
Digital Healing Gardens and Metaverse for Wellness

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ABSTRACT

This paper explores the potential of phygital healing gardens—blending physical and digital dimensions—and metaverse for enhancing psychological wellness in university counselling environments. Traditionally linked to outdoor spaces, healing gardens are reimagined here through virtual reality (VR) and artificial intelligence (AI) within the metaverse, offering immersive, multisensory experiences accessible indoors. Focusing on the MOEBIUS PRO-BEN project, the research examines how digitally mediated nature can support students' mental health by creating adaptive, personalized therapeutic environments. By integrating environmental psychology, technology, and spatial design, the study proposes scalable and replicable models for digital healing gardens, aiming to bridge the gap between nature and therapeutic needs in higher education contexts.

Keywords: Healing gardens, Phygital experiences, Virtual reality, Metaverse, University counselling, Psychological wellness, Immersive therapy, Digital nature, AI in design, Student mental health

INTRODUCTION

In exploring the intersection of phygital experiences—where the physical and digital realms converge—this paper investigates the transformative potential of healing gardens within the context of psychological wellness. Healing gardens, traditionally green spaces aimed at promoting mental and physical well-being through interaction with nature, have long been established in urban settings (Kaplan, 1995; WHO, 2021). However, their integration into indoor counselling environments, particularly in educational institutions, remains a largely unexplored territory. This gap in research offers a valuable opportunity to understand how such spaces can be leveraged in digital forms to enhance psychological health. The role of phygital experiences—where physical and virtual spaces are intertwined—is central to this concept (Emmelkamp & Meyerbröker, 2021). The idea of creating digital healing gardens for university campuses taps into the power of technology, particularly virtual reality (VR), to offer an immersive, multi-sensory engagement with nature. By doing so, this approach aims to extend the restorative benefits of outdoor green spaces to indoor settings where students often seek psychological support, such as counselling centres. The importance of this integration lies in its ability to create therapeutic environments that promote healing and wellness, addressing not only the

emotional and psychological dimensions of well-being but also the relational, social, and environmental aspects. The phygital experience is at the heart of these therapeutic digital gardens. VR offers a dynamic, immersive space where users can experience the calming effects of nature in a virtual context, creating a bridge between the physical absence of a garden and the sensory experience of one. This fusion of reality and digital environments helps to deepen the connection between students and nature, thus promoting emotional and psychological healing even in the absence of a physical garden. It is within this framework that the potential of the metaverse becomes apparent—offering a scalable and adaptable solution for various therapeutic settings, particularly in university counselling spaces (Usmani et al., 2022). By focusing on university campuses, the paper emphasizes the specific benefits for students, a group often under significant psychological stress.

The phygital healing garden approach could enable students to access nature's healing properties without needing to leave the space they occupy for counselling or therapy.

Through the ongoing MOEBIUS PRO-BEN project, the research is trying to demonstrate how the metaverse, powered by artificial intelligence (AI), can facilitate the creation of virtual environments that are not just passive but also responsive to the needs of the users, offering tailored experiences that optimize well-being outcomes. The exploration of digital healing gardens further emphasizes the role of VR as a tool that can help scale therapeutic experiences, making them adaptable to different institutional and social contexts. The research showcases how VR can be integrated into counselling strategies, allowing for a broader, more accessible reach to students. By processing qualitative data within the metaverse, the design process for these environments becomes more precise, ensuring that each space is personalized to its users, thereby improving the therapeutic efficacy of the environment. In conclusion, the integration of phygital healing gardens into university counselling areas offers a compelling vision for the future of psychological wellness. It highlights the importance of combining the benefits of nature with the latest advancements in digital technology to create environments that nurture students' mental and physical well-being. By harnessing the potential of VR and AI within the metaverse, these digital gardens not only extend the therapeutic possibilities of green spaces but also ensure that they can be accessible, scalable, and tailored to meet the diverse needs of individuals seeking psychological support.

