

Design Strategies for Healing Internal Environments and Workplaces A Theoretical Framework

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The purpose of this paper is to construct a theoretical framework for designing healing environments by drawing from existing research. The approach of the paper surveys the literature on how elements of the design have been brought to bear on healing. This effort leads to a holistic approach that considers multiple dimensions of healing as both an individual and social process. The findings of the paper are harnesses that knowledge to provide a theoretical framework based on three design strategies: 1) *supporting strategies* that use specific elements to reinforce physical health, vital life energy, and psychological well-being; 2) *balancing strategies* that are oriented toward harmonizing those elements; and 3) *nourishing strategies* that address emotions, spiritual life, and the soul. Originality, in summary, this paper traces efforts to harmonize individual human health with the built environment across time and uses related knowledge to crystallize a new theoretical framework. It is hoped that this survey of the literature may add to holistic and systemic understandings of healing environments.

Keywords: healing environments, salutogenesis, biophilic architecture, anthroposophical healing, healthy city profiles.

The concept of healing is based on the creation of natural features around human habitation, artificial healing, one of the most important proposals associated with a hospital environment that fits a person's lifestyle. The study focuses on building a framework for designing strategies for the treatment of the built environment, reviewing specific health architectural studies as a first step: identifying the natural health features or general health appearance of the built environment, and the second step: spiritual, building a typical model

The modern industrial-era hospital is not only architecturally fragmented as a *structure*, reflecting the needs of bureaucracy, but it is also fragmented as a *process*, making it difficult for staff to truly cooperate. As a result, it is usually only the symptoms that receive treatment and not the underlying and more complex origin or cause of the illness. Kimball, for example, (2005) described modern hospital structures as "paternalistic, fragmented, independent silos, top-down, top-heavy, bureaucratic, multiple layers, hierarchical, like a bureaucracy state, lack of two-way communication, physician-centric, model-driven clinical model. of business". This is a rather strong condemnation

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Introduction



of the healthcare systems that prevails in much of the world, but unfortunately, it appears to be accurate. Even empirical studies reinforce that conclusion. For example, Badash (2017) found that "The current health care system in the United States (US) is characterized by high costs and adverse patient outcomes".

The article aims to define the main design strategies of healing internal environments, As presented below, this paper identifies three basic sets of strategies for designing healing environments and workplaces.

First, there are *supporting strategies* that use specific elements to reinforce physical health, vital life energy, and psychological well-being. A large body of research has emphasized the role played by natural light, color, surfaces, spaces, sounds, and other elements. Alone or together, they are associated with positive health, and more specifically with health that is 1) physical, 2) part of the vital life energy; and 3) psychological. Recognizing the importance of those elements and implementing them in the context of healing is what represents supporting strategies.

Second, there are *balancing strategies* that are oriented toward harmonizing those elements. The work of Asmussen in particular calls attention to the importance of having elements combine, and building design comes together, in a manner that reinforces the various dimensions of human health. Here, the central concept is the manifestation of opposing yet complementary forces, one that achieves a higher sense of unity, or one that moves from thesis and antithesis to a new thesis. As described in the earlier part of the paper, a sense of harmony, balance, and equilibrium is directly related to health and healing. A balance of design and its elements is therefore reflected in a balance of dynamic life experiences. Balance is essential for spiritual well-being, as well as for the spiritual health of the soul.

Third, there are *nourishing strategies* that address emotions, spiritual life, and the soul. We may not be able to design the atmosphere of the area, but we can design air-conditioning facilities, which show how the area is used, acquired, and how much it is valued. This third strategy, in a sense, goes beyond the basics. It involves concepts and forces across all levels of the body, mind, spirit, and soul. Here, too, Asmussen contributed by developing an architecture that reinforced the life-sustaining factor of healing. Architecture has the task of making people feel belong and at peace with their world. Addition-

ally, this third strategy also speaks to the quality of emotional nourishment, and joy. A roadmap of the theoretical approach is provided in Fig. 1.

The three strategies described above are not entirely new or invented; they are reformulations of existing approaches that account for how wide and deep the research field is, and that also account for the latest developments in the literature.

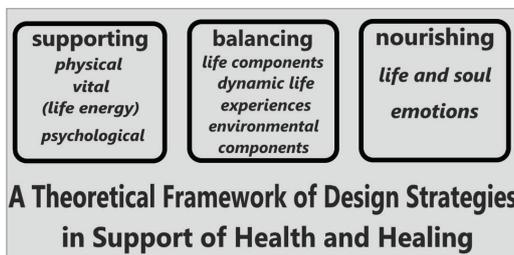


Fig. 1

A Theoretical Framework of Design Strategies in Support of Health and Healing

Before delving into the literature and extracting the most useful insights, it is important to define terms and concepts. Definitions of healing are abundant but among the most compelling is that of Jonas et al. (2003):

"Healing is a dynamic process of recovery, repair, restoration, and transformation of the mind, body, and soul on the path to becoming more whole. Healing occurs at many levels of the human system—mental, physical, emotional and spiritual".

