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**THE INFLUENCE OF A GREEN ENVIRONMENT
AND HORTICULTURAL ACTIVITIES ON
THE SUBJECTIVE WELL-BEING OF
THE ELDERLY LIVING IN LONG-TERM CARE**

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ACADEMIC DISSERTATION

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ABSTRACT

As with many western countries, Finland is experiencing a demographic shift towards an aging society. Increasing numbers of elderly citizens with chronic diseases need institutional care during their later years of life. This burdens the health care system. Supportive environments may reduce health care costs through engendering positive health outcomes. It is evident that environments containing plants have positive health effects, suggesting that such conditions could be one constituent of a supportive environment. The aim of this study was to consider whether green environments and activities related to plants have effects and are positively associated with the subjective well-being of the elderly living in long-term care.

The data for the study were gathered from three types of facility for the elderly. The participants represented various functional abilities, including the elderly capable of managing their activities of daily living and the elderly in nursing care. The data were collected by using interviews and questionnaires. The data concerned the meanings the elderly attached to plant growing, the effects plants had on the well-being of the elderly suffering from dementia, the experiences of staff related to plants in a care environment, the frequency of garden visits, the perceived effects and meanings the elderly attached to garden visits, the occurrence of self-rated depression and the self-rated quality of life among the elderly in nursing care. The Zung Self-rating Depression Scale was used to measure depressive symptomatology. The Nottingham Health Profile (NHP) was used to measure health related quality of life. The data were analyzed using both qualitative (Grounded Theory, phenomenological approach) and statistical methods.

Nurturing plants enabled the participants to use cognitive skills, provided emotional experiences and facilitated social relations among residents in care. In particular those aspects of well-being constrained by institutional environments, such as autonomy, sense of control and identity were facilitated by horticultural activities. The study indicated that the meanings the elderly attach to plants and nurturing them may be associated with their well-being, particularly with social and psychological aspects.

Staff was selected to provide information when studying the role of plants in the well-being of elderly individuals with dementia. According to staff observations, plants contributed significantly to the well-being of individuals with dementia by stimulating their senses, creating positive emotions and offering rewarding activities.

Experiences from the garden were of great significance for most of the elderly participants living in long-term nursing care. It was considered important to see plants and observe nature. The promoting effect of garden visits on mood was obvious: almost all participants felt themselves to be more cheerful and alert outdoors than indoors. For more than a half of the participants visiting the garden enhanced quality of sleep and ability to concentrate; it generated feelings of recovery and promoted peace of mind. The affective effects of visiting the garden tended to be more pronounced among the depressed than among those not depressed. The depressed did not consider social interaction and participation in social activities very important for their well-being.

Visiting an outdoors garden and self-rated health were strongly associated among women living in long-term nursing care. The association remained significant after accounting for health related distresses measured by the NHP. The result suggests that visiting an outdoors garden may enhance the self-rated health independently among elderly women living in long-term care despite their many health problems.

The principal reasons for restricting outdoor visits in long-term care were the lack of

assistance or uncomfortable weather conditions. Very few patients suggested that health related problems restricted outdoor visits. Depression tended to be related to perception of the residents of hindrances and distresses associated with visiting the garden.

Although the results of this study are only indicative due to the small number of participants, it can be concluded that interaction between the elderly and plants, in both active and passive ways, benefits the health of the elderly in long-term care. Providing the elderly with access to plants would probably promote positive health outcomes. However, more multidisciplinary empirical research is needed to clarify the ways in which a green environment is associated with health of the elderly. Evidence from objectively measured health outcomes would facilitate establishing gardens in institutional settings.

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following papers, which are referred to by Roman numerals in the text.

- I Rappe, E. and Evers, A.-M. 2001. The meanings of growing plants: Contributions to the elderly living in sheltered housing. *HortTechnology* 11 (2): 268-272.
- II Rappe, E. and Lindén, L. 2004. Plants in health care environments: Opinions and experiences of the nursing personnel in homes for people with dementia. *Acta Horticulturae* 639: 75-80.
- III Rappe, E. and Kivelä, S.-L. 2005. Effects of garden visits on long-term care residents as related to depression. *HortTechnology* 15(2): 298-303.
- IV Rappe, E., Kivelä, S.-L. and Rita H. 2004. Self-rated health and quality of life: associations with visiting outdoors among the aged living in long-term care.

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AUTHOR'S CONTRIBUTION

The contribution of the author of this thesis to the publications I-IV is presented here.

In paper I, the author was responsible for planning the study. The author gathered and analyzed the data and wrote the manuscript. Dr. Aino-Maija Evers played a supervisory role and offered her advice and guidance during planning the study and writing the manuscript.

In paper II, the author was responsible for planning the study. She gathered and analyzed the data and wrote the manuscript. Dr. Leena Lindén offered her guidance during statistical analyses of the data.

In paper III, the author was responsible for planning the study and for gathering the data. The author analyzed the data and wrote the manuscript. Prof. Sirkka-Liisa Kivelä participated in data analysis and writing the manuscript.

In paper IV, the author was responsible for planning the study. She gathered and analyzed the data and wrote the manuscript. Prof. Sirkka-Liisa Kivelä participated in data analysis and in writing the manuscript. Dr. Hannu Rita offered his advice and guidance during the planning of statistical analyses and interpreting their results as well as writing the manuscript.

1 INTRODUCTION

The number of elderly is increasing, especially the proportion of the oldest. Since diseases and impairments that hamper functional ability are most common among the oldest, it is probable that the number of elderly living in long-term care will remain high or even increase despite the emphasis placed on promoting home care.

Many negative features characterize institutional living. These include loss of autonomy and self-esteem, loneliness and hopelessness. Depression and dementia are frequent among the elderly in long-term care. The functionally efficient and sterile environment of institutions can accelerate decline in the abilities of the elderly.

Supportive environments are associated with positive health outcomes. An environment that provides aesthetic pleasure and possibilities for engaging in meaningful activities, as well as providing opportunities for socializing, may enhance coping during institutional living. Plants are a principal feature of the supportive environment because restoration from stress and cognitive fatigue are related to natural environments containing plants.

The intention of this study was to consider whether green environments and activities related to plants had effects that could be associated with the well-being of the elderly living in long-term care. The increasing numbers of elderly with many chronic diseases add to health care requirements and costs to the community. If a green environment were associated with enhancing well-being, landscape design and horticulture could represent an economically sustainable means to create supportive environments in institutional settings.

1.1 Theoretical background

1.1.1 Human issues in horticulture

This study applied the framework of Human Issues in Horticulture (HIH). HIH is a relatively new perspective in horticulture that started to emerge in the 1980s. In traditional horticultural science focus is generally on the production and exploitation of crops whereas HIH aims at an understanding the interactions between human beings and plants (Relf 1992a, Relf and Lohr 2003). People-plant interactions are defined as “the wide array of human responses (mental, physical, and social) that occur as a result of both active and passive participation with plants” (Relf 1992b). HIH includes a broad range of plant related issues, including health related effects of plants, use of horticultural therapy and healing environments, environmental remediation and environmental education. HIH research is often multidisciplinary, using methods from human sciences, such as psychology, environmental psychology, social sciences and medical sciences. Since the HIH approach is new, it is still in its developmental stages. Theories used in HIH research originate from other disciplines including environmental psychology and social sciences.

1.1.2 Well-being and health in the framework of health promotion

The goal of HIH research is to reveal associations between plants, gardening and human well-being. However, shortcomings in definitions of concepts often prevail in research reports. The concepts of “well-being”, “quality of life” and “health” are used without reference to the approaches from which they originate.

Well-being is frequently studied in social politics. Allard (1976) suggested that the concept of well-being included objective appraisals of both material resources and human relationships. In his theory subjective appraisals of these dimensions are termed happiness. However, in HIH research material dimensions of well-being are often neglected. Well-being in HIH research comprises mainly health-related factors referring either to objectively measurable health effects or subjectively perceived quality of life (e.g. Browne 1992, Ottosson and Grahn 1998, Fjeld 2000, Park et al. 2004).

Health as a state includes both ill-health and well-being, which derive from the often cited definition of the World Health Organization: “Health is a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity”. Downie et al. (2000) developed a more relative model of health in which both ill-health and well-being are interconnected. In their model positive health includes true well-being and fitness. True well-being is related to empowerment of individuals based on autonomy and feelings of well-being. Fitness reflects an individual's physical capacity to cope with demands of the environment in necessary situations. Negative health includes diseases, illnesses, deformities, unwanted states, injuries, disabilities and handicaps. Positive and negative health are linked through physical, mental, and social elements that characterise both states. Overall health is regarded as a sum of all these components. This view suggests that health can be improved either by enhancing positive health or reducing negative health, or by doing both.

There is no unanimity among researchers as to whether the quality of life and health are distinct constructions (Smith et al. 1999, Lercher 2003). Considerable agreement does however exist that quality of life is subjective and multidimensional in nature and includes both positive and negative dimensions of physical, psychological and social domains (The WHOQOL Group 1995). In their meta-analysis Smith. et al. (1999) concluded that when assessing the quality of life, greater emphasis is given to mental health than to physical state and that the pattern is reversed when health status is gauged.

