

Landscape Architecture and Health

Evidence-based health-promoting design and planning

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Abstract

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Swedes are living increasingly longer lives, but the number of years lived in good health is decreasing. The present doctoral dissertation is focused on the threat to Swedish public health that is constituted by aches and pain and various types of mental illnesses, of which fatigue reactions, often called "burnout syndromes," are increasing most rapidly. Besides the personal suffering involved, the costs of increased ill health constitute a threat to the welfare of Swedish society. According to the Swedish government, good health has become a resource – perhaps even the country's most important resource for sustainable development.

Today, several scientific disciplines consider health to be a positive and holistic state encompassing the individual's entire life situation: biological, cultural, social and not least environmental aspects. With the Swedish Parliament's adoption of the public health bill *Public Health Objectives*, public health work in Sweden is to be based on the idea of finding different societal factors that promote good health on equal terms for the entire population. The present doctoral dissertation focuses on a health factor represented by different types of natural environments. The dissertation is based on two studies of two different types of health-promoting natural environments:

Healing gardens – Improvement of ill health
Urban green spaces – Maintenance and fortification of good health

Healing gardens are gardens that are purposely designed to promote health among a certain group of patients. The dissertation focuses on the type of healing garden that is specially intended for patients suffering from fatigue reactions or burnout syndromes. Interest in healing gardens is spreading rapidly throughout the world. However, both in Sweden and in other countries, "healing gardens" are being laid out that do not actually possess health-promoting qualities. In order for health to actually be improved, purposeful design based on the patient group's special needs is required. There is a great need for scientific knowledge concerning how these gardens should be designed.

For a long time past in our history, the importance of city greenery for city dwellers' health and well-being has been pointed out. In the present dissertation, urban green spaces – i.e. greenery in the city such as parks, green areas, schoolyards and gardens belonging to a house – are viewed as health-promoting elements of city planning. Interest in how urban green spaces can maintain and fortify human health is spreading among scientists, architects, politicians and the public. Despite this interest, the problem remains of how urban green spaces should be planned and designed so as to attract the urban population.

The dissertation has an applied perspective and is aimed at both scientists and practitioners. It presents findings from two different studies, one on how healing gardens may be designed for people with burnout syndromes and the other on how urban green spaces may be planned from a health-promoting perspective. The overall purpose is, thus, that the dissertation should contribute to the evidence-based design and planning of health-promoting outdoor environments.

Keywords: Landscape architecture, health, health promotion, healing gardens, urban green spaces, stress and evidence-based design and planning.

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He lay thinking for a while and then Mary saw his beautiful smile begin and gradually change his whole face.

“I shall stop being queer,” he said, “if I go every day to the garden. There is Magic in there – good Magic, you know, Mary. I am sure there is.”

“So am I,” said Mary.

“Even if it isn’t real Magic,” Colin said, “we can pretend it is. *Something* is there – *something!*”

“It’s Magic,” said Mary, “but not black. It’s as white as snow.”

(*The Secret Garden* by Frances Hodgson Burnett, 1909)

Content

Background, 7

How it all started, 7

Pilot project – Solberga Park in Älvsjö, 8

Lessons from the pilot project, 9

Introduction, 10

Why landscape architects should design for health, 10

Theories and central works, 11

Literature on theories from environmental psychology, 11

Literature on theories of design of healing gardens, 12

Literature on planning of urban living environments to promote health, 13

Comments on the selected literature, 14

Problem formulation in the dissertation, 14

Study aim, 15

Central concepts in the dissertation, 15

The two studies in the dissertation, 18

Study 1, 18

Study 2, 18

Methods in the dissertation, 19

Summary of papers, 20

Paper I: What Makes a Garden a Healing Garden?, 20

Paper II: Experiencing a Garden: A Healing Garden for People Suffering from Burnout Diseases, 21

Paper III: Landscape planning & stress, 23

Paper IV: A Garden at Your Doorstep May Reduce Stress: Private Gardens as Restorative Environments in the City, 24

Paper V: Urban green spaces: Promoting health through city planning, 25

Discussion, 26

Concluding remarks and future research, 28

Acknowledgements, 29

References, 31

Printed sources, 31

Internet sources, 33

Schematic summary of research results, 34

Figure 7, 34

Figure 8, 36

Appendix

Papers I-V

The present thesis is based on the following papers, which will be referred to by their Roman numerals:

- I. Stigsdotter, U. A. & Grahn, P. 2002. What Makes a Garden a Healing Garden? *Journal of Therapeutic Horticulture*, vol 13, pp. 60-69.
- II. Stigsdotter, U. A. & Grahn, P. 2003. Experiencing a Garden: A Healing Garden for People Suffering from Burnout Diseases. *Journal of Therapeutic Horticulture*, vol 14, pp. 38-48.
- III. Grahn, P. & Stigsdotter, U. A. 2003. Landscape planning and stress. *Urban Forestry & Urban Greening*, vol 2, pp. 1-18.
- IV. Stigsdotter, U. A. & Grahn P. 2004. A Garden at Your Doorstep May Reduce Stress: Private Gardens as Restorative Environments in the City. *Open Space: People Space, An international conference on inclusive environments, 27-29 October 2004, Edinburgh, Scotland.*
<http://www.openspace.eca.ac.uk/conference/proceedings/summary/Stigsdotter.htm>.
Conference proceedings.
- V. Stigsdotter, U. A. Urban green spaces: Promoting health through city planning. *Inspiring Global Environmental Standards and Ethical Practices*. The National Association of Environmental Professionals', NAEP, 30th Annual Conference, 16-19 April 2005, Alexandria, Virginia USA. *Conference proceedings. In press.*

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Paper III is reprinted with permission from Elsevier.

Paper IV is reprinted with permission from Open Space: People Space; The research centre for inclusive access to outdoor environments, Edinburgh, Scotland.

Paper V is reprinted with permission from The National Association of Environmental Professionals, NAEP, USA.

Background

The present dissertation is a collection of papers previously published by the candidate, preceded by an introductory text. According to the Swedish University of Agricultural Sciences' regulations, the work must consist of at least three and no more than five papers as well as an introductory part (www.slu.se, 2005-02-17). The role played by the introductory part may vary across dissertations. At my final seminar, I was advised by my examiner, Professor Thomas B. Randrup at *Forest & Landscape*, The Royal Veterinary and Agricultural University of Denmark (KVL) in Copenhagen, to view the introduction as a summary of my time as a postgraduate student. I chose to take his advice, as I believe that such a summary will explain how and why my dissertation's various questions and papers have developed.

How it all started

When my time in the landscape architecture program was nearing its end, I still had questions for which I had not received answers during my training. These questions concerned human beings and their longing for good places in the form of gardens. I was fascinated by the Christian idea that humankind is connected to the garden, both in terms of the origins and future of humanity, through the Garden of Eden and the heavenly Garden of Paradise (see Paper I). I found in different religious doctrines similar stories depicting the garden as central for humans (Stigsdotter, 1999; 1998). My thoughts wandered to heavenly heights, and the topic and title of my Master's thesis was *Längtan efter Paradiset (Longing for Paradise)*, Stigsdotter, 1998). My questions – how the longing for Paradise was manifested in medieval monastic gardens and in the renaissance gardens of popes and cardinals – and my background in art history brought me to Italy, the Swedish Institute in Rome and its surrounding landscape. With great fervor, I studied, compared and experienced the monastic gardens and the *hortus conclusus* of the renaissance gardens. My question may seem pretentious and I did not find a straightforward answer, other than that the longing for a secure, innocent and sheltered garden appears to be a universal (Stigsdotter, 1999; 1998). Moreover, I was struck by how remarkably similar the designs of these different religious doctrines' gardens were, with their enclosing walls, geometrical form, just a few symbolic trees and a centrally located water theme (see Figure 1, *ibid.*).

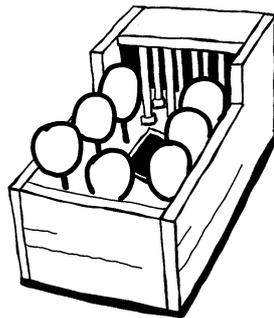


Figure 1. A sketch of an ancient Egyptian model of a small garden. Models of this kind were placed in graves and followed the deceased into the afterlife. Drawing by Ulrika A. Stigsdotter.

My thoughts concerned how landscape architects might design gardens that correspond to this longing in modern humans. According to the Christian doctrine, what is waiting for the faithful after death is eternity in a garden, where they will live in peace with other animals and humans and where there is no shame, pain, illness or hard labor (Stigsdotter, 1999; 1998; Prest, 1988). But is it really a garden in paradise we are longing for today? My thoughts continued toward connecting the idea of a good place to that of a healthful place. The subject of health is always topical, as health is something we all strive for and hope to achieve. In Swedish, the word *hälsa* (health) is etymologically tied to the words *hel* (whole) and *lycka* (happiness) (Hellqvist, 1999; see also Paper V). Thus, health is a positive state encompassing the individual's entire life situation, not least concerning his/her environment (see Paper V). How do we, as landscape architects, create healthy and happy environments? We did not learn how to do this in our training.

My interest in the relation between people and good and healthful garden environments caused me to contact Associate Professor Patrik Grahn. He immediately presented for me the phenomenon of *healing gardens* and enabled me to gain practical experience of them in a pilot project prior to my postgraduate studies.

