5 Health benefits of nature

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CHAPTER OUTLINE

5.1 INTRODUCTION

The idea that contact with **nature** can promote **health** and well-being has a long history in Western as well as non-Western cultures (Box 5.1). This idea is still very much alive today. For example, in a nationwide survey from the Netherlands, 92 per cent of respondents indicated that they agreed with the statement 'a visit to nature gives me a healthy feeling' (Frerichs, 2004). People do not only believe that nature is healthy, they also act on these beliefs. Initiatives that make use of the healing powers of nature have emerged and prospered in many countries. Some well-known examples are the 'green gyms' in the UK (Yerrel, 2008), the 'udeskole' or outdoor education programmes in Denmark (Bentsen, Søndergaard Jensen, Mygind, & Barfoed Randrup, 2010) and 'shinrin-yoku', a popular Japanese practice which refers to the act of visiting nature areas for therapeutic reasons (Park, Tsunetsugu, Kasetani, Kagawa, & Miyazaki, 2010).

The idea that contact with nature is healthy appears so intuitively valid, that for a long time, people felt no need to demonstrate or quantify nature's contribution to their health and well-being. However, recent developments in **public health promotion** in Western countries have stimulated a growing interest in and demand for the scientific study of nature-health relations. Owing to increased stress and a sedentary lifestyle, levels of cardiovascular disease, type II diabetes and respiratory conditions are rising at a rapid rate all across the Western world. Common-sense knowledge

BOX 5.1 HISTORICAL BACKGROUND

One of the earliest references to the health-promoting qualities of nature is found on an ancient Sumerian clay tablet which described the paradisal garden of Dilmun as a place where 'human beings are untouched by illness'. The Greek text *Air, Waters, and Places*, attributed to Hippocrates (460–370 BC), stresses the importance of climate, water quality and a scenic environment for health. In later periods, references to physical and emotional benefits of nature can be found in historical texts about, among other things, mediaeval cloister gardens, romantic picturesque landscapes and Victorian period urban parks. For example, in the early 18th century, British Prime Minister William Pitt aptly captured the health functions of the capital's parks with the phrase 'the lungs of London'.

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suggests that natural environments can help to combat this health crisis by supporting an active, stress-free lifestyle. But does it really work? And if it works, what size and type of nature is needed to achieve certain health benefits? Where? And for whom? To answer these questions, environmental psychologists have started to collect scientific evidence on nature–health relationships and possible mechanisms underlying these relationships. This chapter will give an overview of this research area, starting with a brief introduction to the concepts of health and nature.

5.2 WHAT IS HEALTH AND HOW CAN IT BE MEASURED?

Traditionally, health has been defined in Western societies as the 'absence of diseases'. This definition is in line with the biomedical or **pathogenic approach to health** that conceptualises disease exclusively as a biological process that is the result of exposure to a certain pathogen (such as a virus or a bacterium). By contrast, the biopsychosocial or **salutogenic approach to health** sees health as a multidimensional concept that involves not only biological but also psychological and social influences. This approach focuses on identifying factors that promote health rather than on factors that cause disease (Antonovsky, 1979). The health-promoting effects of nature, as discussed in this chapter, can be placed within this approach.

The biopsychosocial or salutogenic conception of health is reflected in the well-known definition of health proposed by the World Health Organization (WHO, 1948): 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. However, this WHO definition has been criticised as being too broad. Alternatively, health has been defined as 'a condition of well-being free of disease or infirmity' (Saracci, 1997). This definition provides an intermediate view of health as a positive yet measurable concept, and as such, it provides a suitable starting point for the study of health benefits of nature.

The health status of an individual or group can be measured by means of **health indicators**. A distinction can be made between clinical and public health indicators. **Clinical health indicators** cover objective and subjective measures of patient functioning, such as symptom severity, mortality, hospital days, medication use, discomfort (pain, nausea) and patient satisfaction. **Public health indicators** give an indication of the health status of a population. These indicators include measures based on birth and death statistics, such as **mortality rates** and life expectancy, measures of the prevalence and incidence of disease and **illness** (also called **morbidity rates**), measures of self-reported general, mental and physical health, and measures of health-related quality of life. In addition to primary health indicators, **health risk factors**, such as smoking, inactivity or stress, can be distinguished, which are associated with an increased probability of disease occurrence in the future.

