Supporting Aging-in-Place: Drivers and Desired Outcomes of a Healing Environment for Older Adults in Block Spaces of High-Density Cities

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Introduction

The worldwide trend toward high-density cities development is becoming increasingly apparent (Ritchie & Roser, 2018). According to the 2020 “Demographia World Urban Areas” report, the 10 cities with the highest urban population densities are located in South Asia, East Asia, West Asia, and Central Africa. Most of these are located in developing countries, including India, the-Congo (Democratic Republic), China, Syria, and Bangladesh, with urban population densities exceeding 24,000 people per square kilometer[1] (DEMOGRAPHIA, 2020). Moreover, there is a clear trend toward an aging urban population that will gradually enter the “aged society” and “hyper-aged society”[2] (HelpAge International, 2015).

In high-density cities, the aging population has brought about significant pressures on multiple fronts. First, the notable increase in healthcare demands creates challenges for high-density cities in balancing health resource allocation among different age groups. Second, better urban infrastructure adaptation is necessary to address the needs of older adults. This includes considering the mobility, transportation convenience, and social services for older adults in spatial renewal designs. Third, social support networks are crucial for older populations; in high-density cities, constraints such as spatial limitations and fast-paced lifestyles may hamper the establishment and maintenance of such networks (Yao et al., 2023; Zhang et al., 2023). Addressing these issues will require targeted measures in healthcare, urban planning, and social services, as well as economic strategies.

However, there are global variations in resource allocation and urban planning among high-density cities, while considering factors such as economic development, governance, and urban planning strategies that may lead to different construction of block spaces in different areas. Nevertheless, wealthier high-density cities (e.g., Hong Kong, with a per capita GDP of 49,800.54 USD, and Macao, with a per capita GDP of 43,873.59 USD) face similar issues as low-income high-density developing cities (e.g., Delhi with a per capita GDP of 5835 USD), including overcrowded parks, recreational areas, streets, and squares, and incomplete basic sanitation facilities. However, the severity of these issues varies. Additionally, high population density increases the risk of disease transmission (Newman & Hogan, 1981; Ng, 2009). This risk is more pronounced in older adults, especially those residing in older urban areas, further burdening them with performing daily activities and accessing healthcare. For example, the lack of high-quality and sufficient urban green spaces can adversely affect their physical and mental health (Lau et al., 2021). Limited and low-quality block spaces may force them to utilize street corners and unused land for daily activities and recreation (Yung et al., 2017; Zhang et al., 2021).

High-density cities spaces have significant impacts on older adults (Chang et al., 2019; Chi Jackie, 2013; Cramm et al., 2015; Subramanian & Jana, 2018; Tan et al., 2018). Issues such as insecurity and lack of confidence are prevalent in these environments. However, in high-density cities with limited space, changing one spatial element may not be the most effective way to impact the health of older adults directly and positively. Instead, a multidimensional system framework should be developed to clarify the elements involved in the process and consider their interactions to achieve the desired outcome.

Literature Review

"Aging in place" is one of the main strategies to deal with an aging population (European Commission, 2019; Lin, 2021). It refers to the choice of older adults to continue living in the block where they have been living with their family, friends, and neighbors as they age, rather than moving to residential facilities designed for long-term care, such as assisted living facilities (Gatta, 2023). The "place" comprises the block space and home environment, both of which are equally important. In this study, we investigated block spaces (e.g., streets, rest areas, parks, and squares), which are primary places for older adults to engage in daily activities such as traveling, exercising, and socializing (H. He et al., 2020). However, aging leads to a decline in physical and cognitive abilities, rendering older adults more vulnerable to spatial limitations, and influences the use of block spaces (Portegijs et al., 2020). Therefore, the quality of the block space is crucial in retaining older adults, promoting their health, and providing related services (Wiles et al., 2012), and is one of the decisive factors in achieving “aging in place.”

The application of, and research on, healing environments have expanded from specific spatial environments (healthcare facilities, supportive interior environments, healing gardens, etc.) to more urban spaces (e.g., streets, community gardens, city squares, and other open urban spaces) (Xu et al., 2019; Xue & Lau, 2016; Zhou, 2021; Zhou et al., 2021). These urban space studies focused on the factors involved in handling different types of relationships, such as those between spaces and people and objects and people, and among people, as well as the interactive, evidence-based, and systemic nature of the dimensions of the concept. For example, one study explores the commodification of healing landscapes and influence of modern consumer culture on the treatment processes of older adults in China (Zhou, 2021). Zhou et al. (2021) proposed a therapeutic public space framework to explore the collaboration between older adults and other participants in urban open spaces. Finlay et al. (2015) argued that landscapes with therapeutic qualities, such as parks, gardens, greenery on streets, lakes, and oceans, could influence older adults’ perceived physical, mental, and social health through interactions with these spaces. Li and Xu (2020) reported that in high-density cities, healing environments and active living should be integrated into social interactions. This is crucial for creating supportive environments for healthy living and to achieve the integration of landscapes, buildings, spaces, and sustainable urbanization. Xue and Lau (2016) focused on the sensory level of healing perception, emphasizing the importance of a supportive environment and sensory perception for healing and recovery. Xu et al. (2019)showed that both green vision rate[3] and street interface have significant impacts on street healing[4]. Meng et al. (2020) calculated the weight of each indicator affecting the street-healing environment in the high-density city of Macao by using the analytic hierarchy process. For this indicator, Meng (2021) proposed a “healing space design strategy for older adults in blocks” suitable for high-density cities, focusing on the renewal of physical space supplemented by creating a virtual environment. In addition, several hands-on projects and government strategies have been implemented or are underway, such as the Singapore Healing Garden, Dementia Friendly Community, Taiwan Healing Construction, and Homes4Life (Kwan, 2017).