METHODOLOGY

This research employs a comprehensive mixed-methods approach that blends qualitative analysis through case studies, interdisciplinary design principles, and speculative prototyping techniques. The methodology is structured into three pivotal phases that work synergistically to produce a robust framework for understanding and enhancing university counseling environments.

Comparative Case Study Analysis

The first phase of this research involved a meticulous comparative case study analysis of university counseling spaces and healing gardens. The objective

was to extract and analyze best practices regarding spatial effectiveness, immersive environment, AR, and psycho-social support frameworks. The selection of these case studies was guided by specific criteria aimed at ensuring geographical and cultural diversity, as well as the integration of wellness principles into garden design. Notably, all selected cases featured dedicated firms and approaches for psychological support, which are crucial for fostering effective mental health interventions.

Data collection methods for this analysis included a thorough review of institutional reports, careful examination of architectural layouts, on-site observations where feasible, and a comprehensive survey of academic literature on the subject. This multi-faceted data gathering approach not only enriched the analysis but also allowed for nuanced insights into the operational dynamics and user experiences within these counseling spaces.

Design-Based Research (DBR)

Following the comparative analysis, the research transitions into the Design-Based Research (DBR) phase. This innovative approach merges theoretical foundations with practical interventions, fostering a cycle of iterative virtual prototyping that encourages continuous learning and adaptation. Insights gleaned from the case studies directly informed the development of a conceptual prototype, specifically the digital healing gardens designed for enhanced user interaction.

The DBR phase included a series of cross-disciplinary workshops that brought together experts from various fields, including architects, psychologists, designers, and engineers. This collaborative environment facilitated the ideation and validation of essential functional features of the cabin, such as emotional sensing capabilities and adaptive interaction mechanisms designed to personalize user experiences. Furthermore, contextual site analysis was conducted at the Polytechnic University of Bari to identify optimal locations for the resting rooms implementation, taking into consideration the unique attributes of the campus environment.

User-Centered Scenario Development

The final phase of the methodology focused on User-Centered Scenario Development, wherein the proposed digital healing garden was conceptualized using speculative design techniques alongside user scenario development strategies. This involved creating a series of hypothetical set of cases capable to emulate potential interactions within the garden environment, thus enabling researchers to evaluate the possible psychological impacts of the digital healing garden on the resting rooms and counseling rooms users.

To ensure the validity and feasibility of these scenarios, case studies were analyzed and expert interviews were conducted, allowing for critical feedback of the psychologists that could refine the design and function of the digital healing gardens.

HEALING GARDENS – UNIVERSITY THERAPEUTIC GARDENS

The MOEBIUS PRO-BEN project involves the application of the physical healing garden model to the spaces of university buildings and campuses. Today, in fact, the psychological and psycho-physical well-being of university students is a fundamental prerequisite for ensuring a quality academic experience, continuity in educational paths and the harmonious development of personal identity (Sachs, 2016). The university can no longer be understood solely as a place for the transmission of knowledge, but must be reconfigured as an environment that takes care of the person, promoting acceptance, protection and meaningful relationships.

A university context that consciously integrates mental health, environmental quality and inclusion promotes sustainable learning, prevents the onset of distress and facilitates the construction of a solid adult identity.

Numerous international and Italian experiences—from universities demonstrate the effectiveness of integrated wellness projects. These models involve dedicated spaces, psychological supports, welcoming environments and intuitive pathways. It is a holistic person-centered approach that redefines the university as a human ecosystem as well as an academic one.

The concept of psychological and psychophysical well-being within university environments is evolving to include practices and experiences that integrate nature, multisensoriality, and an active relationship with the environment (Ulrich et al., 1991; Cooper Marcus & Sachs, 2014).

Specifically, healing gardens are green spaces designed for therapeutic, regenerative and contemplative purposes. They are not simply ornamental gardens, but environments designed to promote mental health, relaxation and reflection through sensitive, inclusive and multi-sensory design. With this in mind, new spaces designed to heal through experience emerge, engaging body, mind and perception.

