REVIEW ARTICLE

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Contemplative Landscapes: Toward Healthier Built Environments

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Abstract: This review aims to show the current state of knowledge in the area of the visual quality of landscapes in urbanized areas and their influence on people's mental health and well-being. This falls under the passive recreation and passive exposure to the environmental stimuli present in our cities (such as walking in nature and quiet contemplation) as opposed to active interactions with the landscapes such as horticulture therapy and meditation. Passive exposure to natural or built environments can shape our mental health patterns throughout the life cycle. Although we know that the quantity of green spaces in the cities can improve the well-being of city inhabitants and contact with natural environments can alleviate various psychological disorders, it is also likely that the quality of green spaces, including seemingly irrelevant landscape design nuances, can play a more important role for our mental health. At present, one can observe strong demand from policymakers for generating scientific evidence-based knowledge to provide recommendations for urban design and the maintenance of green spaces. The Contemplative Landscape Model is an operationalized construct which includes esthetic, environmental, and mental health values of landscapes and could serve as a useful tool to assist in the current need for knowledge. However, more research with an emphasis on causal relationships is needed.

Keywords: Contemplative; Landscape; Exposure; Urban; Mental health

1. Introduction

A city can be successfully called a human habitat, a place where most of us live or will live soon enough – Figure 1. Fast urbanization, which began during the Industrial Revolution, initiated the large-scale separation of people from nature and has been linked with problems such as crowdedness and segregation, leading to social issues such as alienation, aggression, and to mental disorders[1,2].

It is more difficult to connect with nature in the urbanized world, characterized by traffic, pollution, and noise, where most of the living and working environments are indoors. Furthermore, even when going outdoors, it is difficult to escape the completely built environment. This can lead to mental health problems. The lack of exposure to biodiverse environments has been linked to depression[4], while extensive exposure to built environments has been associated with burnout and stress[5].

At present, the burden of mental health problems is one of the biggest challenges facing developed countries[6,7]. This includes neuropsychiatric diseases (19.5% of all disability-adjusted life years and 40% of all chronic diseases), closely followed by depression (6.2% of all disability-adjusted life-years)[6]. Common mental health and well-being issues include fatigue reactions (burnout) with psychophysical incoordination, mood swings, irritability, easy fatigue, and cognitive disorders. All of these issues, when sustained in everyday life over the years, can lead to depression and anxiety and other serious mental disorders in older age. Mental health problems not only deteriorate people's quality of life but also generate serious economic losses[5,6,8].

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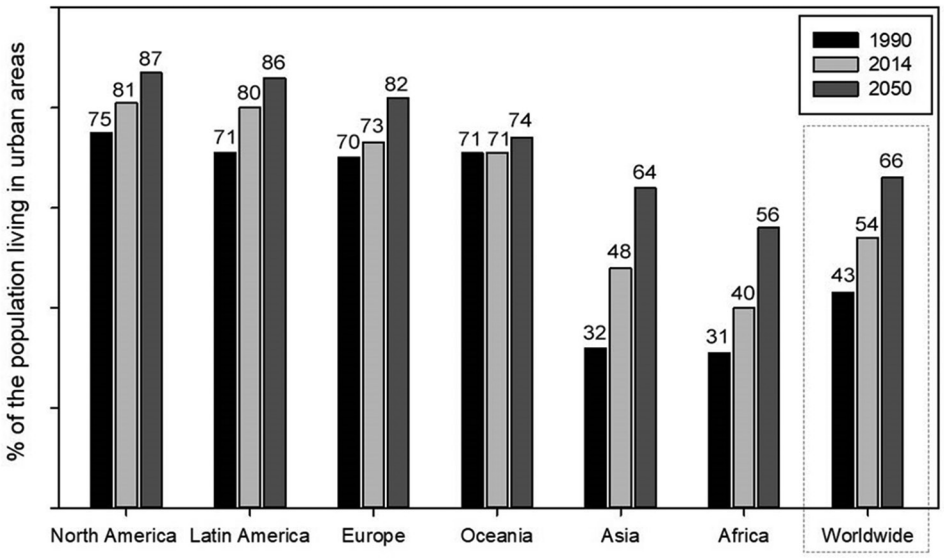

Figure 1; Population living in urbanized areas in 1990, 2014, and 2050 by continent and worldwide[3] UN, 2018).