A significant body of literature has explored the means of achieving healing and constructing healing environments in urban spaces and identified physical, social, and managerial elements of healing. However, practical research in this area has only preliminarily verified the positive effects of healing environments on older adults. Block spaces such as streets, rest areas, parks, and squares, which are essential parts of the healing environment, lack specified definitions and frameworks, and present uncertainty and difficulties for research that need to be addressed. By addressing these issues, we hope to develop effective strategies for integrating healing environment theory into the design and management of high-density city block spaces and improve the quality of life of older adults in block environments.

"Healing," which is a process rather than a sudden occurrence, comprises a complex set of elements, each of which has a prerequisite. When "healing" begins or is in progress, each element is interrelated and functions in concert. In this study, "healing" refers to the process in which older adults obtain health benefits from block spaces, rather than referring to a singular medical concept. In high-density city block spaces, when older adults choose to "age in place," the block space environment can provide them with a sense of control and achievement, and opportunities to collaborate, thereby reducing or avoiding emotional stress, enhancing their confidence in using block spaces, and improving their health status, resulting in greater health and well-being (Meng, 2021). The research questions were as follows: What is the concept of a healing environment for older individuals in high-density city blocks (HEOI-HCBs)? What are the driving factors and desired outcomes of an HEOI-HCBs?

Methods

Research Methods and Data Sources

In this study, we build upon the research methods used by Yigitcanlara et al. (2018) and Zhang et al. (2018) while avoiding their limitations. They performed a manual literature review; hence, they did not use analytical techniques, such as scientometrics or concept clustering, to generate a clearer picture of the topic under investigation. In contrast, their study combined SciMAT science mapping with systematic review analysis to explore the relationships and solve the research questions comprehensively and rigorously (Li et al., 2022; Yu et al., 2023). The sample articles selected for this study were obtained from two online databases: ScienceDirect and Web of Science. In December 2022, we searched for journal articles related to the "healing environment" and "older people" published between January 2000 and December 2022. This period was chosen to provide a comprehensive and in-depth understanding of the evolution of research on this topic. Inclusion criteria were peer-reviewed articles in English. A total of 4,446 articles were obtained after preprocessing, such as removing duplicates articles and those on irrelevant subjects. The study selection process, illustrated in Figure 1, used Preferred Reporting Items for Systematic Reviews (PRISMA) (Moher et al., 2009; Nilsson et al., 2020; Yu et al., 2023).

[Place Figure 1 here]

Study Selection and Analysis

First, SciMAT software was used to analyze the research themes and their evolution from the perspective of the dynamic evolution of themes (strategic diagrams) to illustrate the distribution of the research themes and the evolutionary relationship between them in each period (Xie et al., 2020). SciMAT is distinctive for its ability to analyze literature through co-occurrence and clustering and by creating maps that illustrate the emergence, disappearance, and stability of terms in response to disciplinary development. It generates thematic strategic coordinate graphs, using density and centrality to represent the state of discipline development, and thematic evolution path maps that reveal the content and trends in the field (Cobo et al., 2012). This section provides insight into the systematic literature review conducted in the study. Data were preprocessed using the following steps:

The automatic cleaning function was used in SciMAT to merge keywords into singular and plural forms, followed by a manual merger of abbreviations and full names. This ensured consistency and accuracy in the data preprocessing. The research interval division was determined based on the number of articles and a fixed time window. This approach ensured that the analysis was conducted over a reasonable period. The parameter settings, and analysis unit words comprised "author's" words and "source" words. The data restoration thresholds for the four time periods were 1, 2, 3, and 3, and the selection matrix was in the co-occurrence form. The network restoration thresholds were set as 1, 2, 3, and 3. The similarity index of the standardized network was the association strength, and the clustering algorithm was a simple center algorithm. The maximum and minimum values for network selection were 10 and 3, respectively. Jaccard coefficients were selected for the similarity indices of the evolutionary and overlapping term graphs.

Next, the retrieved articles were screened using the keyword "framework," and 817 articles were obtained. After scrutinizing the abstracts, 68 articles were obtained; finally, after a thorough full-text review, 16 articles were selected.

Third, the methodological steps suggested by Jabareen (2008) were applied to analyze 16 full-text articles on healing, frame analysis, healing environment, and older adults' health to determine new keywords, general themes, broad concepts, or key elements. The steps were as follows: (1) identifying similarities or patterns between general themes, (2) integrating general themes, and (3) building a multidimensional framework. According to the conceptual analysis steps mentioned above, and combined with the characteristics of high-density city blocks, four general themes—"self-environment," "interpersonal relationship," "physical environment," and "information environment"—were determined. These themes are critical for the healing environment of older adults in urban blocks. The driving factors were considered as the core of the proposed framework, and four driving factors and closely related words were employed as keywords for further literature retrieval.

Fourth, to enhance the search and capture a broader perspective, we conducted retrieval and analysis by combining "healing environment" and "older people" with "self-environment ('beliefs' and 'mindfulness')," "interpersonal environment," "physical environment," and "information environment ('digital age')." Several thematic searches were specified through a combination of multiple keywords. We checked the resultant search items by first reading the abstract and then reading the full text to verify the suitability of their scope with the research aim. Additional inclusion criteria for the articles were as follows:

(1) Articles that focus on the concept of therapeutic environments and their impacts on the behavior and health of space users in different spatial contexts (indoors/outdoors).

(2) Articles that focus on the participants in the therapeutic process, including users, administrators, and designers.

(3) Articles that emphasize an understanding of the existing research frameworks' content, particularly their impact on the health and well-being of older people, their relationship with blocks in high-density cities and the realization of "aging in place."