Pilot project – Solberga Park in Älvsjö

In comparison to heavenly gardens, the pilot project constituted an abrupt step into reality. The pilot project was a research and training project run by Älvsjö, a city district just south of Stockholm, and Movium, the Swedish University of Agricultural Sciences' secretariat for urban outdoor environments. The overall goal of the project was to develop a beautiful, stimulating and functional park environment at Solberga Nursing Home in Älvsjö. The park was to be designed primarily for the very old and ailing. The objective was that the park should be a beautiful and secure place offering opportunities both for solitude and for interaction with other residents, family, friends and staff. I carried out the research assignment, which entailed documenting – through participant observation – the process from ideas to design and laying out of the new design proposal for the park (Stigsdotter, 2000). I developed this design proposal in collaboration with the nursing staff and the residents (see Figure 2).

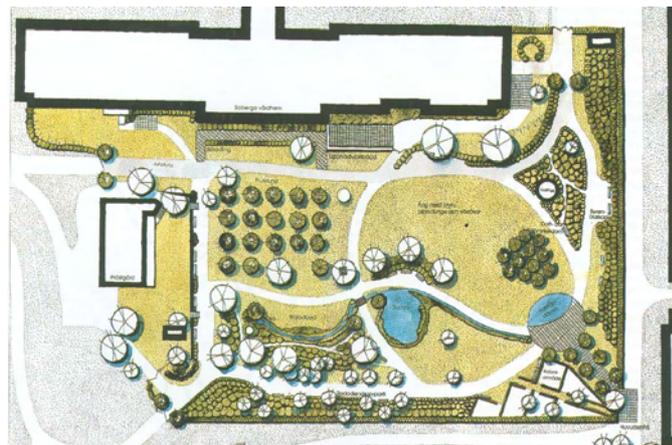


Figure 2. *Plan for Solberga Park, drawn by Ulrika A. Stigsdotter.*

Lessons from the pilot project

My greatest lesson from the pilot project was the realization that designing people's living environments, particularly environments for the weak and ailing, entails an enormous responsibility. In the literature I found a great interest in creating gardens for different patient groups, but I also found very little theoretical ground on which to base my work of giving shape to healing gardens.

I had my strongest experience from the pilot project while sitting with the nursing staff and together sketching a plan for Solberga Park. I realized then that I would never find their insights in books and that collaboration with nursing staff is crucial when designing gardens and parks for different patient groups. One clear result of the collaboration between the various professions is the bridge over the brook through Solberga Park, which involved the joint efforts of a physiotherapist, an occupational therapist, a landscape architect and a carpenter. It is not only a bridge, but also a fine example of universal design, as people can – on equal terms – cross over the bridge regardless of whether they need a wheelchair, a walker, the support of a railing or are fully physically mobile (see Figure 3).

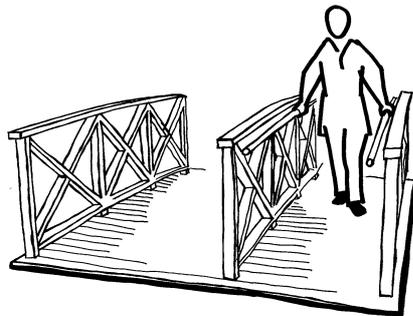


Figure 3. *A sketch of the accessible bridge in Solberga Park, drawn by Ulrika A. Stigsdotter.*

During my conversations with the elderly residents, their longing to go out into the park was revealed, as was the importance of both physical and psychological accessibility. This implies that residents must be physically able to use the park, but also that they must dare to be there – they must be sure that they can find their way back to the building and that there are many benches in case they suddenly need to sit down. In Solberga Park, we tried to address these concerns by ensuring that all paths lead back to entrances to the building, that all entrances are clearly marked and that there is a maximum of 25 meters between benches.

The project continued after I left to begin my postgraduate studies. It has resulted in two reports on how the park has affected residents' health (Lenninger, Olofsson & Thelander, 2002; Olofsson & Thelander, 2002). Although today I might design the park somewhat differently based on the knowledge gained through my studies, recent research shows that Solberga Park is appreciated, used and seems to have positive effects on residents (ibid).

Introduction

The Swedish population is becoming increasingly older, but the years people spend in good health are fewer and fewer (SOU, 2002:5). Ill health is estimated to cost society 258 billion kronor (Lundgren, 2004; see also Paper V). As a result, health is now considered a resource – according to the Swedish government, the most important resource for sustainable development (Skr., 2003/04:129). In addition to the financial loss for society in terms of the costs of rehabilitation, illness may also lead to personal suffering. Serious and long-term illness may affect the life situation of the entire family. Thus, we even have a great deal to gain by working toward maintenance of Swede’s health and rehabilitation of people who are on the road to recovery.

Why landscape architects should design for health

The major illnesses facing society today are mental conditions and aches and pain (Prop. 2002/03:35). These mental conditions include fatigue reactions, or in popular speech “burnout”, fatigue depression, anxiety, depression, fatigue and various more serious diagnoses such as psychosis, schizophrenia and borderline personality disorder (ibid). Aches and pain include backache, neck pain and diffuse pain such as in fibromyalgia. The people most likely to suffer from these conditions are the gainfully employed between the ages of 25 and 65 years (ibid). Different research disciplines are now focusing great interest on how the environment may help to promote health and prevent burnout syndromes. More researchers and others are beginning to view health from a holistic perspective encompassing people’s entire life situation: biological, cultural, social as well as environmental aspects (see Paper V; Hansson, 2004; Qvarsell & Torell, 2001).

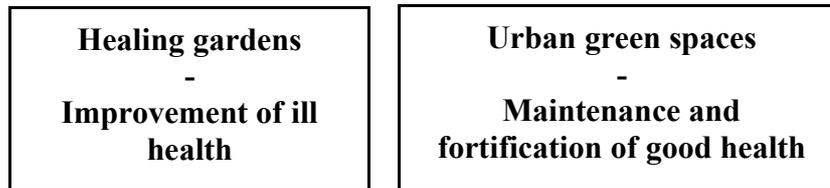


Figure 4. A schematic of the two types of outdoor environments the dissertation focuses on and the expected effects on the visitor’s health status.

This holistic outlook means that, with regard to working towards human health, there is a great deal for landscape architects to do (see Figure 4). Landscape architects may work with designing healing healthcare environments – outdoor areas surrounding hospitals, nursing homes, psychiatric treatment centers – areas surrounding prisons as well as with specially designing healing gardens geared toward rehabilitation of different patient groups. Today, however, the question of how these different healing gardens should be designed so as to promote patient health is mostly unanswered. Yet landscape architecture and landscape architects can contribute even more to human health. For a long time past in Western history, there has been an awareness that greenery in the city may help to promote city dwellers’ health (see Paper V). Because society was responsible for the health of the populace, during the period of industrialization city planners struggled to improve health by offering better sanitation, better housing, safer workplaces as well as sunlight, fresh air and greenery. The question thus arises: How can landscape architects “build away” the stress that causes today’s burnout syndromes?

Theories and central works

Because the different papers in the dissertation include examples of literature in environmental psychology dealing with theories of why and how human beings are affected by their environment, these theories will only be briefly mentioned here. Since the present approach to landscape architecture and health is applied, I will also discuss literature on the design of health-promoting environments. Because this area of study is quite broad, I have chosen to focus on the dissertation's two main lines of inquiry: literature on theories of design of healing gardens and literature on theories of how everyday urban living environments should be planned in order to promote the health of city residents. The selection is intended to illustrate the state of the art in the field of study – landscape architecture and health – by emphasizing significant works and pointing out areas that lack scientific knowledge.

Literature on theories from environmental psychology

Paper III presents people's answers to the question: "What would you recommend a close friend to do if he or she felt stressed and worried?" Among the nearly one thousand randomly selected respondents, there was considerable consensus concerning their primary recommendations:

- take a walk in the forest
- listen to restful music
- take a good rest in a silent and quiet park

Respondents also showed agreement by placing last on their list of recommendations "take sedatives." Their answers would seem to indicate that people have a sort of common inherent feeling that it is good to visit natural environments when we feel stressed and worried (see Papers III and V). Several researchers, based on their different perspectives, have tried to explain why people derive pleasure from being in natural environments. Because these perspectives are presented in most of the articles (Papers I-IV), I will only provide a short account of leading theories here.

Most Swedes no longer live in rural areas, but instead in cities or larger population centers (Statistics Sweden, 2000). Moreover, Swedes spend the greatest proportion of their lives indoors (Qvarsell & Torell, 2001), which is a fairly recent phenomenon in the history of humankind. Actually, only during the most recent century did we stop living lives marked and influenced by the conditions of nature. Several scholars base their theories on the notion that we are biological individuals "designed" to live in close contact with nature (Coss et al., 2003; Ulrich, 2001; 1999; 1993; 1984; Coss, 1991; Ulrich et al., 1991). In natural environments such as parks and gardens, people are able to react to and trust their reflexive and emotional reactions to their surroundings (ibid). There are reflexes and feelings that warn us about dangerous environments, for example, environments with steep slopes, those that are narrow and dark or dry and lifeless (ibid). At the same time, there are other reflexes and feelings that attract us to open, light environments with access to water and vantage points (ibid). For humans, the city constitutes an unnatural environment in which we cannot trust our reflexes and feelings.

Modern city environments may be so unnatural as to cause us to more easily experience stress reactions while in the city, whereas natural environments allow us to relax and rest. Another theory claims that the higher cognitive centers of the human brain are able to rest when we are out in natural environments (Kaplan & Kaplan, 1989). This is because the

brain is capable of two types of attention: directed attention, belonging to the higher cognitive centers, and soft fascination, linked to the old parts of the brain (ibid). In natural environments, the higher cognitive centers can rest, while the old part of the brain is stimulated, giving us restorative experiences. Untidy environments make us tired, while clear and easily read environments give us rest. We also need mild stimulation in order for rest to be healing, and such stimulation may be found in certain natural environments (ibid).

