

CHAPTER 4

PEOPLE-PLANT INTERACTION

The physiological, psychological and sociological effects of plants on people

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Abstract: This paper reports the results of a literature study into the effects of plants on human well-being. Different studies from various countries show that there are many different settings in which humans interact with plants. Some of these settings have a therapeutic aim, others do not. This paper demonstrates that various target groups can benefit from working with plants. Little is known, however, about the mechanisms behind horticultural therapy while the evidence is weak due to the methodological limitations of the studies.

Keywords: human well-being; horticultural therapy; psychological effects of plants; physiological effects of plants; social effects of plants; horticulture and human health

INTRODUCTION

This part of the paper discusses the state of the art concerning the contribution that active human involvement with plants may make to health, well-being and quality of life. Although examples of therapeutic gardening have been reported for decades, research in this field has only started a few years ago. There has been some research, especially in the US, the UK and Japan, but most studies have methodological shortcomings and usually the papers are descriptions of different practices.

Considerable practical experience shows the possible benefits of working with plants. Fortunately, in-depth research into the effects of working with plants on human beings is increasing. In The Netherlands, the growing number of Green Care farms is a striking phenomenon. The amount of Green Care farms has grown from 75 to 430 in a period of four years (1998-2002). Clients on these farms are also working with plants.

The Health Council of The Netherlands (Gezondheidsraad 2004) also mentions an increasing interest in the contribution to human well-being of working with plants in allotment and community gardens. Against this background it seems useful to present an overall picture of the different settings in which plants are being used in interaction with people and the benefits of plants for human well-being.

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First, we describe the various terminologies that are used to express working with plants in different settings, followed by a description of the settings in which humans are involved with plants. Finally, we give an overview of the available information about the benefits of plants for human well-being.

DIFFERENT TERMINOLOGY

Horticulture is used in many settings as a form of direct or indirect therapy. The scale on which horticulture is being used as a therapy differs as well. There are ‘green rooms’ for elderly in care institutes but there are also clients who work on the fields with crops on a Green Care farm. There is a broad range in which horticulture is used by people. In this paragraph we describe the different settings in which plants are being used.

We start with the difference between horticultural therapy and therapeutic horticulture. Sempik et al. (2003) describe horticultural therapy as: “the use of plants by a trained professional as a medium through which certain clinically defined goals may be met”. Sempik et al. (2003) speak of therapeutic horticulture as being “the process by which individuals may develop well-being using plants and horticulture. This is achieved by active or passive involvement” (Growth Point 1999). Sempik et al. (2003) state that horticultural therapy and therapeutic horticulture have different meanings. The first term refers to a therapy that has a predefined clinical goal similar to that found in occupational therapy, whilst therapeutic horticulture is directed towards improving the well-being of the individual in a more generalized way.

Table 1. Difference between therapy and horticulture

Therapy	Horticulture
The individual is paramount	The plants are paramount
Means: working with plants	Means: working with plants
Aim: therapy, improving quality of life	Aim: recreation and productivity
Benefits: improving health, quality of life and well-being	Benefits: vegetables, fruit and pleasure
	Side effect: improving well-being

There are, however, more settings where people work with plants than the horticultural-therapy and therapeutic-horticulture settings mentioned by Sempik et al. (2003), sometimes with a more therapeutic aim and sometimes more as a form of recreation.

The scheme below shows a refinement of the different settings into working with plants in a therapeutic, work or recreational setting; on the left the activities with plants representing a form of horticultural therapy described by Sempik et al. (2003), towards the right activities moving to a form of therapeutic horticulture.

