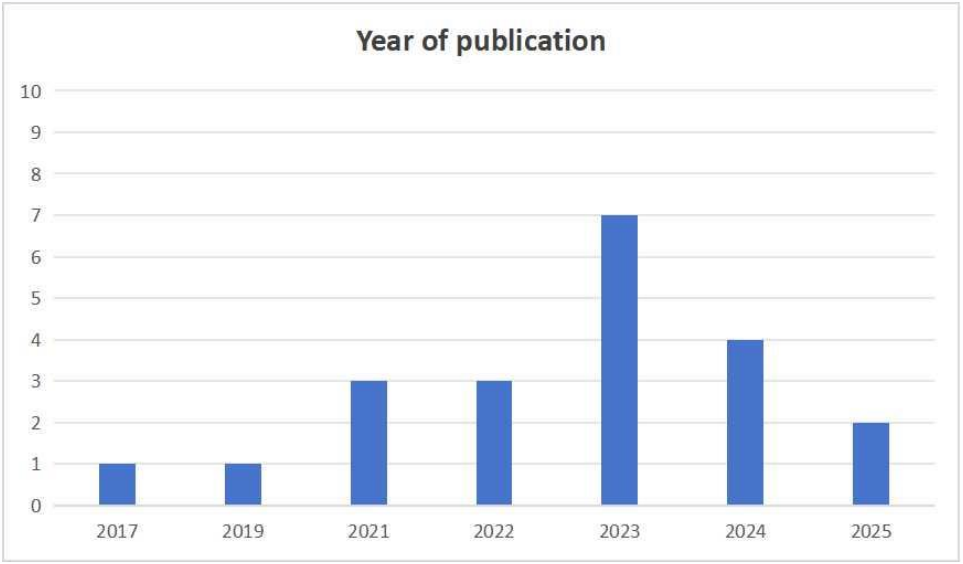

Figure 3. Year of publication

Figure 4 presents the results of the analysis of the regional distribution of research. In terms of the number of papers, research on the application of color design in hospitals is more

prominent in the European region (especially the UK and Canada) and the Asian region (especially China). For example, the UK and Canada have three papers each, which may reflect the research activity in the field of healthcare design and the importance placed on the application of color design in hospital environments in these countries. China similarly had three papers, which may be related to its rapid development in healthcare in recent years and its focus on enhancing the patient experience. In addition, Indonesia published two papers, which may indicate its research interest in exploring the impact of color design on hospital environments. The regional distribution pattern suggests that the studies are mainly concentrated in countries with more developed healthcare systems and a focus on patient experience, which not only help to enhance the comfort of hospital environments but may also have a positive impact on the recovery process of patients, providing new perspectives and approaches to the field of healthcare design.