The experience of stress, however, is something quite natural. Stress reactions are fundamentally the same reactions that once, at the beginning of human history, helped our forefathers survive by preparing the body for fight or flight. Today, instead of fighting or fleeing, we experience stress. For this reason, it is important that city environments offer opportunities for recovery from stress in the form of, e.g., parks and gardens (Asp, 2002). Starting from an evolutionary perspective, some scholars (Herzog et al., 1997; Appleton, 1996; Ulrich 1993; Coss, 1991) consider that, in order to survive, primitive humans had to be able to read in nature the possibilities and obstacles of the environment, so-called "affordances" (Gibson, 1982). Moreover, they believe that this cognitive function still operates in us today. Thus, we experience as restorative natural environments that send messages of security. These theories indicate the need for conscious design, as all natural and garden environments are not experienced as good, secure and restorative (Ulrich, 1999).

Literature on theories of design of healing gardens

In the almost five-thousand-year-old work *The Epic of Gilgamesh* from Mesopotamia, the historical king sings his song of praise to a magnificent garden of paradise. In the garden, King Gilgamesh finds comfort and strength after the sorrow he experienced at the death of his friend. The work is considered the world's oldest preserved epic (Olsson & Algulin, 1990), and may be said to be the world's oldest description of a healing garden. Although the phenomenon of healing gardens has been part of Western culture for thousands of years, it is first during the latest decade that scientific works have been published in the area. In a 1998 issue of the journal *Landscape Architecture*, J. William Thompson directed a question at landscape architects: ".../ do they yet know enough to shape such gardens so that they really help patients to heal?" (Thompson, 1998). His question was justified. Through its design, a healing garden should be able to support and strengthen a specific patient group and to address its needs. As landscape architects, we must know how we want the garden to heal the patient. In Sweden and other countries, gardens are being laid out that claim to be healing gardens, but that do not have healing effects on patients. One reason for this may be the lack of established and reported knowledge concerning how these gardens should be given shape to meet the needs of different patient groups. Most articles describing how a certain type of healing garden is designed fail to explain *why* the garden has a particular design or *how* it is expected to help improve patients' health. The scarcity of literature on how different healing gardens may and should be designed is a focal problem.

In light of the above, however, I wish to present the following work, which stands out from the rest: *Healing gardens* from 1999 (Cooper Marcus & Barnes, 1999). This work comes from the US, which attests to the country's leading position within the healing garden movement. *Healing Gardens* reveals an understanding of the need for collaboration between different scientific and other professional disciplines, such as landscape architecture, psychology, environmental psychology and horticultural therapy. The book also maintains a high scientific standard and includes chapters written by several internationally renowned

researchers. *Healing Gardens* is an extensive and unique work. It tries to connect ideas concerning the shaping of gardens at several different types of healthcare facilities to research results in medicine and environmental psychology. The book emphasizes the need for landscape architects to maintain their focus on the patients. An exposition on a large number of healing gardens at different healthcare facilities points out the advantages and disadvantages of the gardens' different designs. The work's weakness, however, consists of its many and long lists of design guidelines – lists that lack a hierarchy indicating what is most important, of secondary importance and what is at the detail level. As an informed reader, I am sometimes unsure as to how valid certain claims are, that is, as to the extent to which they are based on solid evidence. Despite these weaknesses, I consider *Healing Gardens* to be an important contribution to the literature on the design of healing gardens.

With respect to presentation of evidence-based design guidelines, the literature on healing gardens for patients with Alzheimer's is on the forefront. Relying on case studies, Mooney and Nicell (1992) present, in their article *The Importance of Environment for Alzheimer Residents*, the primary importance of how paths are drawn and how demarcations are formed. This was later further developed into clear design guidelines in Ellen-Elisabeth Grefsrød's book *Eldres liv og hagens visdom (Life of the Elderly – Wisdom of the Garden, 2002)*.

Literature on planning of urban living environments to promote health

The *Ten Books on Architecture* by Vitruvius constitutes one of the most influential works in the area of architecture and city planning. The work is thought to have been completed around 15 BC and has, since that time, served as a model for other texts on architecture, city planning and art as well as provided essential concepts and formulations (Mårtelius, 1989). With regard to laying out a fortified city, Vitruvius states that healthfulness is the first requirement the architect must consider (Vitruvius, 1999). He invoked archaic methods of determining whether a place was healthful. By sacrificing grazing animals and analyzing their organs, he believed one could determine whether or not a given site was healthful (ibid). A healthful site for building a city should, therefore, " /.../ be elevated, not cloudy, not liable to frost, facing those regions of the sky which are neither hot nor cold but temperate." (ibid, p. 26).

As concerns the comprehensive body of literature on people and their urban living environments, most students of architecture and landscape architecture encounter some of the works that, in addition to those of Vitruvius, are considered classics. These include: Camillo Sitte's *Der Städtebau nach seinen künstlerischen Grundsätzen* from 1889, Ebenezer Howard's *Garden Cities of Tomorrow* from 1898, Le Corbusier's *Urbansime* from 1925, Lewis Mumford's *Culture of Cities* from 1938, Kevin Lynch's *The image of the city* from 1960 and Jan Gehl's *Livet mellem husene* from 1971. It is worth noting that these classic works consist primarily of expert statements (Rådberg & Johansson, 1997) and consider only fleetingly human health and well-being. These expert statements often have a fairly weak foundation in the form of systematic observations (ibid). The oldest of these theoretical efforts lack any properly founded empirical observations, leading to a situation in which the values and ideals of different experts are pitted against one another (ibid). The two most modern works, those of Lynch (1960) and Gehl (1971), stand out from the earlier efforts in that they take seriously people's needs and environmental psychology. Both Lynch and Gehl are architects and researchers, and their work shows how research findings may be

made applicable for use by practicing architects and planners. Their work is based on solid data and reveals an understanding of a human perspective on the city as a living environment. Thus, they do not deal with issues of beauty versus ugliness, but with city spaces that are suited to human bodies and the human senses – with how we relate to our surroundings and to our sensory system.

During recent years, the great work of Christopher Alexander, *Nature of order*, has been published in four separate volumes. This work covers city planning, contentment and well-being, but the earliest example of cross-disciplinary work – including evidence-based knowledge on health and on the physical environment that leads to planning recommendations – is the book *With people in mind* from 1998. In this book, scholars Stephan and Rachel Kaplan present some of the research achievements of their more than 20 years of work in environmental psychology. In an attempt to make their results accessible to landscape architects, architects, managers of parklands and urban recreation areas, they have been assisted by landscape architect Robert Ryan. To aid the design process, Ryan tries to convert Kaplan and Kaplan's theories to picture form. I believe, however, that Kaplan and Kaplan's results have been oversimplified in their attempt to make them applicable. Despite this, theirs is an important contribution, which may inspire practitioners to look more closely at their research findings.

Comments on the selected literature

In the current political context, as in efforts toward the fifteen national environmental quality objectives (SOU, 2000:52) and the public health bill *Public Health Objectives* (Prop. 2002/03:35), it is pointed out that urban green spaces are important to public health in Sweden. It is stated that natural environments must be accessible to all groups in society, even weak groups such as children, the elderly and the ailing. This has led, consequently, to a demand – on the part of county councils, municipalities, practicing landscape architects, politicians and the public – for knowledge and literature explaining how healing gardens as well as the city and its natural environments should be given shape on the basis of the perspective of health promotion. For several decades, researchers both in Sweden and other countries have developed the literature on theories developed in environmental psychology. This has resulted in a solid body of literature of high scientific quality. The literature on theories of the design of healing gardens and theories of how everyday urban environments may be planned to promote residents' health is much more sporadic and tends not to be based on scientific evidence.

Problem formulation in the dissertation

The present doctoral dissertation focuses on two important goals in landscape architecture – goals concerning human stress: 1. Designing healing gardens that have health-promoting effects on patients suffering from fatigue reactions (burnout), and 2. Creating spaces for relaxation and exercise in the everyday living environments of city dwellers – spaces such as gardens near the workplace, a city park or courtyard gardens between apartment blocks. Thus, the present work covers a large area, including both healing gardens and urban green spaces. It deals with rehabilitation as well as health promotion. Rehabilitation has a beginning and an expected goal, and between those two points in time improvement is to occur. Health promotion is a question of continuous use in order to acquire something that

has salutogenic effects. The common factor here is that the landscape architect, through his/her design of a healing garden or urban green space, is expected to positively affect the health of visitors.

Study aim

The overall point of departure of the present dissertation is the hypothesis that manifestations of good landscape architecture is able to promote human health. The aim of the study is to obtain and present research results that may be applied by practitioners and that will ultimately lead to evidence-based landscape design and planning to promote health.

The above aim leads to the following four attendant questions:

- Do urban green spaces affect city dwellers' perceived health?
- What existing theories support the notion of positive health effects of healing gardens and horticultural therapy for people suffering from stress reactions?
- How should a healing garden intended for rehabilitation of people with fatigue reactions be designed if it is to promote their health?
- How should urban green spaces be planned and designed if they are to offer city dwellers a health-promoting living environment?

Central concepts in the dissertation

A number of central concepts are used in the different parts of the dissertation, and I wish to summarize and clarify them here.

During recent decades, an increasing number of research disciplines have begun to address the question of human *health*. Many scholars are broadening their perspective from the level of details to a more comprehensive, holistic perspective (see Paper V; Qvarsell & Torell, 2001). The World Health Organization's well-know definition: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948) also shows that health ought to be viewed as a holistic and positive state, which embraces the individual in relation to his/her entire life situation, in terms of its biological, cultural, social and environmental aspects. Today, the words *health* and *well-being* are often used together. This is because if *health* is a positive state, then *well-being* is the feeling of being in good health (www.ne.se, 2005-02-16).

