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Research on the Design of Ceramic Tiles' Intervention in the Healing Environment of Urban Spaces

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ABSTRACT
Amidst the accelerating pace of urbanization and the increasing prominence of mental health issues, exploring the healing construction of urban spaces has become a core topic in the field of human settlement environment research. Given the widespread use of ceramic tiles as a building material in urban spaces, they exhibit significant potential in creating urban environments with healing effects. This paper delves into the universal applicability of the healing function in urban spatial environments, analyzes the feasibility of ceramic tiles' intervention in healing urban spaces, and further explores design strategies for ceramic tiles' integration into healing urban environments. The aim is to open up new perspectives and implementation pathways for ceramic tile design in urban spaces, thereby enriching the theoretical and practical framework for the healing construction of urban spaces.

KEYWORDS
ceramic tile design; healing design; urban spatial environment

In recent years, with the rapid economic and social development in China, the intensification of life pace and workload has become a widespread phenomenon. This trend has been accompanied by frequent occurrences of psychological and behavioral disorders as well as mental health issues, further highlighting the importance of public mental health. Mental health status not only profoundly affects individual well-being but also has a significant impact on the harmony, stability, and development of the entire society. Among the many factors influencing mental health, environmental spatial factors exert a widespread and profound influence on individuals' mental health status due to their long-term, persistent, and potential effects. Previous studies have extensively confirmed the significant value of healing environments in promoting human physical and mental health. Ceramic tiles, as indispensable building materials in the construction of urban spaces, have functions far beyond mere practical spatial needs.

Their unique aesthetic qualities and material properties offer new possibilities for creating urban spaces and home environments with healing effects. These characteristics invisibly contribute to the prevention and mitigation of individual psychological disorders, further highlighting the unique role of ceramic tiles in promoting mental health. This study aims to deeply analyze the characteristics of healing environments and draw on interdisciplinary wisdom to achieve deep integration across disciplines. The research on the design of ceramic tiles' intervention in the healing environment of urban spaces explores how ceramic tiles, with their unique aesthetic and material properties, enhance the healing quality of environments, providing new theoretical support and practical guidance for the field of urban healing environment design.

1 Universal Applicability of the Healing Function in Urban Spatial Environments

1.1 Theoretical Research on Healing Environments

In his book "Healing Places," Wilbert M. Gesler points out that the physical environment of medical treatment settings influences the physical, psychological, social, and emotional aspects of healing. Gesler argues that the environment of treatment settings is integral to treatment and advocates that healthcare should go far beyond biomedical solutions [1]. This concept of environmental influence has a long history, subtly influencing ancient beliefs and perceptions. From the Asclepios temples in ancient Greece used for relief and recuperation to the monasteries in the Middle Ages that provided treatment and spiritual education for believers [2], and the Taoist temples and Buddhist monasteries hidden in remote mountains in China, where people sought solitude to cultivate their minds and bodies, the environment played a role in transforming unhealthy, negative states of mind and body into positive and stable states [3].

The concept of a "healing environment" was first proposed by environmental psychologists at the University of Michigan, who defined it as an environment that "facilitates recovery from negative emotions associated with psychological fatigue and stress" [4]. Healing environments can ameliorate, mitigate, and cure illnesses, guiding individuals' emotions and psychology towards a positive and relaxed state, thereby improving their overall health both physically and psychologically.