The definition of health above also recognizes that the true nature of illness and disease is more systemic than suggested by mainstream medicine. The process of healing, as explained by Day (2003) should be understood in the context surrounding the individual, family, and society. When a person's systems – mental, physical, emotional, and spiritual – are thrown off balance and into

a state of disequilibrium, there are often symptoms that manifest as physical problems. So, what is often regarded as a disease is in reality the outward manifestation of a more underlying or systemic problem. Fortunately, the human body still retains its inherent and instinctual capacity to return to a state of internal stability, to a normal state of homeostasis and full balance. Healing and healthcare, therefore, are partly about reconnecting the individual patient with this inherent capacity. Day (2003) also added that the healing process involves an individual integrating the different levels of physical, emotional, and spiritual life, including the soul.

The perspective described above is compatible with an approach known as anthroposophical medicine, which also approaches human health from a systemic or holistic perspective. More specifically, the anthroposophical concept, conceives of the human organism as a manifestation of multiple elements including physical forces, formative growth forces, and an interacting *anima*, or soul, as outlined by (Sparby, 2020) (Kienle et al. 2019). From this perspective, human existence can be thought of as a kind of system of systems, complete with sensory, motor, nervous, and circulatory systems, and, finally, with an additional *Geist*, or spirit, involved in individual expression and reflection. It is important to note that scholars are not the only ones crystallizing definitions of health. The World Health Organization (WHO), as an international organization affiliated with the United Nations, described health in its constitution in holistic terms: "Health is a state of complete physical, mental and social well-being, not just the absence of illness" (WHO, 1948).

The literature has also a section included efforts to move towards a holistic definition of a healing environment. In this effort, Jonas define a healing environment as follows:, (Jonas et al. 2003)

"An an ideal environment for healing the system and environment that contains people, morals, treatments, and their psychological and physical boundaries. Its purpose is to provide conditions that promote and support the healing power of participants, their relationships, and their environment. This area may include general and specific physical, behavioral, psychological, social and spiritual components including treatment".

One attractive aspect of this definition is that it builds upon a holistic conceptualization of health to merge structure and process, that is, combining the ideas of a healthy built environment with professional practices, allowing healthcare providers to actualize their natural and professional talents.

The next section consists of an extended literature review that is divided into three parts, each corresponding with a different set of design strategies: supporting, balancing, and nourishing. The research methodology is in building a comprehensive conception of studies related to the description, interpretation, and evaluation of healing environments as a theoretical base that is a guide that supports designers of health buildings.

This document emphasizes design approaches that address design elements that promote and enhance self-healing capacity to create interiors that define a healthy lifestyle and are especially important for sick or safe people. three basic techniques are considered here as flow:

Supporting Strategies

There is a large and growing body of research on the elements that are most critical to supporting healing and healing environments. Regarding specific elements, Zetterquist (2009) pointed out that color can nourishes people not just in terms of their senses but also emotionally. From this perspective, color is not only an aesthetic property but can exert a subtle emotional or psychological effect and create a different mood. Vieneau (2019), too, recently focused on the element of color, noting that there has been a shift and that healthcare settings, colors "... such as gold curries, kiwi vegetables, crimson, and Caribbean blues are now considered as stimulant healing tools and therefore can directly promote healing ".Water, in addition to color, plays a role in healing environments as a symbol of peace, tranquility, and life. Water can be associated with energy, movement, and

Main Strategies of Healing Design (Literature Review)

abundance, which contribute to a sense of belonging. This natural phenomenon is often found in hospital gardens, which are often associated with the power of cosmic art (Stark, 2000).

Empirical findings support the observations above. The study of multiple sclerosis patients by Zetterquist (2009), for example, found that sunlight, color, and surfaces all exerted beneficial psychological influences. In addition, Stichler (2001) persuasively he argued that "natural views, natural light, soothing colors, therapeutic sounds, and human family interactions can improve the healing process". Another important factor is odor, especially the relationship between smell and health, and this access is the basis of aromatherapy. In this approach, rooms with a pleasant aroma of nature, flowers, and greenery, thus evoking a sense of vitality (Day, 2003).