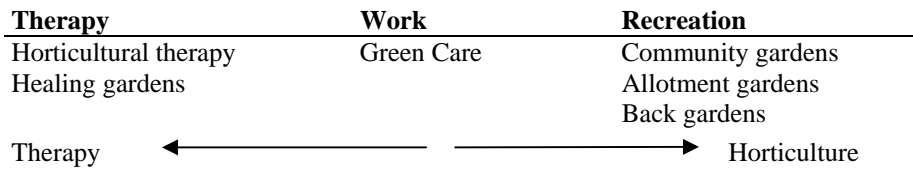


Figure 1. Division of plant activities into therapeutic, work and recreational setting

Therapeutic setting

Horticultural therapy is the use of plants by trained professionals as a medium through which certain clinically defined goals may be met (Sempik et al. 2003). This therapy can take place in a horticultural programme at a care institute or in the practice garden of a horticultural therapist.

Healing gardens are mostly designed to support healing processes and recovery of stress. They are usually situated near care institutes. Healing gardens are designed for different target groups like Alzheimer patients, children with learning disabilities and schizophrenic persons. Each target group has its own special demands regarding the design of such gardens. Working or walking in such healing gardens is a means to rehabilitate clients.

Work setting

On Green Care farms, clients do horticultural work in a farm setting. Clients are helping the farmer and his wife with the normal activities on the farm, like caring for crops on the fields. That means that clients are mostly working with plants on a larger scale. Sometimes they work in a greenhouse. Most clients are on the farm for day activity and they usually have well-defined learning goals. Work has to match the client's goals and abilities. Working on a Green Care farm means producing products with a high quality, working in real life, and to be useful as a client. Working with plants usually has a rehabilitation function. Plants are being used in a work environment.

Gardening is also being used in prison. Prisons have long used inmates as workers on their farms to produce food for use in the institution. Today, horticulture is often used as rehabilitation providing inmates skills they can use after their release.

Recreational setting

Community or allotment gardens are other forms of horticulture but their therapeutic aspect is not directly apparent. People are working alone or in groups to grow crops in their (back) garden or to plant trees or shrubs. Most people have a back garden where they nurse their plants and sometimes grow crops. These forms of working

with plants can be beneficial or therapeutic for the owners but it is not a form of direct therapy and users are usually not aware of the therapeutic effects.

Lewis (1995) mentions urban and community forestry as a form of 'gardening' in cities. Urban groups take the lead in planting and maintaining city trees. In The Netherlands there are examples of the upkeep of green facilities by communities in their own neighbourhood.

Various publications show that horticulture, in many different forms, has been used as a therapy or as an adjunct to therapy in the treatment of diseases (Sempik et al. 2003). In the next section we give a state-of-the-art of the research that has been done on the beneficial effects of working with plants.

WHAT IS KNOWN ABOUT THE GENERAL BENEFITS OF PLANTS ON WELL-BEING?

In the past, evidence of a growing awareness of the benefits of working with plants was largely anecdotal (Kidd and Brascamp 2004). Recent research findings and case studies highlight the positive social and psychical outcomes of active participation in gardening such as increased self-esteem, improved health, sense of community, accomplishment and pride (Lewis 1996). Therapists and participants in horticultural-therapy programmes usually report the same positive benefits like social integration, increase of self-confidence, self-esteem and concentration, and learning of practical skills, structure and routine (Gezondheidsraad 2004).

Unruh (2004) studied 42 men and women in Nova Scotia (Canada) and compares the meaning of gardening for people with cancer and people without cancer. He concludes that the possible meaning of gardening in daily life is diverse and dependent on individual interests, past gardening experiences and current circumstances. The study revealed that gardening can be a possible coping strategy for stressful life experiences and can be beneficial for the physical, emotional, social and spiritual well-being. Beneficial effects of allotment gardens have been attributed to various factors, including enhanced physical activities, reduced levels of stress and mental fatigue, and a better social and cultural integration (Armstrong 2000). There is some evidence that allotment gardens may promote health, well-being and social safety through three mechanisms: enhanced physical activities, reduced stress and improved social cohesion.

Although the above studies give some examples of benefits from working with plants, not only the Health Council of The Netherlands (Gezondheidsraad 2004) but also Sempik et al. (2003) conclude from desktop studies that most of the research is purely descriptive and contains no actual quantitative or qualitative data. Some of the studies have a poor design, which makes their results doubtful. They also mention the lack of long-term epidemiological research (Sempik et al. 2003). Although the amount of thorough research on this subject is limited, we shall describe some studies and outcomes in the section below¹ First, the general physical, mental and social benefits for well-being are shortly described, followed by setting out the benefits for different target groups.