Healing gardens, healing environments and experiential activities such as horticulture are emerging as innovative, evidence-based strategies capable of reducing stress, improving concentration, stimulating positive emotions and creating a sense of connection between the individual and the context.

IMMERSIVE ENVIRONMENTS FOR WELLNESS

When direct access to real natural environments is not feasible or sufficient, immersive technology provides an innovative alternative to simulate the essence of nature, effectively inducing a state of calm and promoting emotional rebalancing.

Several Case Studies in University context present immersive applications for counseling in University context including:

- in China: North China University of Technology in Hebei Province; National Yang Ming Chiao Tung University in Taiwan; Duke Kunshan University in Suzhou.
- in Europe: University of Zaragoza and the National Distance Education University in Zaragoza, Spain; University of Liverpool in Liverpool, UK.
- in America: University of Western Ontario, London, Canada.

The case studies analyzed demonstrate that VR is an effective tool in reducing perceived stress and improving psychological well-being. In particular, mindfulness (Cawley & Tejeiro, 2024) practiced through VR has been shown to be superior to traditional approaches such as audio interventions or distraction activities (e.g., coloring). The integration of natural environments (biophilic design) in VR contributes significantly to the reduction of perceived stress, highlighting the promising effectiveness of biophilic and biophilic enrichment, although without significant measurable effects at the physiological level (Bolten & Barbiero, 2016; Rai et al., 2019).

VR is also able to greatly increase the involvement (i.e., engagement) of users and their adherence to psychological interventions, due to the sense of presence and immersion that facilitates the therapeutic effect. The use of VR is particularly effective in the context of integrated approaches, such as “technical eclecticism,” that combine guided imagery, exposure and storytelling.

Among key mechanisms, mindfulness emerges as central in producing positive changes by enhancing mindfulness, self-compassion (self-compassion) and emotional regulation, key aspects in managing anxiety and academic burnout. Future directions suggested by studies include:

- Prefer short immersive VR interventions to maximize engagement and psychological impact.
- Integrate natural elements into VR contexts to optimize stress reduction.
- Promote accessible and flexible approaches such as using chatbots with psychological expertise in VR settings to reach populations with limited access to traditional psychotherapy.
- Specifically promote self-compassion in mindfulness programs alongside stress reduction as a primary goal.
- Systematically monitor the effectiveness of interventions over the long term, given the prevalence of evidence showing significant positive results in the short term but less stable over time.

DIGITAL HEALING GARDENS - IMMERSIVE ENVIRONMENTS FOR WELLNESS

Within this framework, the concept of Digital Healing Gardens emerges as a transformative solution that incorporates advanced technological media to create indoor spaces that reproduce multi-sensory experiences reminiscent of natural settings.

Key Features of Digital Healing Gardens

The following are the most important features of Digital Healing Gardens:

- **Panoramic Video Projections:** One of the standout features of these digital gardens is the use of expansive video projections that depict stunning natural environments such as lush forests, gently flowing rivers, expansive skies, and vibrant meadows. These immersive visuals create a sense of presence and connection to the outdoors, even when physical nature is absent.

- **3D Audio Experience:** Complementing the visual stimuli is a state-of-the-art 3D audio system that synchronizes environmental sounds with the video content. Users can hear gentle breezes rustling through the trees, the soothing flow of water, and the melodious songs of birds, creating a fully immersive soundscape that enhances the overall experience.
- **Natural Aroma Diffusion:** To further enrich the sensory experience, Digital Healing Gardens can safely diffuse natural aromas that evoke the scents of various outdoor environments. This feature can be automatically adjusted to suit the latest virtual landscapes displayed, reinforcing the connection between users and the simulated natural world.
- **Interactive Technologies:** The incorporation of virtual reality (VR) and augmented reality (AR) allows users to engage actively with the environment. This interactivity can take various forms, including immersive meditative paths, exploratory journeys through digital landscapes, or guided contemplation sessions. This aspect encourages personal engagement and can greatly enhance the therapeutic effects of the space.
- **Customizable LED Lighting:** To simulate the natural progression of time and varying weather conditions, modifiable LED lights can be employed within the Digital Healing Garden. Users might experience a calming sunset or the bright light of dawn, contributing to an ambiance that shifts in alignment with their emotional needs throughout their session.

