

Healing Space Design Effects on Emotion Regulation: A Scoping Review

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Abstract

The built environment plays a vital role in supporting physical and emotional health, especially in healing spaces. Emerging interdisciplinary research shows that experiences in healing spaces can reduce stress and tension, thereby improving emotional well-being. This study proposes a structure to analyze and explain how healing spaces promote emotional regulation in patients by examining the impact of architectural features on emotional regulation in patients with mood disorders. Articles were searched on Scopus, Web of Science, and SciELO, including papers published between June 2015 and July 2023 in English. Articles were screened according to the inclusion criteria, and a narrative discussion was provided. After screening and assessing the quality of article content, 22 articles were selected for analysis. The analysis identified the key mechanisms by which healing spaces promote emotional regulation - healing structures - and categorized them into three main structures: (a) safety for physical and mental development; (b) functionality to support the healing process; (c) ambiance to promote emotional comfort. Space cannot directly cure patients with emotional disorders, but architectural space created through healing structures can effectively elicit patients' emotional responses, accelerate the speed of recovery, and thus realize the purpose of space for emotional therapy.

Keywords: healing space, healing structure, emotional regulation, sensory experience, interior space

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Introduction

Designing for health and well-being used to be the responsibility of healthcare professionals, but that's no longer the case (Engineer et al., 2020). The increasing demand for wellness has expanded the field, making it a focal point for architectural design. Today, architects are dedicated to designing, creating, and enhancing building spaces that promote health. By analyzing data related to patients' physical recovery, they measure the healing effects of these environments. Research has revealed that well-designed spaces can foster cohesion between the body and mind (DuBose et al., 2018), enhance recovery and shorten the length of stay (Lemprecht, 1996), leading to the development of healing space design concepts. This concept often recognizes the impact of space design on patient health (Bell et al., 2018; Jaskiewicz Jr, 2011). Healing spaces are designed and created with the intent and purpose of supporting the well-being of those who utilize the space and to support the well-being of those who use the space (Kreshak, 2020).

“Healing spaces”, have been the main way to address the built environment to enhance the individual’s potential for self-healing (Sakallaris et al., 2015). Conceptually, they involve the intentional use of physical design elements to support both the physical and psychological well-being of users (Sabar & Djimantoro, 2020). Within this context, “well-being” is understood as a positive and integrated state encompassing emotional stability, perceived stress reduction, psychological fulfillment, and overall health (Zhang et al., 2020). Healing spaces are defined here as environments designed to stimulate physical, mental, and spiritual cohesion through positive physical design, thereby supporting the healing process and promoting emotional regulation in patients.

Before delving into this topic, it is necessary to understand the mechanisms of action in healthcare spaces or environments that are most likely to promote physical, mental, emotional, and spiritual healing. This is because humans have specific sensory sensitivities to indoor environments, such as hospitals, which often evoke tension in patients (Essa & Jabbari, 2020). Thus, human perception is fundamentally psychological (Allahyar & Kazemi, 2021). Providing patients with a comfortable, safe, and welcoming environment can enhance cognitive and emotional relaxation (DuBose et al., 2018). Research has found that physical space itself plays a role in an individual’s overall health and well-being and can generate a sense of psychological pleasure by considering an individual’s emotional needs (Djimantoro, 2018). This suggests that healing spaces are designed and created to support the physical health of space users as well as the emotional health of space users (Kreshak, 2020).

Although existing research has reviewed the healing effects of architectural features in emotional health, such as light (St-Jean et al., 2022), noise control (Ventriglio et al., 2021), accessibility (Paquet et al., 2013), and room layout, as well as a compilation of findings on environmental elements that support the healing process by Zhang et al. (2019). However, the authors found that there are no scoping reviews that articulate the interdisciplinary mechanisms of how architectural spaces can promote emotional regulation through the integration of sensory design principles. Indications have not evolved into guiding design strategies to support emotional regulation, especially for individuals suffering from mood disorders. For this reason, there is a need to integrate its predecessor approach to complement some of the authors’ perspectives in this respect.

This review found multiple pieces of literature supporting the positive impact of spatial experience on emotional regulation. For example, some designs that takes into account natural elements can significantly alleviate emotions, stimulate creativity, and improve concentration (Arboleda, 2017; Higuera-Trujillo et al., 2021). In this sense, it is worth highlighting the potential links between architectural features, emotional regulation and healing experiences, meaning that insights from psychology, neuroscience and sensory experience can provide meaningful guidance for architectural interventions. Tackling this convergence requires a broad and unrestricted perspective, which is the core strength of the scoping review (Pham et al., 2014). This is particularly valuable in emerging interdisciplinary fields (Bradbury-Jones et al., 2022) that have not yet been scoped to review their mechanisms of emotional regulation influence.

Therefore, this paper aims to provide a comprehensive understanding of the impact and emotional regulation of healing spaces on patients’ emotions by conducting a scoping review of research in the field of architecture and interior design, to develop a healing structure for spaces that positively impact patients’ emotions. The healing structure will provide a systematic design strategy for the field of healthcare architecture and provide a reliable basis for practical design applications.