These concerns have stimulated scientists to address these issues through inter-disciplinary research approaches. Among the various factors commonly known as increasing the risk of mental disorders (such as lifestyle, habits, and genetic factors), there are socio-environmental characteristics of the living environments[9-11], which may be related to the rapidly changing urban realm.

2. Passive Recreation and Passive Exposure

Besides, all the daily activities performed by the urban population, including self-care procedures, sport wellness activities as well as social interactions, there is a range of passively absorbed stimuli that may contribute to shaping the sense of well-being and mental health throughout the course of their lives. More and more researchers argue that there may be various mental health supporting or harmful exposures existing in the cityscape[12-14]. However, the existing knowledge on precisely which aspects and characteristics of these passive exposures are healthy to have been inconclusive, which has led to an ever-growing interest in the area from the general public, researchers, urban design practitioners as well as policymakers.

In this context, passive recreation design offers an opportunity to create evidence-based, mental-health-promoting exposures in cities. Passive recreation includes activities requiring minimal use of facilities and which have a low environmental impact on the recreational site, i.e., walking, hiking, bird watching, and all sorts of sedentary activities. Passive recreation is directly linked with contemplation, pondering, and reorienting oneself inward. Contemplation of nature during passive recreation activities is also one of the most commonly reported functions of urban parks and gardens[15], and exposing oneself to landscape scenes while simply relaxing and being in nature seems to be the primary motive of urban dwellers to visit parks[16].

Passive exposure to the natural elements of the landscape or naturalized elements built in cities can then have a key role in shaping positive mental health outcomes in the urban population.

3. Quantity versus Quality

A growing body of findings has highlighted the tremendous benefits that contact with nature has on human health and well-being. Experiences with nature have been shown to have psychologically restorative effects, such as recovery from stress and fatigue and the triggering of positive emotions[17-27]. Furthermore, exposure to natural environments has also been shown to improve cognitive functions (concentration, memory, and creative performance), and feelings of vitality while decreasing physiological markers of stress[27-30].

These findings have resulted in widely applied urban greening practices, incorporating elements derived from natural environments into buildings and interiors, as well as national and international action plans to provide access to public green spaces for city residents (Table 1).

Most of the standards relate to the area and proximity of green spaces from the residential areas, which can be summarized as the quantity of green mass accessible per capita. With the myriad types of green open spaces (Figure 2), there are no quality standards that would ensure design strategies and features beneficial to human mental health and well-being. This is probably due to the elusive nature of landscapes and challenges in measuring and standardizing their visual quality.

In addition, most recent cross-sectional studies on ecosystem services (ES) show that the mere existence of urban open spaces, or the area of green space in the urban fabric, does not always correlate with the delivery of ES associated with health and well-being. Researchers suggest that there must be other factors related to the quality of urban green spaces that could better explain the variability of ES provisions[35-39].

4. Need for Interdisciplinary Knowledge

At present, there is a growing demand from policymakers for knowledge about which landscape elements and design strategies trigger the most powerful positive health and well-being outcomes from environmental exposures. For instance, in the "Urban green spaces: Brief for action" recently published, the World Health Organization emphasized the need for