The suggestion based on the model of Downie et al. (2000), that health can be promoted not only by preventing ill-health but also by enhancing well-being and fitness, is in accordance with salutogenesis approach of Antonovsky (1988), in which factors maintaining good health are emphasised. In his theory a strong sense of coherence maintains good health by providing resources to manage everyday strain. When stimuli derived from the environment are comprehensible, manageable and meaningful for an individual, a sense of coherence can be achieved.

The sense of coherence has the same dimensions as the sense of autonomy. Launis (1994) divided the concept of autonomy into dimensions of thinking, wishing and action. Autonomy of thinking is associated with a person's ability to consider issues rationally and to understand the results of his or her own action. Autonomy of wishing is the ability to formulate one's own preferences and to evaluate them critically. Autonomy of action infers a capability of carrying out plans one has made. Downie et al. (2000) suggested that

the concept of autonomy encapsulates the values of self-determination, self-government, sense of responsibility and self-development. One main concern of health promotion is the empowerment of individuals since it enables development of autonomy by contributing to an individual's abilities to control one's life, to express personal will and to develop talents (Downie et al. 2000).

1.1.3 Supportive environments

Environmental effects on health have been recognised in health promotion since the Ottawa Charter for Health Promotion in 1986 for which one main proposal was the creation of healthy environments (WHO 2004). The Sundsvall Statement on Supportive Environments (2004) emphasised equal access to resources for living and opportunities for empowerment to all people despite their impairments or other limiting factors. A supportive environment in a health promotion context refers to the physical and social aspects of the environment.

Ulrich (1999) stated that stress is a major problem in health care facilities. In addition to ill-health, which may promote stress, effective care environments are often psychologically stressful (Ulrich 1991). Stress itself leads to negative health outcomes and may hinder recovery processes. Ulrich (1991, 1999) suggested that stress experiences could be alleviated by environments with conducive characteristics. According to his conceptual model, the key features for individuals in supportive, health promoting environments are sense of control, access to privacy, access to social support, possibilities for movement and exercise and access to nature and to other positive distractions. These characteristics of an environment facilitate an individual's abilities to recover and cope with stress, which in turn results in improved health.

1.1.4 Therapeutic horticulture and horticultural therapy

Gardening and horticulture have been used as a therapy for different groups of people in various settings to promote health, well-being and social inclusion (Davis 1998, Sempik et al. 2003). Horticulture is used in occupational therapy as a component of rehabilitation or specifically as horticultural therapy.

To clarify concepts the English charity Thrive defined therapeutic horticulture and horticultural therapy separately (Sempik et al. 2003, p. 3). They suggested that "Horticultural therapy is the use of plants by a trained professional as a medium through which certain clinically defined goals may be met". Horticultural therapy has a pre-defined clinical goal whereas therapeutic horticulture is directed towards improving the well-being of individuals more generally. According to Thrive, "Therapeutic horticulture is the process by which individuals may develop well-being by using plants and horticulture. This is achieved by active or passive involvement".

Based on their literature review of social and therapeutic horticulture and environmental psychology Sempik et al. (2003) developed a theoretical model showing the main activities, processes and outcomes related to interactions between plants and human beings. The model is based to the assumption that individuals have an innate appreciation of natural environments. Active involvement in horticulture and gardening facilitate development of skills, social processes, interaction and esteem building, which promote

employment and lead to rehabilitation, acceptance and social inclusion. Participation in activities also includes physical activity and food production. Appreciation of nature is regarded as passive involvement that facilitates attention restoration and recovery from stress, leading to feelings of tranquillity, peace and spirituality. Factors in the model can be inter-related with other factors that contribute to overall health.

1.2 The effects of nature and plants on human well-being

Plants and natural landscapes may enhance human well-being by causing positive physiological and psychological responses, by affecting human behaviour or by modifying physical factors of the environment such as relative humidity of the air (Relf 1992a, Relf and Lohr, 2003). Positive responses to plants are observed in perception of pain (Lohr and Pearson-Mims 2000, Diette et al. 2003, Park et al. 2004) and also in perceived health status (Fjeld 2000).

1.2.1 Recovery from stress and effects on mood

Stress is experienced when external demands are perceived to exceed an individual's ability to cope (Kubzansky and Kawachi 2000). Emotions can be considered as responses to these stressful environmental events, motivating individuals to respond in an appropriate way. Stress triggers physiological changes that may impact negatively on health.

The stress reducing effects of nature are well-established. Stress recovery responses can be measured by self-rating of affective states and by physiological measurements of heart period, muscle tension, pulse transit time (systolic blood pressure), brain electrical activity and skin conductance (Ulrich et al. 1991, Ulrich and Parson 1992). These physiological measures are widely recognized as credible indicators of stress and restoration (Ulrich and Parsons 1992).

The results of studies measuring physiological factors indicate that greater stress reduction is afforded by natural environments than by urban environments. In a simulated stress situation, recovery from stress symptoms, evidenced by pulse transit time, skin conductance, muscle tension and heart period, was faster and more complete when the subjects were exposed to natural environments rather than to urban environments (Ulrich et al. 1991). After induced stress, sitting in a room with views of trees promoted more rapid decline in diastolic blood pressure than sitting in a room devoid of a view (Hartig et al. 2003). In the same study, subsequently walking in nature fostered reduction in blood pressure whereas walking in an urban environment engendered blood pressure increase. Laumann et al. (2003) reported that after induced mental load subjects had lower heart rate when shown a video of a natural environment than when shown one of an urban environment.

Emotions affect not only to how human beings feel but also their well-being. In their comprehensive review on affective states and health, Kubzansky and Kawachi (2000) stated that emotions influence health directly by evoking physiological processes and indirectly by associations with behaviour. For example, negative feelings may elevate serum norepinephrine levels that in turn may increase blood pressure or blood lipids. Emotions may also affect the immune system by activating the sympathetic nervous system. The relation-

ship between emotions and health is reciprocal: ill health may lead to negative emotions and emotions may play a role in the etiology of diseases. High levels of anger and anxiety are associated with increased risk of coronary heart disease.

Changes in emotional states are related to exposure to nature. Nature elicits more positively toned effects than urban settings. Subjects exposed to the natural settings had lower scores for anger, aggression and fear compared with subjects exposed to an urban environment (Ulrich et al. 1991). They also reported higher levels of positive effects. Hartig et al. (2003) reported both increase in positive effects and decrease in anger and aggression after a walk in a natural environment. The reverse was recorded after a walk in an urban environment. Viewing videotapes of natural environments elicited greater improvement in the mood of university students than viewing videotapes showing built environments (Van den Berg et al. 2003). However, natural views are not always associated with better mood. In a study by Tennessen and Cimprich (1995) natural views from dormitory windows of undergraduate students did not influence mood state as compared with built views.

The use of green environments may affect stress levels. A strong inverse relationship was established between the frequency of visiting urban open green spaces and the frequency of experiences of stress (Grahn and Stigsdotter 2003).

There is evidence that the degree of experienced stress influences environmental preferences. Van den Berg et al. (2003) reported that among stressed or fatigued people the association between preference and an environment's potential for restoration was especially pronounced. High levels of stress were associated with higher preferences for natural environments and lower preferences for built environments. Korpela (2003) found that adults with severe negative mood were more likely to choose natural sites as favourite places rather than other places.

The psycho-evolutionary theory of Roger Ulrich is based on the stress reducing influences of exposure to nature (Ulrich 1983, Ulrich et al. 1991). The theory contends that acquiring a capacity for restorative response to certain natural settings had major survival-related advantages for early humans. High agreement across cultures in positive responsiveness to nature support the idea that also modern humans might have a prepared readiness to acquire restorative responses from unthreatening natural settings with particular characteristics such as some spatial openness and contents such as flowers (Ulrich et al. 1991, Ulrich 1999).

Ulrich's theory emphasizes the physiological and emotional changes that occur while viewing a scene after a situation involving challenge or threat. The theory suggests that the response to nature is initially preconscious and is evidenced by rapid onset of positive affective response to natural environments. Recent results of Korpela et al. (2002) provided support for rapid affective evaluations of environmental scenes. After a change towards a more positively-toned emotional state, exposure to nature decreases autonomic arousal as evidenced by positive changes in physiological activity levels. These changes are accompanied by sustained attention and decrease in negative emotions.

One-set of the restorative process is fast: restorative responses to nature occur within a few minutes (Ulrich et al. 1991). Fast processing permits quite short exposures to natural views to result in stress reduction.

The physiological changes reducing autonomic arousal during stress recovery indicate that human response to nature has a parasympathetic nervous system component, especially during the initial minutes of recovery (Ulrich et al. 1991). The evidence from lower heart rate during seeing videotapes of natural landscapes suggests that reduced

autonomic arousal engenders less spatially selective attention and results in higher intake (Ulrich et al. 1991, Laumann et al. 2003).

1.2.2 Recovery from attention fatigue

The Attention Restoration Theory (ART) by Rachel and Stephen Kaplan (Kaplan and Kaplan 1989, Kaplan 1995) is another theory that explains the psychological effects of nature experiences.