5.3 WHAT IS NATURE AND HOW CAN IT BE MEASURED?

Within environmental psychology, the term nature is generally used to denote a broad category of natural environments and features of those environments, such as single trees, animals or clouds. Because visual experience plays an important role in human–nature interactions, representations of natural environments and features, such as photographs, films, video and virtual nature, are also included in the concept of nature. The term **natural environment** is also broadly defined to include any kind of environment, place or setting where vegetation and other natural elements (such as water) are dominantly present. However, different terms tend to be used depending on the degree of cultivation and the size of the setting. As discussed in Chapter 4, the term **landscape** is typically used for areas, often located in the countryside, that are the result of an interaction between human and natural factors. The term **nature area** is used to describe more large-scale natural settings that have developed through natural growth rather than design or planning. Finally, **green space** is a term that is mostly used by policy makers to refer to nature in and around urban areas, such as parks, trees along streets and gardens.

Measures of the presence, amount or quality of green space in a certain area or place are commonly referred to as **green space indicators**. Just like health indicators, green space indicators can be assessed in an objective or subjective manner. Objective green space indicators, such as the percentage of an area covered by vegetation or water, can be calculated from maps, photos or land-use databases, or by conducting systematic on-site observations. Subjective (or perceived) indicators can be derived from respondents' own descriptions of the amount and/or quality of green space in their own environment.

5.4 LINKING NATURE TO HEALTH

In 1984, Roger Ulrich published a study in the prestigious journal *Science* which, for the first time, provided reliable empirical evidence that exposure to nature may improve human health (Ulrich, 1984). Using the hospital files of patients recovering from gallbladder surgery, Ulrich demonstrated that patients in rooms overlooking a natural area with trees required somewhat shorter postoperative hospital stays, received fewer negative comments in nurses' notes and needed less doses of strong painkillers than patients with a view of a brick wall, especially on days 2–5 after the surgery, when they had sufficiently recovered to be aware of their surroundings, but still suffered substantial pain (Figure 5.1).

The findings of Ulrich's hospital-file study have been replicated in a series of clinical trials in a Korean hospital in which patients were, after surgery, assigned to rooms

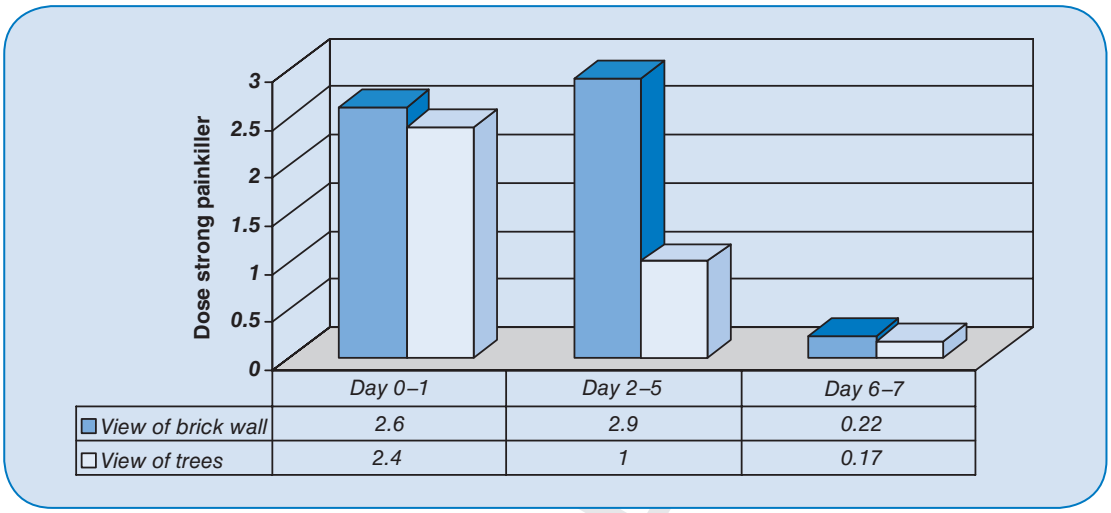

Figure 5.1 *Intake of doses of strong painkillers among patients recovering from gallbladder surgery in rooms with a view of nature or a view of a brick wall.*
Adapted from Ulrich (1984).