Using the processes described above, we finally selected 38 of the 4,446 articles to read, review, and analyze. We categorized the reviewed papers according to themes—that is, "self-environment," "interpersonal relationships," "physical environment," and "information environment." We undertook a conceptual analysis to determine the new concepts/themes or framework elements related to the outcomes of HEOI-HCBs. The analysis produced eight new subthemes—that is, "initiative acquisition," "shared vision," "trust," "empathy," "new technologies," "systematic," "networked," and "perceived usefulness"—which were then considered as desired outcomes of HEOI-HCBs.

Results

A preliminary review of the literature on the relationship between the "healing environment" and "older people" suggested that the number of articles is increasing annually (Figure 2). Research usually involves many disciplines such as social sciences, psychology, arts and humanities, nursing, and environmental science (Figure 3). Scholars, practitioners, and research organizations in different fields have proposed distinct research perspectives, frameworks, and definitions. The researchers mainly include scholars (e.g., doctors, design researchers, and managers), business organizations, governmental organizations (Institute of Architecture, Ministry of Interior, Taiwan), and research institutions (The Samueli Institute, The Academy of Architecture for Health of the American Institute of Architects). Their research purposes would vary depending on their diverse backgrounds.

[Place Figures 2 and 3 about here]

Healing gradually expanded as a supportive environment from its initial use in medical buildings to other public spaces in cities. The audience has grown beyond patients to include broader groups, regardless of the presence of disease. Healing has been accepted as a treatment for health problems (Hamzah et al., 2020), and the impact can be systematic and complete, involving the body, mind, and spirit, as well as society, leading to the overall well-being. Healing is derived from not only the physical space but also the interpersonal and social environments, which are equally important for creating a healing atmosphere. The variables in the physical environment have been constantly enriched, but the evidence-based process has not changed; the entire process is based on communication between people and the environment and their perception. Hence, Weisman's identification of 10 qualities that people ascribe to places in their interactions gains significance. Each of these qualities, such as stimulation, accessibility, crowdedness, privacy, control, legibility, comfort, adaptability, sociality, and meaning (Weisman, 2001), play a crucial role in shaping the healing environment. They highlight the intricate interplay between physical space and the psychological experiences of individuals, underscoring the holistic nature inherent in the healing process.

Healing Environment and Older People

First, in a strategic graphical analysis of the research themes (Figure 4), SciMAT divided the themes into four quadrants(Q1,Q2,Q3,Q4) [5] based on the density and centrality of each cluster.

First subperiod (2000-2008): the influential themes were concentrated in Q1 and Q4, whereas the regional distributions of themes in Q2 and Q3 were not apparent. The main themes in Q1 were social-problem, environment-factor, and social-support; in Q4, cultural-factor, health-services, etc., and in Q3, therapeutic-landscapes, emotion, etc. Comparing the four significant clusters in the same period, we found that the number of clusters in Q2 and Q3 was significantly lower than that in Q1 and Q4, indicating that the overall research in this field has been steadily progressing.

Second subperiod (2009-2013): the influential themes were concentrated in Q1 and Q4, especially in Q4, while the distribution of themes in Q2 and Q3 increased compared to the previous period. The main themes in Q1 were questionnaire, perception, social -interaction, etc.; in Q4, social -support, health-service, environment, etc.; and in Q3, complementary-therapies, green -space, etc. The number of thematic clusters increased from Q1 to Q4 during this period, indicating that new fundamental concepts were emerging in the field and were gradually increasing.

Third subperiod (2014-2017): the influential themes were concentrated in Q4, where the main themes in Q1 were interview, elderly population, etc.; and in Q4, social support. Fourth subperiod (2018-2022): the influential themes were concentrated in Q1, Q3, and Q4, with an increase in the number of themes in Q4. The main themes in Q1 were urban-area, social-support, etc.; and in Q4, questionnaire, adult, etc. The number of theme clusters was still mainly concentrated in Q1 and Q4, and consistent with the previous periods, some new themes emerged in this area of research.

[Place Figure 4 here]

Second, upon analyzing the relevant literature, we identified discussions on the composition of multi-dimensional frameworks. However, these discussions were deemed unsatisfactory primarily due to their limited emphasis on high-density city blocks and the fact that their target audience did not exclusively comprise older adults. For example, the “Optimal Healing Environments (OHE)” framework is more comprehensive, clearer, and well-known (Sakallaris et al., 2015) . Although it covers the main dimensions of a healing environment, it is not fully applicable. Notably, it emphasizes the importance of non-physical environments in terms of two aspects: the internal environment and interpersonal relationships (Sakallaris et al., 2015). The conceptual framework by DuBose et al (2018) for enhancing the performance of healing spaces highlights the significance of a supportive environment and its impact on perceptions of healing and recovery. Iyendo et al. (2016) employed a healing environment model composed by Jain Malkin and proposed six factors (social support, sense of personal control, positive distractions, eliminating environmental stressors, connecting patients to natural views, and gender) that provide a substantial reference for an environment with healing functions. Lim and Lim (2017) reconstructed healing environments and divided them into four categories—physical, psychological, social, and behavioral—stressing the need to extend the study from medical environments to the design of public spaces.

As mentioned above, researchers have defined and developed healing concepts and frameworks for medical environments and urban public spaces. However, the lack of a reliable and widely recognized conceptual framework specifically tailored for high-density city blocks and older people remains evident. Table 1 shows the theme, framework, and drivers corresponding to each concept included in the study.