Method

Study project

In this paper, a scoping review approach will be employed to collect and analyze the literature, providing theories related to the article's topic. The method of scope review is utilized effectively, as it focuses on assessing and understanding the scope of knowledge in specific fields, particularly emerging fields, and identifies the key characteristics or concepts of the field, while also discussing them (Peters et al., 2020). In addition, the methodology provides scholars and researchers in different fields with the latest results (Tod et al., 2022). This state-of-the-art information holds an important position in supporting the development of the field of healing space design. The search period from June 2019 to July 2023 was selected to capture the surge of scholarly attention to healing environments during and following the COVID-19 pandemic, a time when the healing role of architectural space in supporting mental and emotional well-being became a prominent focus in healthcare and design-related research.

Scoping Review Procedures

The goal was to find elements, processes, and mechanisms used in healing spaces to promote emotion regulation that has evidence of impacting the recovery process for people with mood disorders. The scoping review followed a structured five-step process to ensure methodological rigor and transparency. In the first step, the research question was posed: How do people with mood disorders achieve emotional regulation through the experience of healing spaces? Second, a comprehensive search strategy was developed, including the identification of relevant keywords, Boolean operators, and database screening across multiple platforms. In the third step, studies were screened through a multi-stage screening process that included removing duplicates, screening titles and abstracts, and screening for matching papers based on predefined inclusion criteria. In the fourth step, data extraction was performed using standardized charts to capture key information (e.g., study location, methods, and key findings). Finally, the summaries from step four are interpreted and the final results are presented.

Incorporation Criteria

The search used inclusion criteria based on three guidelines: language, study types, and study topics. The language criterion was searched for published articles written in English as the primary writing language from June 2015 through July 2023. The criteria for study types included experimental and survey studies, systematic reviews, and scoping reviews. In addition, three criteria for correlation analysis were developed based on the research themes:

- (1) Investigate indoor architectural elements (e.g., lighting, color, spatial layout, ventilation, noise, temperature) and report findings related to emotions, moods, or psychological responses;
- (2) Examine the effects of sensory stimuli (sight, hearing, smell, touch, taste) in the built environment on emotion or behavior;
- (3) Focusing on spatial experiences in healing, healthcare, or rehabilitation settings.

Studies were included if they met at least one of the above relevance thresholds. This multilevel relevance threshold ensured that only studies that focused on the relationship between emotion and space were retained for the final synthesis. Thus, the applicability of the articles obtained from the review was evaluated with specific criteria during the later search.

Search Strategy

To ensure transparency and reproducibility, the search strategy incorporated a combination of controlled vocabulary and free-text keywords related to architecture, emotion regulation, and sensory environments. Firstly, the core search terms included: “architecture”, “space”, “healing space”, “medical architecture design”, “emotional disorders”, “emotion regulation”, “sensory stimulation”, and “affect”. Next, Boolean operators were used to structure the search strings, such as: (architecture* OR space* OR healing space* OR medical architecture design) AND (emotional disorders* OR sensory stimulation* OR emotions* OR emotion regulation* OR affect*) where the “*” symbol is a truncation. The use of Boolean operators can be utilized to effectively control the scope of the search by means of synonyms or acronyms while ensuring that key terms are not omitted. Additional searches were conducted across multiple databases, including Scopus, Web of Science, and SciELO. Filters were applied to restrict results to: (1) publications in English; (2) peer-reviewed journal articles and reviews; and (3) the date range from June 2019 to July 2023. This was followed by further focused searches for key authors or sources that aligned with the research topic, allowing for a deeper examination of articles excluded due to key terms but still relevant to the topic. Finally, most of the articles were redundant in the search process so the resulting articles were saturated.

Quality Assessment

The articles obtained from the search were assessed for quality after the search process through four steps: (1) removal of duplicate records; (2) screening of titles and abstracts for initial relevance; (3) full-text review based on predefined inclusion criteria; and (4) quality assessment using assessment questions.

To assess the quality of the selected papers, a question-based quality assessment method developed by Connolly et al. (2012) will be applied in this study. Each paper that meets the inclusion criteria is scored based on two questions, with each score ranging from 1 to 3.

Q1: What type of paper is the paper? (1 point if it is a review type, 2 points if it is published in a conference format, and 3 points if it is published in a journal format.)

Q2: Is the methodology applicable to this study? This assessment included an analysis of the materials, methods, and analytical approaches employed to verify the methodological rigor. (Mark 1 if the information reported is incomplete, mark 2 if the information reported is generally complete but details are slightly generalized, and mark 3 if the information reported is clear and thorough.)

In accordance with the quality assessment process, a methodology was used in which two reviewers independently assessed the research quality of the articles based on the question-based quality assessment method. During this time, the reviewers would communicate each score, finally reaching a consensus and assigning a final score. When a paper's final score is equal to or higher than 4, it is considered to be of high quality.

Results

Summary of Review Results

The search yielded 8,838 papers during the term search phase. Duplicate articles were then screened and assessed for relevance and quality based on titles and abstracts, and 36 articles were reviewed in full text, resulting in the selection of 22 articles (Figure 1). One article was a scoping review, two were systematic reviews, six were quantitative methods, and nine were qualitative methods (Table 1).