Physical benefits

Different studies show that nature in general can relieve stress and mental fatigue (Kaplan and Kaplan 1989; Ulrich 1983). A green environment in general may encourage people to have physical exercise. Physical exercise can have positive effects on different health determinants and reduces the risk of different kinds of chronic diseases (Gezondheidsraad 2004). Research also suggests that physical exercise can be useful in the treatment of mental health problems like anxiety and depression (Sempik et al. 2003).

Lewis (1995) mentions a study by Owen (1994), who found that visiting a botanical garden lowers blood pressure and reduces heart rate. Studies show that the presence of vegetation will speed recovery from stress (Ulrich et al. 1991; Kaplan 1993).

Different studies into the effect of physical activity show that activities like gardening are associated with health and reduce risk factors for coronary heart disease.

Mental benefits

Different target groups experience the same mental benefits of working with plants, such as increased sense of self-esteem, awareness and responsibility, especially when working in groups (Kaiser 1976). Participation also increases feelings of value and worth (self-confidence) (Smith and Aldous 1994).

By their beauty, colours and smell, plants in gardens enhance a sense of tranquillity and enjoyment (Kaplan 1973). Leisure in green environments provides feelings of relaxation, autonomy and competition, and makes people open for reflection (Gezondheidsraad 2004). Other studies show that responsibility and control appear to slow down deterioration of the physical and mental condition of elderly (Sempik et al. 2003). In this way working with plants can give the elderly some kind of responsibility and the opportunity to make decisions.

Kaplan (1973) and Lewis (1979) mention the success when finally the plant blooms or bears fruit. This intensely personal activity rewards with feelings of peace and tranquillity. The blooming garden or window box gives proof that the gardener can bring about changes in his or her surroundings. For example, strangers who pass by will often pause to enjoy the flowering accomplishments.

Kidd and Brascamp (2004) did a study on 361 New-Zealand gardeners and found no causal relationships between gardening involvement and psychological well-being, but there were high correlations between gardening and feelings of autonomy, environmental mastery, positive relations with others, purpose in life and self-acceptance.

Kaplan (1973) also studied the benefits of gardening. The following aspects of satisfaction were observed: the garden gave the participants peacefulness, quiet and fascination. Fascination refers to aspects of gardening like working with the soil and observing the progress of the plants. This means that gardening also gives sensory, tangible and physical benefits.

Social benefits

Horticultural therapy and gardening projects stimulate group processes and this in turn appears to promote social cohesion and the development of social and communication skills (Sempik et al. 2003). Horticultural therapy in groups can thereby enhance social interaction (Seller et al. 1999). More social contacts can indirectly lead to a better health because they can reduce the sense of loneliness and the chance of dying, depression and loss of cognitive functions especially with elderly (Gezondheidsraad 2004). For instance, in The Netherlands 15% of the population have feelings of solitude. Research points out that people with more social contacts feel healthier, have less chance of getting coronary heart diseases, and live longer. With elderly it seems that less solitude reduces the risk of dying, depression and loss of cognitive functions (Penninx et al. 1997).

Lewis (1992) saw in different cities that community gardening led to revitalization of depressed, low-income neighbourhoods. In an American study in New York the researchers found that community gardening can have a positive effect on social cohesion in the neighbourhood (Armstrong 2000).

THE BENEFITS OF HORTICULTURE FOR SPECIFIC TARGET GROUPS

Horticulture and psychiatric patients

Different studies show that horticulture improves social functioning of schizophrenic patients (Prema et al. 1986). Perrins-Margalis et al. (2000) mention the importance of group dynamics. They saw that working in a group enabled the participants to draw on each other for ideas and motivation, and accomplish tasks and gain satisfaction. They also reported the importance of sensory aspects of the horticultural activities like smells, colours and handling soil for the patients (Perrins-Margalis et al. 2000). Another study recorded an improvement in the personal appearance and hygiene of patients, reduced violent outbursts, increased communication and reduced isolation (O'Reilly and Handforth 1955). In short, different studies show that the benefits of horticulture for psychiatric patients are: improved communication with others, learning practical skills/teamwork/planning, improved self-confidence and better concentration (Seller et al. 1999).

