

ARTICLE

Therapeutic gardens: historical context, foundations, and landscaping

Jardins Terapêuticos: Contexto Histórico, Fundamentos e Paisagismo

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Abstract: The Therapeutic Garden can be conceptualized as a designated space engineered to engender benefits on physical, psychological, cognitive, and social well-being of its users, facilitated through either passive or active engagement with nature. This review explores the therapeutic function of gardens, encompassing their historical evolution, theoretical underpinnings, concepts, benefits, uses and design guidelines. The therapeutic attributes of plants have been acknowledged since antiquity, underpinning the belief that nature constitutes a primary agent in fostering well-being. This conviction gained traction during the Middle Ages, by the cloister gardens, which sought healing through a communion with nature. Nonetheless, this relationship waned during the Renaissance, only to resurface in the 18th century within the realm of hospital architecture, underscoring the necessity of reinstating therapeutic gardens as an indispensable adjunct for healing patients. In recent times, there has been a resurgence in the quest to reconnect with nature, driven by scientific research highlighting the myriad health benefits of nature exposure, that fundamental various theories such as the Supportive Gardens Theory, Restorative Gardens, and Healing Gardens. These pioneering studies have paved the way for further research exploring the psychological, physical, and social advantages of gardens. Designs for therapeutic gardens should prioritize user needs, drawing from a multidisciplinary approach rooted in evidence-based design principles. However, specific definitions regarding their form and function remain elusive, allowing for a diversity of activities and adaptability to cater to different users.

Keywords: healing garden, landscaping, restorative garden, sensory garden.

Resumo: O Jardim Terapêutico pode ser conceituado como um espaço planejado para promover benefícios relacionados ao bem-estar físico, psicológico, cognitivo e social dos usuários, por meio do contato passivo ou ativo com a natureza. Esta revisão explora a função terapêutica dos jardins, abrangendo sua evolução histórica, fundamentos teóricos, conceitos, benefícios, usos e diretrizes de projeto. Os atributos terapêuticos das plantas são reconhecidos desde a antiguidade, sustentando a crença de que a natureza constitui um agente primordial na promoção do bem-estar. Essa convicção ganhou força durante a Idade Média, com os jardins do claustro, que buscavam a cura por meio da comunhão com a natureza. No entanto, essa relação diminuiu durante o Renascimento, ressurgindo apenas no século XVIII no âmbito da arquitetura hospitalar, ressaltando a necessidade de restabelecer os jardins terapêuticos como um complemento indispensável para a cura dos pacientes. Nos últimos tempos, houve um ressurgimento da busca pela reconexão com a natureza, impulsionado por pesquisas científicas que destacam os inúmeros benefícios para a saúde da exposição à natureza, o que fundamentou várias teorias, como a Teoria dos Jardins de Apoio, Jardins Restauradores e Jardins de Cura. Esses estudos pioneiros abriram caminho para outras pesquisas que exploram as vantagens psicológicas, físicas e sociais dos jardins. Os projetos de jardins terapêuticos devem priorizar as necessidades dos usuários, com base em uma abordagem multidisciplinar fundamentada em princípios de projeto baseados em evidências. No entanto, definições específicas sobre sua forma e função permanecem indefinidas, permitindo uma diversidade de atividades e adaptabilidade para atender as diferentes necessidades dos usuários.

Palavras-chave: jardim de cura, jardim restaurativo, jardim sensorial, paisagismo.

Introduction

In landscaping, the utilization of gardens as therapeutic spaces has roots tracing back to Antiquity, evidenced by the presence of Persian and oriental gardens, as well as shrines to *Asclepius* in Greece. Throughout the Middle Ages, this concept gained significant traction, particularly with the emergence of cloister gardens, purposefully crafted spaces for healing, where it was believed that nature played a pivotal role in rejuvenating the body and mind. However, during the Renaissance, this connection with nature waned, only to resurge in the 18th century with the integration of gardens into hospital settings. This resurgence shed light on Therapeutic Gardens, spaces intentionally designed to enhance individuals' mental, physical, and emotional well-being (Nunes and Manzoor, 2018).

Not until in recent decades the relationship between health and nature has been firmly established, driven by scientific evidence highlighting the benefits of exposure to plants. The groundbreaking research by Ulrich (1984 and 1999), Kaplan and Kaplan (1989), and Kaplan (1995) reignited interest in integrating green spaces into urban design. Their work initiated numerous studies revealing that contact with nature plays a vital role in alleviating stress, symptoms of anxiety, and depression and even contributes to a decrease in cardiovascular issues and an enhancement in immunity (Souter-Brown et al., 2021; Carroll et al., 2023).