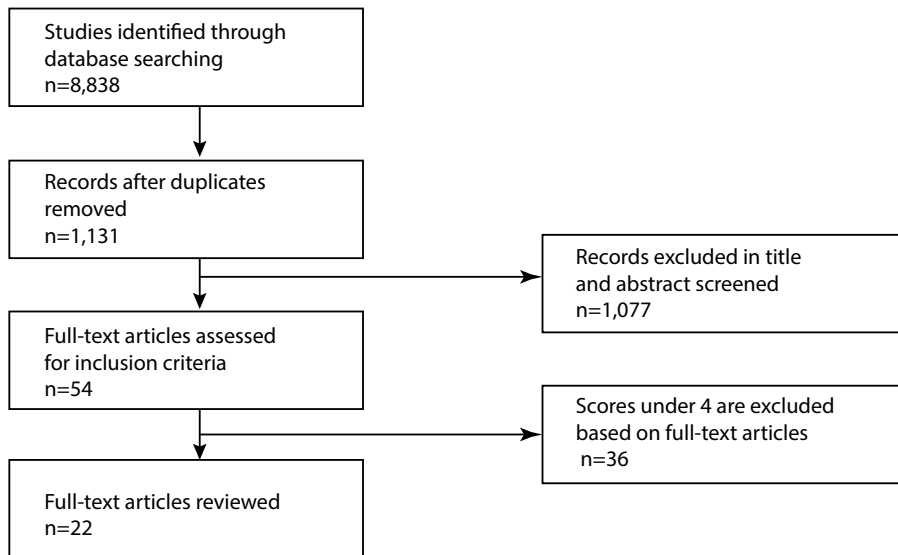


Figure 1: Search and Selection Flowchart.

Table 1: Statistical Information of Included Studies.

No.	Author(s) and year	Location	Topic	Study design	Key Findings
1	(Abd Samad, 2015)	Malaysia	Optimum Healing Spaces of Public Areas for Children Aged 4 to 12 in Malaysian Hospitals	Case study	Healing environments reduce children's anxiety through color use, social interaction, play, and natural elements.
2	(MacAllister et al., 2016)	USA	Exploring Inpatients' Experiences of Healing and Healing Spaces	Mixed study	Architectural principles of healing: Patients' recovery is positively influenced by a sense of being cared for, comfort in the environment, and familiarity resembling home.
3	(Lindberg et al., 2019)	Sweden	The experiences of patients in using sensory rooms in psychiatric inpatient care The Role of Patients' Psychological Comfort in Optimizing Indoor Healing Environments: A Case Study of the Indoor Environments of Recently Built Hospitals in Sulaimani City, Kurdistan, Iraq	Questionnaire survey	Sensory rooms can provide multi-sensory stimuli (light, sound, smell, etc.) that promote calmness, relaxation, autonomy, and a sense of control, helping patients cope with stress and anxiety.
4	(Mahmood F J et al., 2019)	Iraqi	Music Use for Mood Regulation: Self-Awareness and Conscious Listening Choices in Young People with Tendencies to Depression	Questionnaire survey	Determinants of recovery: Key factors include interior aesthetics, privacy and independence, environmental comfort and controllability, air quality and safety, and access to assistive devices.
5	(Stewart et al., 2019)	Australia	Self-Awareness and Conscious Listening Choices in Young People with Tendencies to Depression	Grounded theory	Music and mood regulation: The effects of music listening on mood depend on self-awareness and insight into emotional regulation processes.
6	(Asfour, K. S., 2020)	Egypt	Healing architecture: a spatial experience praxis	Case Study	Healing architecture for youth: Spatial experiences that encourage interaction and convey positive energy can contribute to actual healing outcomes.
7	(Tuszyńska-Bogucka et al., 2020)	Polish	The effects of interior design on wellness – Eye tracking analysis in determining emotional experience of architectural space.	Experiment	Interior design and emotions: Eye-tracking results show that variations in scale, lighting, color, and spatial arrangement significantly influence individuals' emotional states.
8	(Coburn et al., 2020)	UK	Psychological and neural responses to architectural interiors	Experiment	Architecture and well-being: Architectural design can reduce anxiety and stress, highlighting a strong link between the built environment and human perception, emotion, and behavior.
9	(Zhang et al., 2020)	New Zealand	The Association between Green Space and Adolescents' Mental Well-Being: A Systematic Review	Systematic Review	Green spaces and adolescents: Exposure to green environments is associated with reduced stress, improved mood, fewer depressive symptoms, and better emotional health.
10	(James et al., 2020)	Canadian	From Architecture to Evolution: Multisensory Evidence of Decentralized Emotion	Multiple research methods (QL & LR)	Decentralized emotional processing: Emotional value in built environments can be encoded from early sensory perception, suggesting new therapeutic possibilities for mood disorders.
11	(Asfour, K. S., 2021)	India	The Impact of Architecture in the Process of Healing & Well-Being	Multiple research methods (QL & LR)	Healing environments and restoration: Quiet, calm, and relaxing atmospheres support physical, mental, and spiritual recovery through comfort, well-designed spaces, and relaxation.
12	(Higuera-Trujillo et al., 2021)	Spanish	The Cognitive-Emotional Design and Study of Architectural Space: A Scoping Review of Neuroarchitecture and Its Precursor Approaches	Scoping Review	Elements of healing spaces: Soothing colors, natural light, comfortable furniture, greenery, reduced noise, and thoughtful layouts help patients regulate emotions and maintain concentration.