Numerous scholars have been inspired to illustrate or test, with empirical research, the issues and questions arising in the field. Here, it is important to note the work of Mirkine (1996) and specifically the paper "*Physical, Spiritual, Emotional, and Psychological Features in Motivational Buildings Healing*." This research refers to the architectural building environment having the capacity to either strengthen or weaken the human immune system. Some of the factors involved are physical, such as a sufficient oxygen level or the presence of toxic chemical compounds, while other factors are sensory and include a comfortable temperature and a sense of open space and personal mobility, which has a psychological influence on the immune system as well. Some hospitals calculate these physical and sensory factors when evaluating policies and practices (Mir-kine, 1996). Indeed, what is important to recognize in this field is that there is a mutually reinforcing relationship between theory and empirical research.

Thus far, most of the literature surveyed has concerned itself with healing and the healing environment as they relate to hospitals, nursing homes, and other healthcare settings. Scholars have also recognized the importance of these principles in other settings, and in fact, numerous institutions and companies have translated those principles into practice. Here, it is important to note the development of a closely related research field, that of ergonomics, which has as one goal the shaping of the workplace environment so that it accommodates human factors. The research exploring this field includes Boff's (2006) "Revolutions and Shifting Paradigms in Human Factors and Ergonomics," and Gainer's (2008) "History of Ergonomics and Occupational Therapy," and Rucker's (2016) "The Interesting History of Workplace Wellness."

Within the context of healing environments but still related to ergonomics, Gray and Birrell (2014) conducted a study that found that human-centric, biophilic designs for the workplace can "It improves productivity, improves pressure, improves well-being, promotes a co-operative work environment and promotes job satisfaction, thereby contributing to a higher workplace." In a similar vein, Wallmann-Sperlich et al. (2019) explained that biophilic methods bring a natural environment to the workplace, and "preliminary data show positive effects on reducing stress and high productivity in the workplace". More recently, biophilic architecture, which includes green and intelligent buildings, mitigates negative influences on health from indoor work and exerts a positive influence, reinforcing physiological prosperity and psychological health:(Asim and Shree, 2019)

"In terms of efficiency, popularity, and productivity indoors, it is seen as a catalyst for constructive thinking and improving creativity..., which can improve mental performance, reduce stress, and provide peace of mind within the built environment."

Some of the principles described above have been extended to other employment settings. Vien-neau (2019), for example, considered correctional environments such as prisons, and observed the following:

"Noise Pollution Noise (i.e., "unwanted noise") is a common problem in correctional facilities due to overcrowding, sliding doors, loud speakers, working equipment, and televisions. It is widely known that excessive noise can cause communication problems, but can also affect physical well-being".

In this research field, a critical tipping point seems to be the realization that virtually every design principle mentioned above in the context of healthcare may also be applied to society at large. For example, make the case convincingly:

We also suggest that through the use of biophilic design traditional planning for traditional preservation will be improved as it will incorporate human physical, social and psychological well-being. The purpose of biophilic design is to integrate social and environmental sciences to produce human settlements that support human ecosystems...." (Baldwin, Powell, and Kellert (2011).

Why do researchers even go down this road of inquiry? What motivates extending these concepts and principles to the urban infrastructure? One justification is because society as a whole suffers from the illness, that is, the average person suffers from the "discontents" of "civilization" as Sigmund Freud might say – especially when one considers that life expectancy rates are declining in much of the developed world. Ho and Hendi (2018), for instance, found that life expectancy was falling in high-income countries, reversing a historic trend:

"Most of the countries most leading in the study experienced a decline in life expectancy between 2014-15; of 18 countries, 12 face a decline in the life expectancy of women and 11 experience a decrease in the life expectancy of men".

Regarding falling life-expectancy rates, the most recent studies highlight the negative health influence of obesity, a cause of Type-2 Diabetes, heart disease, and a myriad of other health problems. Suicide and the opioid addiction crisis in the United States also contribute to the reversal of life expectancy rates such that they are now decreasing in many countries. Berdine (2019) observed that in the US, the Center for Disease Control has reported falling life-expectancy rates for three years in a row and that it is not caused by elderly people dying sooner but rather by more young people dying sooner: "The increase in mortality rates among young people is due to general suicide and opioid overdoses in particular".

In mainstream society, few people imagine that a building's architecture can have such a profound effect on human health, but decades of research suggest that this is the case. Lundin (2015), for example, believes that architecture, despite being a non-medical medium, can indirectly support the recovery process by offering "functional possibilities" and "supportive space" for therapeutic experiences (Lundin, 2015). In some ways, modern society had to come to this realization the hard way by discovering an association between certain buildings and their materials and sickness. Lee and Van Orden (2008), for example, noted how in the 1970s scientists linked lung diseases to asbestos, a fire-retardant commonly sprayed on interior walls in the United States. This situation led to political controversy, multiple lawsuits, and many cases of lung disease. As inspectors turned their attention to industrial buildings and workplaces, they discovered a myriad of other materials that made people sick, along with related problems of ventilation (Marinelli and Bierman, 1995) and chemical irritation of the eyes, nose, and throat, skin, and nerves (Goodish, 1995). Many of these problems raised awareness about the importance of the built environment in human health.