Different studies show for various target groups that especially group dynamics within horticultural therapy can have beneficial effects for patients with a psychiatric background.

Horticulture and Alzheimer patients

Research shows that horticultural involvement of Alzheimer patients or patients with other forms of dementia gives benefits like a decline of disruptive behaviour and less sleep disturbances (Cohen-Mansfield and Werner 1998; Mooney and Nicell 1992; Fabrigoule et al. 1995). Mooney and Nicell (1992) found a reduction of violent incidents and falls for patients with Alzheimer's disease in institutions with gardens in comparison with institutions without gardens. For older subjects who do

gardening the risk of dementia is reduced because of the activity that is involved (Fabrigoule et al. 1995). Healing gardens can be especially designed for Alzheimer patients. There are activities that best match the different stages of dementia.

In a Dutch study among different care institutes for elderly, green activity as a day activity in such institutes seems to contribute to the quality of life of psycho-geriatric participants (Andreoli 2003).

Studies with Alzheimer patients showed that physical exercise can improve the cognitive abilities. Specifically designed gardens can be a source of sensory stimulation for Alzheimer patients in terms of colour, smell and texture, and can stimulate emotion and positive feelings and memories.

Horticulture and people with learning disabilities

Horticultural therapy can increase the feeling of value and worth and causes people with learning disabilities to consider themselves more desirable than before, thus influencing their self-esteem in a positive way (Smith and Aldous 1994). Sempik et al. (2003) quote Sarver (1985): "agritherapy as approach has several benefits like: appreciation of beauty in the environment; social development through cooperative effort; and a willingness to accept the importance of order and structure" (Sempik et al. 2003). All above-mentioned benefits can improve the well-being of people with learning disabilities.

Horticulture and elderly

There is extensive literature describing the design of tools, techniques and gardens for older people (Sempik et al. 2003). From different studies it appears that physical activity benefits a good health and reduces risk factors for heart diseases and other illness (Caspersen et al. 1991). Mooney and Milstein (1994) asked therapeutic staff for their views on the benefits of horticulture for older people. The benefits that were mentioned include: increased orientation to place, task and seasons, increased attention span, improved or increased interactions with other residents both during and outside the gardening-programme times, reminiscence, increase or improved physical functioning, displays of initiative, increased motivation, and the opportunity to experience success and accomplishment.

Kuo et al. (1998) found in a study with older people (64-91 years old) that social integration in a community coheres positively with contact of these people with public green in the neighbourhood.

Lewis (1995) mentions that in geriatric centres plants and plant projects provide physical and psychological stimulation. A plant growing on the windowsill or in the garden gives an older adult something alive to nurture, providing anticipation for development and new leaves, shoots and flowers. Lewis (1995) notices that for these populations, who no longer need to raise children, living plants provide a substitute and offer opportunities for tomorrow in an institutional setting which otherwise might be very sterile.

Horticulture and prisoners

There are examples of gardening projects within prisons and some research has been done on this topic. Different studies show that subjects learn various skills like responsibility, social skills, problem solving and decision making (Flagler 1995). Subjects also became less hostile and experienced success, and with that built self-confidence and self-esteem (Rice and Remy 1998).

McGuinn and Relf (2001) conclude from their research with young offenders that the horticultural programme may be a tool to improve social bonding of juvenile offenders and “that the tested curriculum appeared to be effective at evoking certain changes in attitudes about personal success and individual perceptions of personal job preparedness that can lead to development of pride and a positive self image” (Sempik et al. 2003).