No.	Author(s) and year	Location	Topic	Study design	Key Findings
13	(Allahyar & Kazemi, 2021)	Iran	Effect of landscape design elements on promoting neuropsychological health of children	Survey	Children's neuropsychological health: Friendly spaces, water features, natural landscapes, and individualized design needs enhance children's psychological well-being.
14	(Canbeyli, 2022)	Turkey	Sensory stimulation via the visual, auditory, olfactory and gustatory systems can modulate mood and depression	Qualitative study	Multisensory stimulation and mood: Visual, auditory, olfactory, and gustatory inputs influence mood and depression, with multisensory interventions proving more effective for treatment.
15	(Li et al., 2022)	China	Regulating effects of the biophilic environment with strawberry plants on psychophysiological health and cognitive performance in small spaces	Experiment	Biophilic environments: Introducing plants such as strawberries can enhance relaxation, positivity, and overall emotional well-being.
16	(Lee, 2022)	Korea	The Interior Experience of Architecture: An Emotional Connection between Space and the Body	Case study	Spatial experience: Rich experiences arise from activating the senses, emphasizing materiality, and fostering emotional connections between people and space.
17	(Colenberg & Jylhä, 2022)	Netherlands	Identifying interior design strategies for healthy workplaces	Qualitative study	Interior design strategies: Comfort, natural environments, social connections, and activity-oriented layouts promote both mental and physical health.
18	(St-Jean et al., 2022)	Canada	A review of the effects of architectural stimuli on human psychology and physiology	Multiple research methods (QL & LR)	Architectural stimuli: Emotional regulation is influenced by spatial geometry, openness, facial pattern recognition, and natural materials.
19	(Rodriguez & Kross, 2023)	USA	Sensory emotion regulation	Experiment	Sensory modalities and emotion: Hearing, smell, touch, taste, and vision each play distinct roles in shaping emotional states, with positive or negative outcomes depending on the stimulus.
20	(Assem et al., 2023)	Egypt	Designing for human wellbeing: A review of the effects of architectural stimuli on human psychology and physiology of neuroarchitecture in design	Systematic review	Design features and inclusivity: Emotional regulation can be supported through architectural design (volume, order, proportions), pleasant environments, emotional assessment models, and consideration of cultural and individual differences.
21	(To & Grierson, 2024)	UK	A study on children's multi-sensorial experiences of nature: design approaches and preferences for primary school architecture case studies in Glasgow, Scotland, UK	Case study	Children's environmental preferences: Natural diversity, flexible and accessible paths, and indoor nature elements enhance children's sensory experience and connection with nature.
22	(Abu-Obeid & Abuhassan, 2024)	Germany	Experiencing cinematic architecture: the impact of architecture on the audience emotional engagement	Experiment	Atmosphere and emotional involvement: Building atmospheres shape emotions by generating pleasure, relaxation, excitement, or tension, depending on design features such as openness, materials, light, scale, and spatial dynamics.

Discussion

Healing Structure in Spaces

The results of this review found that healthcare and healing spaces have been identified that affect and regulate the emotions of patients through aspects of their sensory experience. Specifically, many factors of the healing space can stimulate the human senses in a purposeful, planned, and directed way, and this sensory information will produce positive emotional results thus the purpose of emotional regulation. Among other things, the healing structure plays an important role by both directing the sensory elements of the space to stimulate the human senses purposefully and by guiding the sensory information to evoke positive emotional atmospheres (refer to Figure 2).

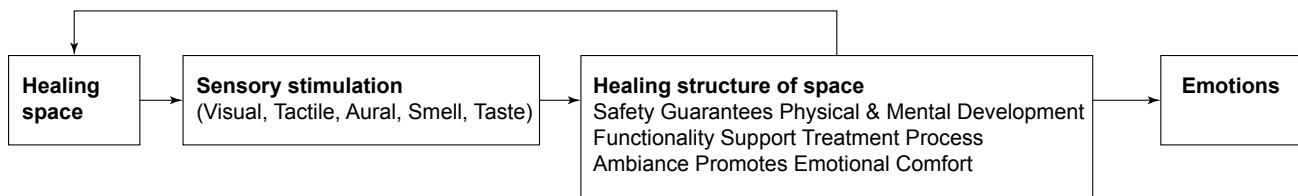


Figure 2: The Role of Healing Structures in the Process of Spatial Influence on Emotions.

This review found that healing structures in space facilitating emotional regulation can be categorized into three main categories:

Safety guarantees physical & mental development: The safety of a space safeguards people's lives as well as their psychological security. Ensure that patients are in a safe, secure and harmless environment.