In hindsight, Western societies had shown concerns over unhealthy urban conditions in previous centuries. Back in the early 19th-century, the built environment could be described as unhealthy, even sick. Davies (2015), for example, conducted an in-depth historical study and found that sickness and death in that era were due to a confluence of eight problems related to the built environment, and these are listed below.

1. Overcrowding. This increased exposure to infectious communicable diseases.
2. A lack of freshwater, plumbing, and sewage treatment. At that time, it was common for the fecal material of both humans and horses to contaminate the water supply.
3. A lack of personal hygiene in the general population. These unsanitary conditions allowed the disease to proliferate.

4. A lack of building regulations and housing codes. This deficiency led to many buildings with overcrowding, a lack of ventilation, and an absence of sunlight, increasing the risk of respiratory disease.
5. Pollution. This toxic discharge resulted from industrial plants and a reliance on coal to heat homes.
6. Dangerous working conditions in mines and factories.
7. Population density. This entails the concentration of poor people in certain parts of the city.
8. Inadequate medical infrastructure. This speaks to the population's limited degree of medical knowledge and irregular access to medical care (481).

A breakthrough of sorts was made in the mid-19th century with John Snow's map of the cholera outbreak in London. This was one of the first scientific milestones in linking the built environment and its configuration to disease. As described by Sarkar and Webster (2017), in 1851 John Snow used point mapping to trace the origin of the cholera outbreak to one single contaminated source of water. Sarkar and Webster (2017) were understandably impressed by the progress made since then:

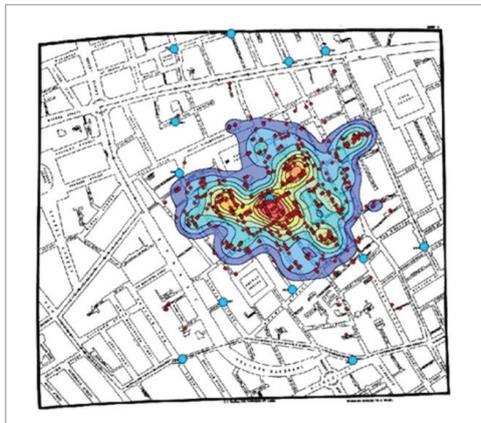
"For the first time in human history, we are now in a position to track down health organizations for the best diversity in urban planning. In a few months at the time of writing, the UK will have

unparalleled national data infrastructure and evidence-based evidence for the relationship between city planning and planning and specific health outcomes" (Fig. 2).

Thus, as demonstrated by Sarkar and Webster (2017), the study of healthy and unhealthy built environments has moved beyond depending on a few lone individuals or institutions, who in turn rely on sparse sets of data. The 1980s was a turning point with the introduction of Geographic Information Systems (GIS). Today, such analysis can also incorporate big data, data linkage, crowdsourcing, crowd computing, and Artificial Intelligence (AI).

Fig. 2

John Snow's 1851
Map of the Cholera
Outbreak in London



Source: Harvard University, The Prediction Project (2020)

The time appears to be right for the extension of healing environments to the wider urban setting (Capolongo, 2018). Guan, Roös, and Jones, D. S. (2018) echoed the importance of these principles. Fortunately, a theory has been put into practice in various cities around the world – in parts of those cities, as a start – including Singapore, Hong Kong, and elsewhere. Tan et al. (2019), for example, conducted a study of 326 older people in Hong Kong and Tainan (Taiwan region), which was designed to understand how adults view the Urban Green Spaces (UGSs), and found that positive relationships have been found between the health facility and the perceived safety in UGS. relationships were stronger for older adults living alone ”.

In this effort to apply healing principles and practices to the wider built environment, or to assess and evaluate those programs that have already been implemented, one useful tool that may be used in this extension, in this expansion, is the *biophilic healing index*. This index can be used to predict and measure the effects of the built environment on well-being. Salingeros (2020) is among the researchers most active in this area and describes the field as follows:

“The proposed "biophilic healing index" - a number from 0 to 20 - allows us to quickly examine those aspects of human health that have been improved due to environmental geometry. Biophilia refers to human reactions to living organisms and to the very special 'biophilic' geometry of our environment”.

Salingaros (2020) also explained that the positive effects of biophilia are produced "1) in close proximity and visible interactions with plants, animals, and other humans; and 2) positive feedback on artificial insemination following geometric rules..." (13). Seriously, these statements are now being investigated because people in such biophilic structures produce areas of emotional response "that can be measured by medical senses such as heart rate, skin temperature, and behavior, adrenaline level, student size, etc."