Physicians endeavor to cure disease. Health and health promotion, however, constitute an area of research that is the focus of increasing numbers of scientific disciplines. The popular concepts *salutogenic* (Antonovsky, 1996) and *health promoting* (Hansson, 2004) are often equated and refer to the circumstances that help to maintain people's good health despite the fact that they are subject to potentially pathogenic biological or psychosocial stressors. Here, I view the environments offered to visitors by healing gardens and urban green spaces as circumstances that contribute to good health. I group such places under the concept *Health-promoting environments* (see Papers I-V).

What, then, is the relationship between health and stress? Stress has been shown to be a good measure of absence of health, that is, of ill health (see Paper V). Thus, stress is not an illness per se, but a collection of natural and necessary reactions. These reactions are basically the same as those that once, in early human history, helped our forefathers survive

by initiating fight-flight reflexes that sharpened the senses in the event of an experienced threat. However, long-term, frequent or intensive stress is harmful, because a constant increase in stress hormones disrupts various bodily functions. For this reason, I view stress reactions as a measure of ill health.

I wish to emphasize here that *landscape architecture* is both a research discipline and a practical profession aimed at shaping outdoor environments based on people's needs. When its goal is to design health-promoting environments, I view *landscape architecture* as an *applied art*, thus as art that is given shape in relation to the needs and expectations of users. In the dissertation, I take a general outlook on what is meant by *design* in relation to outdoor environments. By *good design* I mean conscious design that has a positive impact on the visitor in that it offers expected experiential values and improved or maintained health (see Paper V).

Because many different professions work with gardens and health, we need a basic definition of what a *garden* is if we are to avoid misunderstandings (see Papers I and II). By *garden* I mean an enclosed verdant space that provides the visitor with a feeling of security. The research shows, however, that not all gardens are good for visitors' health (Ulrich, 1999). By *healing gardens* I mean gardens that are purposely designed to *improve the experienced health* of a patient group through an interplay between stays and horticultural therapy in the healing garden (Paper I and II). *Healing garden* is a broad, collective term for different types of gardens that are purposely designed to promote human health. Under this heading are different specific types of gardens such as hospice gardens, rehabilitation gardens and therapy gardens. *Horticultural therapy* is a form of treatment in which the garden and knowledge about the garden's ability to impact the patient constitute the most important tools. The *horticultural therapist* must be able to determine when it is best for the patient to rest, to engage in a light solitary activity, such as taking a walk, or to engage in a group activity, such as sowing seeds.

The dissertation contains a number of different terms, all of which refer to greenery in the city – terms such as urban open spaces, urban green spaces, and urban open green spaces. Common to these terms is that they all refer to urban greenery that is designed, planned or preserved and that may comprise varying amounts of vegetation and be found within the city itself or just on the outskirts. This definition is in accordance with Steven and Rachel Kaplan's (1989) definition of *nature in the town*. During my time as a doctoral student, I have found that the term *urban green spaces* is well understood by both practitioners and scientists, and I have therefore chosen to use it as a collective term. Thus, *urban green spaces* is used here as a collective term covering all greenery in the city, e.g., parks, natural environments near population centers, green areas, gardens, courtyards, gardens at schools and workplaces, etc.

Moves into Sweden's largest cities are increasing in number. Today, the majority of the population lives in cities or larger population centers (Statistics Sweden, 2000). The city has become the everyday *living environment* for most Swedes. By *living environment*, I mean the sum of all the external circumstances under which people live: where they live, work, go to school and spend much of their leisure time. Thus, those conditions required to live life must be found in the city. An example of an old external circumstance is constituted by urban green spaces in the form of parks and gardens. Here I also call these *elements of city planning* (see Paper V). Examples of other city planning elements are buildings, squares and

roads, which together with urban green spaces build up the whole that is the city space (Lövré, 2003; Friberg, 1983).

There is a demand among city dwellers for a greater number of experiences and spatial qualities in urban green spaces (Berggren-Bärring & Grahn, 1995). These qualities or characteristics are given several different names in the dissertation. I prefer, however, to call them the *eight basic characteristics* (see Paper V), and they are summarized in Figure 5 in this introduction. If a green-marked area of the city plan contains several of the basic characteristics, it is generally more popular, more appreciated and visited more often than is a green-marked area with only one or few of the basic characteristics (Berggren-Bärring & Grahn, 1995). Here, the eight basic characteristics are connected to notions of how health-promoting environments in the city should be planned and designed. Some specific basic characteristics are sought after and appreciated with regard to creating environments that have a restorative effect on visitors (see Papers II and V).

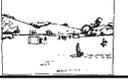
The eight basic characteristics	Character of the garden room	Sketches showing what the garden rooms might look like
1. <i>Serene</i>	Peace, silence and care. Sounds of wind, water, birds and insects. No rubbish, no weeds, no disturbing people.	
2. <i>Wild</i>	Fascination with wild nature. Plants seem self-sown. Lichen- and moss-grown rocks, old paths.	
3. <i>Rich in Species</i>	A room offering a variety of species of animals and plants.	
4. <i>Space</i>	A room offering a restful feeling of "entering another world", a coherent whole, like a beech forest.	
5. <i>The Common</i>	A green, open place providing vistas and inviting you to stay.	
6. <i>The Pleasure Garden</i>	An enclosed, safe and secluded place, where you can relax and be yourself and also experiment and play.	
7. <i>Festive</i>	A meeting place for festivity and pleasure.	
8. <i>Culture</i>	A historical place offering fascination with the course of time.	

Figure 5. Summary of the eight basic characteristics, developed by Associate Professor Patrik Grahn in collaboration with Ann-Margreth Bärring-Berggren (Berggren-Bärring & Grahn, 1995; Grahn, 1991a; 1991b). The drawings were made by Agneta Persson (Grahn, 1991b) and reproduced here by permission of Movium.

The two studies in the dissertation

The dissertation is based on two studies, both of which deal with questions of how landscape architecture can promote health and how health-promoting environments should be given shape. The first study concerns healing gardens, that is, gardens purposefully designed to help *improve the health* of a given patient group (Papers I and II). The second study concerns how greenery in city dwellers' everyday lives can help *maintain and fortify health* (Papers III, IV and V). Both projects deal with ill health caused by stress and with how different outdoor environments should be designed in order to promote human health.

The following attendant questions are posed in Study 1:

- *What existing theories support the notion of positive health effects of healing gardens and horticultural therapy for people suffering from fatigue reactions?*
- *How should a healing garden intended for rehabilitation of people with fatigue reactions be designed if it is to promote their health?*

The following attendant questions are posed in Study 2:

- *Do urban green spaces affect city dwellers' perceived health?*
- *How should urban green spaces be planned and designed if they are to offer city dwellers a health-promoting living environment?*

Study 1

Following the pilot project, I was given the opportunity to work with Associate Professor Patrik Grahn and his research group in building up the healing garden at Alnarp campus. It would be the first garden of its kind in Sweden. Work at the healing garden at Alnarp involves both research and development, that is, advancing the entire concept of horticultural therapy as a professional competency. The goal is to conduct research, together with physicians, on how the garden's design has functioned for the patient group, how well horticultural therapy has worked and to study the short-term and long-term medical effects of stays and rehabilitation in Alnarp's healing garden. We also wished to study the differences between the horticultural therapy group and a patient group with the same diagnosis that has undergone more traditional rehabilitation. Before this could happen, however, the garden needed to be sketched and a rehabilitation program based on garden activities needed to be developed.

Study 1 is a case study that constitutes the prerequisite for a forthcoming intervention study. It includes:

- A summary of leading theories based on research and practice
- A design model

The perspective of Study 1, thus, is to focus on designing a garden that helps to *enable health improvement* among individuals who require rehabilitation for different types of fatigue reactions or burnout syndromes. The aim of the study is that practitioners and researchers in the field of healing gardens will be able to use the results. The study may be called hypothesis-building and it is the prerequisite for a future study of the health effects of, among other things, a healing garden's design. The result of Study 1 is Papers I and II.

Study 2

The second study focuses on urban green spaces, e.g., all greenery in the city, and the health of the urban population. Gardens and parks are not only used to help improve the health of people who are weak and ailing. Ever since antiquity, there has been criticism of unhealthy

environments in the city (see Paper V). To ensure that city dwellers would remain healthy, fresh air, sunlight, greenery and a healthful site at which to locate the city were advocated. Is there any relationship between the health of urban populations and how our cities are designed and built? Because the focus is on city dwellers' health, this study may be seen as epidemiological. It is based on a quantitative postal survey, responded to by nearly 1000 randomly selected individuals in nine Swedish cities. They have answered questions concerning, among other things, whether they have access to a garden at home, how often they visit public parks in the city and how long these visits are; they have also estimated the state of their own health.

How, then, are our cities designed and built? What different types of building elements do they consist of? Where do people live, do they have gardens, do they live near a park? Questions of this kind are usually found in a field of research called urban morphology (Rådberg & Friberg, 1996). This field is in the borderland between several disciplines, chiefly city planning, history of architecture and art history (ibid), but I would also include landscape architecture here.

We may say, thus, that the second study is an epidemiological and urban morphological investigation of urban green spaces as a health-promoting element of city planning. I wish to emphasize the generally applicable aspect of Study 2 – that the topic concerns everyone who lives in a city and who in any way works with city planning. The goal of the study is that the results should be useful in practice in community debates, practical planning of large land areas and in planning processes in which more detailed sketches are prepared.