Benefits of Immersive Experiences

The advantages provided by these immersive environments are significant:

- **Restoring Emotional Balance:** Digital Healing Gardens play a crucial role in helping individuals regain emotional equilibrium during periods of stress or overload. The calming influences of these environments can facilitate relaxation and mental clarity.
- **Access to Relaxing Experiences:** For individuals who may not have access to actual green spaces—whether due to urban settings, physical limitations, or other constraints—these immersive experiences offer a valid alternative that promotes relaxation and well-being.
- **Activation of Imaginative and Introspective Processes:** Engaging with such environments can stimulate creative thinking and introspection. Users may find that they are able to connect with their thoughts and emotions on a deeper level when encased in a soothing, nature-inspired ambiance.
- **Personalized Experiences:** The ability to customize these experiences ensures that they can be tailored to individual preferences. Users can select specific landscapes, adjust the duration of their sessions, and modify sensory stimulation elements, making the experience uniquely suited to their needs and desires.

STUDY CASES ANALYSIS

Immersive Technologies for Mental and Physical Well-Being

Immersive virtual environments represent an emerging resource for the promotion of mental and physical well-being, offering innovative methods for reducing stress, inducing states of relaxation, and enhancing emotional awareness. In particular, technologies such as virtual (VR) and augmented reality (AR) provide a complementary tool to the physical environments traditionally used in interventions aimed at improving mental and physical health. Areas of application are varied and include clinical settings (Riches et al., 2023), work environments (Shree Adhyaru et al., 2022), and, in particular, academic institutions (Dastan et al., 2023).

Experimental studies have examined the effectiveness of using VR environments integrated with elements of chromotherapy (Dastan et al., 2023) and digital nature scenarios based on the principles of biophilia (Wilson, 1984; Riches et al., 2023), with the aim of promoting students' psychophysiological well-being and reducing their subjective level of perceived stress.

VR as a Tool for Promoting Psycho-Physical Well-Being

VR, in particular, represents an innovative and promising tool for promoting psycho-physical well-being due to its ability to create immersive and immersive environments. This technology enables rapid induction of states of relaxation, especially through virtual natural environments or immersive meditative sessions, which promote stress and anxiety reduction. The main benefits of VR for mental and physical well-being include:

- **Rapid induction of relaxation:** Immersive virtual environments, characterized by natural or meditative scenarios, allow a rapid transition to states of calm and tranquility, facilitating stress reduction.
- **Guided multisensory experiences:** The possibility of integrating visual, auditory and color-therapeutic stimuli allows for comprehensive and personalized experiences, capable of responding effectively to different individual needs.
- **Increased sense of presence and involvement:** Strong immersive involvement helps users temporarily disconnect from external stressful stimuli, promoting concentration on relaxing and therapeutic experiences.
- **Complementarity with traditional psychological interventions:** VR can be effectively employed alongside traditional psychological practices such as counseling and mindfulness, enhancing their effectiveness and accessibility.
- **Support in emotional regulation:** Specifically designed virtual content, combining targeted visual and sound elements, stimulates activation of the parasympathetic nervous system, effectively contributing to emotional management and reduction of physiological responses to stress.

In summary, the use of VR constitutes a versatile and scientifically supported resource capable of enriching and complementing strategies for promoting psychological well-being and mental health.