However, uncontrolled urbanization has caused a notable decline in natural spaces within cities, leading to a scarcity of accessible green environments. This deprivation of contact with nature was compounded during the COVID-19 pandemic, as restrictions and social distancing measures further curtailed people's interactions with natural surroundings. This situation resulted in significant consequences to health and well-being, prompting a resurgence of interest in therapeutic gardens and green spaces within modern urban landscapes (Tabrizi et al., 2023).

Gardens have assumed a vital role in integrating urban greenery despite the spatial constraints present in cities. Their design has evolved to underscore health benefits, focusing on user needs through a multidisciplinary approach that aims to maximize therapeutic effects. With this in focus, this paper delves into the therapeutic role of gardens, encompassing their historical progression, theoretical underpinnings, key concepts, advantages, applications, and design principles.

History of the therapeutic function of gardens

Since Antiquity, the therapeutic properties of plants have been extolled in Western and Eastern cultures, with early records predominantly focusing on the medicinal utilization of herbs and aromatic plants by ancient civilizations (Giannenas et al., 2020). In 550

BC, the therapeutic significance of garden spaces appeared through the design of Persian gardens, wherein water was utilized to evoke joy and happiness, contrasting to the arid climate and surroundings of the region. Consequently, the Persian gardens aimed to represent paradise on earth, incorporating zones for introspection and meditation, using symbolically the four elemental forces of nature in meticulously arranged quadrants intersected by two flowing water channels (Fallahi et al., 2020).

During the same era, in Ancient Greece, temples and shrines dedicated to *Asclepius*, the Greek god of healing, were widespread. These spaces, constructed in the Doric style, featured expansive central courtyards, with nature revered as the primary source of well-being. They were designed for the recuperation of the ill and played a pivotal role in the healing process, employing serene and tranquil vistas to stimulate the senses (Kyriakou et al., 2022). Similarly, in Ancient Rome, the earliest European hospitals emerged, known as *Valetudinarias*. These structures boasted spacious courtyards to facilitate air circulation and were dedicated to treatment, recovery, and shelter for war wounded people (Carrião et al., 2019).

The therapeutic potential of gardens was also reported in Asia, particularly within the Chinese and Japanese civilizations, where the bond between humans and nature was deeply ingrained in their cultural traditions. In China, gardens were envisioned as harmonious sanctuaries reflecting the principles of Yin and Yang, as well as Taoist philosophy. These spaces aimed to provide tranquility and serenity, employing carefully selected trees, plants, and water features to cultivate an ambience conducive to meditation and healing. Similarly, in Japan, therapeutic gardens were closely associated with Buddhist temples, serving as havens for contemplation, introspection, and spiritual communion with the natural world. Elements such as rocks, sand, trees, and meandering pathways were thoughtfully arranged to engage the senses and evoke a sense of inner peace and equilibrium. These gardens not only provided recreational retreats but also functioned as sanctuaries for rejuvenating the mind, body, and spirit, epitomizing the profound Asian appreciation for the interconnectedness between humanity and the natural environment (Ding et al., 2021).

During the Middle Ages, the significance of cloister gardens, found in hospitals and monasteries across Europe, Asia, and Africa, emerges as precursors to the formal concept of therapeutic gardens. Enclosed by high walls, these spaces fostered an ambience of seclusion and tranquility, offering opportunities for the observation of aromatic, medicinal, and ornamental plants. Within the cloister gardens, monks, patients, and community members sought solace and recreation through the cultivation and reflection upon these natural elements. Beyond the pragmatic use of plants for medicinal and sustenance purposes, the simple act of communing with nature held therapeutic value, providing restoration for both body and mind amidst the physical and emotional trials of the era. Thus, these cloister gardens served as pivotal connections between humanity and the natural world, where harmony and healing were pursued through a profound simplicity and a deep-rooted connection to the earth (Wang and Tzortzi, 2023).

In literature, a clear correlation exists between health spaces and gardens designed for therapeutic purposes, a tradition dating back to antiquity but solidified with the establishment of cloister gardens. However, during the Renaissance, with the decline of monasteries, these concepts experienced a hiatus. Attention shifted away from green spaces towards architectural structures, relegating gardens to a secondary role. It wasn't until the 18th and 19th centuries, with the advent of pavilion hospitals, psychiatric institutions, sanatoriums, and spa resorts, that therapeutic gardens resurged as integral components of hospital architecture. This renewed focus on nature reflects a revived understanding of the benefits of the natural environments for physical, mental, and emotional well-being, underscoring the importance of reintegrating therapeutic gardens as essential elements in patient care and healing processes (Dushkova and Ignatieva, 2020).