1.2 Universality of Healing Environment Design

The concept of a "healing environment" was initially applied in medical treatment settings, targeting specific patient groups. In 1984, Professor Ulrich from Texas A&M University discovered that patients facing green gardens recovered significantly better than those with only blank walls, indicating the positive effects of the medical environment on treatment, thus initiating research into the impact of spatial environments on human physical and mental well-being. From the mid-19th century to the early 20th century, Florence Nightingale, a British nurse and statistician, believed that hospital buildings should have specific requirements in terms of ward layout, size, windowing, ventilation, heating, materials, and colors. She advocated for the construction of Pavilion Style hospitalsto ensure the rationality of medical processes in layout and reduce patient mortality rates. Through observation and statistics, Nightingale established the understanding that many environmental factors inevitably influence recovery and attempted to put these experiences into practice [5]. With the acceleration of urbanization, the issue of psychological sub-health among urban populations has become increasingly prominent. In the field of urban environment, the advocacy for green and healthy environments has led to the continuous expansion of the scope of "healing environments." They are no longer solely targeted at those suffering from illnesses but have gradually radiated to a wider range of groups. Their goals have shifted from treating diseases and alleviating symptoms to psychological healing, with settings expanding from medical institutions to public spaces and home scenarios, tending towards daily life. The design concept has also transitioned from type-specific research to universal daily applicability. In urban public spaces, streets, residences, and other settings, the healing properties of the built environment and the healing effects of urban life are increasingly intertwined with workplaces, learning environments, and home rest. Ceramic tiles, with their widely distributed characteristics, have the potential to carry healing and comforting emotions for communities.

2 Feasibility of Ceramic Tiles in Creating Healing Environments in Urban Spaces

2.1 Ceramic Tiles' Widespread Distribution and Potential for Community Emotional Healing

Ceramic tiles have a wide range of applications, extending from the exterior walls of urban buildings to interior spaces, from indoor public spaces to home environments, and from floor tiles to wall tiles. The types of ceramic tiles are also diverse, including homogeneous tiles, polished tiles, glazed tiles, vitrified tiles, and handmade tiles, with technical innovations like porcelain slabs also falling into the category of ceramic tiles. Ceramic tiles are ubiquitous in indoor spaces, found in indoor public spaces, home environments, living rooms, kitchens, bathrooms, background walls, and indoor furniture, with an increasingly blurred and boundaryless scope of application. They have transformed from initial building materials to indoor decorative art elements. According to some domestic scholars, "more than 80% of a modern person's life is spent indoors." The extensive use of ceramic tiles in indoor spaces effectively determines the ambient atmosphere of indoor spaces. The exterior space of buildings is an extension of indoor spaces, and the built environment is the material environment with which people have the most prolonged daily interaction. Ceramic tiles not only protect exterior walls but also serve as decorative elements. They are not only found on building exterior walls but also in public environments such as garden landscapes, urban parks, urban green spaces, and urban plazas. With their widespread distribution, ceramic tiles have the capacity to carry the emotional healing of communities.

2.2 Material Properties Lay the Foundation for Integration into Healing Environments

The ancient Chinese text "Kao Gong Ji" states, "Heaven has its times, earth has its qi, materials have their beauty, and craftsmanship has its skill. Only when these four are combined can something excellent be created." This encapsulates the creative ideology of traditional Chinese craftsmanship, exemplified by statements such as "the horns of the swallow, the stems of the jing tree, the bamboo of Fanhu, and the gold and tin of Wu and Yue—these are materials of beauty." These instances demonstrate that material selection should not only meet the functional and technical requirements of the design, but also emphasize the unity of material texture and functionality. Ceramic tiles possess inherent material advantages when applied in urban spaces. Fired at high temperatures, they exhibit excellent stability and better adaptability to various spatial environments compared to common urban building materials like metal, glass, and plastic. With properties such as fire resistance, waterproofness, airtightness, high hardness, and corrosion resistance, ceramic tiles are durable and capable of withstanding the impacts of various internal and external environments [6]. In healing environments, ceramic tiles primarily satisfy functional and safety requirements, with their material physics serving as the foundation for their integration into healing spaces.

Using natural clay as its base material, ceramic tiles combine pollution-free and rustic beauty. Their eco-friendly characteristics align with modern society's values of sustainable development and environmental health, exhibiting a natural affinity with humans. Compared to the cold hardness of reinforced concrete, ceramic tiles add a sense of intimacy and warmth. With high material plasticity and extensive decorative versatility, they can mimic various natural textures

such as stone, wood, and fabric. Through the rich artistic elements of color, patterns, and surface structures, ceramic tiles have transformed from mere cleanliness-focused building materials into aesthetic elements that profoundly influence indoor and outdoor emotional spaces, providing the possibility for them to integrate into environments and exert healing effects.