Horticulture and children

Children with mental health problems experience self-fulfilment, learn basic biology and develop group activities (McGinnis 1989); there is an improvement of their concentration and a decline of incidents (Nixon and Read 1998).

The Health Council of The Netherlands (Gezondheidsraad 2004) mentions the importance of activities for children. Gardens can stimulate children to be active outdoors; activity has positive effects on different health determinants, for children especially on overweight.

Horticulture and burn-out patients

Horticulture can help people with a burn-out syndrome to rehabilitate. Rehabilitation means to restore a person to the quality of life and, in many cases, the employment they had prior to the illness, injury or circumstances that damaged that quality (Sempik et al. 2003).

THE BENEFITS OF PLANTS IN A WORKING ENVIRONMENT

The benefits of working with plants outdoors has been described in the section above but plants are also being used on a small scale in offices. The benefits of plants for office workers in a working environment have been examined in different studies.

Fjeld et al. (2002) did some research into the effects of plants on the well-being and health of office workers. This research shows that there is a positive relationship between plants at the workplace and the health of the office worker. Fjeld et al. (2002) also found a decline of health problems like fatigue, headaches and complaints like dry and soar throat and dry hands when plants and daylight lamps were placed in the office. The attendance of plants seems to have a positive effect on cognitive functioning in terms of attention recovery. Even exposure to plants for a few minutes can lead to positive effects on cognitive functioning. Other research

shows a positive relationship between plants and work productivity and plants and a lower blood pressure (Lohr et al. 1996; Russell 1997).

MECHANISM BEHIND HORTICULTURAL THERAPY

The best known theories that explain the influence of nature on humans, are the Attention Restoration Theory of Kaplan and Kaplan and the psycho-evolutionary model by Ulrich. These theories explain the influence of nature on reduction of stress and mental fatigue. Both theories consider the recovery effects of nature to be evolutionary and native. We will first discuss the Attention Restoration Theory by Kaplan and Kaplan, then the psycho-evolutionary theory by Ulrich, followed by some other explanations.

Kaplan and Kaplan (1989) discovered that mental fatigue arises as a result of the effort involved in inhibiting competing influences. Their ‘Attention Restoration Theory’ explains that nature does not need effort to draw attention but that it stimulates involuntary attention and is therefore restorative. According to Kaplan and Kaplan contact with natural environments results in two ways in reduction of mental fatigue: a. because natural environments give opportunities to take distance of routine activities and thoughts (*being away*); b. because nature automatically drives attention without any labour (*soft fascination*) (Gezondheidsraad 2004). According to Kaplan (1992) nature has four components of restorative experience: being away, fascination, extent and compatibility. Being away refers to “the sense of escape from a part of life that is ordinarily present and not always preferred” (Sempik et al. 2003). Nature *fascinates* people, meaning that it attracts involuntary attention, which requires no effort. Nature gives you the idea that you are in a whole other world that has a meaning and is well-ordered (*extent*). *Compatibility* means that nature needs to fit the activity that you do.

Ulrich and Parsons (1992) mention the *overload* and *arousal* theory. This theory poses that in the modern world we are constantly bombarded with so much noise, movement and visual complexity that our surroundings can overwhelm our senses and lead to damaging levels of psychological and physiological excitement. Environments dominated by plants, on the other hand, are less complex and have patterns that reduce arousal and, therefore, reduce our feelings of stress.

Another theory from Ulrich and Parsons (1992), the learning-experience theory, maintains that people’s responses to plants are a result of their early learning experiences or the culture in which they were raised. According to this theory, individuals who, for example, grow up in Switzerland have a more positive attitude towards landscape with mountains and trees than someone from The Netherlands. According to Ulrich, this theory also holds that modern, western cultures condition people to like nature and plants and to have negative feelings about cities. However, this theory does not take into account the similar responses to nature found among people from different geographical and cultural backgrounds, or even those from different historical periods.

The last theory mentioned by Ulrich and Parsons (1992) is the evolution theory. The evolution theory maintains that our responses to plants are a result of evolution.