The ideas of René Tenon and Florence Nightingale influenced the concept of organizing hospitals into pavilions. Tenon advocated for the reconstruction of a significant medieval hospital in France, while Nightingale pioneered hospital reforms in England. Pavilion hospitals were specifically designed to facilitate the circulation of air and the entry of natural light, countering the unsanitary conditions caused by humidity and poor ventilation. The spaces between the buildings were intentionally

laid out to maximize exposure to sunlight and nature, often incorporating activities such as gardening. These areas were strategically integrated into the patients' recovery process, offering physical and psychological benefits, while also serving as refuge for visitors and staff alike (Tye, 2020).

During the same period, in England, there arose a recognition of the landscape as a modifiable environment capable of enhancing contact with nature, thereby offering mental health benefits and stress relief. Similar movements also emerged in the United States and other countries, with the goal of establishing green spaces to improve health conditions in rapidly expanding urban places. These initiatives underscored the importance of not only physical well-being but also disease prevention, leading to the creation of numerous parks and green areas within densely populated urban settings (Thompson, 2011).

At the beginning of the 20th century, advancements in science and technology gave rise to the emergence of functionalist and technological architecture, characterized by the efficiency and cost-effectiveness of buildings. Within this framework, gardens, courtyards, and surrounding landscapes were predominantly transformed into developed areas, reflecting a pragmatic and utilitarian approach to urban space (Nunes and Manzoor, 2018). It wasn't until the 1980s and 1990s that the connection between health and nature began to be re-established, driven by scientific research highlighting the numerous benefits of nature contact for human well-being. Groundbreaking studies conducted by pioneers such as Ulrich (1984 and 1999), Kaplan and Kaplan (1989), and Kaplan (1995) played an essential role in this reawakening, demonstrating how the presence of nature can mitigate stress, enhance mood, and bolster physical and mental health. These findings reignited interest in incorporating green spaces and natural elements into urban architecture, sparking a resurgence of therapeutic gardens and green areas in contemporary urban environments.

Therapeutic garden Foundations

Research exploring the impacts of nature and landscapes on health has become increasingly prominent in scientific investigation, leading to the formulation of theories and scientific insights regarding the advantages of interactions with plants. A significant milestone in this field was Ulrich's pioneering work on the psychology of the environment (Ulrich, 1984). His research revealed that even the simple act of gazing out of a window at natural scenery could positively influence the recovery of post-operative patients, leading to reductions in recovery time and the use of painkillers.

This groundbreaking discovery formed the foundation of the Supportive Gardens Theory, developed by Ulrich in 1999. This theory asserts that exposure to and views of natural environments can offer significant benefits to physical and emotional well-being of patients, helping to mitigate the stress associated with hospitalization. By recognizing the therapeutic potential of nature, the Supportive Gardens Theory has inspired the development of green spaces in healthcare settings, promoting the creation of environments that not only facilitate physical recovery but also promote patients' emotional well-being.

In his work, Ulrich (1999) identifies four main aspects that a garden should cover to help reduce stress. These are the sense of control, related to the power of choice, in which the user has autonomy over the use of the space; social support, which encompasses positive social interactions and connections with other people, making the garden a facilitator of encounters; the opportunity for physical activity, allowing exercise at different intensities; and positive natural distractions, such as birdsong and the diverse array of colors and shapes found in plants, contribute to the overall calming atmosphere of the garden.

Another important theory that provides guidelines for the needs of a garden with a therapeutic purpose is the Attention Restoration Theory (ART) and Restorative Gardens developed by Kaplan and Kaplan (1989) and Kaplan (1995). This theory explores how natural environments can restore the capacity for attention and relieve mental fatigue. According to the theory, restorative environments need to provide four elements or sensations: *scape*, which offers distance from the source of stress; *ambience*, where the escape occurs, it should provide the feeling of being in a new place; *fascination*, the place should evoke fascination, and interest, and encourage exploration through various attractions; and *compatibility*, allowing the place to be adaptable according to the users' wishes and needs.

Cooper-Marcus and Barnes (1995 and 1999) introduce the concept of Healing Gardens, envisioned as meticulously planned environments designed to support individuals' well-being and health, fostering healing, recovery, and physical and emotional solace. In their works, the authors explored the fundamental design principles and considerations essential for projecting successful therapeutic gardens. These principles include ensuring easy and safe access for all individuals, selecting plants that engage the senses and facilitate a profound connection with nature, incorporating spaces conducive to therapeutic activities such as gardening, contemplation, meditation, and exercise, creating inviting areas that encourage social interaction, and employing design elements that foster a sense of serenity, tranquility, and stress reduction.