Thus, the perspective of Study 2 is to investigate whether verdant urban environments help to *maintain and fortify health* and to consider how such environments should be planned. Study 2 is presented in Papers III, IV and V.

Methods in the dissertation

The area of investigation undertaken in the present dissertation is complicated, which is why the studies have been designed according to the principle of triangulation. There are five basic types of triangulation (Janesick, 1994): data, investigator, theory, methodological and interdisciplinary. Three of them are used here:

Data triangulation - the use of a variety of data sources to study a single problem

Methodological triangulation - the use of multiple methods to study a single problem

Interdisciplinary triangulation - incorporates the use of other disciplines

The use of several different methods is in line with the dissertation's applied approach, because it is a natural part of a practicing landscape architect's work to view and elucidate problems and situations from several different angles and perspectives. Given the present applied research perspective, it is important to try to understand *why* and *how* people are affected by the physical environment and its design. Finding the answers requires different data acquired through different methods, such as study visits, discussions, literature reviews, postal surveys and statistical calculations. The dissertation's field of study – landscape architecture and health – is broad and borders on several other research disciplines focused on human beings, their health and their living environments, chiefly landscape architecture, architecture, general planning, environmental psychology as well as medicine, physiotherapy, occupational therapy and horticultural therapy.

The number of landscape architects in Sweden who are conducting research is slowly beginning to increase, though researchers in the present field of study are still underrepresented. I wish to emphasize, however, the general and applicable aspects of the dissertation. My hope is that it may be used in societal debates and as an inspiration during design and planning at the overall and detail levels. My wish that the dissertation should have a wide reach is part of the purposeful educational goal of my postgraduate studies. This wish is manifested in the conferences I have chosen to speak at and the publications in which I have presented my work.

Summary of papers

Paper I. What Makes a Garden a Healing Garden?

All gardens are not healing gardens. There is even an example of a hospital garden that had a measurable negative effect on patients' health (Ulrich, 1999). What, then, is required if a garden is to be healing? Together with my supervisor, Associate Professor Patrik Grahn, I was able to look more closely at this question in the first study. The study is divided into two parts. The first part discusses and summarizes theories on the healing effects of healing gardens – theories originating from different research disciplines, such as landscape architecture, environmental psychology, medicine and horticultural therapy. The different disciplines define healing gardens and their effects on visitors' well-being in different ways. This leads to a situation in which different actors use the same concepts and terms with reference to different things. This constitutes a problem today. Here, theories of the healing effects of gardens originating from different research disciplines are grouped into three different schools: The Healing Garden School, The Horticultural Therapy School and The Instructive School.

When designing a healing garden, it is fundamental to focus on the people/patients for whom the garden is intended. The second part of the study discusses and presents design hypotheses based on the visitor's needs and his/her relation to the garden. The resulting hypotheses concern creating garden rooms that place different levels of demands on the visitor, and this is a question of accessibility. This may be summarized in the following points:

- A balance between just being in the garden, experiencing it and working with gardening
- The visitor's mental power
- Garden rooms with different characteristics
- The accessibility to the visitor

In our search for a theoretical foundation for designing healing gardens, we turned to the interface between environmental psychology and landscape architecture and to research results that have been obtained, since the 1980s, at the Department of Landscape Planning, Alnarp (Ottosson & Grahn, 1998; Berggren-Bärring & Grahn, 1995, Grahn, 1991a). This was supplemented with several other methods, such as literature reviews and study visits.

Working with several methods requires time and financial resources. The advantage of obtaining results through different methods is that we get a better overall picture of the problem by elucidating it from many angles. I believe that the strength of this study lies in our having had the time and ability to travel and visit internationally renowned healing

gardens, our participation in international conferences and our personal meetings and discussions with leading individuals in the horticultural therapy movement: scientists, horticultural therapists and designers.

The opportunities we have had to visit several healing gardens, often in the company of a local horticultural therapist, have helped to make our understanding of specific healing gardens greater than what it would have been had we only read about them. Our personal discussions with researchers, practitioners and designers have enabled us to pose more questions and to try to better understand their designs and experiences. The aspect of personal experience gives the present method added dimensions and strength. My work with these methods has been supported by the fact that it is based in a research and development environment in which questions are cultivated through discussion.

A great deal is happening in the field of horticultural therapy. What is read, seen and experienced today becomes obsolete fairly quickly. More and more countries are showing a great interest in the area, e.g., Italy, Germany, Netherlands, Denmark, Norway, Korea and Japan. The movement is spreading throughout the world, and there are different views on garden design, the structure of therapeutic programs and on the patients themselves. In the future, I would very much like to see a summary and comparison of the situation in different countries. Yet there is also a need for examination of the situation in Sweden. Our research group Health and Recreation constantly receives information on new healing gardens being built up in Sweden. This great interest is both positive and negative. The negative aspect is that all gardens claiming to be therapeutic or healing do not actually possess such qualities; thus patients and relatives are given false hopes and expectations. Our research group is now conducting research to ensure the quality of the design of such gardens as well as of the horticultural therapy programs undertaken. The positive aspect of this interest is people's growing understanding of how healing gardens can promote human health.

Paper I was written in collaboration with Associate Professor Patrik Grahn. My main contribution has been to develop questions and ideas concerning the difference between a healing garden and a "regular" garden; I have also done much of the writing. The paper discusses a theory synthesis, which leads to the construction of a hypothesis concerning the design of healing gardens. This is then applied in practice through the design of a healing garden at Alnarp campus, which is described in Paper II. Paper I may be seen as an introduction to hypothesis construction for further research. Several researchers, myself among them, will be following the healing garden at Alnarp campus – the patients, staff and rehabilitation programs – for a few years in order to study how the garden, people and programs function together. The focus of my continued research will be on the design of the garden.

Paper II. Experiencing a Garden: A Healing Garden for People Suffering from Burnout Diseases

The overall question addressed in this paper is: Why does the healing garden at Alnarp campus look like it does? The goal of the paper is to answer this question by discussing the design process leading to the healing garden. The method used here involves application of the theoretical hypotheses constructed in Paper I. Work with Paper II has resulted in a deeper and more applied hypothesis construction concerning the design of healing gardens.

The point of departure of the healing garden at Alnarp campus is that it should be viewed as a full-scale laboratory. In order to conduct our research, we have been given the opportunity to lay out a full-scale garden and to build up garden rooms on the basis of scientific findings. This design work is the collaborative effort of several actors, primarily Associate Professor Patrik Grahn and landscape architects Sara Lundström, Frederik Tauchnitz and myself, but discussions have also been pursued with several other individuals with varying competencies, primarily in the areas of horticultural therapy and physiotherapy (see Figure 6). We knew from the outset that this would be an extensive and long-term research project. The project is planned to run for ten years and was begun in 2001. Our hope, however, is that the project can continue to develop as long as there is a need for its activities and for the knowledge developed through them.

This study constitutes the prerequisite for a forthcoming intervention study, in which two groups of people with the same clinical picture – fatigue reactions – will be investigated. One group will receive treatment in the form of horticultural therapy at the healing garden at Alnarp campus and the other will receive more traditional rehabilitation in a completely different environment. Yet another, third group will receive "the usual treatment," which entails the most common current treatment of rest at home in combination with antidepressants such as Zoloft and Prozac. Thus, the purpose is to study the rehabilitation model offered at Alnarp, in which horticultural therapy and the garden itself collaborate in the rehabilitation process.

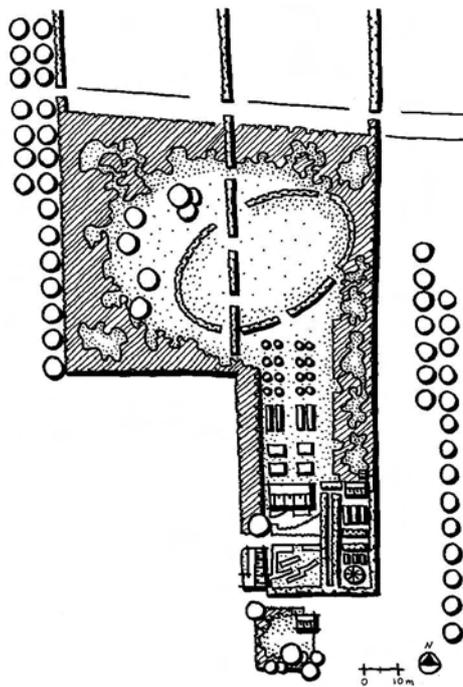


Figure 6. Sketch of the healing garden at Alnarp campus, by Ulrika A. Stigsdotter.

The healing garden at Alnarp campus came to be Sweden's first healing garden connected to a university and its research and teaching, as well as the first to offer a rehabilitation program for people suffering from fatigue reactions or burnout syndromes. Because interest in the area is so great, there are already two additional healing gardens in Sweden that are affiliated with a university: Sinneas Rum (Room of the Senses), affiliated with the Sports Medicine Unit at Umeå University, and Wijks trädgårdar (Wijk's Gardens), affiliated with the University of Gävle and its program in Design and Wood Technology. Over the years, the healing garden at Alnarp campus has come to play a larger role in teaching than was planned at the outset. The great interest on the part of the public encouraged us to start a brand new course in horticultural therapy in 2005. During 2007, we plan to start a three-year bachelor's program in horticultural therapy. The plan is that the bachelor's program will be based entirely at the healing garden at Alnarp.