with and without potted plants (Park, 2006). The results of these trials showed, among other things, that patients in rooms with plants experienced shorter hospital stays and needed fewer intakes of postoperative pain medication than patients in rooms without plants. Unlike the patients in Ulrich's hospital-file study, the patients in the Korean studies were randomly (that means by chance) allocated by the experimenters to rooms that were exactly similar except for the presence of plants. Therefore, the health differences between the groups who recovered in the two types of rooms can be unambiguously attributed to the presence of plants.

Outside the hospital, a substantial amount of research has documented positive health impacts of nature-based therapy programmes, such as wilderness programmes, horticultural therapy or green exercise programmes (Frumkin, 2001). Unfortunately, these studies have typically failed to include control groups that received the same kind of therapy in a non-natural environment. This makes it difficult to determine whether any health benefits were due to the natural environment, or to other factors, such as the structure, staffing and activities of the programmes. Consequently, research on nature-based therapies provides only circumstantial evidence for a relationship between nature and health.

5.5 GREEN SPACE AND PUBLIC HEALTH

A more recent line of research has investigated the relationship between access to green space in the living environment and public health. This research has used

large-scale population studies to compare the health and well-being of people living in green areas with the health and well-being of those living in less green areas. Because attractive, natural neighbourhoods tend to attract wealthier and thus healthier people, advanced statistical techniques are used to control for confounding effects of socio-economic background variables. In a pioneering study among more than 10,000 residents of the Netherlands, De Vries and colleagues (De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003) found that residents with a high percentage of green space in a 1 or 3 km radius around their home reported better general and mental health and fewer health complaints than those with a low percentage of green space around their home. These findings have been replicated with different populations, health measures and green space indicators in studies in the Netherlands (Maas, Verheij et al., 2009) and other countries such as England (Mitchell & Popham, 2007, 2008), Denmark (Stigsdotter et al., 2010), Australia (Sugiyama, Leslie, Giles-Corti, & Owen, 2008) and Japan (Takano, Nakamura, & Watanabe, 2002). However, a recent study in New Zealand found no association between green space and mortality rates (Richardson, Pearce, Mitchell, Day, & Kingham, 2010).

Epidemiological studies have consistently indicated that relationships between green space and health are stronger for groups who tend to spend more time in and near their homes, such as the elderly, housewives and people with a low socio-economic status. As a result, health inequalities between different socio-economic groups might be reduced by the availability of green space. Indeed, a study in England showed that disparity in mortality rates between poor and rich people was about twice as low in very green neighbourhoods as in barren neighbourhoods (Mitchell & Popham, 2008). Thus, access to green space may protect people from the negative health consequences of having a low income.

Research on relationships between green space and health has focused mostly on the presence or amount of green space in the living environment. However, data from a study in 80 Dutch neighbourhoods suggest that the quality of the green space is also important for health (Van Dillen, De Vries, Groenewegen, & Spreeuwenberg, 2011). The researchers collected objective information on quality indicators such as absence of litter, accessibility and colourfulness by means of observations. Residents in neighbourhoods with green space of high quality generally reported better health than residents in neighbourhoods with low quality green space, independent of the amount of green space.

5.6 MECHANISMS LINKING NATURE TO HEALTH

How can a positive relationship between nature and health be explained? We will discuss four possible mechanisms that are frequently mentioned in the literature (De Vries, 2010): (1) improvement in **air quality**, (2) stimulation of **physical activity**, (3)