The term "Healing Garden" has been widely recognized and used in academic circles, especially in reference to the gardens found in hospitals and therapy units. However, Hartig and Cooper-Marcus (2006) point out that the term "healing" may be inappropriate, as it suggests that the garden has the intrinsic ability to heal when, in reality, it functions as a support and complement to medical treatment. In this sense, more appropriate terms would be "therapeutic garden" and "restorative garden" to better reflect the role of the environment in promoting well-being and facilitating individuals' recovery process.

Sensory gardens are another term often mentioned in works, mainly in Portuguese. They are spaces that encourage multisensory perceptions based on elements of nature as a source of tactile, visual, auditory, olfactory, and taste interactions. However, their design does not necessarily include a therapeutic function and can only have an educational and ornamental purpose (Abreu et al., 2021).

Research on the impact of nature on health underscores the crucial role of contact with plants. A vast body of research has elucidated the benefits of this interaction, leading to a notable surge in studies aimed at unraveling the mechanisms underpinning this connection. Broadly, these studies examine various modes of experiencing nature, ranging from mere observation of natural scenes, even through windows, to active participation in garden-related activities such as horticultural therapy and gardening. Furthermore, engaging with the garden environment, whether contemplating, meditating, walking, or exercising, is deemed essential for harnessing the therapeutic advantages offered by nature.

The outcomes of these activities can be categorized into psychological, physical, and social domains based on observations of users. Psychological benefits include an enhanced sense of well-being (Cloe et al., 2020; Stepansky et al., 2022), a reduction in cortisol levels (Souter-Brown et al., 2021), the promotion of a state of calm and relaxation (Cooper-Marcus and Barnes, 1995), and notably, stress reduction (Ulrich, 1999; Han et al., 2018; Young et al., 2020).

The effectiveness of stress reduction can be evidenced by physiological changes in individuals, including decreased cortisol levels and heart rates. Souter-Brown et al. (2021) reported that after thirty minutes of exposure to a sensory garden, participants exhibited reduced cortisol levels and reported heightened well-being and enhanced productivity. Likewise, Twohig-Bennet and Jones (2018) noted that exposure to nature led to decreased cortisol levels and reduced blood pressure and heart rate.

The physical effects are linked to improved balance and preservation of the locomotor system, joints, and muscles (Pasha and Shepley, 2013;

Han et al., 2018; Barakat et al., 2019); improved blood pressure and heart rate regulation (Souter-Brown et al., 2021); and decreased muscle tension, improved motor coordination and physical maintenance (Yar and Kazemi, 2020).

Han et al. (2018) discovered that horticultural therapy among the elderly resulted in enhanced physical performance, including improvements in muscle strength, flexibility, agility, balance, and aerobic endurance. In children, activities involving exposure to nature can enhance motor fitness, encompassing agility, balance, coordination, and overall physical activity levels (Barakat et al., 2019). Pasha and Shepley (2013) observed that gardens equipped with additional resources for children, such as toys, sculptures, and child-sized furniture, tend to promote sustained physical activity over the long term.

Furthermore, therapeutic gardens foster social interaction and connections with others, aiding in social inclusion, environmental education, and inclusive education (Wood et al., 2022). Scartazza et al. (2020) observed positive effects among young individuals with autism spectrum disorder engaging in activities within a therapeutic garden. The multisensory environment facilitated the stimulation of critical thinking, communication, and learning skills, along with the development of motor skills, attention span, sensory integration, cognition, and problem-solving abilities.

Project and uses

The Therapeutic Garden, as currently conceptualized, serves as an environment designed to foster benefits spanning physical, psychological, cognitive, and social well-being through either passive or active engagement with nature. With no strict definitions governing their form and purpose, these gardens accommodate a range of activities and adapt to the needs of various user groups. Often linked with complementary therapies within healthcare settings, they offer a versatile approach to enhancing overall wellness.

To refine the advantages of therapeutic garden projects, it is necessary to prioritize the users' needs as the primary guiding factor. While landscape designers may revel in creative freedom during the planning process, their design choices must be rooted in a multidisciplinary understanding of these spaces' utilization. Consequently, numerous authors have proposed guidelines founded on evidence-based design (EBD). This methodology leverages pre- and post-occupancy data to ascertain users' genuine requirements and evaluate the garden's efficacy in fulfilling these needs (Zingaretti, 2010; Cooper-Marcus and Sachs, 2013).