Context	Institution	Source	Aspirational provision standards
Global	United Nations	Sustainable development goals, Goal 11.7[31]	By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities (15% of the total area of public space that is 45% of average 150-ha city)
Singapore	National Parks Board	Guidelines on greenery provision and tree conservation for developments[32]	The formula for computing a proposed open space is 4.05 m² to every 56.0 m² of GFA (area of open space = [GFA/56.0 m²]×4.05 m²). This is subject to the following: A minimum plot area with an open space of 1000 m² A regular shape with a width of at least 30.0 m Not be fragmented by a road, canal, or other infrastructures Be free from encumbrances above and below the ground level The walking distance measured along the pedestrian walkway from the furthest house unit to the proposed open space should not be more than 250 m.
Victoria/Australia	Minister for planning	Planning and environment act 1987[33]	Local parks within 400 m safe walking distance of at least 95% of all dwellings. Min area 1 ha Linear parks and trails along waterways, vegetation corridors and road reserves within 1 km of 95% of all dwellings 5 ha per 60,000 residents. (~0.8 sqm/person)
England	Natural England	Accessible natural greenspace standard[34]	All people should have accessible natural green space: Of at least 2 ha in size, no more than 300 m (5 min. walk) from home At least one accessible 20 ha site within 2 km of home One accessible 100 ha site within 5 km of home

Table 1. Four examples of national and international agendas and recommendations for the provision of green spaces to the urban residents.

Figure 2; Examples of different types of green open spaces that are not "that green." (a) Jardim do Campo 24 Agosto, Porto, Portugal; (b) Praski Park, Warsaw, Poland; (c) Green parking lot, Toa Payoh, Singapore, (d) Olympic Park, Melbourne, Australia. Source: Google Street View.

change in urban health initiatives with a strong focus on the creation, promotion, and maintenance of green spaces, with an explicit call for expert advice[40].

This need for knowledge resulted in multiple transdisciplinary initiatives, which ultimately aim at informing public decision-making. For example, the ongoing project EKLIPSE, cofunded by the European Commission and the World Health Organization, gathers 11 international experts from relevant disciplines to synthesize the existing knowledge aimed at determining "*Which types and components of urban and peri-urban blue/green spaces have a significant impact on human mental health and mental well-being*"[41]. The final output of the project will be a complete systematic review on this matter.

Moreover, there is also the Design and Health Research Consortium, which was established in 2015 under the American Institute of Architects and is comprised 19 experts from both design and public health disciplines. Members of the Consortium are expected to improve the usefulness and quality of research linking design to health outcomes[42].

The areas of evidence-based design and science-informed design of our cities seek for suitable, sometimes seemingly distant, methods to provide evidence. One example is neuroscience methods such as electroencephalography (EEG), functional magnetic resonance imaging, and functional near-infrared spectroscopy, which are used to test the human brain

response while exposed to different environmental stimuli. Several research teams and individual scientists, including the author, have approached this topic and are continuously improving their experimental designs[43,44]. A new vocabulary bridging psychology and psychiatry with the urban design is also emerging, with the newest term: Neurourbanism[45]. Furthermore, several international organizations with a focus on assessing design with neuroscience tools have been established such as the research NGO NeuroLandscape in 2017[46], the Academy of Neuroscience for Architecture in 2006[47], and some postgraduate courses such as Neuroscience Applied to Architectural Design in Venice, Italy,[48] and the Arbib Neuroscience and Architecture Course at the University of California, San Diego[49].

5. Contemplative Landscapes

With the great complexity of landscape types and features within one view, it is methodologically challenging to isolate and evaluate each component in terms of its potential beneficial effect on health, especially considering that some components may only be beneficial if juxtaposed with others or in special circumstances (for example, the warm light at sunset). Although it is an interesting research approach that could lead to, for instance, testing the scarce elements of natural landscapes effects on health, it seems easier to evaluate the landscape setting as a "whole picture," using reliable and valid criteria for each view.

The Contemplative Landscape Model (CLM) (Figure 3) recently developed by the author and described in a peer-reviewed paper[50] offers the possibility of systematic evaluation of the quality of landscape design understood as a landscape view/image perceived by an observer's eyes.