[Insert Table 1 about here]

Self-Environment and Older People

Among the articles reviewed, only 11 were highly related to self-environment (beliefs and mindfulness) (Table 2). Research on one’s own environment is limited, indicating that little attention has been paid to participants. However, the construction of a self-environment cannot be achieved quickly. It takes time to accumulate data on how to appropriately establish the necessity for various spatial environments when setting up different methods. Sakallaris et al. (2015) regarded the self-environment as the beginning of a healing environment, and the construction of a self-environment as a manifestation of healing intentions and individual integrity. The articles mention the means to build a self-environment in high-density city block spaces, including the following elements:

(1) self-regulation: paying attention to one's own body, mind, and the surrounding environment;
(2) construction of shared vision and unifying common values;
(3) empathy from all parties; and
(4) intergenerational interactions and communication.

Nevertheless, some studies have indicated that self-belief and mindfulness can be delivered and taught. Mindfulness is not intended to change specific symptoms but to consciously practice acceptance, and mindfulness-based interventions can teach individuals to change all aspects of life, including unpleasant sensory experiences. Self-regulation plays a central role in mindfulness (Khoury et al., 2017). Mindfulness is strongly related to compassion, which is a source of healing intentionality (Schmidt, 2004). Moreover, in these studies, the expected outcomes for self-environment were different, as were places of employment. However, almost all included “initiative acquisition” and “shared vision.” In this context, “initiative acquisition” refers to the process by which older persons develop the capacity to initiate health acquisition, whereby individuals involved in healing are encouraged or expected to initiate health actions or interventions. “Shared vision” refers to a collective pursuit and expectation among older individuals, their family members, urban managers, and designers. They collectively aspire to help older individuals achieve health goals by utilizing neighborhood spaces with healing functions. This vision represents a shared understanding of future expectations that can foster consensus among older people and stakeholders in management. It serves as a foundation for inspiring collaborative efforts and cooperation. Nonetheless, block spaces, beyond medical institutions, can be effective in implementing the necessary healing strategies.

[Place Table 2 about here]

Interpersonal Environment and Older People

Only eight articles were closely related to interpersonal relationships (Table 3). Studies have focused on “trust building,” including creating a positive mentality, understanding the person being healed, having a caring presence, developing meaningful relationships, establishing effective communication with patients, and attempting to create a safe therapeutic environment (Ramezan et al., 2017). Simultaneously, researchers have conducted studies on participants’ continuing education, joint involvement in decision-making, and implementation of evidence-based changes, emphasizing the significance of people involved in communication and exchanges where empathy is maintained throughout the process. In these articles, there is more focus on different factors in the interpersonal environment and how they are structured. The various relational aspects presented in the literature (designers, doctors, patients, etc.) share a certain similarity and compatibility with the diverse relational aspects existing in urban city block spaces (city administrators, designers, residents, etc.). There are ways to construct and maintain these interactions, which enlighten the construction of interpersonal environments for high-density city blocks.

[Place Table 3 here]

Physical Environment and Older People

Some researchers believe that if a physical environment contains certain environmental elements, it can have a healing effect (Malkin, 2007). The physical spatial environment is generally regarded as the basic supporting condition for healing intentions and behavior and can facilitate engagement in behaviors and emotions to support healing. Additionally, the environment can induce physical and emotional responses, such as happiness, enjoyment, and relaxation, and can enhance individual control and functionality, all of which are antecedents to healing (DuBose et al., 2018). However, currently, the block spaces (streets, recreational areas, parks, and squares) in some high-density cities appear to be less friendly for older people.

In the 10 articles closely related to the physical environment (Table 4), researchers discussed how to acquire or capture the complex interactions between older people and the environment, how the latter affects spatial perception and health gains for the former, and the application of biosensing technology as a research tool to accomplish related research (Engineer et al., 2020). Iyendo et al. (2016) proposed six elements of healing environments: social support, sense of personal control, elimination of environmental stressors, positive distractions, engendering feelings and connection to natural views. Although it provides an insight into the present study, it is not fully applicable. The authors focus on the physical environment in the clinical setting.

[Insert Table 4 here]

Information Environment and Older People

There is hardly any aspect of daily life that is not pervaded by digital technology starting from information and shopping to participation in political, public, and civil affairs, and older adults are among the largest groups affected by digital inequalities (Schirmer et al., 2022). Among the nine articles closely related to the information environment (Table 5), there is a discussion on “aging digital therapeutics,” and some studies emphasized the need to design digital products suitable for older people to narrow the “digital divide” and enable older people to enjoy the convenience brought by digital life. Muellmann et al. (2018) concluded that eHealth interventions could effectively promote short-term physical activity in older adults aged 55 years and older. Therefore, it is preferable to ensure that older adults are aware of (1) their health status and the relationship between their health and the spatial environment of the city blocks, and (2) activities and facilities in the city blocks that are beneficial to improve their health and how to use the block space for better health.

[Insert Table 5 here]

Discussion

Constructing a Multidimensional Research Framework

The existing research frameworks are limited in how they support researchers' understanding of the application of healing environments in high-density city blocks (e.g., insufficient, non- systematic, not targeted enough, etc.). The multidimensional research framework of this study is illustrated in Figure 4 and Tables 1–5; the final HEOI-HCBs framework presented in Figure 5 combines the driving factors with the expected outcomes, which can be used in future research.