Consequently, each project presents a unique case, and while general recommendations exist, it's crucial to meticulously tailor designs to accommodate the specific needs and expectations of the space's users. For instance, in therapeutic gardens catering to children, it's advisable to incorporate furniture that aligns with their scale and features designs that are both familiar and captivating, such as vibrant colors, interactive elements, and eye-catching aesthetics. The layout should allow children to explore the environment independently while also facilitating interactions with peers and other individuals present. Additionally, integrating water features and the soothing sound of running water can further enhance the sensory experience. Specific recommendations for various users are outlined in Table 1, derived from Paraskevopoulou and Kamperi (2018).

Table 1. Landscaping design recommendations for therapeutic gardens for different groups of users.

User Group	Overall Recommendations
Children	Add trees and green vegetation. Design that brings familiarity to children (such as colorful, bright, child-scale structures). Components with water (especially those that make running sounds). Features that encourage participation in the environment and in interactive activities with other people. Varied and cozy furniture.
Cancer patients	Include ample vegetation, steering clear of plants with strong fragrances. Ensure comfortable seating arrangements. Give preference to shaded spots, and refrain from using reflective materials in sunny areas. Create secluded spaces for increased privacy. Minimize noise disturbances by incorporating gentle sounds.
Patients with mental illness in general	Enhanced engagement with nature. Multisensory experiences. Comfortable seating arrangements. Sun protection with shading and covers. Encouragement of movement and independence to explore. Variety of activities available.
Alzheimer	Integrate art installations and structures to act as landmarks and guides within the garden, designed to engage the sense of touch and promote exploration. These installations should utilize recognizable materials and, whenever possible, reflect the local culture. Incorporate familiar materials throughout the garden to trigger memory and facilitate communication.
Mental and physical disabilities	Provide gardening as a recreational pursuit, incorporating it into occupational therapy sessions. Educationally implement horticultural therapy and gardening. Customize tools and materials used in these activities as needed. Establish a serene, tranquil environment conducive to relaxation.
Hospital staff	Designate a private area exclusively for team use. Furnish the space with comfortable and inviting furniture. Ensure proximity to canteens and restroom facilities. Provide ample shading in the environment for added comfort.

Source: Adapted from Paraskevopoulou and Kamperi (2018).

Barakat et al. (2019) emphasize the importance of location study in the planning of therapeutic gardens, citing tranquility and minimal noise as primary selection criteria. The chosen site should minimize distractions such as pedestrian traffic, vehicle noise, and the operation of machinery, thereby maximizing opportunities for natural interaction. The design and layout should optimize the application of techniques and potential activities, with well-defined boundaries and meticulously planned plant arrangements, and ensure user comfort and safety. Ultimately, the garden should be practical, functional, and secure.

Furthermore, it is advisable to partition specific zones for distinct purposes, simplifying the usability of the space and fostering cohesion within the project. For instance, it should have designated areas for relaxation and reflection, specialized sections for sensory plants, and separate environments for therapeutic sessions and educational endeavors. Additionally, gardens should facilitate social interaction and physical mobility, offer individual autonomy and control, grant direct access to nature, and present positive diversions (Cooper-Marcus and Barnes, 1995).

Water elements such as fountains, ponds, or streams can provide soothing auditory effects, as can the incorporation of materials with diverse compositions, such as stone, pebbles, or wood, in designated areas. Additionally, the inclusion of play structures and toys can be particularly engaging when the intended audience is children (Barakat et al., 2019). However, it's advisable to avoid sculptures, paintings, and other objects with abstract shapes, as they may have a counterproductive effect (Barakat et al., 2019).

As part of general recommendations, careful consideration should be given to several aspects when designing therapeutic gardens. For instance, particular attention should be paid to plant selection, with an emphasis on incorporating a wide variety and abundance of species, as commonly advised. Additionally, it's crucial to include spaces that can be utilized throughout the year, encompassing covered areas with varying degrees of privacy. Providing autonomy and unrestricted movement, including wheelchair accessibility, is crucial. Furthermore, integrating design elements tailored to the specific needs of each patient type and the activities conducted within the garden is essential (Paraskevopoulou and Kamperi, 2018).