Rachel and Stephen Kaplan base their theory on measurements of cognitive and emotional responses over a ten year period among the participants of an outdoor challenge program. In the ART the reduction of mental fatigue is the key process of restoration. The theory is based on that of William James' concepts of voluntary (directed attention) and involuntary attention. Directed attention is defined as the capacity to inhibit compelling stimuli or distractions during purposeful activity. It requires energy. If this demand is prolonged, directed attention can become depleted. In contemporary society the use of directed attention is demanded constantly and it can be fatigued by overuse. The converse of directed attention is involuntary attention, which requires little or no effort. In ART the involuntary attention is also called fascination, describing how certain objects or processes can capture and hold attention effortlessly. When involuntary attention is engaged, directed attention can be restored.

According to ART recovery from mental fatigue is enabled when certain factors characterize the person-environment interaction. These properties of environments trigger mental processes or states that contribute to restorative experiences. The characteristics of an environment facilitating restoration from mental fatigue are being away, extent, fascination and compatibility. According to Kaplan and Kaplan (1989) these factors are commonly available in natural environments.

Being away refers to a change in location or activities enabling a temporary relief from daily concerns and psychological distance from one's usual mental content. Extent refers to the sense that the immediate setting is a part of larger place 'the whole'. This sense derives from the relatedness of immediately perceived elements and cues suggesting that further information is available upon exploration. Setting has extent; it is sufficiently rich and coherent that it can engage the mind for a period long enough to allow directed attention to rest and enables immersion. Fascination refers to effortless attention. Restoration can occur in a setting that evokes fascination. When a setting can hold one's attention effortlessly, directed attention capacity can be restored since there is no need for inhibiting distractions. Fascination can be engaged by environmental contents or by the process of activity. Compatibility refers to the congruence between opportunities and constraints afforded by the setting and a person's inclinations.

Deeply restorative experience includes not only the recovery of directed attention but that an ability to reflect on important issues is involved. Some settings can capture one's attention completely, leaving not enough room for thinking about other issues. This kind of fascination is termed hard fascination (Kaplan 1995). Hard fascination is very intense. It rivets attention and does not allow the deep restoration to be reached because there is no room for reflection (Herzog et al. 1997). Instead, soft fascination, characterized by a moderate level of fascination and aesthetic beauty, allows reflection and deep restorative experience, including that both the recovery of directed attention and reflection can be reached. Aesthetic pleasure, derived from a fascinating environment, helps to offset the

pain that may accompany reflection on serious matters.

The restorative process according to ART involves successive levels: clearing the mind of cognitive noise, recovery of attentional capacity, facing accumulated matters in one's mind and lastly reflection on one's priorities and goals on a broader scale. The duration of the process must be long enough to enable penetration into all successive levels.

There is empirical evidence from ATR to suggest that exposure to nature and plants has a restorative effect on the capacity of directed attention. In a study of Tennessen and Cimprich (1995) natural views were associated with better performance on attentional measures than built views, giving support to the notion that looking at nature can serve as an attention restoring experience. A walk in nature resulted in better performance in a Necker Cube Pattern Control task than a walk in an urban environment (Hartig et al. 2003). Viewing videotapes of natural environments elicited marginally better concentration than viewing built environments (Van den Berg et al. 2003). In a longitudinal study, increase of greenness in a home environment was associated with better performance in attentional tests in children (Wells 2000). Adding plants to a windowless computer lab reduced mental fatigue and improved attentiveness compared to a situation where no plants were present (Lohr et al. 1996).

ART and Ulrich's stress recovery theory share the hypothesis that the psychological and emotional effects of nature on human beings are derived from human evolution in nature. However, there are some basic differences between the theories. In Ulrich's theory recovery occurs after an antecedent stress while in ART recovery occurs after an attentional fatigue. In Ulrich's theory exposure to natural settings elicits autonomic responses, which can occur without recognition or conscious awareness of the elements of the settings (Ulrich et al. 1991), whereas in ART the recovery is a result of conscious cognitive appraisals (Kaplan 1995). This difference is reflected in the duration of recovery processes: stress recovery is faster than recovery from mental fatigue. These antecedent states, stress and attentional fatigue, may occur alone or have some reciprocal relationships (Ulrich et al. 1991, Kaplan 1995, Hartig et al. 2003). Hartig et al. (2003) suggested that the physiological and attentional restoration processes may complement one another, manifesting in different kinds of outcome that emerge at different rates and persist to differing degrees.

1.2.3 Environmental modifications indoors

Plants in indoor environments may contribute to human well-being by raising the relative humidity of the air, and reducing levels of gaseous contaminants and dust accumulation. Too dry indoor air represents a major problem for some workers (Koivunen 2003). Plants can raise relative humidity to levels recommended for human comfort by transpiration of water through stomata. Evaporation from growing media can also contribute (Lohr 1992, Lohr et al. 1996). Plants in association with rhizosphere micro-organisms are able to remove gaseous contaminants such as formaldehyde, benzene, n-hexane, and trichloroethylene from air (Wolverton et al. 1989, Wood et al. 2002). There is evidence that the amount of airborne micro-organisms does not increase when plants are added to the space. In a study conducted in a hospital radiology department no changes in content of fungi or fungal spores were recorded after introducing plants (Fjeld 2000). One study reported reduced dust accumulation on horizontal surfaces when plants were put in a room (Lohr and Pearson-Mims 1996).

1.2.4 Perceived effects on pain and health status

Plants and nature are also associated with better pain control. Improved pain tolerance when seeing plants or natural landscapes may derive from the strong attention holding capacity of nature (Kaplan and Kaplan 1989). A study by Roger Ulrich (1984), in which he examined the effect of a window view on recovery of surgery patients, associated reduced use of pain medication with the view of trees compared with a view of a brick wall. In laboratory studies the presence of ornamental plants has improved pain tolerance (Lohr and Pearson-Mims 2000, Park et al. 2004). The study of Lohr and Pearson-Mims (2000) was conducted in windowless office room. More participants were willing to keep a hand submerged in ice water for 5 min if they were in a room with plants than if they were in room with no plants, or in room with other colourful decorative objects. In a simulated hospital patient room female students kept their hands longer in ice water when plants were present than when they were not present (Park et al. 2004). Flowering plants in particular had positive effects on pain tolerance time, pain intensity and pain distress among subjects. In patients undergoing bronchoscopy sights and sounds from nature significantly reduced pain (Diette et al. 2003). In a randomized, prospective clinical trial pain was reduced during invasive procedures by exposure to a natural mural and sounds of water from the headphones. However, no effects on anxiety of the patients during intervention were established.

Tove Fjeld assessed whether indoor foliage plants affected self-reported human health and discomfort symptoms (Fjeld 2000). The introduction of foliage plants to an office room reduced cough and fatigue complaints by 37% and 30%, respectively. Complaints of dry or hoarse throat and dry or flushed facial skin decreased by about 23 % after intervention. When symptoms were grouped according to body responses, a significant reduction in neuropsychological symptoms (e.g. fatigue, headache, dizziness) and in mucous membrane symptoms was registered (e.g. irritation of eyes, stuffy nose) while skin symptoms (e.g. hands with dry skin) seemed to be unaffected. Plants also contributed to feelings of well-being: 82% of the participants were of the opinion that they felt more comfortable when they had plants in the office.

When plants and full-spectrum fluorescent lamps were added to the windowless room in a hospital radiology department, a decrease of 25% in all health complaints was recorded. Significant reductions were recorded in fatigue, feeling heavy-headed, headache, dry or hoarse throat and hands with dry, itching skin. When the time spent in the room was taken into account, those persons who spent most of their day there were associated with a decrease of 34% in complaints while those working less than a half day in the room with a decrease of 17% in complaints.

Complaints about health were also 21% lower among pupils in classrooms with foliage plants and fluorescent lamps compared with control classrooms without plants and lamps. Pupils in classrooms with plants and lamps were more positive about their classroom than those of the control group.

1.3 The elderly in institutional care

The elderly are increasing in number in western countries for two reasons. Firstly, life expectancy is increasing in developed countries (Tilastokeskus 2004a). Secondly, after the Second World War birth rate was high up to the 1950s and these baby boom cohorts will

reach old age in the near future. It is estimated that one quarter (26%) of the Finnish population will be over 65 years of age in 2030. The proportion of the elderly aged over 80 years is growing in particular (Tilastokeskus 2004b). Since the disabilities that hamper both physical and mental functioning are commonest during later years (Hervonen et al. 1998, Helin 2002), the numbers of elderly who need long-term care is probably increasing. Nowadays every fourth elderly person over 85 years of age is in long-term care in Finland (Helin 2002).

1.3.1 Characteristics of living

The health related quality of life of Finnish elderly in residential care is significantly poorer than among non-institutionalized elderly (Noro and Aro 1996). In long-term care the life of the elderly is often marked by loneliness, social isolation and by feelings of worthlessness (Noro 1998). Conflicts between a residents' autonomy and security are common (Päivärinta 1997). According to Grahn (1991) an elderly person in institutional care often adopts a passive role as a dependent. The emphasis placed on diseases in care work reinforces this role of decrepitude among the elderly (Liukkonen 1995, Stein 1997). Furthermore, the design of the grounds of homes for the elderly is often highly institutional, which can aggravate problems of isolation, loneliness and loss of capability and identity (Stoneham and Thoday 1996).