Functionality Support Treatment Process: The different functions of a healing space provide an environment that supports the healing process and helps patients recover and heal physically and mentally.

Atmosphere Promotes Emotional Comfort: The spatial atmosphere promotes emotional comfort by stimulating the senses and emotions that provide patients with different emotional experiences such as comfort, relaxation, or focus.

These structures can enable architecture to have an impact on human health, behaviour, and emotional functioning. In some cases, architectural elements have a direct impact on healing, but in most cases, architecture affects different sensory stimulation through these healing structures (Spence, 2020; Watts et al., 2016), which in turn affect the human body and promote emotional regulation. In other words, architectural spaces have a direct impact on the patient's body, but not a direct on their emotions. Emotional healing and recovery are more dependent on the patient's own senses and self-acceptance. The healing structure can improve the materiality of the space to stimulate the patient's physical senses for the purpose of linking the space to the patient's emotions (Lee, 2022).

Thus, architectural space cannot directly lead to healing, but it can assist the patient's body and emotions in a positive direction through healing structures, such as making the patient feel relaxed, cozy, safe, and other positive emotional atmospheres; architectural space can enhance the patient's concentration and thus divert the influence of negative emotions (Taheri & Ghasemi Sichani, 2015), which are the prerequisites for the promotion of emotional regulation by space. According to the evidence provided through the literature review, the healing structure of architectural space involves Safety guarantees physical & mental development, Functionality Support Treatment Process, Ambiance Promotes Emotional Comfort, which have been shown to have an impact on the mood and emotions of people with mood disorders.

Safety Guarantees Physical and Mental Development

According to Table 1, many researchers consider safety as one of the most essential considerations for healing spaces (Mahmood et al., 2019; Asfour, 2020; Colenberg & Jylhä, 2022). Space safety refers to the extent to which people are free from harm or threats to their lives in a given environment (Zhang et al., 2019), and whether or not it can adversely affect a person's physical and mental health. That said, healing space safety is mainly divided into physical and psychological safety. Ensuring a safe and stimulating environment is crucial, especially for patients with multiple disabilities, as it can greatly affect treatment outcomes (Borowczyk, 2019). The safety guarantees physical & mental development, including physical safety and psychological safety, are shown in Table 2, which demonstrates the sources of the 11 pieces of literature that support these ideas.

Table 2: Summary of Relevant Literature (Based on Table 1)

The functions of healing spaces	Reference sources
Physical safety	(Samad, 2015); (MacAllister et al., 2016); (Asfour K. S., 2020); (Coburn et al., 2020); (Allahyar & Kazemi, 2021); (Zhang et al., 2020); (Assem et al., 2023); (Abu-Obeid & Abuhassan, 2024)
Psychological safety	(MacAllister et al., 2016); (Mahmood F J et al., 2019); (Lee, 2022); (Colenberg & Jylhä, 2022); (Allahyar & Kazemi, 2021); (Assem et al., 2023)

Physical Safety

A safe space provides the opportunity to protect people's bodies from hazards, disasters, accidents, and potential threats such as the presence of toxic gases and chemicals or other safety factors in the space. This can be achieved through proper building safety design, such as improving fire protection systems to increase fire resistance (Kodur et al., 2020), installing anti-slip facilities to reduce the risk of falls (Hanger, 2017), using green plants to absorb harmful substances (Junardi & Leonardo, 2023; Y. Zhang et al., 2020), quiet spaces to protect patient hearing (Watts et al., 2016) and furniture and tools in the space to avoid sharpness to reduce the risk of stabbing (Phuah et al., 2022). Teenagers and children, in particular, should be given more attention to their physical safety in healing spaces, as their awareness of safety needs to be improved compared to that of adults.

Psychological Safety

Architectural spaces can have a positive or negative impact on individuals' emotional responses (DuBose et al., 2018). This means that a healing space ought to make people feel comfortable, relaxed, and at ease without triggering fear, anxiety, or psychological stress. Expanding access to natural light in the room is not only beneficial to the physiological functioning of the patient, but it can also lead to positive emotional changes, such as a reduction in the symptoms of the patient's mood disorder (Joines et al., 2015; Terman et al., 2001). A study found that green plants in space are also an effective way to build psychological safety, which can influence metabolism and induce a sense of well-being by generating large amounts of negative ions directly in the central nervous system (Liu et al., 2017). In addition, respecting individual rights and emotional needs can reduce fear and anxiety and construct their psychological safety. For example, satisfying the curiosity and playfulness of pediatric patients can better enable children to increase their trust and familiarity with the space (Abulawi et al., 2019; Lawi, 2017); patients with mood disorders are more in need of an independent space to satisfy their emotional needs, so the healing space should have a certain degree of privacy while focusing on its social attributes (Bettarello et al., 2021).

Functionality Support Treatment Process

Healing functionalities usually refer to the ability of a building or space to have a positive impact on the health and recovery of an individual or group (Meng et al., 2020). The 22 literature articles organized according to Table 1 suggest that 14 of them recommend the creation of a physical space that supports healing, and that the space needs to have specific functions that promote patient recovery. The functions of healing spaces, including Spatial Experience, Versatility, Sensory stimulation, and Balance of public & private spaces, are shown in Table 3, which demonstrates the sources of the 14 pieces of literature that support these ideas.