Regarding vegetation selection opting for a diverse array of species featuring varying flowering periods and unique ornamental attributes, including different shapes, colors, and textures is fundamental. These characteristics not only enhance the visual appeal but also attract birds, butterflies, and other small animals, contributing to a biodiverse ecosystem (Fig. 1A). However, it's imperative to avoid plants that are toxic, thorny, or emit strong odors, as noted by Cooper-Marcus and Barnes (1999). These considerations help cultivate a safe, welcoming, and stimulating environment for users of therapeutic gardens.

The plant species selection should be adapted to the climatic conditions of the site, the sunlight exposure of the beds, the local availability of species, and the specific attributes that the landscaper aims to emphasize, particularly considering the activities to be explored and the desired effects on the landscape (Cooper-Marcus and Sachs, 2013). Table 2 offers general recommendations to assist in the selection of species for garden vegetation.

Table 2. General characteristics of plants suitable for use in therapeutic gardens.

Plant material	Overall Recommendations
Flowers	Incorporate a variety of colors and shapes to attract diverse insects and birds to the garden. Utilize warm colors like orange, yellow, and red to foster an inviting atmosphere, while cooler tones contribute to a serene environment. Integrate aromatic plants to enhance the sense of smell, while ensuring that strong fragrances are avoided for users with cancer.
Foliage	Using plants with different textures to promote the tactile experience and contribute to the experience of visually impaired users.
Grasses	They offer a rich visual effect when interacting with the wind, providing lightness, movement, and natural sounds in the garden.
Trees and shrubs	Establishing visual layers within the garden to encourage observation from various perspectives. Promoting a sense of privacy to transform the garden into a secluded and secure environment. Facilitating the creation of diverse gradients of shade and light throughout the garden. Enhancing biodiversity by attracting a greater variety of insects and birds.
Edible plants	They stimulate the senses. Promote engagement with the garden.

Source: Adapted from Chicago Botanic Garden, 2024

The variety of plant species allows for the creation of distinct environments in the garden. Trees with denser canopies can form shaded areas, providing environmental comfort, while trees with less dense canopies can create bands of light contrasting with the shade, producing interesting visual effects (Fig. 1B). Shrubs and herbaceous plants with different life cycles can be used as elements of contemplation due to the diversity of shapes, colors, textures, and scents they offer, providing users of the garden with an enriching sensory experience (Fig. 1C) (Mattiuiz, 2023).

**Fig. 1.** Therapeutic Garden Project located at ESALQ/USP.

A Flowerbed with vibrant-colored flowers composition; **B** Shaded area with tropical composition; and **C** Diversity of shapes, colors, and textures.

Many activities can be carried out in therapeutic gardens, such as contemplation, walking, meditation/prayer, resting, rehabilitation exercises, meals, reading, sports, therapies, and gardening, among others (Fig. 2). Because of this, the garden can take on different forms and be located in various environments, being specifically designed to meet the needs of different users.

**Fig. 2.** Examples of uses and activities developed in the Therapeutic Garden Project located at ESALQ/USP.

Conclusions

The potential of therapeutic gardens reveals their importance as spaces designed to promote the users' physical, psychological, cognitive, and social well-being through interaction with nature. Therapeutic garden projects should be designed with precaution to account for the varied needs of different users. A multidisciplinary and evidence-based approach is essential to create spaces that meet the individual's physical, emotional, and social needs. The flexibility and adaptability of projects are fundamental to allowing a wide range of therapeutic activities and ensuring that the environment is inclusive and welcoming to all.

Author Contribution

CFMM: conceptualization, validation, methodology, resources, writing-reviewing and editing, supervision. **TAS:** conceptualization, methodology, investigation, writing-reviewing and editing. **POM:** conceptualization, methodology, investigation, writing-reviewing and editing.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Data Availability Statement

Data will be made available on request.