We first wrote Paper II so that we would not forget our original thoughts and so that others might be inspired by the project or share their viewpoints, thus helping to further develop our ideas. My main contribution has been participation in the design work and writing the sections on design of the garden, while Associate Professor Patrik Grahn has written about the needs of patients and the medical background. We have written together about how the hypotheses are integrated into the garden design and about how the garden might function in future intervention studies.

Paper III. Landscape planning & stress

Very few people would refute the claim that being outdoors in city parks and green areas is good for human health. But is there actually any evidence showing that this is true? How general is the experience that stays in city parks make you feel better and less stressed? How can we design and plan people's urban living environments so that they actually serve to promote health? While considering questions of this sort, I was given, at the beginning of my postgraduate work, access to a database. This database included postal surveys completed by nearly 1000 randomly selected individuals. Answers to the survey questions chiefly concern how the respondents make use of urban green spaces in their everyday lives and how they rate their own health status. I now had the opportunity to pose a number of questions to the survey database, which resulted in Papers III and IV. The overall main question of Paper III is: Can the public urban open green spaces of a town or a city affect feelings of stress among inhabitants and thus reduce the number of stress-related reactions due to exhaustion?

We sought the answers to our questions using the statistical software SAS (SAS Statistics, 1996). Working with statistics requires solid knowledge of the subject, and thus the statistical calculations for Paper III were made in collaboration with Associate Professor Jan-Eric Englund. I wish to stress that though we could not have done the statistics without the help of a statistician, a statistician could also not have conducted the study alone. The most important aspect of this study is the questions posed, and posing the right questions – questions that resulted in revealing associations that formed the foundation of Papers III and IV – requires the perspective of a landscape architect.

Paper III presents research results showing a significant relationship between frequency and length of stays in urban green spaces and frequency of perceived stress: the more often and longer you visit a park or garden, the fewer occasions of stress you suffer. The findings also show that this phenomenon is independent of sex, age and socioeconomic status. Thus, we

may call the positive health effects of stays in urban green spaces democratic. If the goal of society is better health on equal terms for all city dwellers, then it would seem fruitful to invest in urban green spaces as a tool in achieving this public health goal. With this as our point of departure, we were able to pose questions to the database that concern how a city should be planned if it is to promote the health of its inhabitants.

Among the results applicable to the context of planning and design, we find that what prevents respondents from spending time in urban green spaces is lack of time and the fact that the closest green area is a great distance from their home. The length of visits to urban green spaces is the single factor most important to promoting health and counteracting stress. The results also show that after a distance of 50 meters from home is exceeded, the length of visits decreases and the frequency of stress occasions increases. Thus, it is important that public green areas be located near residential areas. Our interest in investigating how important it is to have a natural environment immediately adjacent to the dwelling resulted in Paper IV, which takes a closer look at this question.

The survey questions have provided us with a great deal of information about the respondents. We know, for instance, where they live, their sex, age, educational level, where they work, their form of housing and how they feel. What we do not have, however, is information on their lifestyles. Because people's lifestyles are varyingly sound, there is a risk that those who are not interested in spending time in city parks have simply chosen not to respond to the survey. I would like to have seen survey questions addressing the issue of lifestyle. In this connection, however, it should be pointed out that participation in a raffle for a trip to Egypt was promised to everyone who answered the survey, which may have encouraged even people who are not particularly interested in urban green spaces to complete the survey.

The results presented in Paper III must be further developed into more user-friendly design tools for planners, architects and landscape architects. My contribution in this study involved posing relevant questions to the data based on the overall hypothesis, developing index classes for greenery, checking statistical lists chiefly concerning socioeconomic status as well as writing the paper in collaboration with Associate Professor Patrik Grahn. We also presented this paper orally at the IUFRO conference in Copenhagen in 2002.

Paper IV. A Garden at Your Doorstep May Reduce Stress: Private Gardens as Restorative Environments in the City

Increasingly, people in the West are living their lives farther from nature. The majority of Swedes now live in cities and, moreover, spend most of their time indoors (Qvarsell & Torell, 2001). This insight resulted in several questions concerning the home environments of city dwellers in Sweden. The overall question addressed in Paper IV is: Can gardens surrounding residential homes in cities help to create a less stressful everyday environment? Attendant questions addressed here include: Does living in an apartment versus living in a house with a garden have any affect on health? Does having a balcony versus not having one have any affect on health?

The methods used in Paper IV are identical to those in Paper III, that is, posing questions to the database and looking for statistically significant associations using the statistical software SAS (SAS Statistics, 1996). Here again, Associate Professor Jan-Eric Englund contributed his knowledge and helped to check the calculations.

The results of this study show that having access to a garden has a significant positive impact on stress. There is also a significant positive relationship between frequency of garden visits and stress prevention. Simply having a balcony may lead to fewer stress occasions, a verdant courtyard adjacent to apartment houses leads to even fewer occasions and best of all is having your own abundantly verdant garden. Interestingly, the study shows that people of all socioeconomic classes have gardens. Thus, in Sweden, having access to a garden does not appear to be a class issue.

Because both greenery adjacent to your own home and visits to urban green spaces may affect how often you experience stress, the question arises: What is most important for public health, public parks in the city or private gardens? Our results show that both are important, but that having your own garden is the most important of the two alternatives. The findings indicate the importance of having an abundantly verdant outdoor environment adjacent to the home. In cases of new construction, we may consider the health-related advantages of building with versus without balconies. In planning housing projects, we may view areas of greenery surrounding buildings in a new light, not merely as esthetically attractive elements, but also as health-promoting elements.

Because the database is the same as that used in Paper III, we still know nothing about the respondents' lifestyles. Another question I would like to have seen in the survey concerns what kind of view respondents have from their homes. We have reason to believe that a view of a verdant garden can affect stress levels (Stigsdotter & Grahn, 2004b).

My role in Paper IV is more central than in Paper III, as I formulated most of the research questions, wrote the article and presented it orally at the conference Open Space: People Space in Edinburgh 2004. The statistical calculations were primarily made by Associate Professor Patrik Grahn, to some extent by me, and were finally checked by Associate Professor Jan-Eric Englund.

Paper V. Urban green spaces: Promoting health through city planning

After having been asked in various contexts to tell about the results of the previous studies (paper III and IV), I came to realize the need for me to present our research in a more accessible, applied and nuanced manner. This is in line with the so-called "third mission" of Swedish universities, which concerns the spreading of research results and the creation of conditions for closer associations between academia, society and industry (www.slu.se, 2005-02-15). Thus, the final paper in the dissertation discusses the major question of how a health-promoting city should be planned. In Paper V, I develop my discussion of our results by placing them in a broader context, for example, the ongoing debate on urban development, previous research, sustainable development, national public health goals and the notion of health as a resource. In order to accomplish this in a scientific paper, I needed to let my own voice be heard without debasing the scientific value of the findings. I chose, therefore, the method of the scientific essay.

In Paper V, I explain that, since our early civilization, health has been an important precondition for cities and urban green spaces and a significant element of city planning. As mentioned, in Sweden, offering city dwellers a healthful living environment has been the responsibility of society since the 19th century. The current public health bill, *Public Health Objectives*, takes this as a point of departure and states: "There is a clear relationship between people's use of urban green spaces for general recreation and their access to such

spaces in their own neighborhoods. Studies show that people's everyday environments are of great importance to their stress levels and health" (Prop. 2002/03:35, p. 61, translation by K. Williams). The plan is to work toward meeting these objectives within a 20-year period. This means that we must get started now. At the same time, however, there is a debate in Sweden, and other countries, about the dense as opposed to the sprawled city. In the middle of this debate are the notions of safeguarding urban green spaces and improving their quality.

Papers V and II constitute the most applied parts of the dissertation. I make no dramatic proposals here (Paper V) – this is not a question of identifying the ideal city plan, but of how we can take advantage of the resources that currently exist in the form of green areas. Practicing landscape architects, politicians and ecologists have all shown great interest in our research results. In Paper V, they are able to find useful arguments and help with giving shape to their ideas. Yet this interest in our work also implies a great responsibility. There is considerable work left to be done with operationalizing our results and making them more user-friendly.

Discussion

The dissertation covers a wide field of study. Its overall point of departure is the hypothesis that manifestations of good landscape architecture can promote human health. Naturally, I am aware that many other factors in the outdoor environment may also affect our health. Healing gardens and urban green spaces have the unique ability to offer simultaneously many factors that can facilitate good health – factors such as daylight (Küller & Wetterberg, 1996; Küller & Lindsten, 1992), activities and exercise (Perk, 1998; Pate, 1995; Küller & Küller, 1994), stimulation of the senses (Lundberg, 2001; Kaplan, 1987) and aesthetically pleasing experiences (Dilani, 1999; Rapp, 1999; Ulrich, 1983). I do not claim to have provided a comprehensive picture here. Based on statistical calculations, the research results presented here may be interpreted as evidence for real and significant associations between city dwellers' use of urban green spaces and their experiences of stress. The dissertation is to be viewed as a contribution to the field – a contribution that I hope will increase our understanding of how important landscape architecture can be for human health, both with regard to rehabilitation and health promotion.

The aim of the present dissertation is to obtain and present research results that may be applied by practitioners and that will ultimately lead to evidence-based landscape design and planning to promote health. With reference to this, two attendant questions were formulated that became the two studies underlying the dissertation. Study 1 deals with healing gardens, i.e., gardens purposefully designed to facilitate the improved health of a patient group (Papers I and II). Study 2 concerns how greenery in city dwellers' everyday living environments can help to maintain and fortify health (Papers III, IV and V). Both projects deal with ill health caused by stress and with how different outdoor environments should be designed if they are to promote health.