[Insert Figure 5 about here]

First, it defines HEOI-HCBs as a collaborative, sustainable, and systematic space. It applies the logic of the input-process-output (IPO) model based on the "systems view" (Chadwick, 2013; Fincher, 1972; Yigitcanlara et al., 2018). In this model, HEOI-HCBs (the prototype) is regarded as the input of the created "asset;" the four "drivers" (self-environment, interpersonal environment, physical environment, and information environment) constitute "process;" "expected outcomes" (initiative acquisition, shared vision, trust, empathy, new technologies, systematic, networked, perceived usefulness) constitute the "output." "Initiative acquisition," "shared vision," "trust," and "empathy" represent individual, interpersonal, and societal dynamics, while "new technologies" and "systematic" are considered reflections of the desired outcomes following active interventions by urban managers and designers. Specifically, "systematic" refers to the organized and orderly implementation of design elements within urban spaces, ensuring arrangements that are cohesive and purposeful. This is deemed an ideal outcome as it signifies the successful application of systematic design principles, contributing to the overall well-being of older people.

Similarly, the term "new technologies," as an anticipated outcome arising from the information environment, embodies the context of the digital city era. Digital technologies offer a promise to address the health needs of older individuals and transform various aspects of geriatric care. These technologies, such as common body-worn sensing devices mounted on different accessories, clothing, or skin (e.g., GPS, Global Positioning System, Apple Watch, Oura Ring, Philips VitalPatch, and Orpyx Insoles Plantar Pressure Sensor), are rapidly transforming how older adults access healthcare, interact with urban spaces, and engage with the healthcare system (Chen et al., 2023). In summary, these subthemes are identified as outcomes because they represent positive achievements or manifestations of practices in healing spaces for the older adults within high-density city blocks.

Second, the logic of the framework is that the chain of causality starts from the drivers and continues to achieve a series of expected outcomes such as "initiative acquisition," "shared vision," "trust," and "empathy;" these causal relationships are initially derived from the "asset" of high-density cities. This process is comprehensive and systematic (Figure 6). The "driver" is expressed as the construction elements of HEOI-HCBs (superimposed by the relationship between the healing environment and older people, the development trend of high-density cities, and requirements of "aging in place"), which are transformed into the expected results to better serve high-density cities and older people and facilitate sustainable development of urban, social, and economic environments, as well as ensure health equity.

In addition, as illustrated in Figure 5(Ⅱ), we organize our discussion according to the logical framework of the A-B-C model (Volicer & Hurley, 2003), emphasizing how the self, interpersonal, physical, and information environments (A) within healing spaces for older citizens living in high-density city blocks impact their perceptions and cognition (B). This, in turn, initiates positive health behaviors, ultimately exerting positive effects on the physical, psychological, and social health of older people (C). This framework is explained as follows:

A (Antecedent): "The intrinsic, interpersonal, physical, and information environments within healing spaces for older adults in high-density city blocks." In high-density cities areas, these environments collectively form a comprehensive ecosystem within healing spaces for older adults. The ecosystem aspects include spatial design, interactions among community residents, and the management of information flow. These factors collaboratively shape the daily experiences of older people within this environment.

B (Behavior): "The impact on the perception and cognition of the block's older adults, which triggers corresponding positive health behaviors." In healing spaces characterized by positive environmental features, older adults may be more likely to retain their perceptive and cognitive capacities than those in blocks without positive environmental features. For example, elements such as natural features in the space, friendly block interactions, and accessible information resources may enhance the psychological state and cognitive functionality of older adults. This positive shift in perception and cognition may initiate a series of positive health behaviors, including active participation in block activities, a proactive approach to maintaining physical activity, and a heightened focus on mental well-being.

C (Consequence): "Ultimately generating positive implications for the physical, psychological, and social health of older individuals in the population." Through these positive health behaviors, older adults may experience multiple benefits across physical, psychological, and social dimensions. Physical health benefits may include enhanced mobility and immune system functionality; psychological well-being may involve lower levels of depression and anxiety; social health benefits may encompass a stronger social support network and an improved sense of community integration. These positive consequences cumulatively constitute the positive impact of healing spaces in high-density city blocks on the lives of older adults. Figure 5(Ⅱ) underscores the impact of the environment on perception and cognition and how these influences translate into positive health behaviors and comprehensive health benefits.

In terms of “self-environment” (Figure 6), researchers usually believe that “healing” is promoted by “intrinsic beliefs” and “expectations” and is related to the person being served (Sakallaris et al., 2015; Schmidt, 2004). The healing process is optimized when one’s self-environment is rooted in healing intentions (Moss et al., 2015). The “self-environment” is vital for healing because one’s thoughts, emotions, and spirits directly impact their mental, physical, and behavioral choices. This study considers “healing intentions” and “healthy lifestyles” as the core of self-environmental construction. This framework aims to help older adults re-conceptualize high-density city blocks spaces through the concrete implementation of physical and information environments. It seeks to inspire them to actively engage in block space activities, motivating them to change and strengthen their attitudes and confidence regarding personal health. Simultaneously, it aims to cultivate their awareness that utilizing block spaces can contribute to obtaining or maintaining health. Throughout this process, urban designers, administrators, and researchers also undergo a transformation from initial builders to later-stage facilitators. Ultimately, the goal is for older adults to achieve “self-healing” by fully leveraging block spaces.

The “interpersonal environment” (Figure 6) can be described as the relationships involved in the interpersonal environment among urban management personnel, designers, service organizations (volunteers), people belonging to other age groups, and older people. This study emphasizes the participation of older adults in research, planning, design, and usage. Healing is generally considered to occur in such relationships (S. Y. He et al., 2020).

In the overall relationship, there are not only interactions between older people, but also communication between different age groups. These relationships between older adults and various participants can be critical for constructing a healing environment (Sakallaris et al., 2015). Accordingly, establishing a communication platform, balancing interests, maintaining trust, clarifying responsibilities to reduce misunderstanding, and forming a collaborative mechanism for participation are key tasks. In this process, it is crucial to establish the correct “beliefs” (urban managers, designers, etc., aiming to facilitate “aging in place” for older adults through block spaces), employ effective “methods,” formulate scientific “standards” (for healing updates design in block spaces), and provide an equitable “platform” (the development of information environments). Only through these measures can a favorable “interpersonal environment” be created.