References

- ABREU, M.C.; ANDRADE, K.I.; COELHO JUNIOR, W.P.; SILVA, M.C.; SOUSA, W.G. M.; SANTOS, M.F.; BENDINI, J.N. Botânica em cinco sentidos: o jardim sensorial como um instrumento para a sensibilização quanto a importância da botânica em escolas de um município do sertão piauiense. *Research, Society and Development*, v.10, n.1, p.1-14, 2021. <http://dx.doi.org/10.33448/rsd-v10i1.11448>
- BARAKAT, A.E.R.; BAKR, A.; EL-SAYAD, Z. Nature as a healer for autistic children. *Alexandria Engineering Journal*, v.58, p.353-366, 2019. <http://dx.doi.org/10.1016/j.aej.2018.10.014>
- CARRIÃO, G.A.; MARQUES, J.R.; MARINHO, J.L. Atenção hospitalar: interatividades por entre constituição histórico-social, gestão e humanização em saúde. *Revista de Gestão em Sistemas de Saúde*, v.8, n.2, p.189-202, 2019. <http://dx.doi.org/10.5585/rgss.v8i2.14930>
- CARROLL, C.; MCCRAY, S.; UTTER, J. Acceptability and feasibility of a hospital-based herb and vegetable garden for health care workers. *Journal of Nutrition Education and Behavior*, v.55, n.12, p.877-883, 2023. <http://dx.doi.org/10.1016/j.jneb.2023.10.008>
- CHICAGO BOTANIC GARDEN. 2024. *Sensory Garden*. Chicago Botanic Garden center information. Available in: < <https://www.chicagobotanic.org/gardens/sensory>>. Accessed on: March 11th 2024.
- CLOE, E.Y.; JORGENSEN, A.; SHEFFIELD, D. Does a natural environment enhance the effectiveness of Mindfulness-Based Stress Reduction (MBSR)? Examining the mental health and wellbeing, and nature connectedness benefits. *Landscape and Urban Planning*, v.202, p.103886, 2020. <http://dx.doi.org/10.1016/j.landurbplan.2020.103886>
- COOPER-MARCUS, C.; BARNES, M. *Gardens in the Healthcare Facilities: Uses, therapeutic benefits, and design recommendations*. Martinez: The Center for Health, 1995. 70p.
- COOPER-MARCUS, C.; BARNES, M. *Healing Gardens: therapeutic benefits and design recommendations*. New York: Wiley, 1999.
- COOPER-MARCUS, C.; SACHS, N.A. *Therapeutic Landscapes: An evidence-based approach to designing healing gardens and restorative outdoor spaces*. New York: Wiley, 2013.
- DING, Y.; ZUEVA, P.; GRAŽULEVIČIŪTĖ-VILENIŠKĖ, I.; YABLONSKA, H.; POZATKO, M. A traditional Japanese garden and its lessons for modern times. *Landscape Architecture and Art*, v.19, n.19, p.85-97, 2021.
- DUSHKOVA, D.; IGNATIEVA, M. New trends in urban environmental health research: from geography of diseases to therapeutic landscapes and healing gardens. *Geography, Environment, Sustainability*, v.13, n.1, p.159-171, 2020. <http://dx.doi.org/10.24057/2071-9388-2019-99>
- FALLAHI, E.; FALLAHI, P.; MAHDAVI, S. Ancient urban gardens of Persia: concept, history, and influence on other world gardens. *HortTechnology*, v.30, n.1, p.6-12, 2020. <http://dx.doi.org/10.21273/horttech04415-19>
- GIANNENAS, I.; SIDIROPOULOU, E.; BONOS, E.; CHRISTAKI, E.; FLOROU-PANERI, P. The history of herbs, medicinal and aromatic plants, and their extracts. *Feed Additives*, p.1-18, 2020. <http://dx.doi.org/10.1016/b978-0-12-814700-9.00001-7>
- HAN, A.R.; PARK, S.A.; AHN, B.E. Reduced stress and improved physical functional ability in elderly with mental health problems following a horticultural therapy program. *Complementary Therapies in Medicine*, v.38, p.19-23, 2018. <http://dx.doi.org/10.1016/j.ctim.2018.03.011>
- HARTIG, T.; COOPER-MARCUS, C. Essay: healing gardens: places for nature in health care. *The Lancet*, v.368, n.1, p.36-37, 2006. [http://dx.doi.org/10.1016/s0140-6736\(06\)69920-0](http://dx.doi.org/10.1016/s0140-6736(06)69920-0)
- KAPLAN, R.; KAPLAN, S. *The experience of nature: A psychological perspective*. Cambridge: Cambridge University Press, 1989.
- KAPLAN, S. The restorative benefits of nature: toward an integrative framework. *Journal of Environmental Psychology*, v.15, n.3, p.169-182, 1995. [http://dx.doi.org/10.1016/0272-4944\(95\)90001-2](http://dx.doi.org/10.1016/0272-4944(95)90001-2)
- KYRIAKOU, G.; KYRIAKOU, A.; MALOULOU, A. Medical practice, urban legends, myths and folklore regarding dermatology in ancient Greek history. *Actas Dermo-Sifiliográficas*, v.113, n.10, p.951-954, 2022. <http://dx.doi.org/10.1016/j.ad.2022.10.032>
- MATTIUZ, C.F.M. 2023. *Estação ESALQ 101/2022: O Jardim Sensorial*. Available in: <<https://podcasters.spotify.com/pod/show/esalq-midias/episodes/Estao-Esalq-1012022---O-Jardim-Sensorial-da-Esalq-e1eod5t/a-a7f6nkv>>. Accessed on: March 5, 2024.
- NUNES, J.C.A.; MANZOOR, S. Introduction: Ars therapeutica, hortus sanitatem. Gardens and Therapy. *Gardens and Landscapes of Portugal*, v.5, n.1, p.1-3, 2018. <http://dx.doi.org/10.2478/glp-2019-0001>
- PARASKEVOPOULOU, A.T.; KAMPERI, E. Design of hospital healing gardens linked to pre- or post-occupancy research findings. *Frontiers of Architectural Research*, v.7, n.3, p.395-414, 2018
- PASHA, S.; SHEPLEY, M.M. Research note: Physical activity in pediatric healing gardens. *Landscape and Urban Planning*, v.118, p.53-58, 2013. <http://dx.doi.org/10.1016/j.landurbplan.2013.05.005>
- SCARTAZZA, A.; MANCINI, M. L.; PROIETTI, S.; MOSCATELLO, S.; MATTIONI, C.; COSTANTINI, F.; BACCIO, D.; VILLANI, F.; MASSACCI, A. Caring local biodiversity in a healing garden: therapeutic benefits in young subjects with autism. *Urban Forestry & Urban Greening*, v.47, 2020. <http://dx.doi.org/10.1016/j.ufug.2019.126511>
- SOUTER-BROWN, G.; HINCKSON, E.; DUNCAN, S. Effects of a sensory garden on workplace wellbeing: a randomized control trial. *Landscape and Urban Planning*, v.207, 2021. <http://dx.doi.org/10.1016/j.landurbplan.2020.103997>
- STEPANSKY, K.; DELBERT, T.; BUCEY, J.C. Active student engagement within a university's therapeutic sensory garden green space: pilot study of utilization and student perceived quality of life. *Urban Forestry & Urban Greening*, v.67, 2022. <http://dx.doi.org/10.1016/j.ufug.2021.127452>
- TABRIZI, N.; LAK, A.; MOUSSAVIA, S. M.R. Green space and the health of the older adult during pandemics: a narrative review on the experience of covid-19. *Frontiers in Public Health*, v.11, n.1, p.1-16, 2023. <http://dx.doi.org/10.3389/fpubh.2023.1218091>