1.3.2 Dementia and depression

Dementia and depression are common disorders that impact negatively on quality of life among the elderly living in institutions. The proportion of people suffering from dementia is steadily growing mainly due to increasing life span. Dementia predominantly affects elderly people: 55% of people who suffer from dementia are over 80 years old. It is estimated that in 2000 about 80 000 people suffered from moderate to severe dementia in Finland. In addition, 30 000 people suffered from mild dementia. The incidence of dementia among people over 64 years old is 11 000 pa in Finland. It is estimated that the number of demented people in 2030 will be 128 000. In long-term care two out of three elderly persons suffer from dementia (Viramo and Sulkava 2001).

Although research interest in the etiology of dementia and development of pharmacological treatments is high, no curative treatment exists for dementia. Therefore, the emphasis of nursing is on maintaining functional ability (Kitwood and Bredin 1992) and on creating positive experiences for patients (Sulkava et al. 1994).

Depression is another major health problem among the elderly. The prevalence of clinical depression in long-term care is high. Estimates of major depressive disorder are 12% -14% and for minor depression 17% -30% (Alexopoulos 2000, Teresi et al. 2001). If nursing home residents with less severe, but yet significant depressive symptomatology, are included, about a half (44%) suffer from depression (Teresi et al. 2001). Major depression increases somatic morbidity and mortality (Pulska et al. 1997, Teresi et al. 2001, Cohen 2002, Blazer 2003). Medical illnesses, stress, and impaired social support are related to late-life depression (Kivelä et al. 1996, Blazer 2003).

1.4 The effects of nature and plants on well-being of the elderly

1.4.1 Health effects of a green environment in institutions for the elderly

Studies of the elderly living in institutions indicate positive associations between well-being of residents and green environments near by. Landscaped grounds in retirement communities and homes for the elderly have been found to be very significant for the residents (Talbot and Kaplan 1991, Browne 1992, Stoneham and Jones 1997). The elderly appreciate natural settings with less physical demand (Talbot and Kaplan 1991) so the main benefits of housing landscapes stem from passive pursuits such as sitting outdoors (Stoneham and Jones 1997). For retirement home residents passive involvement with a green environment by looking from windows and excursions into outdoor recreational areas are important constituents of well-being and life satisfaction (Brascamp and Kidd 2004). Possibilities for exercise in a green environment are also associated with mortality. In a cohort study walkable green spaces near residential environments increased the probability of five year survival of senior citizens in Tokyo (Takano et al. 2002).

Based on a study of four retirement communities Browne (1992) reported five areas in which nature may have an impact on the promotion of well-being of the elderly. Firstly, the elderly may improve their psychological well-being through aesthetics. In creating aesthetically pleasing, non-institutional settings, plants and landscape design play a main role. Purposefully designed outdoor spaces offer a variety of experiences through nature observation and diverse vegetation can also enhance well-being. For those with mobility limitations, views to nature from windows are important. Secondly, environmental stimulation from seasonal variation of plants may affect mental activity, maintain awareness of time and decrease boredom. Thirdly, gardening provides opportunities for self-expression and individuality and helps the elderly to be interested in their own home. Fourthly, visual appeal of the vegetation is important in encouraging the elderly to go out for a walk. Lastly, plants trigger social interaction and networking through shared activities and by providing topics for conversation.

Talbot and Kaplan (1991) found that contacts with nature were very important for the elderly. The availability of outdoor settings that permitted sitting and observing, enjoying flower gardens, and relaxing in the context of nature, enhanced their quality of life. Nature compensations, like reading about nature or watching nature programs on television, did not substitute for first-hand contact with nature.

Therapeutic gardens may have many health related effects on residents of nursing homes for elderly people by promoting independence, autonomy, competence, and self-esteem of the residents, by increasing social interaction, and by providing sensory stimulation and opportunities for exercise. These are implicated in preventing many diseases, maintaining functional ability and reducing symptoms of depression (Ousset et al. 1998, Zeisel and Tyson 1999, Singh et al. 2001, Pennix et al. 2002).

Visiting outdoors and seeing greenery was associated with better concentration ability and enhanced mood among the elderly living in nursing care (Ottosson and Grahn 1998). Resting outdoors for one hour in a green environment increased the ability to concentrate compared with resting indoors. The subjects assessed that being outdoors in a park-like courtyard promoted their balance of mind and they felt themselves to be

more cheerful after visits. Those elderly persons rated fresh air, exercise, and seeing trees, shrubs, and flowers as being the most important aspects of outdoor visits. When the psychophysiological balance of the elderly was taken into account, it appeared that those subjects with poor balance ratings benefited most from outdoor visits as evidenced by reduced diastolic blood pressure and heart rate.

1.4.2 Garden environment for the elderly with dementia

Gardens may be especially important for the elderly suffering from dementia. For example, *Sinnenas Trädgård* in Stockholm, Sweden, has proved to be a preferred place among the elderly with dementia (Rappe 2003). In dementia illnesses cognitive and functional abilities decrease progressively and individuals become more and more dependent on provisions from their environment (Sulkava et al. 1994).

An environment that meets the needs of demented people may affect behaviour positively and delay functional and cognitive declines (Valla and Harrington 1998). After all, gardens in the homes for the elderly create a pleasant, home-like environment. In their review-article, Day et al. (2000) listed many advantages by which home-like, non-institutional environments in nursing homes for people with dementia may affect the well-being of residents. A non-institutional character is associated with improved intellectual and emotional well-being, enhanced social interaction, reduced agitation and exit-seeking, improved functionality and greater preference and pleasure. Studies comparing environments of traditional nursing homes with environments of homes of non-institutional character have established that residents in the latter are less aggressive and anxious, preserve better motor functions and use less medicines. In addition, relatives and staff express greater preference for non-institutional environments.

Impaired ability to learn new information is often the first symptom of a dementing illness (Sulkava et al. 1994). Functional ability and recalling previously learned information are better preserved which may present resources through which contact with the outdoor environment can be maintained (Carman 2002). Individuals suffering from dementia are often confused and have problems in finding their way and in identification of objects and places (Zeisel and Tyson 1999, Teresi et al. 2000). Garden environments provide abundant information and cues about time, place and purpose, helping orientation for reality. Perception of familiar characteristics in the environment may result in a sense of comfort and feelings of control (Carman 2002). Activities in the garden help to draw on memories of earlier life and keep residents involved in their lives (Zeisel and Tyson 1999).

Sensory deprivation, boredom and loneliness are commonly associated with inappropriate behaviour among nursing home residents with dementia (Cohen-Mansfield 2001). Sensory stimulation afforded by a garden may prevent emotional outbursts and facilitate connectedness in individuals with dementia (Carman 2002). Gardens are safe and comfortable places for social interaction and providing privacy in an institutional setting (Carman 2002). In a Swedish home for demented elderly persons, increase in visits of relatives was recorded after establishing a garden (Rappe 2003).

Wandering is often considered to be inappropriate for elderly patients suffering from dementia because it represents a burden for caregivers and leads to restrictive care (Cohen-Mansfield 2001) and use of sedative medicines that accelerate functional decline (Valla and Harrington 1998). Providing a nursing home with a safe fenced outdoor area and continuous loops of walking paths enables residents to wander without danger of

getting lost (Beckwith and Gilster 1997, Valla and Harrington 1998, Zeisel and Tyson 1999).

Many design recommendations have been suggested for outdoor environments for patients suffering from dementia (e.g. Beckwith and Gilster 1997, Ousset et al. 1998, Valla and Harrington 1998, Zeisel and Tyson 1999), but research findings that support the positive effects of particular designs are few. Some studies found that outdoor visits are associated with reduced aggression among people with dementia (Day et al. 2000, Cohen-Mansfield 2001). What actually causes the recorded positive changes associated with outdoor walks is less clear since in most studies there are many changing variables like social contact, increased autonomy, outdoor light, or fresh air that may affect the outcomes (Cohen-Mansfield 2001). Privacy and personalization of space, residential character, and understandable environment were associated with both reduced aggressive and agitated behaviour and fewer psychological problems (Zeisel et al. 2003). Cox et al. (2004) reported that a garden increased the pleasure of nursing-home residents with dementia measured using the Affect Rating Scale. They concluded that the residents derived pleasure from engaging spontaneously in gardening activities like watering and deadheading. Compared with a multisensory Snoezelen room, gardens tended to animate and engage the residents rather than relax and calm them. Gardens also positively affected the well-being of visitors and staff.

1.4.3 Horticultural activities and health of the elderly

Horticulture is one of the most common and most commonly enjoyed leisure pursuits of older adults (Hill and Relf 1982, Sarola 1994, Haas et al. 1998). Pleasure and end-products are not the only benefits older people derive from gardening, but health promoting outcomes are also suggested. Gardening is associated with morbidity in epidemiological studies. In a study of Fabrigoule et al. (1995) gardening was one of the activities associated with lower risk of dementia among older people in France. The authors suggested that the protective effect of gardening and other complex activities like knitting could be due to stimulation of cognitive functions. Among elderly Dutch men those that gardened had lower risk of coronary heart disease than those who were less active (Caspersen et al. 1991). Gardening was independently positively associated with total cholesterol, HDL cholesterol, and systolic blood pressure after adjusting for confounding effects. Participation in gardening decreased less with increasing age than, for example, participation in sports.