Given the benefits outlined above, Beatley and Newman (2013) contributed arguments to the discussion by extending the concept of health to human security in a larger sense:

"Biophilic cities are cities that provide close and daily contact with nature, the surrounding environment, but also seek to promote awareness and care of this species. Biophilic cities, it is said here, are also sustainable and strong cities. Achieving the conditions of a living city will go a long way in promoting social and environmental resilience, in the face of climate change, natural disasters and economic uncertainty and the various fears that cities will face in the future."

The context above is one in which physical and physiological factors are interrelated, making it is possible to conceive of the biophilic healing index and its measure of the degree to which something is biophilic. In the list below, each item on the index is assigned a numerical value of 0 (none), 1 (some), or 2 (a large amount), yielding a total whose maximum is 20. There are 10 components in the biophilic index as listed by Salingaros (2020).

- | | |
|--|---|
| 1. Sunlight: the best from many indicators. | 6. Details: meant to attract the eye. |
| 2. Color: variety and combination of hues. | 7. Water: sound and visibility. |
| 3. Gravity: balance and balance about a straight axis. | 8. Health: living plants, animals, and other people. |
| 4. Fractals: things that happen on a depleted scale. | 9. Representation of nature: natural decoration, realistic paintings, sculptures and symbolic sculptures. |
| 5. Curves: on small, medium and large scales. | 10. Organized-complexity: intricate yet coherent designs. |

Salingaros (2020) has also presented this index as a kind of equation as follows:

Biophilic Index = Light + Color + Gravity + Fractals + Curves + Detail + Water + Life + Representations-of-nature + Organized-complexity.

It is important to note that some cities have already had experience with metrics and evaluations of biophilic urban projects. Xue et al. (2019) studied this issue in their paper, *"From Biophilic Design to Biophilic Urbanism: Stakeholders' Perspectives,"* finding that in Singapore the concepts of "biophilic infrastructure," "sensorial design," and "green space place-making" considered by stakeholders to be most cost-effective strategies" (195).

Numerous scholars have been working along parallel lines. Liao (2019), for example, argued that it is time that cities be redesigned so that they reflect the principles discussed here:

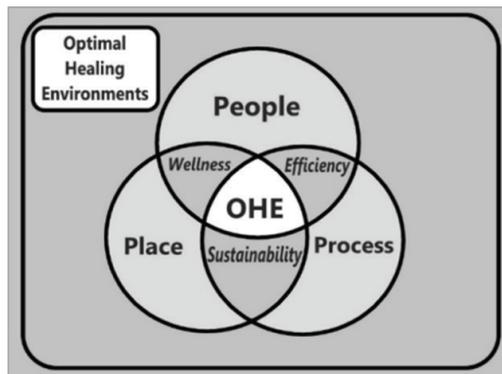
"Deliberate efforts are needed to improve the ecosystem functions of green urban areas, including parks, streams and river streams, planting roads, etc., to turn it into a real infrastructure or what Benedict and McMahon (2002) are all a 'life support system', without any disruption to urban development".

As suggested in the trajectory of this survey thus far, the principles of health, healing environments, and biophilic built environments have expanded across time to include non-healthcare settings and urban infrastructure.

Balancing Strategies

Scholarship has effectively addressed many of the topics related to the concept of balancing strategies. Zborowsky and Kreitzer (2009), for example, whose work lends itself to hypothesis generation and testing, emphasized the importance of a three-dimensional relationship between

Fig. 3

Optimal Healing
Environments

Adapted from Zborowsky and Kreitzer (2009)

people seeking a balance of body, mind, and soul, *places* based on wellness, and *process* as defined by efficiency and sustainability. Such a model is illustrated below in Fig. 3.

A similar and related model – entirely consistent with those included above – is furnished by MacAllister, Bellanti, and Sakallaris (2016), who identified that a balance among elements is instrumental in a patient's healing experience, as illustrated in Fig. 4 below.

The concept of moderation also focused on the work of Mahmood and Tayib (2020), which found that there are three key elements to building a

healing environment: (1) Appearance, (2) Privacy, and (3) Comfort and control. This is consistent with methods such as Kienle et al. (2019), excluding anthroposophical medicine is also derived from both consensus-based and traditional and complementary medicine (T&CM) programs:

"One important aspect of T&CM is to focus on patient-centered and multidisciplinary care as well as the integration of cultural perspectives on a variety of settings. It can contribute to the well-being and well-being of the people as part of the United Nations Sustainable Development Goals".