2.3 Physical Properties Provide Safeguards for Integration into Healing Environments

As architectural decorative materials, functionality and decoration are the basic attributes of ceramic tiles. The functionality of ceramic tiles mostly extends from their physical properties. Functionality at the physical level refers to the ability of ceramic tiles to meet people's usage requirements and ensure ergonomic safety, comfort, and health by altering their physical structures or properties, adjusting the body formulation, firing temperature, surface materials, technical processes, and processing treatments. For instance, the anti-slip property of ceramic tiles is one of the most frequently mentioned functionalities. In our daily lives, falls and accidents caused by slippery tiles are common occurrences. Therefore, to reduce or eliminate injuries from these accidents, the anti-slip property of ceramic tiles is in high demand in risky environments such as restaurants, medical facilities, and schools. Anti-slip ceramic tiles provide users with a sense of security and peace of mind, transitioning from behavioral safety to psychological reassurance. With the continuous infusion of ceramic tile technology, we now have negative ion ceramic tiles that can purify the air, energy-saving and environmentally friendly heated ceramic tiles, antibacterial ceramic tiles that prevent and kill bacteria, breathable ceramic tiles that regulate humidity and dissipate odors, and far-infrared ceramic tiles that emit specific wavelengths, all of which have excellent therapeutic and health benefits for specific patient groups and also exhibit healing effects on urban residents. Thus, multifunctional ceramic tiles have entered urban spaces.

3 Design Research on the Integration of Ceramic Tiles into Healing Urban Spaces

3.1 Sensory Healing Design

(1) Visual Feature Healing Design

The visual appearance of materials conveys strong emotional expressiveness. Vision is the process through which humans perceive their surroundings and the environment, serving as the most fundamental element of visual perception and aesthetics [7]. As a crucial element in environmental spaces, ceramic tiles exert their visual healing influence mainly in the following three aspects: Firstly, in terms of shape and size, ceramic tiles are lightweight and freely formed, allowing for flexible cutting and combinations. Rectangular tiles impart spatial extensibility and a sense of calm rationality, while polygonal and circular tiles create a gentle atmosphere. In terms of size, ranging from conventional dimensions to oversized slabs, small-sized tiles exhibit rhythm and agility, while large-sized tiles produce a strong visual impact, forming an overall coherent visual effect. Secondly, in terms of color and pattern, ceramic tiles come in diverse surface designs, with patterns including imitations of nature (such as wood grain, stone texture, and metal finish), emphasizing designs that bring people closer to nature; pattern-based designs focus on decoration; and plain-colored designs emphasize texture, with moderate brightness and purity to create a comfortable spatial atmosphere. Finally, in terms of laying methods, the application of ceramic tiles tends towards cross-boundary uses, making it possible to use floor tiles on walls, wall tiles on floors, and indoor tiles on exterior walls. By breaking traditional laying rules, such as freely combining cuts, colors, directions, and sizes, and contrasting smooth with rough tiles, combined with the flexibility of mechanized production, adopting diversified layout designs is a key strategy to enrich the decorative style of ceramic tiles and enhance spatial expressiveness. Through innovative designs in shape and size, color and pattern, and laying methods, ceramic tiles not only enrich the visual hierarchy of space but also profoundly influence the emotional atmosphere and healing effects of the environment.

(2) Haptic Feature Healing Design

The tactile design of ceramic tiles is deeply rooted in a profound understanding of human tactile experiences and sensations. By subtly simulating and reproducing the textures and surface finishes of various materials, it greatly enriches the artistic expression of ceramic tiles and effectively broadens their application scope. More importantly, this design strategy fully satisfies people's emotional needs at both physiological and psychological levels, imparting a more humanized quality to ceramic tiles.