Opportunities for the elderly to continue gardening are limited after they move into institutional care. Moving into residential care leads to a significant reduction in range and frequency of gardening activities compared with those possible during a previously independent life (Stoneham and Jones 1997, Brascamp and Kidd 2004). For example, vegetable growing stopped completely after moving to sheltered care. Although the passive use of a green environment is valued by the residents in institutional care, active interaction is also regarded as being important (Stoneham and Jones 1997, Brascamp and Kidd 2004). Brascamp and Kidd (2004) found that reasons for gardening among residents in a retirement home were associated with the therapeutic value of gardening, the satisfaction of seeing the results and of being able to share the enjoyment with other residents. Health reasons limited the actual enjoyment derived from gardening and there was a discrepancy between actual and ideal levels of gardening. Stein (1997) noted that

through gardening, residents in nursing homes were able to create new memories and meanings for their lives.

A principal content of gardening is fostering a living entity (Lewis 1992, Matsuo 1995). One of the major constituents of high quality life in old age is the feeling of being needed (Ojala 1989). Plants may contribute to this feeling providing purposeful activities since they require daily care. Plants grow and change with the season. The elderly are often nervous about the future since they are afraid of deterioration of their own health. Changing appearances of plants can be viewed as something favourable, representing positive prospects and hope for the future (Gaskins and Fórte 1995, Lewis 1996).

In long-term care facilities horticultural activities can be used as a therapeutic tool to improve the quality of life of the residents. Horticultural activities are goal-orientated, success based, productive and purposeful, providing satisfaction to the elderly engaged in them (Hill and Relf 1982, Mackenzie et al. 2000, Jarrot et al. 2002). Plant related activities may help the elderly maintain health, facilitate rehabilitation from and cope with chronic diseases and impairments, and alleviate symptoms of dementia (Haas et al. 1998). Horticultural therapy programmes that focus on group activities, sensory stimulation, and empowerment, may lead to an improvement in affect, behaviour and attitude of the residents (Mackenzie et al. 2000). The positive effects derive from an enhanced sense of self-worth and purpose in life, increased level of physical and mental activity, establishment of a sense of community and enhanced social support.

Gardening activities provide a wide array of attributes and benefits (Hill and Relf 1982). With older adults all manner of horticultural activities from planting and weeding to making a flower arrangement can be used in therapy (Haas et al. 1998). Horticultural activities focusing on plant culture have been demonstrated to be more interactive than craft-type activities among older adults (Kerrigan and Stevenson 1997, Predny and Relf 2000).

Plant material is a source of stimulation and motivation (Haas et al. 1998). Gardening activities can be modified so that the experience of success is possible regardless of the impairments of individuals (Jarrot et al. 2002). The same gardening activity can be used to meet different therapeutic needs because an activity can be presented in various ways depending on the abilities and needs of the target group. It may also simultaneously be influential at many levels including physiological, psychological, and social functioning (Haas et al. 1998). Horticultural activities allow reciprocal relationships with nature and other people; the elderly are not only recipients of care but can give nurturing and valuable things to others (Stein 1997, Mackenzie et al. 2000).

According to Jarrot et al. (2002) therapeutic horticultural activities are appropriate for older adults with dementia since the activities are familiar and meaningful to most and provide opportunities for reminiscence and exercising competence. In addition, horticultural activities are creative, result in tangible end-products, provide exercise for a wide range of physical and cognitive skills and enhance social interaction. The continuity of familiar activities supporting a sense of competence and self-esteem may help to cope with progressive loss of abilities. Plants provide sensory stimulation for all the senses through colours, structures, scents, tastes, forms and sometimes by sounds. Sensory stimulation is important for the elderly suffering from dementia since it can improve orientation and trigger memory (Haas et al. 1998).

Evidenced mainly by observational research, horticultural activities were shown to contribute to the psychological and social well-being of older people (Mooney and Milstein 1994, Mackenzie et al. 2000, Barnicle and Midden 2003, Jarrot and Gigliotti 2004).

Based on the experiences of staff and residents Mackenzie et al. (2000) concluded that horticultural activities among older adults increased self-efficacy, the sense of purpose in life, enhanced social support, increased positive affect and decreased agitation. Even the participants with major cognitive impairments and depressed affect showed improvements in behaviour. The horticultural activity program helped the residents to escape temporarily the institutional environment. Towards the end of life horticultural activities were noted to increase quality of life.

The 7-week indoor horticultural therapy program resulted in a significant increase in psychological well-being among older residents in a long-term facility compared with a control group that instead showed a slight decrease in their psychological well-being (Barnicle and Midden 2003).

The clients with dementia who participated in a 10-week horticultural therapy program were observed under validated procedure of quantified observations by trained researchers. The observations indicated that participants engaged in horticultural activities for longer periods of time than when engaged in non-horticultural activities (Jarrot et al. 2002). Differences in affect were not observed among residents engaged in horticultural and non-horticultural activities.

Jarrot and Gigliotti (2004) found that horticultural activities promoted cognitive, psychosocial and physical benefits in adults with dementia. The most commonly observed benefits of horticultural activities were interaction, initiation, concentration and activity completion.

In a study of Mooney and Milstein (1994) horticultural therapy for older people twice a week for six months resulted in an increase in psychological well-being. In a therapy group, ratings of belligerence/ irritability and paranoia/suspicion on a scale measuring physical and mental impairment of function (PAMIE) decreased compared with a control group during therapy. The more deteriorated subjects in particular exhibited an improvement. Staff observed increase in orientation, attention span and initiative among participants. Improved interaction and physical functioning were also mentioned in focus group discussions.

2 AIMS OF THE STUDY

The main purpose of this study was to examine whether exposure to a green environment and activities related to plants and gardening affected subjective well-being of the elderly living in institutional care. The more specific objectives were:

- 1) to examine whether plants and nurturing them have meanings that can be associated with the subjective well-being of the elderly living in sheltered care (I).
- 2) to establish the role of plants in well-being of the elderly individuals with dementia and to describe how nursing staff regard plants in a care environment (II).
- 3) to examine the perceived effects and meanings the elderly attach to garden visits in long-term nursing care and to assess whether associations exist between experiences from garden visits and self-rated depression (III).
- 4) to examine if the frequency of outdoor visits to a garden environment is associated with self-rated health of the elderly in long-term nursing care (IV).
- 5) to establish the factors impacting on the accessibility of the outdoor environment and the frequency of outdoor visits in institutional care (III, IV).

3 SUBJECTS AND METHODS

In this study well-being was considered in health-related terms, comprising both interconnected dimensions of ill-health and well-being in which environment and social relationships may have an effect. Focus was on the subjective experiences of the participants. The study applied the framework of health promotion. More detailed information about subjects and methods can be found in the original publications (I-IV).

3.1 Subjects

To ensure a comprehensive coverage of human-plant interactions various kinds of long-term care settings were included in this study. The aim was to choose subjects representing various functional and cognitive abilities, ranging from rather independent individuals to dependent ones.

When assessing whether plants and the experience of caring for them could be meaningfully associated with the subjective well-being of the elderly (I) data were gathered among residents of a sheltered housing area. The twelve participants were all living quite independently and had fairly good physical and cognitive abilities. All lived alone in their apartments in a housing area that consisted of 55 dwellings in four terraced houses. The housing area was located in the center of a small rural community and participants were mainly former residents of the neighbouring countryside.

The staff of the facility helped to choose the participants for the study. The participants were required to be able to communicate and be without severe impairments. Both enthusiastic gardeners and uninterested participants were sought for the study. All residents were notified about the study through mailing an information sheet. All residents who were asked to participate agreed to do so. Eight of the selected interviewees were women and four were men. The average age was 80.6 years; the youngest interviewee was 68 years old and the oldest was 88 years of age. The participants had lived in sheltered housing from two to 24 years, the average being 11.6 years. The residents of the area were offered the possibility to grow plants in flower beds under their windows and indoors. All the participants were able to garden if they so wished.

When examining the role of plants in well-being of the elderly individuals suffering from dementia (II) data were gathered in ten nursing homes located in a city. The staff was canvassed for information as the residents of the homes had such severe impairments that normal communication was impossible. The total number of staff in homes, including deputies and students, was 85 of which 65 participated in the study. All participants were women. Of the participants 33% were auxiliary nurses, 25% nurses, 20% home help assistants, social nurses or people having other education in health work and 22% people from other fields or students. They represented the following age groups: 27% were young (30 years or younger), 36% middle-aged (31-45 years), and 37% old (over 45 years). Gardening was a common hobby: 72 % of participants reported that they gardened. Everyone had indoor plants in their homes.

The number of residents in the homes ranged between 8 and 14 and the number of personnel between 6 and 10. The homes were non-institutional, homelike settings having numerous plants both outdoors and indoors. All the homes were single storied, which enabled easy access to outdoors.