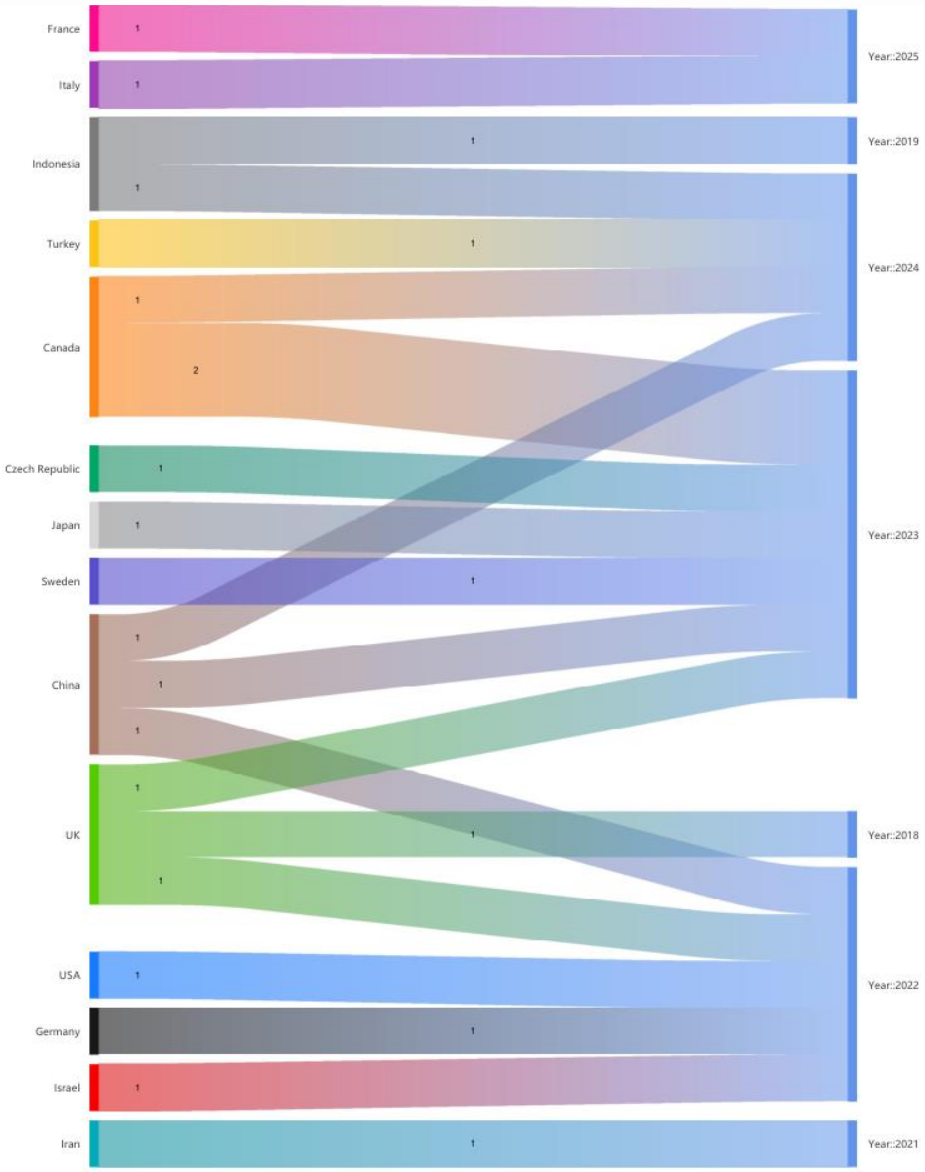

Figure 4. Country of studies and years of publication with the number of articles.

Table 2 presents a graphical representation of the relationship between the themes of the literature, the year of publication, and their number. There were initially thirty-two coded attributes, and after renaming and merging, the coded results were grouped into five themes: art therapy applications, color and light effects, paediatric environmental design, integration of cultural traditions, and multi-sensory spatial design, which will be explored in detail in the subsequent qualitative analysis section. As can be seen from the graph, paediatric environmental design has a higher volume of research in 2019 and 2023, showing that this area has received more attention over the years. Art Therapy Applications has a more significant volume of research in 2018 and 2024, indicating that interest in art therapy has increased in these years. Color and Light Effects has the highest volume of research in 2025, showing continued interest and growth in this area. Spatial perception and multisensory interventions experienced a significant increase in research volume in 2022, reflecting a growing focus on how environmental factors can impact patient experience. The integration of cultural traditions has a moderate amount of research in 2021, indicating interest in the use of cultural elements in design. Overall, research trends indicate an emphasis on multidisciplinary approaches that aim to improve healthcare environments and patient experiences through integrated design strategies.

Table 2
The theme according to the year

	2018	2019	2021	2022	2023	2024	2025	Totals
Art Therapy Applications	1			1	2	1	1	6
Color and light effects			2	2	4	1	1	10
Integration of cultural traditions			1	1				2
Pediatric environmental design		1			1	2		4
Spatial design and multisensory interventions				1		1	1	3
Totals	1	1	3	5	7	5	3	25

Table 3 shows the distribution of the different authors on the various research themes. It can be observed that the majority of authors focused on "color and light effects", indicating that this area is the primary focus of the current research. In addition, "art therapy applications" and "spatial design and multisensory interventions" are also the focus of some authors. It is worth noting that most authors have a single research theme, typically focusing on a specific area or direction. However, there are also some authors with broader research themes who try to combine multiple research themes. For example, Rahimi-Mehr and Vahideh's study combines the themes of 'color and light effects' and 'integration of cultural traditions', which not only enriches the content of the study, but also shows the diversity and innovation of the research (Rahimi-Mehr, 2021) . By combining the effects of color and light with cultural traditions, it is possible to explore the differences in the psychological and physiological effects of color and light on people in different cultures, and how design can be used to meet the needs of different cultural groups. Overall, this chart reveals research trends in various areas, highlighting the hotspots and diversity of current research.

Table 3
Documents to a theme table

	Art Therapy Applications	Color and light effects	Integration of cultural traditions	Pediatric environmental design	Spatial design and multisensory interventions
Alhsainat, Aseel (Alhsainat & Günçe, 2024)				√	
Balabanoff, Doreen (Balabanoff, 2023)		√			
Bates, Victoria (Bates, 2023)		√			
Bonnin, Gaël (Bonnin & Goudey, 2025)		√			
Boyce, Melanie (Boyce et al., 2018)	√				
Dwiputri, Swasty (Swasty et al., 2025)				√	
Fudickar, Axel (Fudickar et al., 2022)		√			
Gashoot, Moamer M (Gashoot, 2022)			√		
Ishikawa, Atsuo (Ishikawa, 2023)		√			
Kalantari, Saleh (Kalantari et al., 2022)					√
Lindahl, Jeanette (Lindahl et al., 2023)		√			
(Litwin et al., 2023), Sasha Martinelli, Valentina (Martinelli et al., 2025)	√			√	√
Metzl, Einat S (Metzl, 2022)	√				
Nair, Ashwini Sunil (Nair et al., 2022)		√			

Olaizola, Sofia (Olaizola et al., 2024)	√						
Rahimi-Mehr, Vahideh (Rahimi-Mehr, 2021)			√	√			
Raudenská, Jaroslava (Raudenská et al., 2023)	√						
Swasty, Wirania (Swasty et al., 2025)							√
Zheng, Haohua, Lingying Liu (Zheng et al., 2024)			√			√	
Zhou, ShiShuang (Zhou et al., 2023)	√						

The analysis of the published literature shows that researchers in the field of color design in hospital applications tend to publish their findings in specific journals. As shown in Table 4 Research in Health Environments Research and Design Journal, CHILDREN-BASEL, and JOURNAL OF VISUAL ART AND DESIGN are among the most frequently chosen journals by researchers in this field. It is worth noting that despite the high number of publications in specific journals, overall, research in this area is more evenly distributed across journals, suggesting that there has not yet been a clear trend of concentration in research on the use of color design in hospitals.