The first attendant question of Study 1 is: What existing theories support the notion of positive health effects of healing gardens and horticultural therapy for people suffering from fatigue reactions? Interest in healing gardens is spreading rapidly throughout the world, and several different research disciplines and professions are now working with healing gardens and their effects on different patient groups. During my

postgraduate studies, I was astounded at the great differences in how different scientists and practitioners view horticultural therapy and healing gardens. These differences allowed them to be assigned to different schools:

- The Healing Gardens School. Advocated primarily by landscape architects and environmental psychologists. The health effects are assumed to be derived above all from the experiences of the garden room as such, its design and contents.
- The Horticultural Therapy School. Advocated primarily by medical scientists and horticultural therapists. The health effects are assumed to be derived primarily from the activities in the garden room.
- The Instorative School. Advocated primarily by landscape architects, environmental psychologists, physicians and horticultural therapists. The health effects are assumed to be derived from the activities in the garden room, and the visitor's background and character.

Second question attendant question of Study 1 is: How should a healing garden intended for rehabilitation of people with fatigue reactions be designed if it is to promote their health? This is a question of the landscape architect focusing on the patient. As landscape architects, we must clearly understand how and why we think that the garden will be able to promote patients' health. At the end of this introductory text, I present a summary (Figure 7) showing how far my work has come in this regard.

Since the present articles were written, great changes have occurred in Sweden. Researchers from different disciplines are now meeting to study the medical effects of the healing garden at Alnarp campus and of the horticultural therapy program conducted there. The same tendency has not been observed among practitioners. Different kinds of healing gardens are being laid out in Sweden, but many of them are not designed to meet the special needs of visitors. At Alnarp campus, we are now discussing the possibility of certification of healing gardens. The certification process would involve examination of both the horticultural therapy program and the garden's design. This would lead to a demand for evidence-based design and planning of health-promoting environments.

The first attendant question of Study 2 is: Do urban green spaces affect city dwellers' perceived health? The results of the dissertation show a significant relationship between frequency and length of stays in urban green spaces and frequency of perceived stress among city dwellers: the more often and longer you visit a park or garden, the fewer occasions of stress you suffer. In this case, the concept of stress consists of one factor, formed by feelings of fatigue, irritation and a general feeling of being chased, harassed and stressed, here called level of stress. Though I was already convinced before starting my doctoral work that parks and green areas constitute urban spaces important for human health, I was in fact surprised that the phenomenon is so general in nature. Perhaps this explains why, ever since antiquity, parks and other health-related aspects have been crucial factors in the choice of location for a city and in city planning. I wish to emphasize again that health is positively affected by stays in city parks and gardens regardless of the visitor's sex, age or socioeconomic status. This aspect should constitute one good argument for safeguarding the greenery that already exists in our cities. Hopefully, it can help to create an outlook on urban green spaces in which they are viewed as a means of achieving increased health among urban populations.

Second attendant question of Study 2 is: How should urban green spaces be planned and designed if they are to offer city dwellers a health-promoting living environment? Because our findings show that the most important factor concerns length of visits to urban green spaces, it is of great importance that these spaces become an element of city planning that is integrated into the everyday living environments of city dwellers. Visiting city parks and green areas often and, above all, for longer periods is crucial to the positive effects these areas can have on visitors' perceived health. Moreover, urban green spaces must offer visitors rooms for both rest and activity. Our results concerning suggestions for how urban green spaces may be planned based on a health-promoting perspective are summarized in Figure 8.

Concluding remarks and future research

Like many other doctoral dissertations, the present work gives rise to more questions and reflections than answers and solutions. My work is in no way finished. In the dissertation, I have tried to find solutions to two concrete problems concerning how health-promoting environments may be designed on the basis of scientific results. Thus, the work may be viewed as a pragmatic effort. By this I mean that the present results have to do with practical applicability and use. The results, however, must be further developed into more user-friendly tools for design and planning. In both Study 1 and 2, I apply *the eight basic characteristics* (see Figure 5). Further testing and development of these eight basic characteristics into a user-friendly design and planning tool will be, for me, an interesting and important research objective. I plan to continue this work at the healing garden at Alnarp campus and regionally. The research group once started by Professor Emeritus Gunnar Sorte and Associate Professor Patrik Grahn has grown over the years and now includes scientists from several disciplines. By studying results obtained by the medical researchers at Alnarp, interviewing the rehabilitation staff and the patients and by studying the garden itself, I will analyze how the garden design has worked. From a regional perspective, I will also try to operationalize the eight basic characteristics in order to provide user-friendly tools for planning. These studies will entail interviews with focus groups and a new survey on people's health-related experiences of and feelings about visits to various recreational areas in Skåne, in southern Sweden.

During my time as a doctoral student, I have had the privilege of studying and working in a close collaboration with my supervisor, Associate Professor Patrik Grahn. He has sometimes had the role of mentor and teacher, at other times we have worked on a more equal basis. Today, it is at times difficult to remember who has contributed what to our joint work. During my doctoral studies, however, we have each focused our attention on different perspectives in the area of research on landscape architecture and health. Associate Professor Patrik Grahn is now responsible for major interdisciplinary projects dealing with nature, health, medicine and rehabilitation. He participates in conferences for physicians and other medical professionals and presents results on the medical effects of stays in city parks and in the healing garden at Alnarp. My focus is increasingly on making our results on health and stays in verdant environments usable for practitioners – working landscape architects, planners and decision-makers. I am looking more closely at how these environments should be given shape and seeking design and planning tools that are based on scientific evidence.

In the introduction to the dissertation, I asked whether modern humankind is still longing for a garden of paradise. I asked this because, today, more and more people are feeling stressed and need places where they can find rest and experience recovery. If we let ourselves become inspired by the eight basic characteristics, we find that the characteristics *Rich in species*, *Serene* and *The pleasure garden* are those most sought after by people who feel stressed. These basic characteristics may be described as an enclosed, safe and secluded room, where you can relax and be yourself. Such rooms are peaceful, quiet and nurturing places, where the sounds of water, birds and insects are found. We recognize here similarities to descriptions of a garden of paradise. The question that emerges is whether this picture of a garden of paradise is simply an archetype. Sometime in the future, I hope to have the opportunity to look more closely at this question and to develop the contact I once began with Jungian psychoanalysts.

Acknowledgements

“Scientific people are always curious and I am going to be scientific. I keep saying to myself. ‘What is it? What is it?’ It’s something. It can’t be nothing! I don’t know its name so I call it Magic. I have never seen the sun rise but Mary and Dickon have and from what they tell me I am sure that it is Magic too. Something pushes it up and draws it. Sometimes since I’ve been in the garden I’ve looked up through the trees at the sky and I have had a strange feeling of being happy as if something were pushing and drawing in my chest and making me breathe fast. Magic is always pushing and drawing and making things out of nothing. Everything is made out of Magic, leaves and trees, flowers and birds, badgers and foxes and squirrels and people. So it must be all around us. In this garden – in all the places. The Magic in this garden has made me stand up and know I am going to live to be a man. I am going to make the scientific experiment of trying to get some and put it in myself and make it push and draw me and make me strong. I don’t know how to do it but I think that if you keep thinking about it and calling it perhaps it will come. Perhaps that is the first baby way to get it. When I was going to try to stand that first time Mary kept saying to herself as fast as she could, ‘You can do it!’ You can do it!’ and I did. I had to try myself at the same time, of course, but her Magic helped me - and so did Dickon’s. Every morning and evening and as often in the daytime as I can remember I am going to say, ‘ Magic is in me! Magic is making me well! I am going to be as strong as Dickon, as strong as Dickon!’ And you must all do it, too. That is my experiment.”

The excerpt above is from the classic children’s book *The Secret Garden*, by Frances Hodgson Burnett (1909). The person speaking is the sickly boy Collin. At the center of the story’s events are Collin and Mary, two unhappy and unloved children living in early 20th century England. Both Mary’s parents die in India in a cholera epidemic. Alone, mean and sickly herself, Mary is sent to her uncle in England, Collin’s father. Her uncle cares nothing for the children, but instead sinks deeper into his own grief following the death of his wife. His son, Collin, escapes into his own illness and his feelings of guilt about the fact that his mother died giving birth to him. In the lonely castle, located on one of the heaths of Yorkshire, both these neglected children meet a healthy farm boy, Dickon, and the castle’s old gardener, Ben Weatherstaff. On the castle’s estate, they find a forgotten and secret garden, which they together bring back to life. The parallels drawn between the garden’s rebirth and the children’s development are almost over-explicit, but at the same time the

book constitutes a tribute to nature and a healthy life, and it gives concrete and practical advice about caring for a garden.

Although today, almost 100 years after the book was written, the story may seem somewhat sentimental, it is still much appreciated. I am among those who have allowed themselves to be captured and touched by the children's fates. I am proud, today, that I have actually devoted an entire doctoral dissertation to trying to find the solution to poor Collin's question about what type of magic we are drawn into when we are outside in nature or in a garden. For, as Collin says: "It's something. It can't be nothing!" The question is, though, what is it? I am trying, through my research efforts, to help make the picture clearer, but perhaps the romance or the mystical passion will somehow be damaged by what I have written here. Might it, in the end, be better to talk about magic?

I am enormously thankful for the opportunities I have been given to study this white magic, and would here like to give my sincere thanks to everyone who, in different ways, has made this possible. The following people deserve extra thanks:

Professor Emeritus, Gunnar Sorte – who introduced me to Patrik Grahn and to the field of environmental psychology.

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I also wish to express my warm thanks to the people who make life Fun and Absolutely Fabulous when I'm not working: Dad, Pernilla Vesterlund, Joakim Axelsson, Peter Gustavsson, Ph. D. Christian Pålsson, and Johan Forsberg.

