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Designing Outdoor Spaces for Mental Health: Innovative Evidence-Based Landscaping Approaches

Abstract

The increased pace of urbanization along with the pressure of an educational system that is increasingly fragmented socially, and growing global mental health issues have contributed to the lack of mental health well-being in people; therefore, the outdoors – especially the urban green and landscaped spaces – have emerged as a non-clinical resource to help improve the quality of mental health. Although there are numerous studies on the relationship between mental health and outdoor environmental design and the connection is evident in the literature, many designers and contractors use evidence based design for the purpose of landscaping (as a preventative measure) instead of functionally, aesthetically, or both. The purpose of this article is to explore the evidence based aspects of designing and implementing the outdoors as a means to restore mental wellness, regulate emotions, and build psychological resiliency. This study is focused only on studies in academic peer-reviewed journals (2023–2025), and combined the results from environmental psychology, landscape architecture, urban planning, and public health. In addition, it identified the physical characteristics of landscape spaces including: cohesiveness, vegetative quality, the degree of exposure to mental health issues, accessibility, and social interaction. Finally, based on the above analysis, the author developed a conceptual model, which links physical design with both psychological response and the interaction between people and their environment. The findings demonstrate that the advantages for mental health arise from landscape design itself, rather than just mental health, and that there should be an association between design choices and human psychological and social processes.

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Keywords

mental health, outdoor spaces, landscape design, green spaces, restorative environments, evidence-based design

JEL: R11, Q51, I31

1 Introduction

A large portion of public health concerns today are related to mental illness, as reported by many on issues ranging from the prevalence of stress and anxiety in urban residents, to the high levels of depression and mental fatigue found among college students, and the increased levels of stress, anxiety and burnout experienced by employees. Urban sprawl, less access to natural settings, and increasingly demanding cognitive environments all likely contribute to the aforementioned phenomena, however, they will continue to be an important area of research and development for clinically based solutions. An increasing amount of attention has been given to the environmental context of a person's mental health. Of the various environmental contexts contributing to a person's mental health, the most significant and the most often ignored are the outdoors including parks, university campuses, residential areas and urban green ways. The outdoors possess the unique characteristics of being a part of people's daily routines, being available to anyone regardless of their current mental health status or if they are receiving any formal mental health services, and being able to alter a person's state of mind through both structured and unstructured, and frequent and infrequent interactions. As noted in numerous studies, the health advantages of outdoor environments and specifically green spaces are well established. Studies have shown that green spaces provide several positive mental health effects including decreased stress, improved moods, improved concentration and increased life satisfaction (Collins et al.,2023; Grigoletto et al., 2023; Xu et al., 2025).

More recent research has challenged the idea that simply providing access to green space is sufficient for realizing potential psychological benefits from that green space. Evidence is increasingly demonstrating that there is an association between the characteristics of green spaces and the likelihood of realizing psychological benefits from them. In some instances, the presence of green spaces can create environments of dis-comfort and insecurity. The increasing body

of evidence regarding the psychological effects of green space has yet to be integrated into current landscaping practices due to their focus on aesthetic appeal of the design, cost and maintenance of the design, and lack of consideration to the structural implications of mental health as it relates to design of the space. It is within this context that authors seek to fill this void through documenting the evidence-based methods to apply psychological principles of outdoor environment design for the purpose of addressing mental health.

This study seeks to provide evidence to convert modern evidence to landscape design strategy to enhance psychological well-being (See Fig.1). To accomplish this, the study will synthesize the most up-to-date empirical evidence and develop a conceptual framework that illustrates the connection between specific elements of landscape design and resultant mental health effects. Ultimately, the author hopes to close the gap between evidence and implementation, while supporting, in a direct and intentional way, the notion that mental health should become a fundamental design goal, as opposed to an ancillary benefit.

In addition to synthesizing current empirical literature, this project draws on the author's professional experience as an evidence-based landscape designer to identify a need for developing an evidence-based landscaping protocol that would utilize landscape elements as therapeutic tools to promote cognitive restoration, emotional regulation and everyday mental well-being. The landscaping protocol described in this paper, utilizes the findings from recent empirical research in environmental psychology and public health to provide designers with specific guidelines for the use of spatial zoning, vegetation selection and perceptual design techniques to support cognitive restoration, emotional regulation and everyday mental well-being. In addition, the landscaping protocol will advance traditional landscape design practices by promoting mental health outcomes as a primary and measurable design outcome rather than simply a potential by-product of aesthetic or ecological design solutions.