Table 4
Articles reviewed based on the journal

	2017	2019	2021	2022	2023	2024	2025
Behavioral Sciences						1	
BMC COMPLEMENTARY MEDICINE AND THERAPIES					1		
Buildings						1	
CHILDREN-BASEL				1		1	
Color Research and Application					1		
Frontiers in Psychiatry				1			
Health and Social Care in the Community	1						
Health Environments Research and Design Journal					2		
HERD-HEALTH ENVIRONMENTS			1				

RESEARCH \& DESIGN JOURNAL					
International Journal of Environmental Research and Public Health					1
International Journal of Hospitality Management					1
JAPAN ARCHITECTURAL REVIEW			1		
Journal of Environmental Psychology		1			
JOURNAL OF VISUAL ART AND DESIGN	1			1	
PAIN AND THERAPY			1		
Traditional Medicine Research		1			
Twentieth Century British History			1		
Wiener Medizinische Wochenschrift		1			

Overall, this section reveals trends in research on color design in hospitals through quantitative findings, and these data reflect to some extent the feasibility of color design implementation in the literature. Although existing research has covered many aspects, such as the impact of color on patients' emotions and the recovery process, conceptual differences still exist between design aesthetics and healthcare function. Furthermore, few studies have clearly articulated how color design can be integrated with a hospital's overall treatment strategy. Although color design is an important part of hospital environments, it is underappreciated by policymakers and healthcare planners. Similar to most healthcare fields, the design of hospital environments also faces the challenge of improving patient satisfaction and treatment outcomes, making it particularly urgent to investigate the impact of color design on enhancing the quality of the hospital environmental experience, thereby increasing patients' willingness to recover. Future research should further investigate the specific effects of color design in hospitals and explore how color design can be utilized to enhance the overall patient experience.

Qualitative Findings

This section is a qualitative analysis that aims to illustrate the thematic strands that emerged from answering the research questions and reviewing the relevant literature . The study began by coding the articles individually, and then systematized the theories and concepts of interest to the researcher through coding synthesis and generalization, constructing an overall network diagram (Figure 5). Five core themes were identified: (1) Art therapy applications, (2) Color and light effects, (3) Pediatric environmental design, (4) Integration of cultural traditions, and (5) Spatial design and multisensory interventions. These themes do not exist in isolation, and there may be crossover in the literature, so that some studies address more than one theme simultaneously. This paper discusses these themes to answer the research question: What are the current status and trends in the literature surrounding the use of color design in hospital environments?

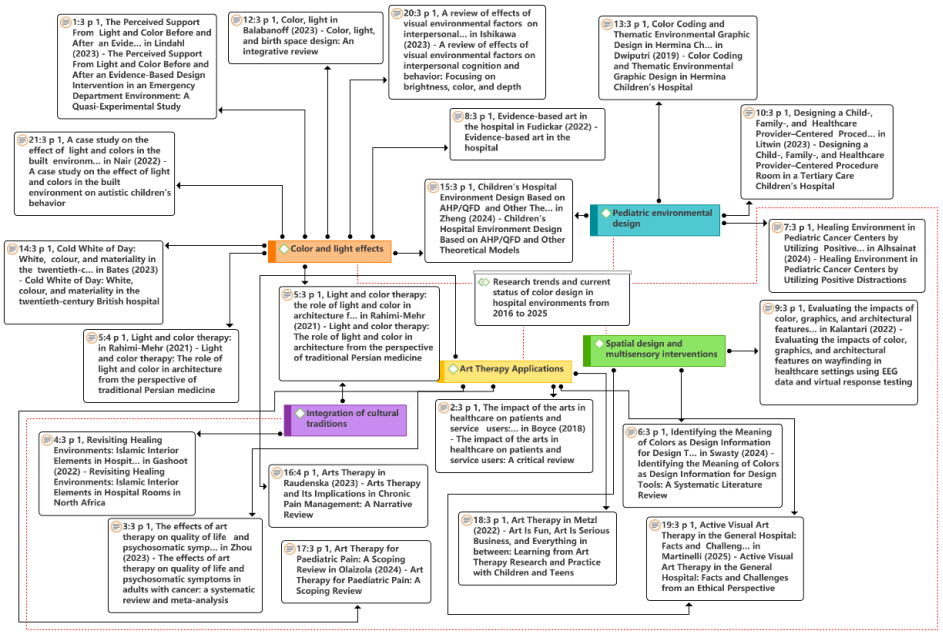

Figure 5. Overall network
Theme 1: Art therapy applications

From existing research, it is clear that color design can not only positively influence the psychological state of patients, but also demonstrate potential therapeutic effects on a physiological level.

The psychological effects of color have been widely documented, with Rahimi-Mehr pointing out that colors can influence a person's psychological state, for example, by triggering emotions such as happiness and calmness through colour, and even regulating psychological and intellectual balance. In the hospital environment, this psychological regulation is significant, helping to alleviate patients' anxiety and fear (Rahimi-Mehr, 2021). Olaizola's research has shown that art therapy (including color design) is effective in reducing psychosocial disorders such as pain, anxiety, stress, and fear in children during the treatment process (Olaizola et al., 2024). Moreover, in Metzl's experiment, it was found that art therapy in schools seemed to have some positive effects and showed no signs of being harmful (Metzl, 2022).

On the other hand, colors also show potential therapeutic effects on a physiological level. Scientific and physiological studies have demonstrated that colors can trigger physiological responses in the body, such as regulating blood pressure, altering the heartbeat, inducing sweating, influencing the respiratory system, and even stimulating brain wave patterns. In a hospital environment, this physiological modulation can provide strong support for patient recovery. For example, in traditional Persian medicine, studies have been conducted on the use of specific colors to treat specific diseases, such as the use of red for strabismus in children and the use of black and green for conjunctivitis (Rahimi-Mehr, 2021).