Since we evolved in environments comprised primarily of plants, we have a psychological response to them. This evolutionary response is seen in an unlearned tendency to pay attention and respond positively to certain combinations of plants and other natural elements, such as water and stone.

Lewis (1995) studied the benefits of working with plants on human well-being. He linked special characteristics of working with plants to benefits and needs for human well-being. Lewis thinks self-esteem is the key success of working with plants. Self-esteem is the keystone to emotional well-being; a poor self-appraisal, among other factors, determines how one treats one's surroundings and how destructive one will be towards oneself or others. Gardeners' pride and self-esteem increase because other people in the community enjoy the plants and flowers, translated into improved feelings about the communities in which they live. People and plants are also independent, plants receive care and nurturing and gardeners find a confirmation of success in the growth of plants. Plants can therefore give people self-confidence.

Plants are effective in challenging human responses because their environment is in contrast with the social world in which we move. The garden is a safe place, a friendly setting where everyone is welcome. Plants are non-judgmental, non-threatening, and non-discriminating. According to Lewis (1996) they respond to care, not to the strengths or weaknesses of the person providing it. Our hi-tech world is unpredictable but plants have a fixed cycle and we can rely on that.

Lewis (1996) thinks that horticultural therapy is so effective because plants and people share the rhythm of life. They both evolve and change, respond to nurture and climate, and live and die. This biological link allows a patient to make an emotional investment in a plant; however, it is a safe, non-threatening investment. The commitment is one-way. Should the patient choose to withdraw, there will be no recriminations. In severely damaged patients, such a relationship can signify the first willingness to reach out to another living being. Some studies show that horticultural therapy can lead to *social inclusion* although there is no statistical evidence. Sempik et al. (2003) mention in their report the four dimensions to identify inclusion from Burchardt et al. (2002), namely: consumption, production, social interaction and political engagement. Burchardt et al. refer to social inclusion to the processes by which people are enabled to participate in these four key activities. These four dimensions of social inclusion can be the outcomes of social and therapeutic horticulture. For instance, with the dimension 'production', Burchardt means that people are engaged in a socially valuable activity. With gardening you can produce vegetables and fruit, which can be donated to other people.

Lewis (1995) mentions a study by community psychiatrist Dumont who looked at the city and tried to understand it in terms of the mental-health needs of urban residents. Dumont found that the city dweller has need for stimulation to break the monotony of daily life; sense of community and sense of mastery of the environment. He found that gardening can satisfy the needs of city dwellers. For instance neighbours come to know each other when they create their garden. They are not forced but contacts develop spontaneously. There are no barriers when the person who grows the best lettuce is questioned by other gardeners on how to

improve their crop. The gardens are evidence of individual achievement which overcomes the helplessness of low-income areas, showing that, indeed, individuals can bring about a change (*sense of mastery of the environment*). New leaves and flowers give the gardener enhanced feelings of pride and self-esteem.

CONCLUSION

Different studies from various countries show that people-plant interactions promote human well-being of different target groups, not only curative but also as a preventive treatment for individuals as well as groups. These findings show that apparently people think that working with plants is beneficial for human well-being. However, little research has been done on the determinants of working with plants that are beneficial for human well-being. Little is known about the mechanism behind horticultural therapy and in many cases the evidence is weak due to methodological limitations of the research.

Sempik et al. (2003) mention that a number of reports are published as 'pilot studies' or 'preliminary results' without being followed up with the full research findings. The Health Council of The Netherlands (Gezondheidsraad 2004) also concludes from its desktop study about 'Nature and Health' that follow-up research is required in order to provide further support for the indicators from existing theoretical and empirical research into the beneficial effect of nature in general, including working with plants, on health. Especially large-scale epidemiological studies would be a great help in finding evidence for the beneficial effects on the well-being that therapists, clients and gardeners experience from working with plants.

ENDNOTE

¹ The reports by the Health Council of The Netherlands and the Dutch Advisory Council for Research on Spatial Planning (Gezondheidsraad 2004) and Sempik et al. (2003) were of great help in finding the right studies

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