With loving thanks, I dedicate this dissertation to Kristin Karlsson.

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Limhamn, February 2005

Ulrika A. Stigsdotter

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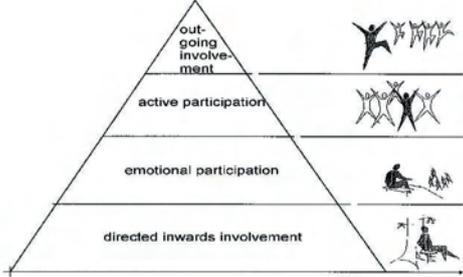
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Research findings	Arguments	Design recommendations
The purpose of the healing garden	In the face of designing a healing garden, it is fundamental to know what effects you wish to achieve with your design. For patient groups suffering from fatigue reactions/burnout, it is important that the garden meet the following three demands (see right-hand column).	<ol style="list-style-type: none"> 1. That there are rooms in which sad, distressed and upset people may be calmed down and restored 2. That the patient is able to meet the demands of the garden at a slow pace, from very low-level demands to increasingly advanced levels 3. Ensure that the patients feel they can manage
The Instorative School	The health effects are derived from the garden room as such, from the activities and the visitor's background and character.	The design of the garden must be accomplished together with the design of the horticultural therapy program to be applied in care or rehabilitation.
Flexibility	A healing garden constitutes a constantly ongoing process. It is not "finished" when it has been laid out, but must always be open to change in order to best meet the needs and desires of the patients.	For this patient group, the fact that the garden is not experienced as completely finished may be liberating. Patients may feel they can more easily tackle rooms that are purposefully left "unfinished."
The visitor's strength of mind	The design of a healing garden for patients suffering from fatigue reactions/burnout must take the patients' strength of mind into account. This means that you must design so that the patient is able to become stronger and still find rooms and activities in the healing garden that correspond to his/her new needs and that make greater demands on him/her.	 <p>A person's experience of nature will depend on how much he/she is able to absorb from the environment and how strong his/her mental power is. This may be illustrated with the aid of a pyramid, where the need for natural environments with few demands is large at the bottom of the pyramid and smaller at the top. A healing garden for people suffering from fatigue reactions/burnout must be designed to create different levels of demands on the visitor.</p>
Visitor accessibility to the garden	Healing gardens involve the patient being in the garden. This means that patients must be wearing the right clothes and that it must not be physically difficult for them to get around in the garden.	In designing a healing garden for patients with fatigue reactions/burnout, you must strike a sensitive balance. Such patients often have an impaired body image. Walking on different ground surfaces may increase their bodily awareness as well as provide exercise for those who have been ill for a longer period. At the same time, you must design the garden so that it is accessible to people with functional disorders, but without diminishing the experiential value of the garden room.

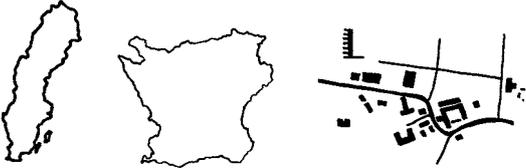
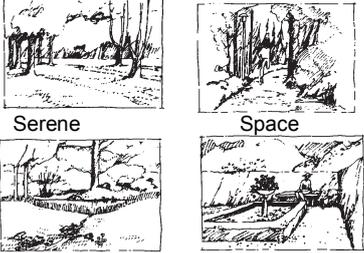
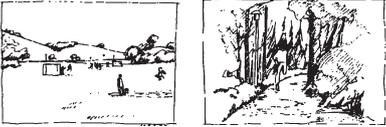
Landscape architecture concerns creating rooms out-of-doors	Landscape architecture is about designing rooms. It is important that a garden provide a feeling of security.	A garden consists of walls, floors and ceilings. Working to give the garden clear delimitations from the surrounding landscape and other garden rooms may increase the patient's feeling of security.
The geographical and historical context of the garden	We experience a garden based on the situation in which we find ourselves. This means that people who are impaired in some way, e.g., who suffer from fatigue reactions/burnout, will perceive the manifestation of a garden in a completely different way than will people who are not impaired. An appropriate approach to designing a garden may be to take advantage of the geographical and historical context in which it is placed. This does not mean that you should create a historizing garden, but that the initial experience of the garden, the first room entered, should not feel too abstract in relation the picture most people have of what a garden is and can be.	In your design, find out about and take advantage of the context in which the garden is found.  Sweden Region Skåne Alnarp Campus
Basic characteristics that are sought after and should be included in the design of a restorative room in the healing garden.	Particularly sought after are the basic characteristics Serene, Space and Rich in Species, and to some extent also Culture.	 Serene Space Rich in Species Culture
Basic characteristics that are sought after and that should be included in the design of exercise- and activity-promoting environments in the healing garden	The possibility of physical activity offered by natural environments helps in avoiding stress. During exercise, stress hormones are released from the body. The basic characteristics The Common and Space are important in designing such environments.	 The Common Space

Figure 7. Summary of research results for use in designing healing gardens intended for patients with fatigue reactions/burnout.

Research results	Arguments	Planning recommendations																					
<p>The public green area's location in the city</p>	<p>There should preferably be public green areas adjacent to the home, i.e., a maximum of 50 meters away. Greater distances make public green areas inaccessible. The more often you visit public urban green spaces, and the longer the visits, the fewer stress occasions you will experience. The frequency and length of visits decrease with distance, which has a negative effect on health.</p>	<table border="1"> <caption>Data from the line graph</caption> <thead> <tr> <th>Distance (m)</th> <th>Number of visits (a year)</th> <th>Length of visit (hours)</th> <th>Number of experienced stress occasions (a year)</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>250</td> <td>175</td> <td>80</td> </tr> <tr> <td>100</td> <td>225</td> <td>165</td> <td>105</td> </tr> <tr> <td>300</td> <td>215</td> <td>145</td> <td>110</td> </tr> <tr> <td>1000</td> <td>130</td> <td>80</td> <td>120</td> </tr> </tbody> </table>		Distance (m)	Number of visits (a year)	Length of visit (hours)	Number of experienced stress occasions (a year)	50	250	175	80	100	225	165	105	300	215	145	110	1000	130	80	120
Distance (m)	Number of visits (a year)	Length of visit (hours)	Number of experienced stress occasions (a year)																				
50	250	175	80																				
100	225	165	105																				
300	215	145	110																				
1000	130	80	120																				
<p>Access to a garden at home</p>	<p>The type of outdoor environment accessible immediately adjacent to the home is significantly ($p < 0.0001$) associated with stress.</p>	<p>Type of outdoor environment accessible at home</p> <p>The respondents live in an apartment block and have no balcony. They have no access to a yard and no allotment or summerhouse.</p> <p>The respondents live in an apartment block and have a balcony. They have no access to an allotment or a summerhouse. They have access to a yard but one without greenery.</p> <p>The respondents live in an apartment block but have access to an allotment or a summerhouse, or to a yard with much greenery, or live in a house with a small verdant garden.</p> <p>The respondents live in a house with a verdant garden (site 600 square meters or bigger).</p>	<p>Mean number of stress occasions a year</p> <p>193.00</p> <p>125.68</p> <p>86.30</p> <p>64.96</p>																				
<p>Basic characteristics sought after for exercise- and activity-promoting environments in the city</p>	<p>The possibility of physical activity offered by natural environments helps in avoiding stress. During exercise, stress hormones are released from the body.</p>	<p>Basic characteristics:</p> <p>The Common Space are important in designing such environments.</p>																					

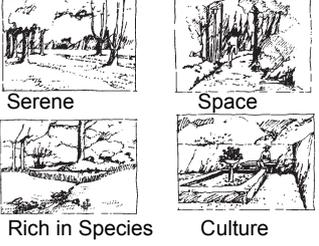
<p>Basic characteristics sought after for restorative environments in the city</p>	<p>City dwellers are exposed to stressors. Long-term stress may trigger and exacerbate severe illnesses. Thus, there is a need for urban environments that offer rest in the waking state. Natural environments have been shown to be appropriate, i.e., the basic characteristics: Serene, Space, Rich in Species, in particular, and to some extent Culture.</p>	 <p>Serene Space Rich in Species Culture</p>											
<p>Access to a garden at work</p>	<p>There is a significant ($p < 0.02$) association between access to a garden at work and employees' experienced stress. With regard to frequency of experienced stress occasions, having a view of a verdant garden is just as important as visits to the garden.</p>	<table border="1"> <thead> <tr> <th>Type of outdoor environment accessible at work</th> <th>Mean number of stress occasions a year</th> </tr> </thead> <tbody> <tr> <td>Having no view of a garden, and no chance to go out during breaks</td> <td>153.73</td> </tr> <tr> <td>Having no view of a garden and a chance of a break out-of-doors (once a month at most)</td> <td>104.08</td> </tr> <tr> <td>Having a view of a garden and few or no chances of a break out-of-doors (once a week at most)</td> <td>96.66</td> </tr> <tr> <td>Having a view of a green garden and chances of a break in a garden more than once a week</td> <td>77.07</td> </tr> </tbody> </table>	Type of outdoor environment accessible at work	Mean number of stress occasions a year	Having no view of a garden, and no chance to go out during breaks	153.73	Having no view of a garden and a chance of a break out-of-doors (once a month at most)	104.08	Having a view of a garden and few or no chances of a break out-of-doors (once a week at most)	96.66	Having a view of a green garden and chances of a break in a garden more than once a week	77.07	
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Figure 8. Summary of research results for use in planning urban green spaces from the perspective of health promotion.