2 Literature Review

2.1 Outdoor Green Spaces and Psychological Well-Being

Research has established a positive correlation between spending time in natural outdoor settings and an improvement in overall mental health and wellness (Zhuang, 2025). Individuals who live in or work near green spaces are typically experiencing less stress, anxiety, depression and experience a higher level of well-being (Chen, Liang & Zhao, 2025; Collins et al.,2023) and this relationship holds true regardless of whether they are located at home, work or other environments where they spend most of their time. While it has been determined that the length of time spent in green spaces can lead

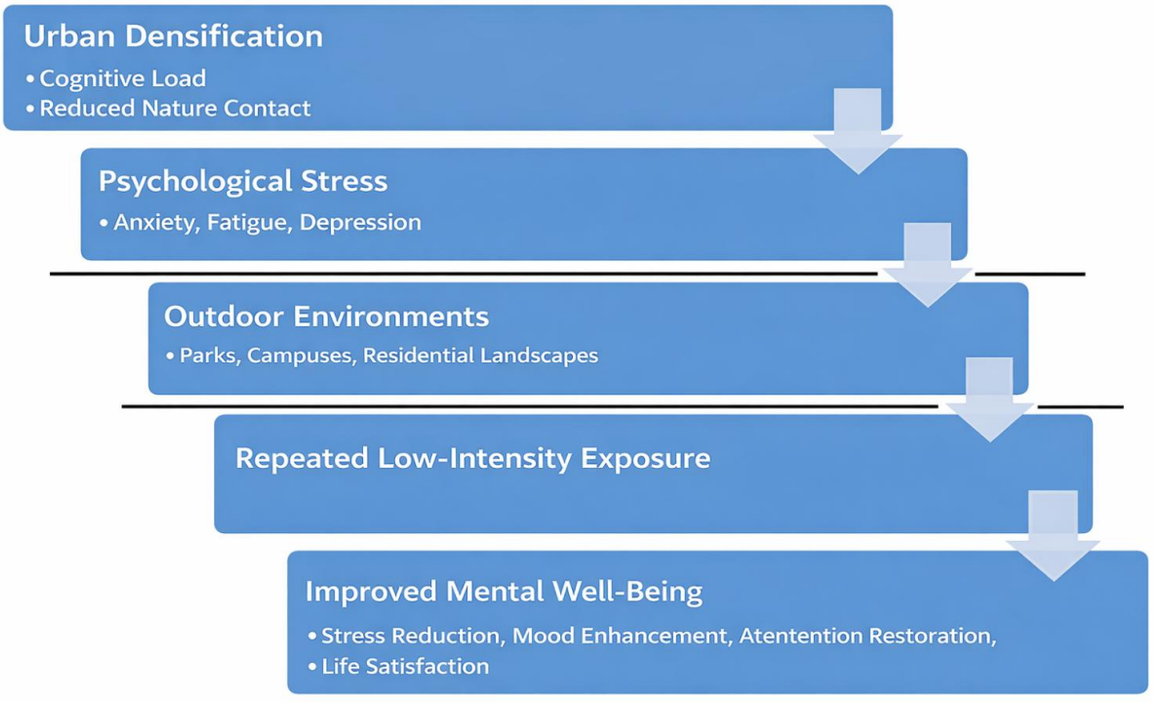

FIGURE 1 Outdoor environment conceptual overview as preventive and supportive mental health infrastructure

Source: author's own development

to improved mental health, it seems to be more so about the quantity of exposure to green spaces, versus the length of time spent there for relaxation purposes.

Research has shown that while the quality of green spaces is more important to an individual's mental health status than the quantity of green spaces available, a study by Xu et al. (2025) identified additional variables that were also important to an individual's mental wellbeing in a green space, including that the green space was well-maintained, had a diverse variety of plants/vegetation, safe access to the green space, and was of good design/space configuration (Xu et al., 2025). Cheng (2025) further researched that an individual's psychological perception of the quality of the landscape directly affected how much of a relationship existed between the quantity of green space and an individual's mental wellbeing (Cheng, 2025).