When examining the experiences related to garden visits and the associations between depression (III) and self-rated health (IV) with garden visits, the study population was chosen from among the residents of a large nursing home in a city. In total 55 residents (45 women, 10 men) participated in the study. The first 30 participants participated in both the studies III and IV and filled the questionnaires concerning garden experiences, depression and self-rated health at the same time. In addition to those 30 participants, furthermore 25 persons participated in the study of assessing the associations between self-rated health and outdoor visits. The last 25 participants were not included in the depression study since the depression questionnaire was too demanding to answer for them. All participants were in long-term care. Their mean age was 84.7 years (min. 64 years, max. 98 years). The selection of the participants was based on the recommendations of charge nurses. Charge nurses provided lists of the residents able to participate in the interviews (without major cognitive, hearing, or speech impairments). Three residents refused to participate. All participants were able to answer questions independently in the interview.

3.2 Methods

Both quantitative and qualitative methods were used in the study. Data were gathered through interviews, using scaled and open-ended questionnaires, and validated scaled questionnaires addressed specific health aspects.

3.2.1 Data collection

To assess whether plants and nurturing them contributes to the well-being of the elderly living in sheltered care, the meaningfulness of the process for the elderly was examined (I). The study applied a qualitative approach to describe how elderly people themselves experience plants and nurturing plants in an institutional environment. In this study, the experience of caring for plants was defined as a physical, cognitive and emotional interaction of the elderly with plants. The interaction of the elderly with plants meant either the actual growing or the mental activity involved in nurturing a plant.

The data were collected using a theme-interview (Hirsijärvi and Hurme 1995) and by observation. In data collection principles of selective sampling were used. After interviews of twelve residents it became apparent that no new items emerged related to human-plant interaction and data collection was stopped. The interviews were conducted in August 1997 by Erja Rappe in the homes of the participants. The average duration of an interview was 1.5 hours. Information was requested on age of the interviewees, their impairments, their dwelling-time in sheltered housing and their life histories. The main theme of the interview was the resident's relationships to plants. The interviews were taped and transcribed verbatim when the statements concerned the themes. Observations were made about plants during the course of the interviews and notes were taken after each interview. The age of the interviewees and their dwelling-times in sheltered housing were verified by consulting with the administration of the facility.

The data from examining the role of plants in the well-being of individuals with dementia were gathered using the survey questionnaire directed to the staff (II). It was assumed that staff was able to observe the effects which plants may have had on the well-

being of the residents. The questionnaire consisted of four parts. In the first part demographic information about the respondents was collected. The second part consisted of 26 statements concerning how plants affected the well-being of those with dementia, the knowledge the personnel had about plants and the ways the personnel experienced the effects of plants on their work. The third part of the questionnaire included both open-ended and yes/no questions about plants and their use in homes. In the fourth part there was a list of 12 items concerning the physical or social environment of homes of those suffering from dementia or the personnel's own homes (results not presented). A covering letter giving information about the study was attached to each questionnaire. The questionnaires were distributed to homes by Erja Rappe on 6 March, 2000 and collected personally after two weeks. The response rate was 77% (65 returned questionnaires).

The data concerning the visits to a green environment were gathered using two types of questionnaire (III, IV). Visiting outdoors was defined as either visiting the garden or being on the balcony. Visits to the balcony were included in the study since they enabled passive experiences of nature. Both questionnaires included demographic variables (gender, age, length of stay in institutions, frequency of visitors), frequency of visiting outdoors, and staff assessment of residents' functional abilities on a scale from 1 (independent) to 5 (bedridden and requiring help in all activities). Data were gathered in July and August 2001 by Erja Rappe.

In the depression study, a long questionnaire, including perceived effects of outdoor visits, and the self-rated importance of elements of gardens, social interaction, and activities was presented to the 30 participants (III). The questionnaire comprised open-ended questions and scaled statements. Subjective experiences of visiting outdoors were gauged using eight statements (concentration, balance, recovery, sleep, pain, medication, mood and strain). The self-rated importance of garden elements, social interaction and activities were asked using 13 items (fresh air, exercise, other persons, interaction, trees, shrubs, flowers, animals, observation, scents, sounds, activities and calming down).

Last 25 participants filled in a shorter questionnaire concerning outdoor visits, including season of visits, accompanying person, destination and activities during the visits, and experienced hindrances in the interview (IV). Staff assessed the frequency and season of visiting outdoors on their behalf. If there were differences in assessments between participants and the staff, the variable was coded according to the staff (one case).

The Zung Self-rating Depression Scale, ZSDS (Zung 1965) was used to assess symptoms of depression (III). The scale is a self-administrative quantitative measure of depressive symptoms and includes 20 either positively or negatively formulated items. The scale was used during the interview by one of the authors (Erja Rappe). Those scoring >40 raw sumpoints were classified as depressed. All 30 participants took part in answering the items on the Zung scale, but four persons missed one or more items, and sumpoints were calculated for 26 persons (24 women and two men).

The self-rated health (IV) was estimated by posing the question: 'At the present time, would you say that your health is excellent, very good, good, fair, or poor?' Health related quality of life was measured using the Nottingham Health Profile (NHP), which consists of 38 binary "yes"/"no" items identifying distresses in physical, medical and social health. NHP is a profile measure consisting of six dimensions related to health: energy level, sleep, pain, physical abilities, emotional reactions and social isolation. A sumscore for each dimension was calculated for every participant by weighting "yes" answers for individual items. The weightings were derived from a representative Finnish population

sample. The range of the scale is 0-100, higher values indicating poor health-related quality of life (Koivukangas et al. 1995).

3.2.2 Qualitative analyses

The method of Grounded Theory (Glaser and Strauss 1971) was chosen to apply in the first part of the study because no research concerning the meanings the elderly attached to their growing of plants was found when reviewing the literature (I). Grounded Theory is suitable for application in studies concerning unknown issues. The role of subjective meanings as guiding factors in human behavior, symbolic interactionism, is one of the basic assumptions of Grounded Theory. In symbolic interactionism, reality is seen as both a social constituent and a real physical one (Charon 1995). In this study, plants and horticultural activities were regarded as social objects that were used intentionally to communicate and represent something more than that immediately perceived.

The first stage of the data analysis involved reading the transcribed interviews and producing corresponding mindmaps of the relationships between each interviewee and plants. The mindmaps helped to establish preliminary categories for the data classification. The data were then coded using the method of continuous comparison (Glaser and Strauss 1971). By reading the data repeatedly, new categories emerged and the connections between categories were clarified. When coding the data emphasis was placed on actions, thoughts and feelings related to the resident's own growing of plants or to the growing of plants by other residents.

In the second part of the study (II) answers to open-ended questions were analyzed by quantitative content analysis and using a phenomenological approach (Jasper 1994, Lukkarinen 2001). This approach was applied since the aim of the study was to examine the meanings the participants attributed to their experiences. By using a phenomenological approach human experience can be investigated per se without the interpretation of the researcher since the meanings of the experience comes from the descriptions of the experiences (Jasper 1994). When using a phenomenological approach the researcher has to exclude all his or her preconceptions concerning the issue under study. To facilitate the bracketing of her own experiences, the researcher thoroughly examined her own beliefs and attitudes before analysis. The categorisation of respondents' comments was based on the commonalities occurring in their experiences.

3.2.3 Statistical analyses

Statistical analysis were conducted using PC-based SPSS, version 10 (IV, III) and NCSS 2000 (II) (Hintze 1999).

Groups were compared using means and / or proportions. The significances of differences between groups were tested using analysis of variance (ANOVA), t-test, chi square test and Fisher's exact-test (II, III, IV).

In assessing the associations between depression (III) and NHP-dimensions (IV) with the frequency of visiting outdoors, Spearman correlation coefficients were used. Potential predictors and confounders for self-rated health were analysed with linear regression (IV). To judge the reliability of the sumvariables, Cronbach's alpha coefficients were computed (III, IV).

The items concerning the importance of garden elements, social interaction and ac-

tivities were subjected to principal component factor analysis (III). Factors with eigenvalues greater than 1.0 were selected for further analysis and rotated using Varimax with Kaiser Normalization. Factor loading of at least 0.500 was a criterion for item inclusion. If the item had a loading greater than 0.500 for more than one factor, it was included only in the factor for which its loading was highest.

4 RESULTS AND DISCUSSION

4.1 Caring for plants and the well-being of the elderly (I)

The meanings that participants attached to the experience of caring for plants were classified into six categories representing three individual and three social meanings (Table 1).

Table 1.
The meanings that the elderly in sheltered housing attached to growing plants: the categories with examples of statements

Individual meanings

One's own growing skills

a. Individual settings and growing methods:

"I now have only petunias because they are growing so well."

"I use that special fertilizer with water."

b. Interpretation of the plant's needs and response

"But those geraniums can be without watering two days, they are so modest."

"I watered Saintpaulia too much and it died. I have a habit of watering plants too much."

c. Adaptation:

"I have noticed that these artificial flowers are best."

"I have to restrict plants indoors because they aggravate my breathing problems. I must always smell the plants first [if they are suitable]."

Continuity of time:

"I brought those plants from home "

"I have bought seeds of flowers early enough in winter, when the selection is comprehensive."

Creating experiences:

"I am caring for those flowers because I have no husband to care for."

"This [pot plant] I got last Christmas. It was very little then. I have tried to nurse it as well as I can and it has survived."

"Flowers are feast for the eye."

Social meanings:

Significant acts for other people:

"Yes they come to admire the blooming flowers and praise them very much."

"He said last autumn that if I need seeds, I just go to pick them from his flowerbed."