[Insert Figure 6 here]

The “physical environment” is regarded as the foundation of the healing environment for high-density city blocks and is the most critical driving element (Figure 7). Accessibility, experience, public health, street paving, space lighting, and the sights, noise, and microclimate of the surrounding physical facilities are vital components of the physical environment (Chen et al., 2022; Iyendo et al., 2016; Miao et al., 2024; Zhou et al., 2021). Such inclusiveness in the physical environment is consistent with the local spatial form and structure, creating a spatial atmosphere familiar to older adults and having coherent objects in the place (landmarks, connections, and sports). Moreover, the physical environment is the basis for supporting healing intention and relations and creating a positive physical environment that bears space for older adults to "rest" and "recover," along with mental and physical aspects.

Regarding the "information environment" for older adults (Figure 7), in the new technology era, traditional methods of communication and information acquisition are increasingly being replaced by new media and technology, and its impact on older adults may be greater than on other age groups (Schirmer et al., 2022). Consequently, if a new information environment cannot be constructed according to the change, older adults can find it difficult to receive the required information when diverse transmission channels are not accessible. Over time, older adults may feel disappointed because they do not have a proper channel, resulting in social isolation (Phang J, 2023).

Consequently, instead of treating HEOI-HCBs as a single space with all functions, it can be regarded as an "interconnected" and "complementary" spatial organic network system by changing its previous form of outputting services from a single space. The "information environment" of the "healing environment" lies in the effective combination of the transmission of spatial information and acquisition by older adults. It serves as a key medium and an adjustable element for interactions with other elements. Management personnels, designers, and other participants are vital in managing and using spatial information. Methods of transmitting and acquiring spatial information include block-space use manuals, mobile apps, presentations, workshops, and interactive facilities.

[Insert Figure 7 here]

Finally, this study proposes the construction of an appropriate framework relating to the healing environment for older adults in cities by integrating driving factors and expected outcomes. The conceptual framework centers on discovering vital elements to achieve the expected outcomes. These elements play a crucial role in the functioning and effectiveness of the proposed framework for HEOI-HCBs.

The framework not only serves as an initial perspective for understanding the healing environments of older persons in high-density city blocks, but also expands the theoretical and research scope of healing environments by integrating environmental, social, and personal factors. It emphasizes the role of promoting "ageing in place" strategies; this is particularly important for addressing the challenges of global population ageing. The framework has interdisciplinary applicability and can be integrated with other fields, including sociology, public health, and economics, to provide researchers with new perspectives and research methods. In addition, the framework provides a flexible and effective tool for policy makers and urban planners to accurately identify and respond to the specific needs of older people's convalescent environments in high-density cities, thereby significantly improving the quality of life of older people in block spaces. Ultimately, the framework not only provides new directions for in-depth research in the field but also provides practical guidance for the practice of spatial regeneration in blocks, thus contributing to the creation of more inclusive and sustainable high-density city blocks.

Conclusion

The "healing environment" is a useful construct for studying the relationship between high-density city blocks and the health of older adults, with an evidence-based process and scientific nature. Owing to the limited high-density city spaces and need for social equity, it may not be possible to specifically design "healing gardens" or "large public healing spaces" for older adults. Therefore, this study assumes that a high-density city blocks spaces, including streets, rest areas, parks, and squares, can be designed, updated, and configured to possess a "healing function." This will eventually create a healing space for older adults in the block, promoting their health and supporting "aging in place" in high-density cities.

This study discusses the existing literature relating to the healing environment and older adults through a systematic review and conceptual analysis to address the related issues and problems of limited space in high-density city blocks and unlimited health needs of older adults. The results indicate that the concept of a healing environment for high-density city block spaces has not been well defined. Our study proposes that the self-environment, interpersonal relationships, physical surroundings, and the information environment within the context of healing spaces for older adults in high-density city blocks can empower individuals, fostering a sense of control, achievement, and opportunities for collaborative interactions in the use of neighborhood spaces. This, in turn, mitigates emotional stress, boosts confidence in utilizing these spaces, and enhances overall health, contributing to greater well-being among older adults. Most existing conceptual frameworks are controversial or inadequate and cannot be directly used in the spatial environment of high-density city blocks. Notably, the "information environment" has been explored relatively less in previous studies. However, in the context of the "Digital City" era, older adults also have a "digital life," which makes it significant and necessary to include the "information environment." This context differentiates our study's framework from previous research frameworks and represents a key innovative aspect of our research.

This study provides a valuable reference for high-density cities to deal with “aging in place” and contributes to the theory by interweaving the drivers (self-environment, interpersonal relationships, physical environment, and information environment) of healing environments and expected outcomes (initiative acquisition, shared vision, trust, empathy, new technologies, systematic, networked, and perceived usefulness) in novel ways within a new framework. This will encourage researchers in the fields of high-density city spaces and geriatric health to investigate and evaluate studies through the conceptual framework of the healing environment of older adults in high-density city blocks. The proposed method also emphasizes the significance of focusing on the input-process-output model to better plan and design high-density city blocks, followed by continuous monitoring and evaluation.

However, it is important to consider the following limitations when interpreting the specific findings of this research: (1) the exclusion of documents other than peer-reviewed full-text articles may have limited the scope of the review; (2) the selection of keywords may have overlooked relevant articles; and (3) author’s unconscious bias may have affected the review and interpretation of the findings. These limitations will be addressed in future studies.