2.2 Restorative and Healing Landscape Concepts

In addition to research on green spaces and mental health and wellbeing, recent research has explored the concept of "restorative" or "healing" landscapes since the onset of the COVID-19 pandemic, which has caused many people to re-evaluate the importance of access to nature and their own mental health and wellbeing. Research has defined "healing landscapes" as being able to help regulate emotions and aid in cognitive recovery during extended periods of stress and uncertainty (Ren, Weng & Hu, 2025). Research on campus landscapes has supported these findings. Research has demonstrated that University landscapes that include clear boundaries of circulation, shade, and a variety of types of structural vegetation, positively affect students' mental health and wellbeing (He, Bowring & Lawson, 2025). Research has also demonstrated that campus outdoor spaces that allow individuals to feel safe and protected, and provide a sense of visual freedom, or "prospect", are capable of restoring mental energy in a quantifiable manner (Reddy & Raina, 2025). These studies suggest that restoration occurs in green spaces that are low in terms of cognitive demand and high in terms of providing sufficient sensory stimulation to keep an individual engaged without becoming overwhelmed or underwhelmed (See Fig. 2).

2.3 Social Cohesion, Accessibility, and Use Patterns

In addition to environmental factors, social and behavioral pathways contribute to the mental health impacts caused by access to outside areas (Zhu, Yao & Li, 2025; Zhuang, 2025). In fact, the body of research demonstrates that social cohesion acts as an important mediator of the relationship between the availability of green space and individuals' mental health. For example, studies indicate that accessible

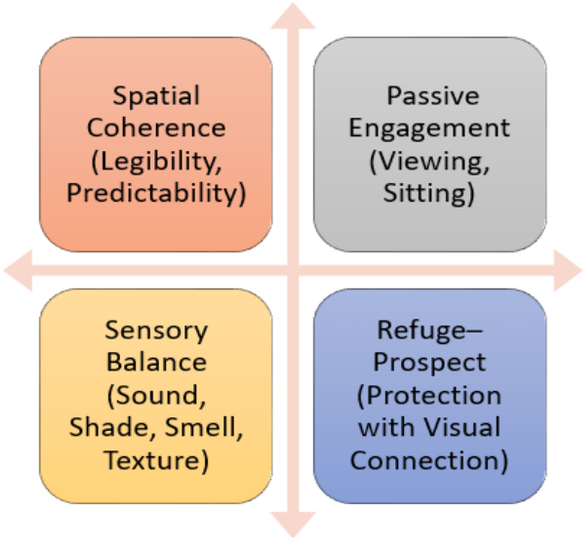

FIGURE 2 Choice matrix for selecting landscape solutions to reduce cognitive load

Source: author's own development

urban green spaces lead to enhanced mental health through increased social contact and community cohesion prior to and during times of social isolation, including the COVID-19 pandemic (Wilson, Neale & Roe, 2024); primarily due to the increased accessibility and visibility of the green spaces.

In fact, studies demonstrate that the visual presence of green spaces enhances the mental wellbeing of university students, regardless if the students are physically active or not (Bai et al.,2024). Moreover, studies also indicate that the social aspects of using green spaces (e.g. inclusion, connectivity), particularly in the context of urban settings, are significant predictors of improved mental health outcomes in European cities (Cardinali et al., 2024) and therefore landscape interventions to promote mental health should consider community psychosocial factors as equally important as individual psychosocial factors (Fig.3).

2.4 Contextual Sensitivity and Vulnerable Groups

The mental health impacts from green spaces may be influenced by the specific context in which they are accessed (Zhu, Yao & Li, 2025). For example, Chen et al. (2025) demonstrate how spatial and socioeconomic contexts (urban village/neighborhood) can influence the psychological impacts of green spaces (Chen, Liang & Zhao, 2025). Similarly, studies demonstrate that neighborhood green spaces provide a valuable resource for improving the mental wellbeing of those living in poverty in the United States (Xian et al., 2024). Additionally, several studies document the beneficial impact of green spaces on behavior problems and emotional regulation of children and adolescents (Vanaken & Danckaerts, 2018).