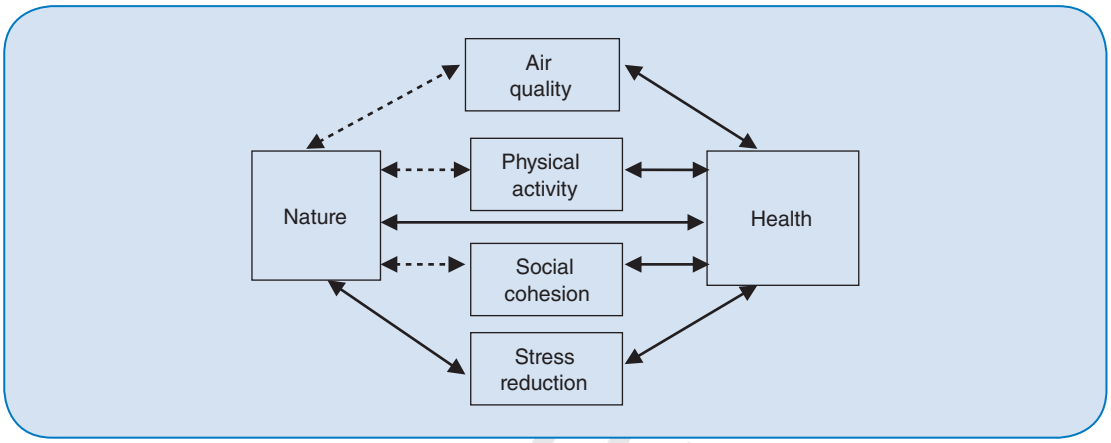

Figure 5.2 *Schematic representation of relationships among nature, health, and underlying mechanisms. Solid lines represent established relationships; dashed lines represent weaker or inconsistent relationships.*

facilitation of **social cohesion**, and (4) restoration from (or reduction in) **stress** and **mental fatigue** (Figure 5.2). This selection is not complete; other mechanisms, such as reduced aggression and crime or an increased intake of healthy foods (from the garden), may also be at work. However, because research on these mechanisms is mostly absent or limited, their relevance cannot yet be assessed.

The importance of air quality, physical activity, social cohesion and stress reduction for health has been well established. However, to qualify as explanations of health benefits of nature, it needs to be demonstrated that these factors are positively related to the presence of nature. With respect to air quality, it has been sufficiently proven that trees and other green elements can filter fine particle pollution from the air. However, the capacity of trees to filter the air is limited. Calculations from American data indicate that a city needs to have a tree cover of 42 per cent to achieve a reduction in fine dust of 1 per cent (Nowak, Crane, & Stevens, 2006). Moreover, trees may also have a negative influence on air quality; they can impede airflow in urban areas which can cause dust to be 'trapped'. Based on these and other findings, the effect of vegetation (trees and shrubs) on air quality in and around cities appears to be limited and variable (Wesseling, Beijk, & Van Kuijeren, 2008).

When it comes to physical activity, people do usually appreciate the presence of green spaces in the local area that can be used for recreation and transport. This does not mean, however, that physical activity levels will rise as more green space becomes locally available. The desire to exercise is to a large extent intrinsically motivated. People who want to be active will find themselves a way to do so, even if it requires taking the car to travel to a remote green area. Moreover, being in a green area does not necessarily imply being active. Some green spaces invite passive forms of recreation, such as quiet reflection, rather than active forms. In line with these considerations, the evidence for a positive link between nature and physical

activity thus far has been mixed and inconclusive (Maas, Verheij, Spreeuwenberg, & Groenewegen, 2008). However, for special groups such as children and the elderly who are more limited in their freedom to move, there is consistent and growing evidence that the greenness of the environment is positively related to physical activity (Floriani & Kennedy, 2008).

Several studies have shown that green space nearby may contribute to social contacts and cohesion (or bonds) between neighbourhood members (Coley, Kuo, & Sullivan, 1997; Kuo, Sullivan, Coley, & Brunson, 1998). However, because most of these studies have been conducted in the same, very poor and barren, city neighbourhood of Chicago, the relevance of these findings to other settings may be questioned. Studies conducted in wealthier and greener areas suggest that green space may promote a general sense of cohesion and community in a neighbourhood without actually stimulating the amount of social contacts with neighbours (Maas, van Dillen, Verheij, & Groenewegen, 2009; Sugiyama et al., 2008).