Table 3: Summary of Relevant Literature (Based on Table 1)

The functions of healing spaces	Reference sources
Spatial Experience	(Samad, 2015); (MacAllister et al., 2016); (Asfour K. S., 2020); (Coburn et al., 2020); (Allahyar & Kazemi, 2021); (Zhang et al., 2020); (James et al., 2020); (Abu-Obeid & Abuhassan, 2024)
Versatility	(MacAllister et al., 2016); (Mahmood F J et al., 2019)
Sensory stimulation	(Lindberg et al., 2019); (Stewart et al., 2019); (Tuszyńska-Bogucka et al., 2020); (Canbeyli, 2022); (Li et al., 2022)
Balance of public & private spaces	(Mahmood F J et al., 2019); (James et al., 2020); (Abu-Obeid & Abuhassan, 2024)

Spatial Experience

The environment shapes our experience of space in constant interaction with the body, and the healing experience for patients occurs over time, not instantaneously. Research has shown that sensory, aesthetic and emotional experiences are considered important in healing spaces in terms of their healing function for people with mood disorders (Asfour, 2020; Coburn et al., 2017; Pasqualini et al., 2018). This suggests that the internal spatial experience of a building can be associated with the emotions of those experiencing it. In fact, during the design process, the form and structure of the building space adjusts the spatial experience through modules such as walls, columns, floors, corridors, doors and windows, which may trigger more complex spatial feelings (Lee, 2022; MacAllister et al., 2016; Selami Cifter & Cifter, 2017). Specifically, by adding features for interaction and play with patients, spaces can enhance positive emotional experiences that lead to actual healing outcomes (Garzotto et al., 2019). Architectural spaces where wood is the primary material have a positive impact on people's health, comfort, and psychological aspects (Abu-Obeid & Abuhassan, 2024; Tonetti & Rossetti, 2023). The beauty and aesthetic features of architecture can also stimulate emotions and positive feelings, drawing closer the connection between space and emotion (Coburn et al., 2017; Tuszynska-Bogucka et al., 2020). This further confirms that architectural spatial experience can influence our perception of ourselves and our surroundings, which in turn affects patients' emotions.

Versatility

The healing nature of space has been found to fulfill the needs of different healing approaches, and therefore, the versatility function of space is also a key reference that requires space design. For example, green space or natural elements can distract patients from internal stressors by engaging them in physical activities through the use of greenery or pro-nature materials in the space (Masterton et al., 2020; To & Grierson, 2024). Research has demonstrated that green space is one of the embodiments of versatility, with better mood-boosting effects on post-war traumatized patients (Biglin, 2020), child survivors of violence (Ismatillah et al., 2022), pediatric cancer patients (Ibrahim et al., 2020), and elderly populations (Marques et al., 2019). In addition, another important indicator of versatility is social interaction, which requires the space to support social communication and interaction between patients and build connections between external and internal spaces (Kim, 2021). In particular, smart devices and game interactions have been used in spaces as important tools for treating traumatized children (Ogawa, 2004).

Moreover, sensory intervention is also an important manifestation of versatility. It can promote relaxation and a sense of security by providing patients with a comfortable sensory environment, including soft lighting, quiet music, soothing aromas, etc (Borowczyk, 2019). Studies have proved the healing effect of this intervention on women's birth (Nielsen & Overgaard, 2020), psychiatric patients (Hedlund Lindberg et al., 2019), autism (Unwin et al., 2022), and patients with mood disorders (Bhui, 2018).

Sensory Stimulation

Some neuroscience studies have shown that the sense of human receives sensory information from the outside world that is fed into the emotional processing areas of the brain (Kryklywy et al., 2020). In other words, the human body's experience in space can drive the senses to acquire information and produce an emotional response, which can influence participants' emotional experience. As a result, many scholars believe that the use of specific sensory stimuli in space can help to regulate and promote emotional recovery in patients. For example, auditory exposure in space using specific music therapy and a variety of non-musical

stimuli drives a calming emotional response in people with anxiety disorders (Canbeyli, 2022; Stewart et al., 2019); visual stimulation with exposure to bright light for approximately 1 hour has been shown to reduce the depressed emotional response in people with seasonal depression (Abd Samad, 2015; Pjrek et al., 2020); vegetation and flowers can produce aromatic odors and pro-natural olfactory and tactile stimuli that can contribute to driving a positive mood in people with autism (Gopal & Raghavan, 2018; Y. Zhang et al., 2020). providing rich sensory experiences by simultaneously mobilizing multiple senses (such as vision, hearing, smell, and touch) to influence an individual's emotional state can help with the rehabilitation of autism, children with disabilities, and patients with cognitive impairment (Fava & Strauss, 2010; Novakovic et al., 2019; Selamat et al., 2019; Tonetti & Rossetti, 2023). This sensory stimulation has evolved into Snoezelen's Sensory Environments, which help individuals reduce stress and anxiety by integrating a variety of specific sensory stimuli to create a welcoming and comfortable atmosphere (Nielsen & Overgaard, 2020). Sensory stimulation of space is therefore an important function in influencing and regulating mood.