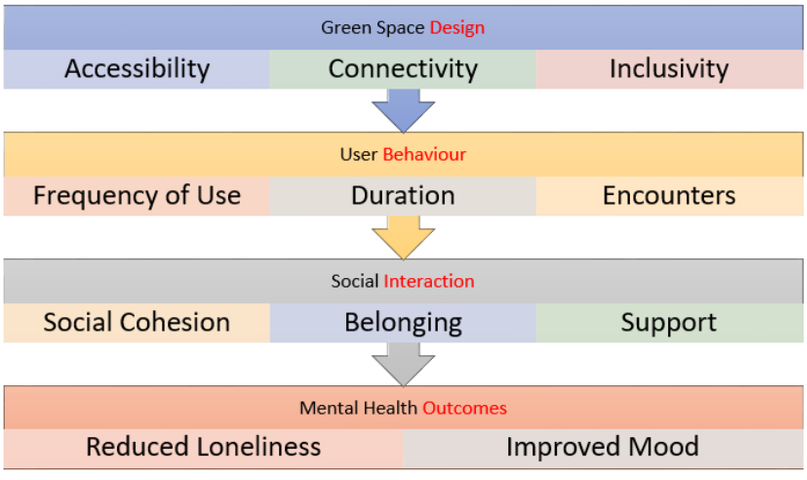

FIGURE 3 Social and behavioral patterns with green space exposure and mental health outcomes

Source: author's own development

3 Material and Methods

3.1 Research Design

A qualitative, evidence-synthesis methodology has been used for this research to understand and to identify how the use of designing outdoor spaces can affect the mental health of those using them (Zhuang, 2025). This research will theoretically explain and will provide design-related insights, as opposed to creating new empirical data through primary research, instead integrating and interpreting the results of the most recent, peer-reviewed research. The purpose of this study is to discover the empirical relationships associated with common design features, psychological attributes and usage behaviors of various types of spaces for mental health issues.

3.2 Data Sources and Inclusion Criteria

The analysis reported herein is entirely based upon peer-reviewed literature referenced by the author and listed in the bibliography. As such, the literature reviewed for this analysis is a closed corpus (i.e., all literature examined falls within this corpus), and none of the literature outside this corpus was examined. Most of the studies evaluated in this analysis were published between 2023-2025, providing evidence relevant to contemporary research interests and methodologies. An older systematic review was retained due to the continued relevance to the field of the effects of exposure to green spaces on the mental health of children and adolescents (Vanaken & Danckaerts, 2018). Only studies meeting a minimum of three criteria were included: they studied outdoor, green or blue-green spaces; they identified a mental health or psychological well-being outcome (e.g., stress, restoration, happiness, emotional regulation); and/or, they provided empirical, systematic or theoretical insight(s) into aspects related to landscape design. Studies that only addressed ecological performance or urban form without identifying psychological outcomes were excluded.

3.3 Analytical Procedure

This analysis included three phases of data collection. Phase one of this data collection phase involved reviewing all sources to determine how certain aspects of the design of parks relate to mental health results. There were six categories of design features including: spatial layout, vegetation, design and access to parks, visual appeal, sensory stimulation, and social interaction. Phase two of the data collection phase involved groupings of the resultant effects into thematic categories using the technique of comparative analyses. Using this thematic analysis provided a method for determining the various intermediate variables (perception, satisfaction, and use) that many authors believe provide a link between design and resultant mental health effects (Bai et al.,2024; Zhou, Wang & Liu, 2024). Phase three of the data collection phase involved combining the identified themes into a single design framework that illustrates the relationship between the physical attributes of design, the psychological responses to those attributes, and the behavioral responses that result from those interactions. The design framework was formed by comparing multiple sources with the purpose of verifying both construct validity and empirical support for the relationships established within it.

4 Findings and Discussion

4.1 Conceptual Framework for Mental-Health-Oriented Landscaping

The body of research reviewed above was synthesized into a conceptual model to identify the

physical, psychological, and behavioral factors that relate to the design of outdoor spaces and their effects on mental health (Fig.4). Specifically, the model identifies the mental health impacts of outdoor spaces, and specifically green spaces, as an intended outcome of the design process, rather than an incidental result of design.

The model demonstrates and defines three distinct factors: design structure, psychological response, and user interaction. All three factors are analytically distinct, but exist together in an interdependent manner. The likelihood that a person will receive mental health benefits from using outdoor spaces is highest when the three factors work together; however, when they do not, the potential for restoration is greatly diminished.