- THOMPSON, C.W. Linking landscape and health: the recurring theme. **Landscape and Urban Planning**, v.99, n.3-4, p.187-195, 2011. <http://dx.doi.org/10.1016/j.landurbplan.2010.10.006>
- TYE, J. Florence Nightingale's lasting legacy for health care. **Nurse Leader**, v.18, n.3, p.220-226, 2020. <http://dx.doi.org/10.1016/j.mnl.2020.03.023>
- ULRICH, R.S. Effects of gardens on health outcomes: Theory and research. In: COOPER-MARCUS, C.; BARNES, M. **Healing gardens: Therapeutic benefits and design recommendations**. New York: Wiley, 1999. p.27-85.
- ULRICH, R.S. View through a window may influence recovery from surgery. **Science**, v.224, n.4647, p.420-421, 1984. <http://dx.doi.org/10.1126/science.6143402>
- WANG, Q.; TZORTZI, J.N. Design guidelines for healing gardens in the general hospital. **Frontiers in Public Health**, v.11, p.1-2, 2023. <http://dx.doi.org/10.3389/fpubh.2023.1288586>
- WOOD, C.J.; POLLEY, M.; BARTON, J.L.; WICKS, C.L. Therapeutic community gardening as a green social prescription for mental ill-health: impact, barriers, and facilitators from the perspective of multiple stakeholders. **International Journal of Environmental Research and Public Health**, v.19, n.20, 2022. <http://dx.doi.org/10.3390/ijerph192013612>
- YAR, M.A.; KAZEMI, F. The role of dish gardens on the physical and neuropsychological improvement of hospitalized children. **Urban Forestry and Urban Greening**, v.53, 126713, 2020. <http://dx.doi.org/10.1016/j.ufug.2020.126713>
- YOUNG, C.; HOFMANN, M.; FREY, D.; MORETTI, M.; BAUER, N. Psychological restoration in urban gardens related to garden type, biodiversity and garden-related stress. **Landscape and Urban Planning**, v.198, 2020. <http://dx.doi.org/10.1016/j.landurbplan.2020.103777>
- ZINGARETTI, G. Evidence based design. **International Hospital Federation Journal**, v.46, n.2, p.22-24, 2010.