This observation, among many others, moves towards a more holistic view of health and healing environments. The built environment surrounding the patient, along with the kinds of treatment given to the patient, is supremely important in this larger system of health. As will be shown, the combination of shapes, sounds, color, light, and other elements all affect a person in profound ways; they can create relief and bliss or, conversely, tension and stress. One of the tasks in this review is to identify the combinations of environmental elements which are most recognized by scholarship as exerting a positive influence on health and healing.

In this research field, the work of Ulrich (1984) is significant because it initiated a round of empirical analyses that lasted for decades. In that 1984 study, it was found that patients' recovery times were shorter for patients who had an immediate view of nature, of trees than it was for patients who faced a white wall (Ulrich, 1984). This suggests that there is an equilibrium or balance between a patient's physical body and nature. Later, many other studies would confirm and refine the finding that the human body benefits through direct exposure to natural environments. Several years later, Venolia (1988) argued that a healthy environment should accommodate the multiple levels of interaction between caregivers and patients. More specifically, Venolia (1988) identified eight essential elements that should be brought together into a larger whole, most of which, in the decades to come, were further studied by scholars in the research area:

1. Improve communication with nature, culture, and society.
2. Enable the level of confidentiality required of the patient.
3. Reduce physical damage.
4. Space expansion with various incentives and various meanings.
5. Encouraging and providing time for rest and peace.
6. Allow people to interact with the environment.
7. Balance and stability over flexibility.
8. The situation should be good.

What is crucial to remember about these elements is that their presence in the built environment can manifest into a patient's physical space as healing effects. In contrast, the absence or the opposites of these elements, when countering these eight basic principles, can manifest as detrimental influences on a patient's health.

Another interesting balancing strategy with non-Western and Chinese origins is that of *feng shui*. As described by Mainenti (2018), this attention to the orientation and relationship between the built environment and cardinal directions is thought to play a factor in healing. Also, as described by Mak and Ng (2008) in their paper, "*Feng Shui: Alternative Framework for Complexity in Design*, "this traditional approach is ready to introduce the built environment." *Feng shui is a traditional Chinese philosophy aimed at creating harmony between nature, buildings, and people* ".

One well-known aspect of *feng shui* is the balance between the opposing yet complementary forces of *yin* and *yang*, with details about this knowledge contained in the *Yi Jing* or Book of Changes (Unschuld, 1986). Like contemporary systems theory and complexity theory, ancient Chinese civilization also focused on the relationship between micro and macro, that is, between the individual and the larger environment. In this worldview, the individual is a part of the rhythms of astronomical, meteorological, climatic, and epidemiological cycles (Needham, 2000). In addition to the concept of *yin* and *yang*, *feng shui* also has the five phases of North (Water), East (Wood), South (Fire), West (Metal), and Center (Earth), all of which factor into traditional Chinese approaches to healing environments (Mainenti, 2018).

The basic concept of *feng shui* has been applied in Western research. Obiozo and Smallwood (2017), for example, analyzed construction sites in terms of *feng shui* principles:

"Stress-related conditions from the construction environment that have no psychological and environmental implications lead to workers' injuries, and exclude their performance, as well as the cohesive integration of the workplace as a highly beneficial environment." and *feng shui* principles as a response to the psychological and constructive risks to construction through the expansion of construction sites ".

Granted, in the West, there is some disagreement over whether or not *feng shui*, as part of ancient Chinese cosmology, is real science. This question might be answered more definitively one way or the other if and when a new scientific paradigm emerges, one with new technological tools with which to test related hypotheses.

Other scholars have developed ideas along similar lines, as have architects. Consider, for example, Erik Asmussen's principles of life-enhancing designs, a topic addressed in the literature (Coates, 2001). Asmussen's architecture goes beyond matters of superficial appearance and reflects deeper functional and even spiritual elements. This involves the emergence of an architectural language merging artificial and organic forms, heightening one's sense of aliveness and participation in the outside world. Asmussen's buildings are widely regarded as life-enhancing in that patients are empowered and can strengthen the vital life force. Asmussen pointed out that architecture, in addition to efficiently provide for human needs, has the task of making people feel like ownership and beauty in the natural world. Buildings that create a sense of harmony between artificial and nature and space, a higher sense of unity, can catalyze human self-healing and self-renewal of nature (Coates, 2001).

Asmussen's architecture embodies seven vital principles of life-supporting design that are intended to support health and healing. These are listed below and then summarized in turn. It is important to remember that they are not intended to exist in isolation but rather in a unified balance (Coates, 2001).