Design Structure refers to the design attributes of an outdoor space, i.e., layout, vegetation, accessibility, visibility, balance of senses, and other features. Each design attribute influences the way a user navigates an outdoor space and impacts their ability to psychologically engage with the environment. The Psychological Response factor represents the mechanisms of the mind that influence an individual's reaction to the design attributes of an outdoor space. The psychological response includes stress, attention, and mood, as well as an individual's feeling of safety.

The design structure influences whether or not the psychological response of an individual is either promoted or hindered due to the degree of clarity of perception and ease of emotion. User Interaction refers to the behavioral attributes of individuals, including the number of visits made to an outdoor space, the amount of time spent in the space, the degree of social interaction that occurs within the space, and the patterns of movement within the space.

4.2 Design Structure and Landscape Quality as Foundational Conditions

Design structure is the fundamental context within which psychological and behavioral processes occur. Of all the metrics of successful design structure identified in the literature reviewed, the quality of the landscape is the one most frequently mentioned (Rastkhadiv, Hami & Pouya, 2024). Quality of the landscape does not refer to the amount of vegetation, but rather to the standards of maintenance, diversity of vegetation, organization of space, and perceived safety of the landscape.

Xu et al., (2025) further support the conceptual model's argument that the relationship between the amount of green space and mental well-being is greater when there is a high-quality landscape than when there is merely a large area of green space (Xu et al., 2025). This supports the conceptual model's view that design structure should be evaluated in spatial/experiential terms.

Cheng (2025) provides additional support for this argument through demonstrating that the psychological perception of the public mediates the relationship between the objective characteristics of landscapes and mental health (Cheng, 2025; Delgado-Serrano et al.,2024). Green spaces can provide ecological function, but if they are visually disorganized or poorly maintained, they will typically fail to induce restorative responses. Within the conceptual model, design structures that have such an effect are described as acting indirectly through perceptual/interpretive processes. As such, the findings also suggest a preference for a "quality not quantity" approach to planning relative to landscape as a psychological pre-condition for other forms of engagement (Russo, 2024).

4.3 Spatial Coherence and Cognitive–Emotional Regulation

Coherence is so central to the structural design of the model that it has become one of the most important factors of determining the degree of coherence of an environment. The degree of coherence of an environment is determined by its legibility, predictability and ease of navigation (Delgado-Serrano et al.,2024). An environment

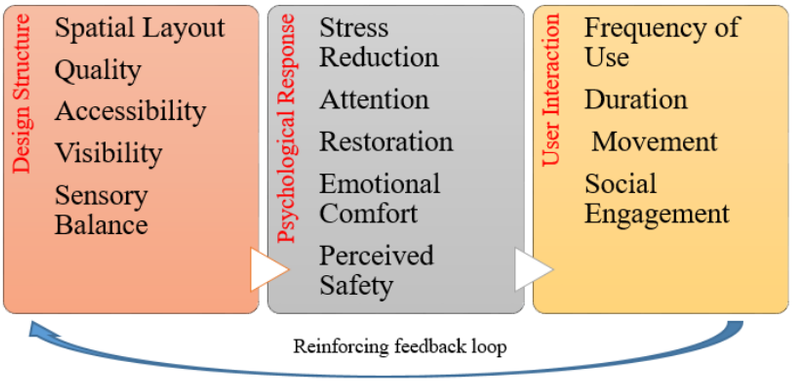

FIGURE 4 Conceptual framework outcome suggestion

Source: author's own development

that is highly coherent will provide users with less cognitive load because there is less uncertainty and thus less attention required to navigate through the environment and orient oneself. As documented in Healing Landscapes studies, environments that have clarity in circulation patterns, adequate mixing of open and enclosed spaces, and sufficient visual cues support emotional and cognitive restoration(Ren, Weng & Hu, 2025).

Spatial coherence in the model illustrates how the design structure is associated with the psychological effects of a reduction in the demand for attention and an increase in perceptual ease. There is empirical evidence of this relationship, specifically on the subject of campus settings. For example, He et al. (2025) established a positive correlation between the quality of spatial design of university landscapes and student mental health. University landscapes were defined as having "shaded pathways" and "visual continuity." Reddy & Raina (2025) similarly discovered that university students reported the experience of obtaining mental restoration value from university campus settings when they had "good visual continuity" and "predictable spatial order." Thus, all of these studies demonstrate the economy of thought promoted by the model. Environments that stimulate are not restorative; rather, environments that are designed to be highly coherent, particularly those that are intended to promote mental health, are essential.