To summarize, the framework developed in this study was based on the spatial environment of high-density city blocks and integrated various aspects of the relationship between the healing environment and health of older adults’, forming a feasible framework. Local governments and researchers can use this framework to understand and solve related problems. Moreover, the result-oriented framework helps determine how the healing environment can support high-density cities in addressing the increasing social challenge of “aging in place.” Ultimately, this will contribute to the sustainable development of high-density cities and promote equitable health among older adults.

Authors’ Contributions

Lingchao Meng conceived the research question, wrote the original draft, and acquired funding, including data collection, analysis, organization, visualization, and the creation of all figures and tables. Lingchao Meng, Kuo-Hsun Wen, Nannan Xi, and Tao Zheng contributed to the conceptualization, methodology, and editing, and critically reviewed the manuscript. All authors approved the final submission.

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Declaration of Conflicting Interests

The author knows that there are no conflicts of interest associated with this publication.

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Table 1. Articles with frames.

Study	Theme	Framework	Drivers
(1)Liu et al. (2022)	User, system, and information	Blockchain-healing and therapeutic design (BC-HTD)	Self-environment, interpersonal environment, and information environment
(2)Zhou et al. (2021)	The commodification of therapeutic landscapes, marketing activities, consumers' actual needs	A therapeutic public spaces framework	Physical and social elements of urban open spaces， interactions, information, potential inclusion
(3)Oh et al. (2020)	Forest Therapy Experiences, an integrated way of healing with emotional and cognitive changes	A nature-based therapy process model	Self-own, stimulation, acceptance, change
(4)Gao and Zhang (2020)	Nature, artwork, doorway position, furniture layout, room size, wall colour	Health care environments	Physical environments
(5)Marston and van Hoof (2019)	Community support and health services, communication and information, respect and social inclusion, social participation	New smart age-friendly ecosystem framework	Self-environment, interpersonal environment, physical environments, and information environment
(6)Zhang et al. (2018)	Comfortable environment (thermally, visually and acoustically), relaxed atmosphere (pictures, background music and a beautiful view outside)	Environment–occupant–health framework	Physical environment, interpersonal environment
(7)DuBose et al. (2018)	Emotional, psychological, social, behavioral, and functional	Healthcare settings framework	Homelike environment, access to views and nature, light, noise control, barrier-free environment, and room layout
(8)Lim and Lim (2017)	Physical environment, psychological environment, social environment, and behavioral environment	Healing environment in public design	Physical environment, psychological environment, social environment, and behavioral environment
(9)Iyendo et al. (2016)	Social support, positive distractions, sense of personal control, eliminating environmental	Healing framework for health care facilities	Physical environment

	stressors, connecting patients to natural views, engenders feelings		
(10)Schreuder et al. (2016)	spatial comfort, safety and security, autonomy, sensory comfort, privacy, and social comfort	Healthcare settings framework	Autonomy (self-environment), interpersonal environment, physical environment
(11)(Sakallaris et al., 2015)	User-centered, influence each other, physical environment, whole-person, whole-system	Optimal Healing Environments framework	Internal, interpersonal, behavioral, external
(12)Finlay et al. (2015)	Landscapes embedded with therapeutic qualities included parks, gardens, street greenery. Physical wellbeing, physical wellbeing, social wellbeing	Green and blue spaces	Self-environment, interpersonal environment, physical environment
(13)Tenngart Ivarsson and Grahn (2012)	Environment–behaviour relations, people's need and intentions	Recreational walks (introvert and extrovert walks)	Self-environment, physical environment
(14)Shikder et al. (2011)	Lighting design, photobiological impacts	General and therapeutic lighting design framework	Self-environment, physical environment
(15)Largo-Wight (2011)	Welcoming animals (fish tanks) and pets (dogs) inside, lighting rooms with bright natural light, allowing outside air and sounds to flood inside, and listening to recorded sounds of nature	Cultivating healthy places and communities	Physical environments
(16)Schweitzer (2004)	Personal space, the sensory environment, environmental complexity, fresh air and ventilation, light (natural and artificial), color, viewing nature, experiencing nature	Health care environments	Self-environment, physical environments

Table 2. Self-environment and older people.

Study	Theme	Framework	Outcome
(1)Hazlett-Stevens et al. (2019)	Mindfulness-Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT)	N/A	Initiative acquire, shared vision, positive mood
(2)Greeson and Chin (2019)	Mindfulness as a treatment and prevention, self-Care	N/A	Initiative acquisition, shared vision
(3)Khoury et al. (2017)	Convergence, self-regulation, mindfulness, attention	N/A	Directing attention, self-regulation of attention, initiative acquire
(4)Malinowski et al. (2017)	Mindfulness meditation and aging, emotion regulation, behavioral changes	N/A	Initiative acquisition, shared vision
(5)Geiger et al. (2016)	Mindfulness-based interventions, acceptability to older people	N/A	Emotional well-being, shared vision, mindfulness training
(6)Pallesen et al. (2016)	Mindfulness-based therapy, avoidance reduction	N/A	Mindfulness treatment, self-empowerment
(7)Sakallaris et al. (2015)	User-centered, influence each other, physical environment, whole-person, whole-system	Global Advances in Health and Medicine	Healing intention, initiative acquire, shared vision
(8)Moss et al. (2015)	Mindfulness-Based Stress Reduction (MBSR) health-related quality of life, psychological flexibility, mindfulness, self-compassion, psychological distress	N/A	Initiative acquisition, shared vision, trust
(9)Thornton (2005)	Whole-person caring, comprehensive healing environment	The theoretical model of whole-person caring	Shared vision, trust, empathy, systematic
(10)Schmidt (2004)	Healing interactions, empathy, mindfulness,	N/A	Initiative acquisition, shared vision, trust, empathy

	awareness		
(11)Barker and Giles (2003)	Mindfulness, intergenerational interactions	Intergenerational Communication Model	Shared vision, trust

Table 3. Interpersonal environment and older people.