Balance of Spatial Zoning

Architectural space zoning includes public areas, private areas, transition or connection areas, game interaction areas, and escape areas. A balance of different zoning of the building space can effectively meet the users' needs and facilitate the healing process. Studies have shown that open areas of the building space (public areas) contribute to the satisfaction and comfort of the facility's users (Kim, 2021). Meaningful, familiar and personalized private areas attract patients' interest and protect privacy (Gashoot, 2022). For healing spaces for patients with mental disorders, creating transition zones can help patients recalibrate their senses as they move from one level of stimulation to the next (Habbak & Khodeir, 2023). Smart play areas for children with neurodevelopmental disorders provide rich interactive and sensory stimulation to improve communication, emotion and cognition (Garzotto et al., 2019). Additionally, escape areas provide respite for autistic individuals from the overstimulation of the environment (Mostafa, 2014). Therefore, the zoning of the healing space needs to meet the patient's emotional needs and follow the actual treatment needs.

Atmosphere Promotes Emotional Comfort

The atmosphere created by healing architectural environments' physical, and spatial features is associated with psychological outcomes, for example stress and anxiety levels and other health-related qualities (MacAllister et al., 2016; Y. Zhang et al., 2019). Among the 22 analyzed studies, 16 support the theory that atmosphere promotes emotional comfort (see Table 4). Most of their views focus on the effectiveness of spatial ambiance in promoting emotional comfort in terms of relieving emotions, stimulating creativity, and focusing attention.

Table 4: Summary of Relevant Literature (Based on Table 1)

Atmosphere Promotes Emotional Comfort	Reference sources
Ease emotions	(Samad & Rahim 2015); (MacAllister et al. 2016); (Lindberg et al. 2019); (Mahmood F J et al. 2019); (Lee 2022); (Colenberg & Jylhä 2022); (Rodriguez & Kross 2023); (Canbeyli 2022); (Li et al. 2022); (Assem et al. 2023); (Abu-Obeid & Abuhassan, 2024)
Stimulating creativity	(Colenberg & Jylhä 2022); (St-Jean et al. 2022); (Rodriguez & Kross 2023); (Higuera-Trujillo et al. 2021); (Assem et al. 2023)
Concentration	(Samad & Rahim 2015); (MacAllister et al. 2016); (Lindberg et al. 2019); (Higuera-Trujillo et al. 2021); (Allahyar & Kazemi 2021); (To and Grierson, 2024)

Ease Emotions

The atmosphere is characterized by changes in the perceived materiality of the space, ranging from the sensory characteristics of direct physical experience to the “manipulated atmosphere” of the built space (Gandy, 2017). Studies have shown that a spatial atmosphere created with low-decibel soothing music, soft blankets, and blue-based light sources and patterns can be effective in relieving patients’ anxiety symptoms and providing emotional relief (Asfour, 2020; Monzavi, 2019). The green space atmosphere created by plants, flowers, and other natural elements has the healing effect of reducing stress and mental fatigue, soothing emotions, and preventing depression (Bray et al., 2022; T. Zhang et al., 2019). Moreover, studies have shown that accessible designs such as eliminating difficult-to-climb stairs, introducing unique color recognition systems and touchable patterns, which can be convenient for visually impaired and disabled people and create an atmosphere with humanistic care can be effective in alleviating negative emotions (Borowczyk, 2019).

Stimulating Creativity

The specific atmosphere created by an architectural space can stimulate the creativity of its users. Several studies have found that the use of interactive shapes and forms, as well as the interactive appearance of interior spaces, creates a playful atmosphere that is effective in stimulating patients and allowing them to use their creativity in order to achieve satisfactory healing outcomes (Mahmood & Tayib, 2020; Monzavi, 2019). For example, prefabricated wooden modules with different functions allow people with cognitive disabilities to freely plan the form and layout of a space, enhancing their imagination and creativity, and thus gaining a sense of accomplishment (Tonetti & Rossetti, 2023). The creation of “free zones” in the space can effectively support the creativity of adolescents with mental illness in the healing process (Fricke et al., 2019).

Concentration

The atmosphere is also a key factor in transforming ‘space’ into a meaningful ‘place’ (Dai & Zheng, 2021), influencing attention to some extent. Research has shown that the use of virtual reality in architectural spaces can be effective in supporting the healing process for people with specific phobias (Maskey et al., 2019). This is mainly through enhancing the effects of visual, tactile and auditory stimulation, which enables focusing the patient’s attention and distracting from negative emotions. Tsai and Hong’s study noted that the use of modular and movable furniture, which allows the pattern of the interior space to become flexible and change with the needs of the person suffering from dementia, can soften the rigidity of the space and help to train the patient’s attention to alleviate the symptoms of dementia (Tsai & Hong, 2019). Nielsen and Overgaard found that providing maternal mothers with multi-sensory stimulation and experiences, such as warm light, soothing music, and aromatic fragrances, in a positive distraction way helps patients focus on the stimuli rather than their own anxious emotions (Nielsen & Overgaard, 2020).