4.4 Accessibility, Visibility, and Patterns of Everyday Exposure

Visibility and accessibility in the proposed model represent the two primary connections between the components of design and user interaction (Rastkhadiv, Hami & Pouya, 2024). An outdoor environment that is difficult to access, is not visually connected to other areas of the environment or is socio-spatially exclusive is likely to preclude the opportunity for repeated and sustained interactions among individuals. Empirical validation of this connection exists. Collins et al. (2023), demonstrated that while both public and private gardens contribute positively to mental health, this contribution is only made possible by their accessibility (Collins et al.,2023). Similarly, Bai et al. (2024), illustrated that merely being able to see a green space (even if physically inaccessible) contributes positively to the mental health of university students (Bai et al.,2024).

These studies all reinforce the theoretical model that common, casual encounters with nature serve as a type of ongoing mental health support system. The benefits of psychological well-being do not come solely from occasional, planned trips to destination parks; rather they occur through the many, relatively easy to use, encounters between the user and nature that can be easily incorporated into the daily routine. Green spaces provide psychological effects to their users even when the users are simply passing through the space and not actively using it (Li et al., 2026). These findings indicate that from an engineering/design standpoint, green spaces should be built into the active routes of daily travel and not as separate "amenities". Overall, the design of a space should provide the same level of mental health benefit based on the amount of time users spend interacting with the space.

4.5 Social Cohesion as a Behavioural–Psychological Mediator

The theoretical model identifies social interaction as one of the three behavioral channels through which the presence of outdoor settings impacts an individual's mental well-being. Social interaction does not refer to just solitary usage of the park but to include passive social interactions, cooperative activities, and a sense of community among users. As illustrated by Wilson et al., (2024), increased access to urban greenery leads to increased social cohesion and subsequently has a positive impact on the mental well-being of individuals during times of social unrest (Wilson, Neale & Roe, 2024). Cardinali et al. (2024) demonstrated that across various European cities, the mental health-related benefits of using green spaces are most positively associated with those characteristics of green spaces that foster inclusiveness, connectivity, and usability (Cardinali et al., 2024).

Social cohesion is the intersection of user interaction and psychological response within the theoretical model. Spaces that facilitate informal social interactions will generally produce higher levels of psychological well-being for users by reducing the likelihood of feelings of loneliness and enhancing social support systems (Li et al., 2026). Conversely, spaces designed solely to allow people to visually enjoy the scenery or to allow people to be in the space alone will likely underachieve in terms of producing mental health-related benefits. To achieve mental health-related benefits, landscaping must incorporate both higher levels of social interaction as well as greater opportunity for individual reflection.

4.6 Contextual Sensitivity, Inequality, and Ethical Design Implications

Outdoor environments are not equitably or similarly distributed for mental health purposes among all people or geographic locations. An individual's economic, cultural and techno-ecological environment will impact design, psychology and social interaction within their environment. As shown by Chen et al. (2025), residents of urban villages may experience different psychological responses to green space than residents of formally designated neighborhoods due to variations in access and design of those spaces. Local green spaces are also valued highly (Xian et al., 2024) especially in socio-economically disadvantaged populations where there are few mental health services (Xian et al., 2024).

A number of case studies have been cited as examples of the importance of an equitable and socially conscious approach to design in regards to landscaping that is intended to support mental health and the ethical considerations of such design (Rastkhadiv, Hami & Pouya, 2024).

A supportive landscape for mental health based on psycho-behavioral processes cannot be equated to landscapes that restrict social behavior and are marginalizing in nature. Therefore this type of thinking provides empirical evidence supporting the notion that landscaping must be designed to be sensitive to the environmental context in which it exists and responsive to social needs (Zhuang, 2025).

In addition to the quality of design of outdoor spaces, planners' decision-making related to socio-politically and systemically derived inequity issues can have substantial implications for an individual's mental health.

4.7 Practical Implementation in Sunshine Landscape Projects

As part of this project, the author has operationalized the conceptual framework presented in this research in her professional landscape practice through various projects completed for clients by Sunshine Landscape Solutions LLC in the USA. As part of each project, the author uses systematic methods to apply the principles of Attention Restoration Theory (ART) to empirically supported spatial interventions, utilizing the principles discussed above to heed to the needs of the local populace.