Additionally, there has been growing interest in the use of art therapy as a mind-body therapy in hospitals. For cancer patients, art therapy can help alleviate emotional stress, alleviate physical symptoms, and enhance quality of life (Zhou et al., 2023). With Raudenská pointing

out that art therapy offers a unique opportunity to improve the mental health of patients by engaging the senses and the body in treatment, and that in the context of chronic pain management, art therapy has been recognized as an effective means of support to help patients to cope with their emotional distress and to improve their quality of life (Raudenská et al., 2023) (Figure 6).

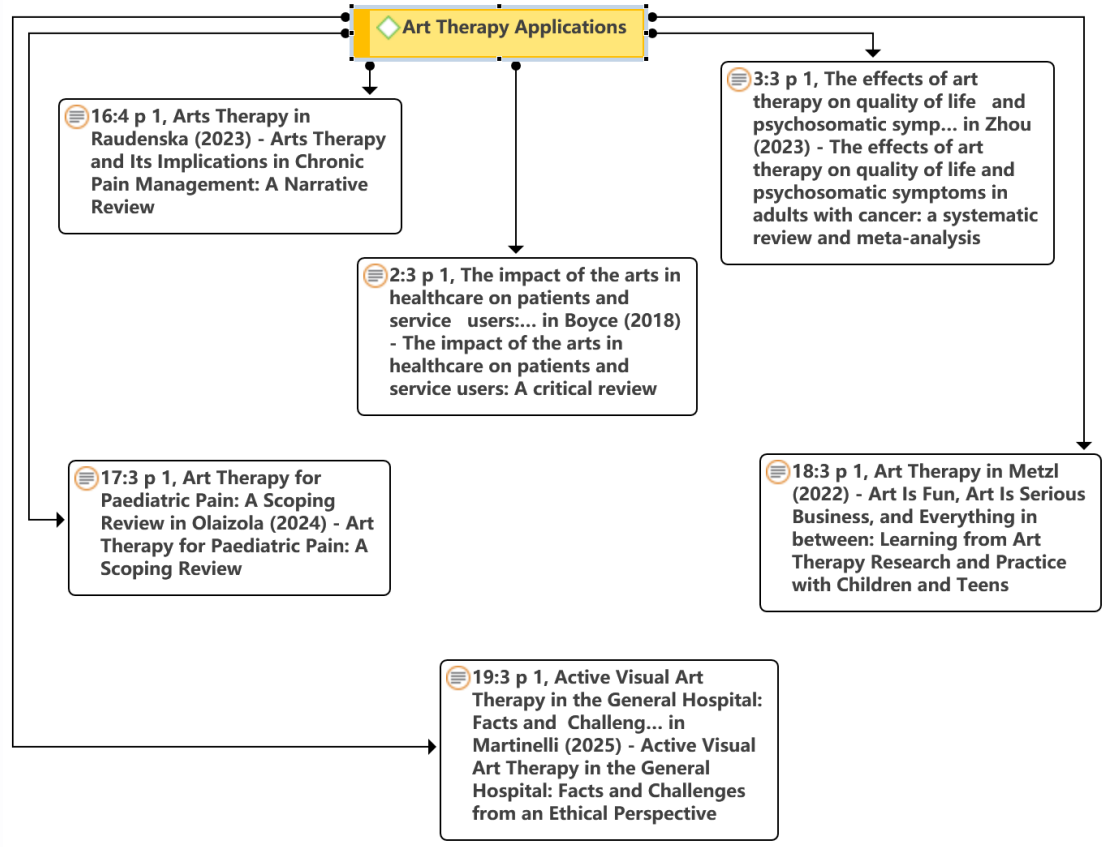

Figure 6. Network on art therapy applications.

Theme 2: Color and light effects

Research on the use of color and light effects in hospital environments has revealed a multidimensional trend and status, which has a significant positive impact on improving the psychological and physiological well-being of patients. Light and color in the physical environment have been linked to psychological, physiological, and social responses affecting the five senses, and together they are considered necessary for perception and understanding of the world, and have a unique impact on each individual (Fudickar et al., 2022). Bonnin argues that a brightly colored visual environment should induce positive emotions, thereby enhancing executive functioning and reducing rumination (Bonnin & Goudey, 2025). In a medical setting, Bates felt that white was important and felt that white objects were retained as symbols of hygiene, even though people began to use bright colors as a sign of 'modernity'. Secondly, they show that this association with the color white was materially unstable throughout the twentieth century (Bates, 2023). In addition, color coding and contrast can be used to attract and distract attention in care environments, and colors may also trigger emotional and physiological responses, affecting stress levels, emotional states, the care process, feelings of well-being, safety, and independence (Lindahl et al., 2023).

From the perspective of traditional Persian medicine, light and color are crucial elements in maintaining health and well-being. Rahimi-mehr believes that color has a significant effect on a person's psychology, behavior and physical balance, triggering emotions such as happiness, depression, calmness, or impatience; and also triggering physiological responses such as regulating blood pressure, altering the heartbeat, inducing sweating, affecting the respiratory system, and even stimulating brainwave patterns (Rahimi-Mehr, 2021).