Indications about the gardener:

"...she has always so beautiful flowers. She buys so many plants and changes them if they are withering. They [flowers] are beautiful, if one can afford the expense. "

"There are people who do not have plants. They move so poorly that they can not nurse them [plants]."

A feeling of togetherness:

"I am not the only one who has complained that pansies do not succeed"

"Sometimes we talk about plants when we are sitting on the bench. Yes, it [talking about plants] is very usual."

Individual meanings attached to plants and nurturing them that emerged from the data were one's own growing skills, continuity of time and creating experiences. The category "own growing skills", which played a central role in the individual meaning, was divided into sub-categories according to the goals pursued: individual settings and growing methods, interpretation of the plant's needs and responses and adaptation.

The participants were allowed to grow any plants they wanted to under their windows. Individuality appeared in the choice of the species and growing methods that were applied in accordance with how necessary they were considered to be. There was a clear awareness among participants that each of them used their own, often secret, methods. As Browne (1992) mentioned, caring for plants provided opportunities for self-expression and individuality.

Individual growing skills were employed to understand the responses of plants and to adjust activities to meet the needs of plants. Participants were capable of estimating the influence of weather conditions, pathogens, pests and the choice of species on the need for nurturing and successful growing. Growing methods were also self-evaluated by interpreting the responses of the plants and were changed accordingly.

The participants were able to evaluate how well the environment suited growing. They grew species that they expected to succeed under the prevailing conditions. In addition, growing skills were adapted to accommodate restrictions imposed by aging and disabilities. Participants developed growing methods to facilitate their activities including use of raised containers. Participants indicated that if their state of health were to deteriorate they would reduce efforts devoted to nurturing plants or lower the standard of nurturing. They did not seek assistance from staff for tending to the plants. When they could no longer manage their plants by themselves gardening activities would cease.

Horticultural activities generally promoted the autonomy of participants in all the dimensions reported by Launis (1994). Autonomy of thought was realized in an ability to understand the reactions of plants and, in turn, plant responses to nurturing. Opportunities for individual choice of species and growing methods supported the autonomy of wishing. Freedom of choice has been associated with improved alertness, active participation and sense of well-being (Langer and Rodin 1976) and improved health and mortality indicators (Rodin and Langer 1977) among elderly nursing home residents. The ability to make adjustments to one's activities accordingly to plant response and aging supported the autonomy of action.

Memories, prospects and continuity linked time to plant growing. Some of the participants brought potted plants or perennials to the institution from their former homes. Although the participants had a cautious attitude towards the future and were concerned about their deteriorating health, plants promoted positive expectations. According to Golant (1984), constant environmental experiences of the elderly support their sense of control and competence. The environment that enabled plants to be grown allowed continuity of identity of the participants as growers. They were used to gardening and the pursuit usually provided them with successful experiences. The experience of competence derived from horticultural activities contributed to their sense of control over their environment.

Meaningfulness, experiences of success and feelings of accomplishment are associated with horticultural activities of the elderly living in institutional care (Hill and Relf 1982, Brascamp and Kidd 2004). In this study gardening provided these positive experiences for the participants. As with the health maintaining theory of Antonovsky (1988), horticultural activities provided the participants with a sense of coherence. The stimuli derived

from plants and nurturing them were comprehensible and meaningful for them and they were capable of managing plants.

Participants associated aesthetic and emotional experiences with plants and their nurture. Flowers were considered to be beautiful by both women and men. Following the growth and development of the plants was considered fascinating and interesting. Growing activities for men were mainly considered a duty while for women plants represented an object of caring. Plants also offered a way to express feelings of care and love for other people. The plants children had given to the participants were of special significance and were cherished. Participants derived aesthetic pleasure from a green environment which may help them to cope with deteriorating health and other negative issues during their later life.

Social meanings emerged from the data and included significant acts for other people, indications about the gardener and a feeling of togetherness. The activities related to plants offered opportunities for the residents such as exercising expertise in planting and watering other residents' plants. Mackenzie et al. (2000) suggested the same recently when they evaluated a horticultural therapy program managed from the University of Pennsylvania Health System. In the program horticultural activities promoted the self-efficacy and self-empowerment of long-term care residents by providing opportunities for various roles as caregivers or teachers. Ojala (1989) stated that the feeling of being needed was a central indicator of the perception of a high quality of life in old age. Furthermore, meaningful roles that give content to life reduce the tendency for the elderly to become depressed. In this study, participants felt themselves to be necessary not only to the plants, but also for the other residents.

Plants were used as indicators about the grower in the community. Plants revealed how capable the grower was, what her or his state of health was, how wealthy she or he was, and how well the relatives took care of her or him. Since participants were aware that other residents drew conclusions about them from their plants, they used plants to demonstrate to others their skills and preferences. This kind of use of plants can be regarded as the non-verbal articulation of identity, as mentioned by Baars (1998). By comparing one's own plants with another's participants defined their position in the community.

The life history of the participants was closely associated with agriculture. The competence of growing constituted a collective identity. Participants could understand each other by sharing a common world of experience. In their acts, participants took others into account and communicated through their acts in the ways they knew others could interpret. This strengthened the sense of togetherness.

This study confirmed the results of earlier research (e.g. Browne 1992, Stein 1997) that the meanings the participants attached to plants and caring for them could promote their psychological and social well-being. Horticultural activities enabled participants to use their cognitive skills, provided emotional experiences for them and facilitated social relations.

4.2 Plants and well-being of the elderly with dementia (II)

According to nursing personnel, plants in the care environment promoted the well-being of the elderly with dementia. The attitudes of personnel towards plants were mainly positive and despite some problems plants caused, they did not identify reasons to restrict the

presence of plants.

The health related benefits the personnel reported were derived from the positive changes in the physical environment caused by the plants and from horticultural or other activities associated with plants.

According to personnel plants created a pleasant, homelike environment. A non-institutional environment is associated with many positive health outcomes in people suffering from dementia, such as reduced agitation and less use of medicines (Day et al. 2000). Both indoor and outdoor plants reduced noise and delineated spaces providing shelter. According to staff observations plants were noted to increase humidity, remove pollutants and decrease dust in the air. These effects were reported previously (Wolverton et al. 1989, Lohr 1992, Lohr and Pearson-Mims, 1996).

The decline in cognitive abilities, especially in memory, is often the first symptom of dementia (Sulkava et al. 1994). Decreased cognitive capacity leads to difficulties in perceiving and understanding the environment and individuals become dependent on what their environment can provide. According to nursing personnel the characteristics of plants that accompany changes in season helped residents to orientate themselves in time. The colours and scents of the plants stimulated the senses of the residents and activated their memories. Personnel observed that it was not only familiar plants that residents were interested in, but also exotic, colourful flowers and berries drew their attention.

Physical ability remains unimpaired in dementia sufferers often longer than cognitive abilities (Sulkava et al. 1994). Actions related to plants were often familiar to residents and enabled them use their skills in maintaining functional ability. Individuals with dementia often have inferiority complexes (Kitwood and Bredin 1992). Horticultural activities are often associated with enhancement of self-esteem (e.g. Mackenzie et al. 2000, Jarrot et al. 2002). Personnel reported that gardening activities raised self-esteem of the residents by providing feelings of success and accomplishment.

Of the respondents, 65% had employed horticultural activities as therapy in care work. Those who had gardening as a hobby and were 31-45 year old educated nurses or auxiliary nurses, used horticulture more in care work than other groups. The most often employed activities in care work were propagation, planting, watering, removing old flowers and leaves, raking leaves, tasting and smelling, picking flowers and harvesting. According to personnel residents were interested in plants. Jarrot et al. (2002) reported that adults with dementia were engaged in horticultural activities for longer periods of time than in other activities. This may indicate that individuals with dementia perceive plants as appealing. Plants were a good topic of conversation, increasing social interaction between residents and personnel, but also to some degree among the residents themselves. Personnel had moreover calmed down anxious and restless residents by drawing their attention to familiar plants.

Although personnel experienced that plants added to the workload to some extent, they regarded plants as important features of a care environment. This positive attitude might result from their experiences of plants enhancing the atmosphere of the workplace. Research conducted in working environments established positive impacts of plants on the well-being of the workers (Lohr et al. 1996, Larsen et al. 1998, Fjeld 2000). However, lack of horticultural knowledge was felt to be a problem. Respondents were of the opinion that education about plants and adapted growing methods suitable for demented individuals were necessary.

4.3 Perceived effects of garden experiences and self-rated depression (III)

The results from this study confirmed those of earlier studies (Browne 1992, Stoneham and Jones 1997) that landscaped, green residential areas are important for the elderly. The effect of garden visits on promoting mood was obvious: almost all participants felt themselves to be more cheerful and alert outdoors than indoors. Exposure to natural scenes was associated with positive changes in mood in previous studies (Ulrich et al. 1991, Ottosson and Grahn 1998, Hartig et al. 2003, Van den Berg et al. 2003). Exposure to nature and plants is also associated with increased attentional capacity (Tennessen and Cimprich 1995, Lohr et al. 1996, Wells 2000, Hartig et al. 2003, Van den Berg et al. 2003). Being outdoors for a short time is found to increase the concentration ability of the frail elderly living in a nursing home as measured using various concentration tests such as Digit Span Forward and Backward and The Symbol Digit Modalities Test (Ottosson and Grahn 1998). The perceived experiences of the participants were in line with these previous results. According to the self assessment of the participants, more than half felt that visiting the garden improved their ability to concentrate.