CLM is based on the assumption that each landscape view has some contemplative value determined by the aggregation of seven key-features including landscape layers, landform, vegetation, color and light, compatibility, archetypal elements, and the character of peace and silence. The process of identification of these features was based on a thorough literature review and expert consultation through discussions based on the Delphi method. 37 landscape features and design strategies formed 7 key-categories, which had been further tested for reliability and validity[50]. As a result, the psychometric landscape evaluation tool called the Contemplative Landscape Questionnaire was formed to serve experts in the assessment of any given green outdoor space in terms of its contemplative value.

Furthermore, the effects of highly contemplative landscapes were evaluated in a passive exposure EEG experiment, by comparing the brainwave oscillations averaged across participants between resting state and exposure to landscapes with high and low contemplative scores[43]. This study suggests that highly contemplative landscapes capture more visual, stimuli-driven, and effortless attention from the viewers, which can be linked with switching attention systems[27,51] and is compatible with a stress reduction mechanism.

The CLM can be used not only to evaluate existing landscape views but also to inform an evidence-based design through its practicality and compliance with the classic landscape design theory principles. The CLM has been featured

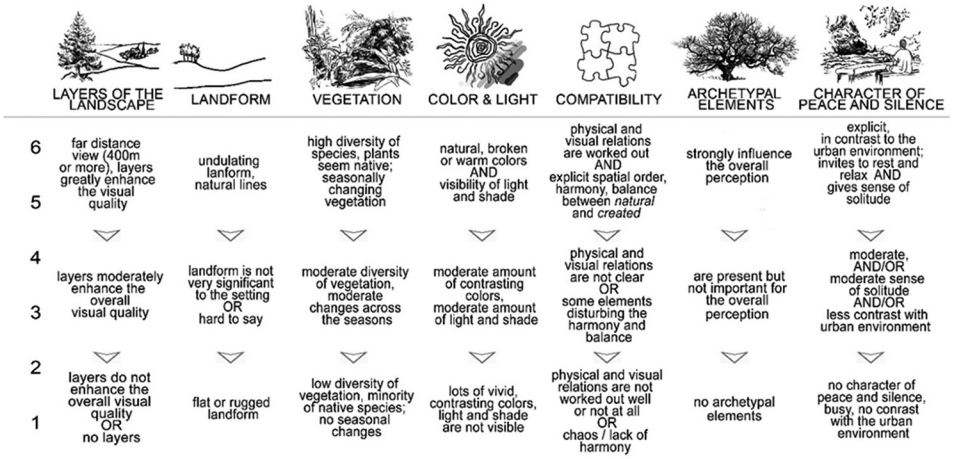

Figure 3; Contemplative Landscape Model for landscape evaluation with 1–6 points scoring scale.

in a book of guidelines for the design of new public neighborhoods in Singapore, as part of providing an esthetic values ES to residents[52]. An operationalized concept of Contemplative Landscape can also serve as the basis for creating digital tools that can help recognize the most contemplative landscapes from a large number of sites. An example of this is the Contemplative Landscape Automated Scoring System, an artificial intelligence-based software that scores any given digital image of a landscape according to the CLM criteria with a tested accuracy of an expert[53].

6. Conclusions

In the current search for healthier built environments in cities, there is a need for rigorous scientific evidence on the influence of passive exposures to certain landscapes on the mental health and well-being of urban dwellers. More specifically, data on which types and components of urban landscapes can help alleviate the burden of mental health disorders and can improve quality of life among the urban population.

There is a growing number of research initiatives as well as calls for knowledge continuously emerging in the field of evidence-based design for healthy urban landscapes. The knowledge is still limited. It lacks more rigorous experimental design, the development of interdisciplinary bridges, demonstration of the causal as opposed to just correlational relationships between design strategies and positive health outcomes, and replication of experiments. While there is still much ahead for researchers, there have been attempts to make vague landscape design language operational for science.

An operationalized and validated CLM offer an adequate frame for scoring views in any urbanized settings and can be used together with scientific methods from various disciplines (such as neuroscience) to inform design practice and urban decision-making in an endeavor to create healthier built environments for the ever-growing urban population.

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