1. Unity of form and function
2. Unity
3. Physical modification
4. It is in harmony with nature and space
5. Living wall
6. Color light and color vision
7. Powerful balance of local experience

First, there is the principle of *unity of form and function*, thus fusing the artificial and the natural in a way that enhances the mission or goal of the setting. Second, there is *polarity*, or the inclusion

of complementary opposites, including the rhythmic process of expansion and contraction: "To say those contrasting elements are polar is to say that they are at once different yet inseparably related" (Coates, 2001). Third, there is *metamorphosis*, meaning that things are not always what they appear and forms, surfaces, and colors can create new spaces and experiences at any moment. Fourth, there is a sense of *harmony* with nature and the site such that the building feels like it belongs there. Fifth, there is the concept of a living wall in that "downward-bearing load" and "upward-striving support" should be visible in the shape and surfaces of walls and windows, thus allowing the entire building to assume the qualities of a living and breathing organism (Coates, 2001). Sixth, there should be a sense of color luminosity and color perspective, and this is accomplished through the application of partially transparent layers of paint, thus creating a bright, luminescent surface that also has depth and richness. Seventh, there is the principle of the dynamic equilibrium of spatial experience, which as explained by Coates (2001) offers both security or intimacy and freedom:

"Consistency and flexibility, balancing and balancing, secure intimacy and increased openness are maintained in a critical and dynamic balance with the ever-changing experience of movement and relaxation. However whether one is moving or resting there is always a sense of dynamic balance where the seed of anti-space energy already contains the moment and the current. of equality and balance in all systems.

Nourishing Strategies

A closely related but distinct area of research includes that of strategies that nourish the spirit or soul. These strategies speak to a deeper level of influence by the elements concerned, and to a more profound sense of health and stability. For example, Stark (2001) noted how certain "axes" factor into healing environments, and these include cosmic principles of life and earth energy, topography and guidance, healing gardens and water use, interior spaces and energy flow, and finally building's occupational practices or rituals. Along similar lines, Day (2003) conceived of healthy buildings as those that nourish life's vitality, its physical, mental, and spiritual vitality. Fusing elements into a nourishing influence is an effort reflected in the work of Dijkstra, Pieterse, and Pruyn (2006), for example, who examined the interplay of many factors:

"Best results have been obtained, especially for sunlight, windows, scents, and seating arrangements. Inconsistent results have been obtained with sound, environment, landscape, television and several interventions."

Similarly, the benefits of providing sick children with "environmental exposure, play activities and testing spaces," and found that they not only help children, give them the freedom to be a child again, not just a sick child, but also help student nurses gain "... broader understanding of health care without -biomedical. It changed their learning and opened their eyes to the holistic approach to caring for sick children "(Van der Riet et al. 2017).

Nature is an element that has received considerable research attention. As observed by Hand et al. (2017), nature supports children's health:

"Children, in particular, are thought to show a deeper involvement in life (biophilia), and health disorders, such as attention deficit hyperactivity disorder, depression, obesity, and depression, are caused by a lack of contact with wildlife, which is called environmental disturbance."

Olivos-Jara (2020) also conducted an empirical study showing that for children, nature can have a positive psychological influence and reinforce their emotional intelligence.

A study of how medical gardens can nourish and improve health care knowledge for patients with Alzheimer's and dementia. The authors found that gardens stimulated mental regeneration and had other positive physical, social, and psychological effects. As they conclude: "Treatment gardens should be expanded to quickly locate more patients. Future indicators for the construction of

health gardens with a focus on patient experience are directed" (Uwajeh, Polay, and Iyendo, 2018) Running parallel with research on nature, scholars have turned their attention to the nourishing potential of art and its creation, something that invariably involves color. Arts-based activities have been found to promote healing. For example, Abulawi, Walker, and Boyko (2019) conducted an empirical study whose participants included children from the ages of three to 18, parents, medical staff, and four teams of designers. Art-based research activities and less formal discussions led to the conclusion that creating art can be part of the healing process. (Abulawi, Walker, and Boyko, 2019).

Another factor or factor, which often gets little attention from research, is how history and cultural values can nourish emotional and spiritual health. Jeong (2019), for example, has learned how the new Seoul Daehan Hospital, which is part of the Seoul National University Medical Center (SNU) Campus and Hospital, is integrated with the historical site of Kyungmo Palace in a way that reflects traditional architectural styles. As described by Jeong (2019):

"SNU Medical Campus and Hospital is an excellent case study of the future of using cultural heritage sites as places of healing. The construction of a healing space for medical sites that use a historical and cultural site provides a new meaning to cultural heritage through its sustainable use".

What is interesting about the Jeong study is that while many scholars have focused on the role of nature, few have considered the potential of historical sites as healing environments. Historical sites may be of particular value for traditional and collectivist cultures, like those in Asia. Fig. 4.

As demonstrated by decades of detailed scholarship, the potential nourishing effects of the surrounding environment, which includes many diverse elements, is a significant factor in healing. Table S1 shows an overview of the theoretical framework of the study.