In particular, the author utilizes spatial zoning and plant selection strategies to implement aspects of guided contemplation in the landscapes she designs. The author structures the landscapes she designs into hierarchical zones that correspond to different cognitive and emotional states, ranging from transitional spaces that facilitate a gradual disengagement from cognitive stimuli to central restorative spaces that facilitate extended periods of mental recovery. To reduce cognitive loads associated with navigation and promote "being away" and "extent," the author designs circulation paths in a simple and visually legible way.

To select plants for each zone, the author selects species with high biophilic response indices that prioritize the variety of vegetation forms, textures, colors, and seasonality documented in recent studies (2023-2025) to elicit positive affective responses, reduced attentional loads, and improved emotional regulation. To maintain voluntary and involuntary attention without over-stimulating the user, layered planting compositions, rhythmic repetitions and carefully controlled visual depth are utilized to reinforce the ART mechanism of "soft fascination."

Additionally, the author strategically places seating areas, creates micro-prospect/refuge combinations and controls view lines to create a balanced relationship between feelings of safety and open perception. This allows users to engage in passive observation, social presence without obligation, or reflective solitude - modes of engagement that have been shown to improve psychological restoration. Most importantly, these design decisions are not solely aesthetic; they are also based upon documented psychological outcomes from contemporary environmental psychology and landscape research.

Therefore, through this applied methodology, Sunshine Landscape projects function as actual-world test sites where theoretical concepts such as spatial coherence, accessibility, perceptual quality and social affordances are incorporated into a singular, operational design paradigm. Ultimately, this project provides evidence that evidence-based mental health principles can be embedded into everyday landscapes (i.e., residential, educational and semi-public) and do not require specialized therapeutic garden settings.

5 Limitations and Future Directions

While this study contributes to the field of research, there are limitations to consider in the interpretation of the results. The first limitation is that the study relies upon a qualitative synthesis of existing research (i.e., secondary data), as opposed to primary empirical data. While appropriate for developing concepts, this methodological approach cannot support causal inferences or provide an estimate of the quantitative effects of the various components of the framework; thus, the framework represents the convergence of relational patterns rather than empirically-derived pathways.

The second limitation of the study relates to the scope of analysis, which is constrained by the availability of relevant literature. Although the studies reviewed represent a variety of geographic locations, the distribution of evidence is uneven, with limited representation from low-income countries/regions and non-urban areas; therefore, the generalizability of the framework to other cultural, climatic, and socio-spatial contexts is limited.

A third limitation of the study is that the methodologies used in the studies reviewed were heterogeneous, consisting of cross-sectional analyses, reviews, and perception-based assessments. The heterogeneity of the methodologies used in the studies reviewed provided richness to the synthesis; however, this heterogeneity complicated the direct comparisons among the studies reviewed and obscured some nuances during thematic integration.

A fourth limitation of the study is that the framework primarily focused on the psychological and behavioral outcomes associated with the use of public open space, while a number of the systemic factors associated with the creation and ongoing management of public open spaces, such as governance, maintenance, and

institutional decision-making processes were only indirectly represented in the framework. Finally, the framework did not explicitly address the dynamic nature of time and how mental health outcomes related to public open spaces change over time. In summary, the framework presented in this study is intended to be a theoretically-grounded beginning point for the study of the relationship between public open spaces and mental health, and as such, will require additional empirical evaluation and contextual modification through subsequent research.

6 Conclusions

This study demonstrates that public open spaces can contribute to the support of mental health in meaningful ways, but only if they are created using evidence-based design practices that account for the psychological needs of users. Mental health benefits resulting from the use of public open spaces result from the alignment of the psychological qualities of spatial coherence, landscape quality, accessibility, and social affordances of the space.

By providing a theoretical framework to guide designers and planners to create public open spaces that actively support the psychological well-being of people in their daily lives, the paper also makes the argument that mental health should be treated as a key objective of landscape design. By applying the principles of evidence-based landscaping to design public open spaces, designers and planners have the opportunity to develop public open spaces that go beyond aesthetic appeal and intuitive design, and instead focus on creating outdoor spaces that support the well-being of people's minds.

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