The use of color and light has also received attention in hospital design. Zheng believes that in a children's hospital environment, bright colors can attract children's attention and reduce fear, while natural light and soft non-glare lighting can help regulate moods (Zheng et al., 2024). For children with autism, Nair points out that good lighting and color choices are crucial to improving their behaviour and mood, and that overly bright and vibrant colors should be avoided to avoid overstimulation and upsetting them (Nair et al., 2022). Overall, the application of color and light effects in the hospital environment can not only improve the psychological state of patients but also show potential therapeutic effects at the physiological level. Its application in the hospital environment has broad prospects, which are worthy of further in-depth research and exploration (Figure 7).

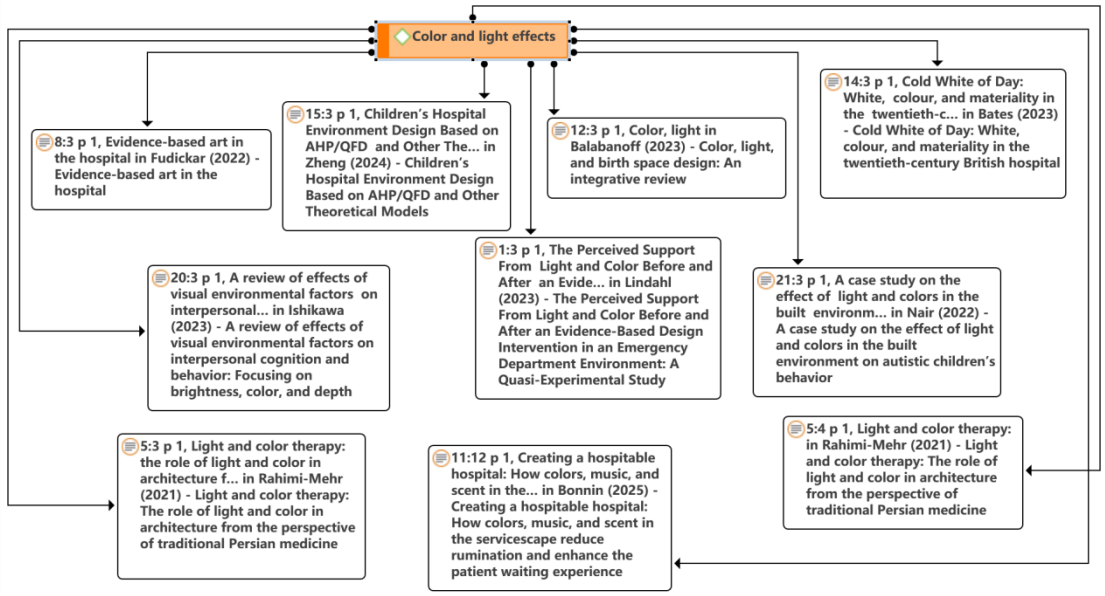

Figure 7. Network on color and light effects.

Theme 3: Pediatric environmental design

In paediatric hospital environments, the current state of research on color design and environmental creation suggests that color and light effects have a significant positive impact on improving the psychological and physiological state of children. Studies have shown that children's sensitivity and preference for color differ from those of adults, as they tend to prefer bright, vibrant colors, such as primary colors like red, blue, and yellow, which attract their attention and thus reduce their fear of being in a healthcare environment. However, the current design of many hospitals tends to ignore children's special needs for color, mostly using white walls to create a monotonous, cold environment, which not only lacks vitality and warmth but may also trigger children's anxiety and unease, which may hurt their psychological recovery process (Zheng et al., 2024).

In paediatric cancer centre environments, Alhsainat's study identified six positive distraction themes: the aesthetics of the environment and art, access to nature, spatial arrangement, patterns of socialization, play and interactive technologies, and sound and illumination interventions. These themes highlight the importance of creating a supportive and engaging environment for children undergoing treatment (Alhsainat & Günçe, 2024).

To improve this situation, research based on Piagetian cognitive theory suggests that hospitals should adopt a rich color palette to provide a more welcoming and appropriate spatial environment for paediatric patients through visual stimulation. Meanwhile, light plays a crucial role in creating a positive and therapeutic environment. The design should maximize the use of windows to bring in natural light and regulate children's moods. In areas where natural light is scarce, soft, non-glare lighting should be chosen (Zheng et al., 2024). In addition, Litwin believes that children can also pre-determine the specifications for colors, lighting, music, and decorative themes, especially for those who require frequent therapy sessions, and that this personalized environment design can make them feel more comfortable and relaxed (Litwin et al., 2023).

In conclusion, research trends in paediatric environmental design have highlighted the importance of color and light effects in improving the healthcare experience for children. By adopting child-friendly color and lighting schemes, not only can children's anxiety and fear be reduced, but they can also be provided with a more welcoming and comfortable therapeutic environment, which in turn promotes their psychological and physical recovery. Future research and practice should further explore how color and light effects can be better integrated into the design of paediatric hospitals to meet the unique needs of this special group of children (Figure 8).