Chromotherapy in VR

Chromotherapy is a practice that employs colored light, belonging to the visible spectrum, soft illumination and multisensory stimuli, with the aim of modulating psychophysiological processes in both clinical and nonclinical settings. In addition to being used as a complementary treatment in some pathological conditions, including chronic pain, nosebleeds, and skin lesions (Dastan et al., 2023), it is frequently adopted for stress management, anxiety reduction, and improving psychological well-being (Aktekin et al., 2012). Each color chosen for color therapy is associated with specific effects, as documented by numerous studies in the literature:

- **Blue:** Promotes relaxation and reduces stress. It has been shown to accelerate post-exposure recovery from stressful stimuli (Minguillon et al., 2017).
- **Green:** Improves cognitive functions in the elderly, such as orientation, memory and attention (Paragas et al., 2019).
- **Magenta:** Stimulates cardiac activity and adrenaline production; is associated with feelings of energy, determination and controlled passion (Sembian et al., 2015).
- **White:** Often used as a control condition in experimental studies, with no significant relaxing effects (Minguillon et al., 2017).

The high costs and limited accessibility of color therapy rooms, reduce their large-scale use. Therefore, VR through digital immersive environments is an effective and replicable alternative for several reasons supported by scientific evidence:

- **Greater accessibility and affordability:** Physical chromotherapy rooms require substantial resources in terms of infrastructure, maintenance, and physical space, as well as having limited capacity for simultaneous use. In contrast, virtual reality chromotherapy (VRCR), relying on digital environments, is a significantly cheaper, easily scalable and replicable solution. This technology allows for wide accessibility, even in home settings or in healthcare facilities with limited resources (Vaquero-Blasco et al., 2020).
- **Portability and scalability:** VR allows therapeutic experiences to be enjoyed anywhere, overcoming the spatial limitations of physical rooms. This makes VR particularly suitable for telemedicine programs or remote psychological support, increasing the potential for large-scale impact (Vaquero-Blasco et al., 2021).
- **Potential for personalization and therapeutic innovation:** Unlike physical spaces, which are often static, VR environments can be dynamic, interactive, and highly customizable. Although current approaches to VRCR are still limited (e.g., static replicas of physical rooms or 360-degree videos), there is ample room for development to create more

immersive experiences, adaptable to individual needs, and with greater therapeutic impact (Vaquero-Blasco et al., 2020; Vaquero-Blasco et al., 2021).

Following a review of the scientific literature (Dastan et al., 2023), it was possible to draft guidelines that are useful in understanding how the concept of chromotherapy is implemented in VR.

Natural Sceneries and Biophilia in VR

The integration of natural sceneries into immersive virtual environments is based on the principle of biophilia, according to which human beings possess an innate propensity to connect with nature, thus promoting mental and physical well-being and mental health.

Nature experiences in VR are often set in tranquil and visually serene settings, rich in natural elements (such as meadows, trees, sky, and animal sounds) designed to promote relaxation.

As a result of a review of the scientific literature (Shree Adhyaru et al., 2022; Riches et al., 2023; Riches et al., 2024), it was possible to draw up guidelines useful for understanding how the concept of biophilia is implemented in VR.

CONCLUSION

By employing this integrative methodology, the research effectively positions the proposed intervention as both evidence-based and grounded in experiential realities. It aims to address the complex emotional and cognitive needs of university students, facilitating a supportive environment conducive to mental well-being and personal growth. This structured approach not only highlights the importance of research rigor but also emphasizes the need for practical, user-centric solutions in the evolving landscape of university mental health support.

It is essential to note that while Digital Healing Gardens present a compelling alternative for enhancing emotional well-being and relaxation, they should be utilized as complementary tools rather than substitutes for real human relationships or physical interaction with natural environments. The holistic benefits of nature and interpersonal connections remain irreplaceable and vital, emphasizing the importance of fostering a balanced approach to mental health and well-being that integrates both technological innovations and authentic life experiences. By bridging the gap between virtual and physical interactions with nature, we can cultivate a more profound and versatile understanding of wellness in the modern world.

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