Through ingenious texture design, the originally cold ceramic tiles are transformed into decorative materials with a soft texture and warm touch. Taking Tokyo Metro stations in Japan as an example, these stations cleverly utilize materials such as microcrystalline stone and matte glaze to create differentiated tactile zones. Among them, ceramic tiles with a rough texture are used to clearly mark the boundaries of blind pathways, providing clear navigational information for visually impaired individuals. Smooth glazed ceramic tiles, on the other hand, are used to guide pedestrian flow, with their smooth touch helping to alleviate passengers' anxiety. Behind the tactile design of ceramic tiles lies not only a deep

exploration of materials science but also a meticulous concern for human perception and psychological needs.

3.2 Functional Ecological Innovative Design

Through technological innovation, ceramic tiles are endowed with the ability to actively regulate the environment. These materials not only meet basic decorative needs but also positively guide users' emotions through multi-dimensional sensory interventions. New eco-friendly ceramic tiles, equipped with nano-photocatalytic coatings or negative ion-releasing materials (such as titanium oxide composites), can effectively decompose indoor harmful gases like formaldehyde and benzene while emitting negative oxygen ions, simulating the natural environment of a forest and thus creating a fresh and clean indoor air environment for users at the olfactory level. Taking Dongpeng Eco-Soft Tile as an example, this product uses environmentally friendly activated clay as the main raw material. Its unique porous structure can adsorb pollutants and decompose them through photocatalytic reactions, achieving efficient and eco-friendly air purification functions. Furthermore, the temperature control function of ceramic tiles is also one of the current research hotspots. By adopting advanced phase change materials, ceramic tiles can automatically absorb and store excess heat when the ambient temperature exceeds a set threshold (such as 26° C), thereby maintaining the surface temperature within a comfortable range of 22-24°C. This function not only enhances the comfort of the indoor environment but also effectively eliminates irritability and discomfort that may be caused by high temperatures, further improving users' living experience.

The combination of functional design and emotional healing in ceramic tiles not only drives advancements in building material science but also provides new ideas and methods for designing healing spaces in modern cities. By comprehensively utilizing advanced ceramic tile material technology and design concepts, a more humanized, intelligent, and healing urban environment can be created.

3.3 Cultural Healing Design

In contemporary urban space design, the translation of regional symbols in ceramic tile design serves as a crucial path to achieving cultural healing functions. This primarily involves transforming abstract cultural symbols into perceptible spatial experiences through ceramic tiles as material carriers. For example, the courtyard of the new Suzhou Museum adopts "ice crack" celadon porcelain tiles, reconstructing traditional garden paving patterns with modern digital cutting technology. The "ice crack" pattern, unique to the famous Ge kiln of the Song Dynasty, features randomly intersecting lines that metaphorically represent the philosophical view of "harmony between man and nature" in traditional Chinese culture. This reconstruction triggers cultural identity. Additionally, ceramic tiles possess a narrative function, manifested in their design elements and decorative effects. Through the synergistic effect of tile materials, patterns, craftsmanship, and their relationship with the environmental space, abstract stories, memories, or cultural connotations are transformed into perceptible spatial language. This establishes emotional connections at both physical and psychological levels, conveys specific stories and emotions, and realizes the narrative design of ceramic tiles. For instance, the "Falling Leaves Tiles" at the Jewish Museum Berlin use 6, 000 laser-engraved metallic glaze tiles to simulate the form of falling leaves, each inscribed with the name and birth and death years of Holocaust victims. The tactile feedback when visitors step on them metaphorically accomplishes collective memory healing.

4 Conclusion

As an indispensable component in the urban spatial environment, ceramic tiles not only demonstrate unique artistic charm in the construction of healing spaces but also embody profound humanistic care. With the acceleration of urbanization and the increasing emphasis on mental health, ceramic tile design will place greater emphasis on the exploration and realization of its healing functions. In the future, ceramic tile design will trend towards greater diversification, personalization, and intelligence, creating urban spatial environments that better meet human emotional needs and provide psychological comfort by integrating advanced technology and innovative design concepts. Meanwhile, interdisciplinary collaboration and research will become key forces driving the widespread application of ceramic tile design in the construction of healing spaces. We have reason to believe that in the near future, ceramic tiles will become indispensable media for emotional healing in the urban spatial environment, bringing people more wonderful experiences and sensations in their lives.

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