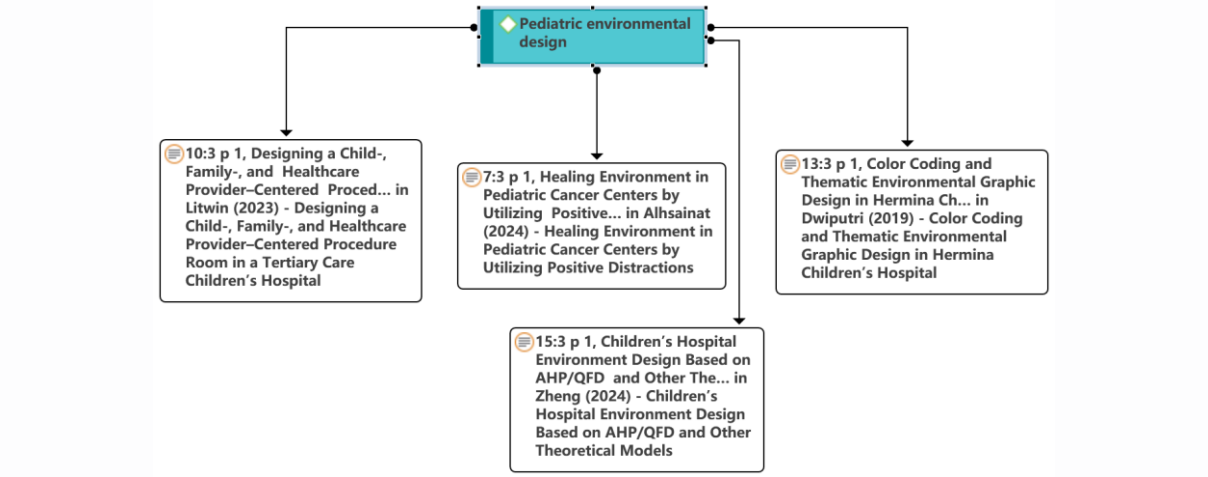

Figure 8. Network on pediatric environmental design

Theme 4: Integration of cultural traditions

The trend and current state of research on incorporating elements of cultural traditions in hospital color design suggests that cultural context has a profound influence on the design of hospital environments. Gashoot argues that the symbolic and religious elements of Islamic culture are of great significance to Muslim patients, and that these are not only culturally significant but also believed to have a positive therapeutic effect on the rehabilitation of hospitalized patients. Therefore, in the design of hospitals in the Middle East, it is advisable

to incorporate elements of Islamic art and design to promote the health and well-being of patients (Gashoot, 2022).

Green and white are two important colors in Islamic culture. Green, the color of the first flag of the Islamic State used by the Prophet Muhammad, symbolizes peace, unity, and purity, while white is associated with peace, unity, and purity. These colors not only remind Muslim patients of the importance of their culture but are also considered to have a healing effect on Muslims in times of hardship (Gashoot, 2022).

From the perspective of traditional Persian medicine, Rahimi-Mehr believes that light and color play a critical role in the health and healing of individuals. For example, in traditional Persian medicine, specific colors are avoided to maintain health. This includes avoiding the use of dark colors (black) in the environment because it leads to a build-up of depression, and avoiding the use of white to prevent diseases such as snow blindness (Rahimi-Mehr, 2021).
Overall, the integration of cultural traditions into hospital color design not only meets the cultural needs of patients but also promotes their recovery at the psychological and physiological levels. Future research and practice should further explore how to effectively integrate elements of cultural traditions into hospital design across diverse cultural contexts, with the goal of creating more inclusive and therapeutic healthcare environments (Figure 9).

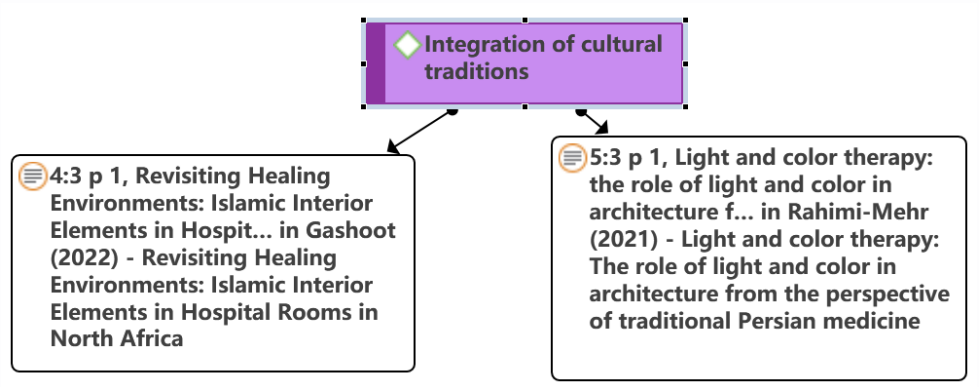

Figure 9. Network on Integration of cultural traditions.

Theme 5: Spatial design and multisensory interventions
The trend and current state of research on color design and multisensory spatial interventions in hospital environments suggest that color not only evokes emotions and memories but also plays a crucial role in spatial design, enhancing the comfort and well-being of patients, visitors, and healthcare professionals (Swasty et al., 2025). According to Swasty's research, the use of color in design can evoke memories and emotions, and these associations have significant value in spatial design (Swasty et al., 2025). For example, in Kalantari's literature, Kalantari argues that the judicious use of color schemes can enhance the internal orientation of hospitals, helping patients and visitors find their way around more easily and thereby reducing their anxiety and unease (Kalantari et al., 2022).

Multi-sensory spatial design should be used in hospital environments. Martinelli points out that the use of 3D models, paintings, or other forms of visual art can help doctors communicate information to patients about their condition, the required procedure, or treatment more effectively, thereby improving the patient's ability to provide informed

consent (Martinelli et al., 2025). This multi-sensory intervention not only facilitates the delivery of information but also supports patients on a psychological level, thereby enhancing their therapeutic experience.

In hospital space design, the combination of color and other design elements can create a more welcoming and comfortable environment. By optimizing color schemes and graphic design, hospitals can improve internal navigation systems and enhance the patient and visitor experience (Kalantari et al., 2022). Not only does this design strategy help to reduce patient anxiety, but it also enhances the productivity of healthcare professionals as they can guide patients and visitors with greater ease.