Source: Adapted from MacAllister, Bellanti, and Sakallaris (2016)

Fig. 4

A Framework for Optimal Healing Environments

This paper engaged in a sustained review of the literature that confirms the value of three overlapping and mutually reinforcing strategies. Academic research has engaged with the many elements of healing environments, along with systemic and holistic worldviews and perspectives. The exciting promise of this research field is one reason why the world now sees the extension of its elements and principles to settings beyond healthcare. At first, ergonomic, anthroposophical, and biophilic principles were extended to the workplace, to correctional facilities, and limited spaces or specific buildings. In time, these proposals could and should form the basis for a bold reformulation of life and healing.

Empirical testing has also shed light on just how significant these elements are. It is possible to consider the literature in its totality and propose a new theoretical framework consisting of three strategies. First, the paper has identified the importance of *supporting strategies* that use specific elements to reinforce physical health, vital life energy, and psychological well-being. This is an important preliminary step because it is necessary to identify specific elements. As shown in the paper, among the most important elements are light, shape, color, surfaces, and related ones such as nature and water. At this first stage, their combination, integration, or balancing is not the primary concern. In other words, supporting strategies tend to focus on the identification and distinguishing of specific elements and observations of how they support healing.

Discussion and Conclusion

Table 1

Shows an overview of the theoretical framework of the study

	Basic vocabulary	Minor vocabulary	Possible values and physical characteristics	
Design strategies, employment of self-healing process	Support strategy	Physical support	Space character	Human scale Reduce sharpness, the geometry of space
			Space components character	Daylighting
				Natural ventilation
				Use of raw materials
				Reduce environmental pollution of noise
				Reduce electromagnetic pollution EMF
			Relationship of a space character	Personalization
				Way-finding
				Flexibility
		Empowerment		
		Simulation		
		Coherence		
		Affordance		
		Control		
		Restoration		
		Vital support (life-energy)	Harmony with nature	Implantation at nature
				Use of natural materials
			Aspects of natural metaphors	Exposure of biological rhythm of nature (seasons, daily cycle)
				Renewable
				Breathing (contraction & expansion)
		Living wall	Growth	
			Fluidity & movement	
		Psychological support	Phenomenal impressions	Interaction between enclosure & eligibility
				Comfortable space
Pleasure space				
Desirable space				
Prevent implicit passive feeling	Rewarding space			
	Confusion of understanding difficulty			
	The frustration of hard decision maker			
	Deny from neutral space			
	Lack of control			
Sensitive responses	Disturbance of huge volume			
	Ugly of poor impressions			
	Cold, hard, bad, pollute, pure, warm, smooth.... ext			
Change of character	Change of color			
	Change of Smell			
	Change of light			

Design strategies, employment of self-healing process	Basic vocabulary	Minor vocabulary	Possible values and physical characteristics	
	Balance strategy	The balance of life components		Balance of basic components lifestyle (body, soul, spirit)
Balance of dynamic life experience			Lifestyle (life energy)	Individual & group, participations & isolation, mental image & reality, static & dynamic
			Space impression	Stability vs variation, order vs chaos, symmetry v's asymmetry, shelter v's openness, quiet v's crowded
Balance of surroundings, environment components			Nature and quality of the environment (natural or manufacture)	
Nourishment strategy	Soul nourishment-Life factor nourishment		Genius loci (belonging to the natural world)	
			Renovation meaning derived from the cosmic renewal of nature	
			Orientation and the biological clock	
	Emotional nourishment		Brightness of daylight	
			Brightness of color	
			Nature elements (water, gardens, wild)	

Second, the balancing elements take the theoretical construct to a higher level in that this level begins to situate and juxtapose the elements together. The goal of this effort is to reach a state of equilibrium between the elements such that it promotes the body's sense of equilibrium, in effect using the built environment to mirror and reinforce, physical health. From this perspective, balancing strategies are oriented toward integrating and transcending elements to reach a higher level of harmony.

Third, this paper has identified nourishing strategies for the spirit and soul. This level may incorporate or assimilate supporting and balancing strategies but the difference is that they speak to a higher level of spiritual consciousness and being.

At first glance, the topic of healing environments seems narrow but this paper demonstrated that it is not. The topic is multi-dimensional and includes a wide spectrum of sub-topics, some of them, such as feng shui, stretching back to antiquity. In large part, the latest developments may be seen as a reaction to the unhealthy state of cities and workplaces, a legacy of the Industrial Revolution. This paper calls for further research on the subjects raised above, including for more empirical studies on how healing principles may be evaluated once put into practice. Approaches such as the biophilic index show much promise, and an active and engaged research field has the potential for surmounting future challenges.

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