The three mechanisms discussed thus far all assume that people must 'go out' and make direct physical contact with nature in order to experience health benefits. The validity of this assumption is, however, challenged by findings that merely viewing nature from a window can already have beneficial effects. For example, the patients in Ulrich's hospital study experienced health benefits from viewing nature while they were lying in bed, alone, in an air-conditioned room. Physical activity, social contacts or air quality cannot have caused these effects; there must be another, more perceptual or psychological, route leading from nature to health. The existence of such a psychological route is indicated by a large body of experimental studies which have consistently shown that viewing (slides or videos of) natural environments promotes faster and more complete restoration from stress and mental fatigue than viewing built or other non-natural environments. The details of this research, which has become known as 'restorative environments research', will be discussed in the next chapter.

Based on the quality and quantity of research and consistency of the findings, experts agree that stress-reduction provides the most plausible and comprehensive explanation for health benefits of nature (Health Council of the Netherlands, 2004). This underlines the importance of considering psychological factors when promoting healthy environments. However, more research is needed before any conclusions on the relative importance of different mechanisms underlying relationships between nature and health can be drawn.

5.7 SUMMARY

In this chapter we have provided an overview of recent efforts at empirically verifying the long-standing and widely held notion that contact with nature can promote people's health and well-being. We have shown that there is increasing evidence from well-controlled research that links nature to clinical and public health indicators.

However, the causal nature of this relationship needs to be further established. We have also discussed the evidence for four mechanisms that may explain a relationship between nature and health: (1) air quality, (2) physical activity, (3) social cohesion and (4) stress reduction. This chapter suggested that thus far stress reduction provides the most plausible and comprehensive explanation for health benefits of nature. In general, the scientific research and insights discussed in this chapter provide a scientific base for the formal acceptance and better practical use of health benefits of nature in policy and practice.

GLOSSARY

air quality a measure of the condition of air relative to the requirements of humans or other species.

clinical health indicators objective and subjective measures of patient functioning.

epidemiological studies studies on the distribution and determinants of health-related states or events.

green space a term mostly used by policy makers to refer to nature in and around urban areas.

green space indicator a measure of the presence, quantity or quality of green space.

health a condition of well-being free of disease or infirmity.

health indicator a measure of the health status of an individual or group.

health risk factor behaviour or other characteristics associated with an increased probability of future disease occurrence.

illness the subjective state of 'unwellness' which can occur independently of, or in conjunction with, disease or sickness.

landscape an area, as perceived by people, whose character is the result of the action and interaction of natural and human factors.

mental fatigue a neurological symptom, also referred to as 'directed attentional fatigue', which occurs when parts of the central executive brain system become fatigued.

morbidity rate the number of individuals suffering from a disease during a given time period (the prevalence rate) or the number of newly appearing cases of a disease per unit of time (incidence rate).

mortality rate the number of deaths (in general, or due to a specific cause) in a population, typically expressed in units of deaths per 1000 individuals per year.

natural environment any kind of environment, place or setting where vegetation and other natural elements are dominantly present.

nature a broad concept that encompasses natural areas such as forests as well as agricultural landscapes, urban greenery, and natural elements and features such as trees and lakes.

nature area a natural setting, often large scale and remotely located, that has developed through natural growth rather than design or planning.

pathogenic approach to health an approach to health that focuses on the identification and elimination of factors that cause disease.

physical activity any bodily movement produced by skeletal muscles that causes your body to work harder than normal.

public health indicators objective and subjective measures of the health status of a population, such as measures based on the prevalence and incidence of disease, or self-reported health measures.

public health promotion the science of protecting and improving the health of communities through education, promotion of healthy lifestyles, and research for disease and injury prevention.

salutogenic approach to health an approach to health that focuses on factors that promote human health and well-being.

social cohesion the degree to which members of a community feel committed to the community and other members of the community.

stress a real or perceived threat or challenge to the integrity of the organism, which is often accompanied by fear or anxiety.

SUGGESTIONS FOR FURTHER READING

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REVIEW QUESTIONS

1. Why is it important to empirically verify relationships between nature and health?
2. What is the main difference between the biomedical/pathogenic and biopsychosocial/salutogenic approaches to health?
3. What are health inequalities and how can green space in the living environment reduce such inequalities?
4. How can a positive relationship between nature and health be explained? Describe the mechanisms that are commonly used to explain health benefits of nature.
5. What is known about the relationship between nature and physical activity?