Overall, the use of color design and multisensory spatial interventions in hospital environments has significant potential to improve the psychological and physiological state of patients and enhance the overall healthcare experience. Future research and practice should further explore how to integrate color design with other multisensory interventions to create more therapeutic and inclusive healthcare spaces (Figure 10).

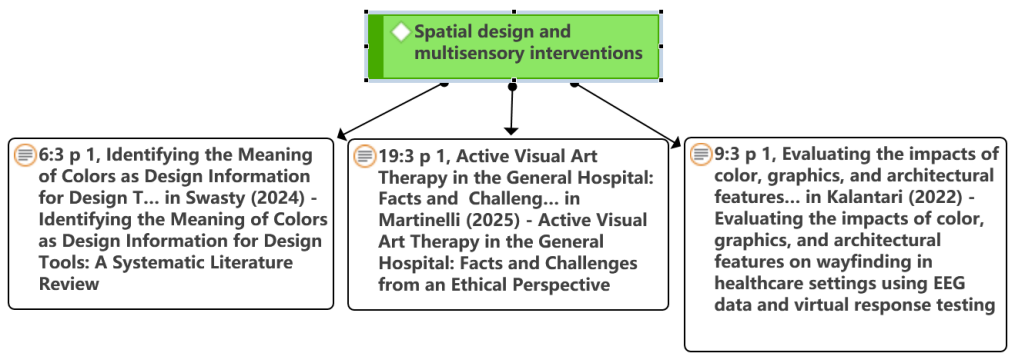

Figure 10. Network on spatial design and multisensory interventions.

Discussion and Future Research Direction

The above analyses and discussions of existing literature provide suggestions for further research in the field of color design in hospital applications. Based on the above thematic network framework, the author proposes new research directions: (1) In the practice of color design in hospitals, further investigating the specific needs of patients, healthcare workers, patients' families and visitors, in order to better guide the design process and ensure that the design meets the actual needs of different groups; (2) In-depth discussion of the relationship between color design, hospital culture and regional cultures will contribute to the development of theories of medical design and theory in the cultural field, and also provides new perspectives for multidisciplinary cross-research; (3) Research on the process of hospital color design and design specifications for the integration of traditional elements from different cultures will help hospital management and design teams to improve the quality and effectiveness of color design; (4) Investigation and research on hospital color design practitioners (e.g., designers and architects) will be an essential part of the process of deepening the understanding of the phenomenon of the application of color design in the healthcare environment. The phenomenon of application in healthcare environments will help to identify problems and challenges in practical application and provide a basis for optimizing design practice.

Conclusion

This paper reviews 21 articles using two methods. The first part is quantitative and focuses on analyzing the data obtained from the WOS; the second part of the qualitative analysis utilized ATLAS.ti 9 for thematic coding. The results of the analysis show that the theme of color design in hospital applications is currently in a developmental stage, limited mainly by the fact that the theoretical system for the application of color design in healthcare environments is not yet well developed and by the lack of in-depth explorations by researchers in this field of the integration of color design and healthcare functions.

This study systematically reviews the literature on color design in hospital environments and explores the current fragmentation of research in the fields of architecture, psychology, medicine, and design. By focusing on users' perceptual and cognitive responses, this study identifies dominant patterns, unresolved issues, and emerging trends in the field.

The theoretical significance of this study is to clarify the conceptual boundaries of hospital color design and reveal its under-theorized status in the broader field of medical design. It highlights the need for interdisciplinary integration and lays the foundation for building a more cohesive research framework that links environmental color design with user well-being, spatial psychology, and treatment outcomes. This knowledge integration not only enriches academic discussions but also promotes the development of new theoretical models based on empirical user experience. From a practical perspective, this study provides a reference for designing more humane and restorative medical environments by providing insights into color strategies that meet user needs. The results provide evidence-based guidance for future research and design practice, supporting the development of healthcare spaces that prioritize comfort, recovery, and emotional well-being.

Author contributions: Fanxuan Kong wrote the original draft, did the survey, and managed the data by using software for visual and formal analysis. All authors reviewed subsequent versions of the manuscript several times. All authors have read and agreed to the published manuscript. Qiuxia Zhu reviewed and edited the original drafts, proposed certain research methods, used software to validate the data, supervised in real time, conceptualised much of what was in the original drafts, and managed the project.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Conflicts of Interest: The authors declare no conflict of interest.

References

Alhsainat, A., & Günçe, K. (2024). Healing Environment in Pediatric Cancer Centers by Utilizing Positive Distractions. *Behavioral Sciences*, *14*(11), 1010. https://doi.org/10.3390/bs14111010

Balabanoff, D. (2023). Color, light, and birth space design: An integrative review. *Color Research & Application*, *48*(5), 413–432. https://doi.org/10.1002/col.22842

Bates, V. (2023). Cold White of Day: White, colour, and materiality in the twentieth-century British hospital. *Twentieth Century British History*, *34*(1), 1–37. https://doi.org/10.1093/tcbh/hwac020

Bonnin, G., & Goudey, A. (2025). Creating a hospitable hospital: How colors, music, and scent in the servicescape reduce rumination and enhance the patient waiting experience. *International Journal of Hospitality Management*, *128*, 104155. https://doi.org/10.1016/j.ijhm.2025.104155