In summary, according to the discussion in the above review, the convalescent structure reflects the interior space’s safety, functionality, comfort and psychological well-being. These structures of the healing structure translate into a sense of security, efficiency, comfort, and stress relief, which in turn helps to regulate the patient’s mood. Figure 3 summarizes the main aspects of spatial healing structures; in this, “physical” and “psychological safety” serve as healing basic-contents that set the fundamental conditions for healing. In contrast, “functionality supports treatment process” and “ambiance promotes emotional comfort” represent higher-level spatial attributes as healing key-contents that further enhance sensory

engagement and emotional regulation by supporting healing activities and creating a comfortable atmosphere.

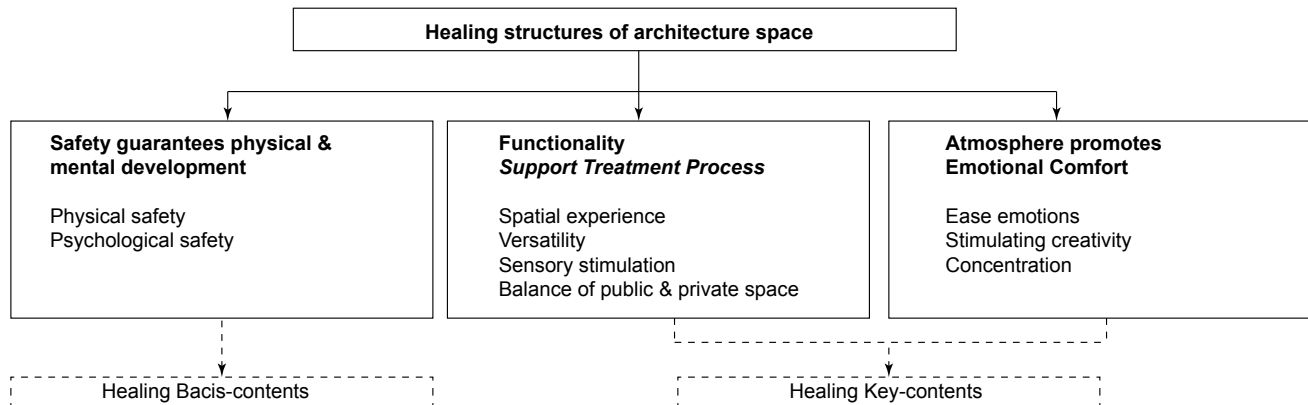


Figure 3: The Healing Structure of Architectural Space.

This healing structure is important to the field of healthcare architecture because it reveals specific strategies for healing spaces to promote patient emotional regulation. Table 5, based on Figure 3, summarizes the key components of this structure, including the specific strategies of the healing architecture and their impact on patients' emotions. In addition, Table 5 does not identify "specific healing" approaches, as each strategy may have a different impact on mood. Nonetheless, the healing structure supports healthcare architects in combining these strategies to promote health and well-being through building design and planning.

Table 5: Specific Strategies for Healing Structures and Their Impact on Emotions.

	Healing Structures	Sub-structures	Positive correlation with patient emotional health
Healing structure of space	Safety guarantees physical & mental development	Physical safety	Patients are guaranteed to be physically safe from harm.
		Psychological safety	Respecting individual rights and emotional needs mitigates fear and anxiety.
	Functionality Support Treatment Process	Spatial experience	The space is easy to interact and experience with facilities and equipment that meet the patient's treatment needs.
		Versatility	The space serves various functions to accommodate diverse healing approaches.
		Sensory stimulation	Sensory stimulation and calming elements are incorporated to support the patient's healing process.
		Balance of public & private spaces	Treatment areas are designated for individual privacy, while also fostering opportunities for interaction and communication with other patients or staff, promoting mutual support and sharing.
	Ambiance Promotes Emotional Comfort	Ease emotions	Creating a serene ambiance contributes to relaxation, alleviating stress and anxiety.
		Stimulating creativity	Infusing the environment with movement, vitality, and creativity stimulates patients' creative energy and vitality.
		Concentration	Fostering inner peace and concentration, the environment promotes a calm atmosphere that enhances focus and concentration.

Conclusion

This research is a scoping review centered on how healing spaces can enhance emotional regulation for people with mood disorders, and the research integrates theoretical findings from multiple disciplines, including architecture, medicine, and psychology. In response to the research question, this scoping review contributes a conceptual framework of healing structures such as safety, functionality, and sense of atmosphere. This is to understand how architectural environments can support emotional regulation in people with mood disorders. The main contribution of this work lies in integrating insights from architecture, medicine, and psychology to highlight the potential of “emotionally oriented spaces” as a design approach for mental health promotion.

Although this review provides a conceptual framework, empirical validation is needed. Future research should test the healing structure model in specific contexts (e.g., hospitals or rehabilitation centers) to explore how architectural interventions can be personalized to promote emotional well-being. These studies will help translate healing design principles into evidence-based practice and promote more inclusive built environments.

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