Study	Theme	Framework	Outcome
(1)Ruengtam (2019)	Healing relationship, environmental perception, healing environment design, facilities related to health and security, facilities related to physical exercise	N/A	Demand, willingness, trust, empathy
(2)Ramezan et al. (2017)	Trust building, develop meaningful relationships	N/A	Shared vision, trust, empathy
(3)Norman et al. (2016)	Watson's theory of human caring, caritas processes (ie, loving kindness, authentic presence, spirituality, being the environment, believing in miracles)	N/A	Positive energy, trust, empathy
(4)Clarke et al. (2016)	Healing communities, importance of relationships in mental health service delivery, sense of belonging and positive emotions	N/A	Shared vision, relationships, empathy
(5)Goldenberg et al. (2013)	Gene–environment interactions, social and environmental factors as more important than genetics	N/A	Trust, empathy, community-engaged
(6)Duffy et al. (2007)	Relationship-centered care, affiliation needs and basic human needs	N/A	Shared vision, trust, empathy
(7)Miller and Crabtree (2005)	Personal and social/community event, healing landscapes as emergent life space	N/A	Shared vision, trust, empathy
(8) D'Antonio (2004)	Reciprocity between interpersonal relationships and healing Environment	N/A	Trust, empathy

Table 4. Physical environment and older people.

Study	Theme	Framework	Outcome
(1)Engineer et al. (2020)	Urban green spaces (UGSs), electroencephalography (EEG) signal	N/A	New technologies, systematic
(2)DuBose et al. (2018)	Evidence-based design (EBD), emotional, psychological, social, behavioral, and functional	Healthcare settings framework	New technologies, systematic, healing intention, healing relationships
(3)Arslan et al. (2018)	Therapeutic Gardens, health facilities, assisted-living house, medicinal and aromatic plants	N/A	New technologies, systematic, emotional and cognitive functioning
(4)Fehr and Capolongo (2016)	Healing environment, urban health	N/A	Communication, convergence, new technologies
(5)Schreuder et al. (2016)	Spatial comfort, safety and security, autonomy, sensory comfort, privacy, and social comfort	Healthcare settings framework	Systematic, new technologies
(6)Pallesen et al. (2016)	Healing environment for the elderly, long-term care hospital and nursing home	N/A	Systematic, livability, safety/security
(7)Sakallaris et al. (2015)	A Japanese style garden, an herb garden, a simple landscaped area planted with a single tree, organized gardens	N/A	Assisted living facility, systematic
(8)Huisman et al. (2012)	Healthcare facilities (HCF), Evidence-based healthcare design	N/A	Privacy, comfort, control, systematic
(9)Edvardsson (2008)	Health care contexts	N/A	Long-Term Care Facilities, systematic

(10)Marti and Giusti (2007)	Multi-sensory, non-pharmacological therapeutic protocols, ambient technologies	N/A	New technologies, systematic

Table 5. Information environment and older people.

Study	Theme	Framework	Outcome
(1)Schirmer et al. (2022)	Lifeworlds of older people, internet and social media, digital skills training	N/A	Values, perceived usefulness, networked
(2)Mace et al. (2022)	Digital health divide, ageism, preventative care	N/A	Inclusion, emotional and cognitive functioning
(3)Seifert et al. (2021)	Digital Services, frail older adults, social exclusion, digital exclusion	N/A	Positive functioning, networked, perceived usefulness
(4)Ienca et al. (2021)	Digital health technologies, healthy ageing, quality of life	N/A	Well-being, positive attitude,
(5)Xie et al. (2020)	Digital infrastructure, high-quality information, online and offline strategies,	N/A	Well-coordinated, perceived usefulness
(6)Seifert (2021)	In-person society, digital services, digital events, health information	N/A	Social participation, networked, performance
(7)Muellmann et al. (2018)	Ehealth interventions, electronic databases	N/A	Networked, perceived usefulness
(8)Zeeb et al. (2018)	Ehealth approaches, inequality in healthcare utilization	N/A	Distributive justice, networked
(9)Lupton (2017)	Digital health technologies, technology and feelings	N/A	Well-being, emotional and cognitive functioning

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[1] Internationally, there is no unified threshold for high-density cities, but there are studies that calculate, based on statistics, that a city with a population of more than 15,000/km^2 is considered a high-density city, and a city with a population of more than 25,000/km^2 is considered an ultra-high density city.

[2] The World Health Organization (WHO) and the United Nations define an "aging society" as one in which more than 7% of the population is 65 years or older. In an "aged society," more than 14% of the population is 65 years or older, and in a "super-aged society," more than 21% of the population is 65 years or older.

[3] "Green vision rate" refers to the proportion of visible greenery within the visual field of an individual in an urban environment.

[4] "Street healing," which is defined as the therapeutic impact of urban streetscapes on the well-being and health of individuals, encompasses the positive effects of greenery, architectural elements, and other urban design features on mental and physical health.

[5] Motor themes: Quadrant 1 themes exhibit high density, strong centrality, and significant evolution, indicating a mature and crucial development. Highly developed and isolated themes: Quadrant 2 themes show high density but low centrality. These themes are well-developed in the field but are not research focal points and are less crucial for current development prospects. Emerging or declining themes: Quadrant 3 themes have low density and centrality. They are on the periphery of research, typically representing emerging or declining topics. Basic and transversal themes: Quadrant 4 represents fundamental topics in the research field. They exert a significant influence and have substantial development potential.