Boyce, M., Bungay, H., Munn-Giddings, C., & Wilson, C. (2018). The impact of the arts in healthcare on patients and service users: A critical review. *Health & Social Care in the Community*, *26*(4), 458–473. https://doi.org/10.1111/hsc.12502

Fudickar, A., Konetzka, D., Nielsen, S. M. L., & Hathorn, K. (2022). Evidence-based art in the hospital. *Wiener Medizinische Wochenschrift*, *172*(9–10), 234–241. https://doi.org/10.1007/s10354-021-00861-7

Gashoot, M. M. (2022). Revisiting Healing Environments: Islamic Interior Elements in Hospital Rooms in North Africa. *HERD: Health Environments Research & Design Journal*, *15*(1), 315–332. https://doi.org/10.1177/19375867211042350

Ishikawa, A. (2023). A review of effects of visual environmental factors on interpersonal cognition and behavior: Focusing on brightness, color, and depth. *JAPAN ARCHITECTURAL REVIEW*, *6*(1), e12343. https://doi.org/10.1002/2475-8876.12343

Kalantari, S., Tripathi, V., Kan, J., Rounds, J. D., Mostafavi, A., Snell, R., & Cruz-Garza, J. G. (2022). Evaluating the impacts of color, graphics, and architectural features on wayfinding in healthcare settings using EEG data and virtual response testing. *Journal of Environmental Psychology*, *79*, 101744. https://doi.org/10.1016/j.jenvp.2021.101744

Lindahl, J., Thulesius, H., Wijk, H., Edvardsson, D., & Elmqvist, C. (2023). The Perceived Support From Light and Color Before and After an Evidence-Based Design Intervention in an Emergency Department Environment: A Quasi-Experimental Study. *HERD: Health Environments Research & Design Journal*, *16*(2), 109–124. https://doi.org/10.1177/19375867221150215

Litwin, S., Clarke, L., Copeland, J., Tyrrell, J., Tait, C., Mohabir, V., & Campbell, F. (2023). Designing a Child-, Family-, and Healthcare Provider–Centered Procedure Room in a Tertiary Care Children's Hospital. *HERD: Health Environments Research & Design Journal*, *16*(3), 195–209. https://doi.org/10.1177/19375867231161097

Martinelli, V., Lumer, E. L. L., Fusar Poli, L., Chiappedi, M., & Politi, P. (2025). Active Visual Art Therapy in the General Hospital: Facts and Challenges from an Ethical Perspective. *International Journal of Environmental Research and Public Health*, *22*(2), 316. https://doi.org/10.3390/ijerph22020316

Metzl, E. S. (2022). Art Is Fun, Art Is Serious Business, and Everything in between: Learning from Art Therapy Research and Practice with Children and Teens. *Children*, *9*(9), 1320. https://doi.org/10.3390/children9091320

Nair, A. S., Priya, R. S., Rajagopal, P., Pradeepa, C., Senthil, R., Dhanalakshmi, S., Lai, K. W., Wu, X., & Zuo, X. (2022). A case study on the effect of light and colors in the built environment

on autistic children's behavior. *Frontiers in Psychiatry*, *13*, 1042641. https://doi.org/10.3389/fpsyt.2022.1042641

Olaizola, S., Lalloo, C., Vickers, V., Kelenc, L., Tariq, S., Brown, S. C., & Stinson, J. N. (2024). Art Therapy for Paediatric Pain: A Scoping Review. *Children*, *11*(6), 619. https://doi.org/10.3390/children11060619

Qiu, W. (2024). Research on the Color Design of Hospital Inpatient Wards Under the Concept of Color Empowerment. In L. C. Jain, V. E. Balas, Q. Wu, & F. Shi (Eds), *Frontiers in Artificial Intelligence and Applications*. IOS Press. https://doi.org/10.3233/FAIA231497

Rahimi-Mehr, V. (2021). Light and color therapy: The role of light and color in architecture from the perspective of traditional Persian medicine. *Traditional Medicine Research*, *6*(5), 47. https://doi.org/10.53388/TMR20210606234

Raudenská, J., Šteinerová, V., Vodičková, Š., Raudenský, M., Fulková, M., Urits, I., Viswanath, O., Varrassi, G., & Javůrková, A. (2023). Arts Therapy and Its Implications in Chronic Pain Management: A Narrative Review. *Pain and Therapy*, *12*(6), 1309–1337. https://doi.org/10.1007/s40122-023-00542-w

Swasty, W., Utami, L. A., Ronggowarsito, B. I., & Yudiarti, D. (2025). Identifying the Meaning of Colors as Design Information for Design Tools: A Systematic Literature Review. *Journal of Visual Art and Design*, *16*(2), 205–228. https://doi.org/10.5614/j.vad.2024.16.2.5

Zairul, M. (2021). The recent trends on prefabricated buildings with circular economy (CE) approach. *Cleaner Engineering and Technology*, *4*, 100239. https://doi.org/10.1016/j.clet.2021.100239

Zheng, H., Liu, L., Zhang, Q., Wang, Y., & Wei, Y. (2024). Children's Hospital Environment Design Based on AHP/QFD and Other Theoretical Models. *Buildings*, *14*(6), 1499. https://doi.org/10.3390/buildings14061499

Zhou, S., Yu, M., Zhou, Z., Wang, L., Liu, W., & Dai, Q. (2023). The effects of art therapy on quality of life and psychosomatic symptoms in adults with cancer: A systematic review and meta-analysis. *BMC Complementary Medicine and Therapies*, *23*(1), 434. https://doi.org/10.1186/s12906-023-04258-4