For more than a half of the participants visiting the garden was felt to provide feelings of recovery, to enhance the quality of sleep and to promote peace of mind. These perceived positive changes might result from stress-reducing effects of nature as established in many studies (Ulrich et al. 1991, Hartig et al. 2003, Laumann et al. 2003). Half of the participants in this study felt that visiting the garden decreased pain. This result is in accordance with findings that views of nature and plants are associated with better pain tolerance (Lohr and Pearson-Mims 2000, Diette et al. 2003, Park et al. 2004). Only one third considered garden visits to be burdensome. Garden visits were not felt to have any effect on the use of medicines.

Seeing plants (trees, shrubs, and flowers) and observing nature were of great importance for the participants. Most participants felt garden visits important for providing possibilities for calming down. In factor analysis for gauging the importance of garden elements, social interaction and activities, the main factor, which accounted for 23% of the total variance, contained items related to plants and calming down. It suggested that the garden environment was used for emotion regulation. This notion gets support from the studies of environmental psychology in which emotion regulation is associated with natural favourite places (e.g. Korpela et al. 2001).

To get exercise and fresh air and to see other people were also rated important aspects of garden visits. Social activity, including interacting with other people or participating in activities, was felt to be less important among participants than individual experiences. This may be due to the restricted autonomy related to institutional living. Privacy and personal choices in experiences may be better achieved outdoors than indoors. Opportunities for individual experiences should be emphasized in institutional environments since non-social aspects of activities may promote health and longevity in late old age (Lennartsson and Silverstein 2001).

The result that 46% of the participants were found to be depressed as measured using the ZSDS confirms previous observations that prevalence of depressive disorders is high among elderly in long-term care (Pahkala et al. 1995, Teresi et al. 2001). Poor self-rated health was related to depression. Since the number of participants was small, differences between depressed (n= 12) and non-depressed (n=14) participants were not established using statistical tests but the trends are described.

When comparing subjective experiences between the depressed and the non-depressed participants it was noted that affective effects of visiting the garden tended to be more pronounced among the depressed than among those not depressed. A greater proportion of the depressed than of the non-depressed felt more balanced and more cheerful and alert after visiting the garden. Temporary escape from indoors to garden environments in institutional settings is associated with reduced stress level and better sense of control (Cooper Marcus and Barnes 1995, Ulrich 1999). Garden visits for the depressed may provide temporary escape from anxious feelings resulting in a better affective state.

Garden visits tended to burden the depressed more heavily than the non-depressed. In addition, the depressed did not get the feelings of recovery from visits to the same degree as the non-depressed. Strain related to garden visits may be a consequence of poor health and fatigue associated with depression.

Some trends were also noted when comparing the importance ratings of garden elements, social interaction and activities between the depressed and the non-depressed. Getting fresh air was important for the most depressed. Social interaction and participation in activities were not considered to be very important among the depressed. The symptoms of the depressed reflected the feelings of loss of self-esteem and fatigue, which may decrease willingness to be in the company of other persons. Social activities, like horticultural therapy, are recommended to prevent isolation of the residents in long-term care (Mackenzie et al. 2000, Barnicle and Midden 2003). When such activities are implemented for depressed elderly people sufficient physical and psychological support should be provided in order to promote coping skills.

There are some limitations related to this study which deserve attention. Since the sample size was small, results are only indicative. The data were gathered by interviewing the participants and the frequency of outdoor visits was not confirmed independently. The time spent outdoors may have had an effect on the experiences related to garden visits. In this study no information about the time spent in the garden was sought.

Although there were shortcomings in the study design, the results suggest that visiting the garden may affect positively the subjective well-being of both the depressed and non-depressed elderly living in long-term care. Intervention studies are needed to establish the effect of garden visits on depressive symptomatology.

4.4 Outdoor visits in a garden environment and self-rated health (IV)

A high frequency of visiting an outdoors green environment and good self-rated health were strongly associated. When adjusted for age a high frequency of outdoor visits was associated with good self-rated health of women (n=45), but not of men (n=10). In men, the association was however positive and the degree of the effect similar as in women, but was not statistically significant.

In women the positive effect of outdoor visits on self-rated health remained stable even when the health related distresses measured using the NHP-scale were taken into account in linear regression models. In men the regression coefficients of the frequency of visiting outdoors were unstable when the six dimensions of the NHP-scale were added separately as variables for self-rated health. This result may be partly due to small sample size. However, it may indicate some gender differences in the effects of outdoor visits on self-rated health.

It is reasonable to assume that individuals of good health and with no mobility limitations would visit outdoors more often than those of poor health with mobility limitations. In this study mobility limitations or other health impairments measured using the NHP-scale were not associated with the frequency of visiting outdoors.

During outdoor visits there are many variables that may account for positive health outcomes e.g. daylight, fresh air, green vistas and physical activity (Cohen-Mansfield 2001). To study more closely how physical activity during outdoor visits was associated with self-rated health, separate regression analyses were conducted for independently mobile and dependently mobile participants. Among independently mobile women the positive association between a high frequency of outdoor visits and good self-rated health was strong. However, among dependently mobile women the positive association was not so strong, but remained evident, indicating that there may be other health promoting aspects associated with outdoor visits than increased physical activity.

Exposure to nature is associated with better pain tolerance (Lohr and Pearson-Mims 2000, Diette et al. 2003, Park et al. 2004), which may be based on the strong attention-holding capacity of nature and its restorative features (Kaplan and Kaplan 1989, Ulrich et al. 1991). Additionally, outdoor visits to green areas are associated with improved ability to concentrate and positive mood shifts among the elderly living nursing homes (Ottosson and Grahn 1998). Better coping with pains and restoration in a green environment may especially enhance the emotional and cognitive well-being of the most dependent participants, resulting in better perceived health.

Health related quality of life was measured by using the binary NHP-scale. Some dimensions of the NHP-scale accurately predicted the self-rated health (energy level and pain for women and emotional reactions for men). However, no statistically significant correlations between various health dimensions of the NHP-scale and the frequency of outdoor visits were established. This may reflect that outdoor visits had no effect on these health dimensions or that the scale was not sensitive enough to detect the health promoting aspects of visiting outdoors. The result that among women the positive effect of the high frequency of outdoor visits on self-rated health remained stable, even when all the NHP-dimension were taken into account, indicates that the effect was not mediated by the measured dimensions.

This cross-sectional study suggested that visiting an outdoors green environment may enhance self-rated health independently among elderly women living in long-term care despite their many health problems. However, conclusions concerning causality remain contentious. Further research is needed to define the features of physical environment that affect health and to establish causal relationships.

4.5 The accessibility of the outdoor environment in long-term care (III, IV)

Mobility is one of the constituents of self-rated health as this and previous studies (Noro and Aro 1996, Jylhä et al. 2001) report. Factors related to the accessibility to the outdoor environment may confound the effects of mobility on self-rated health since perceived walking difficulties are partly dependent on the characteristics of the environment. When assessing the health outcomes related to a certain environment, accessibility should be taken into consideration.

The study participants visited outdoors quite often. In total, over 70% of them visited

outdoors daily or weekly at least during summer. Outdoor visits were more frequent in summer. Only 27% of the participants visited outdoors year round and others, except one who reported not visiting outdoors at all, visited outdoors only in summer. In winter more men than women visited outdoors (50% vs. 23%).

The main reason to restrict outdoor visits among the elderly in long-term care was the difficulty in getting assistance for visits. Circumstances related to weather conditions were the second most important problem. Slippery walks and snow in the winter, and cold and windy weather year round, were regarded as common hindrances. Aspects related to physical environment were mentioned less frequently: steep and uneven paths were reported to be a problem. Some participants had difficulties with heavy and locked doors and doorsteps. It is noteworthy that only five participants out of 55 indicated that their poor health restricted outdoor visits.

Most of the participants of the study wanted to visit outdoors; only five of them expressed no willingness to go outdoors. Environments that are experienced as restorative are preferred among stressed people (Van den Berg et al. 2003). The willingness of the participants to go outdoors might be due to perceived restorative effects of the garden environment. The experience of getting help for visits when wanted was positively associated with the frequency of the visits. The participants, who were able to visit outdoors without an accompanying person, visited outdoors almost daily. Visiting outdoors only with relatives was associated with a low frequency of visits. Use of walking aids and wheelchairs was not associated with the frequency of visiting outdoors. Depression tended to be related to the perception of the residents that they experienced hindrances and distresses associated with outdoor visits.

Physical activity is one of the main concerns for the health promotion of the elderly since it is related to positive health outcomes (Booth et al. 2000, Humpel et al. 2002, Van der Bij et al. 2002). The promotion of outdoor visits among the residents in long-term care may require some changes in the attitudes of the staff and relatives since the main difficulty associated with visits was the lack of adequate help. Considering outdoor visits as an important part of nursing care, having positive health effects on the elderly, might motivate the staff and relatives to provide more assistance.

According to behavioural choice theory, changes in environment that increase the proximity and convenience of physical activity can increase the frequency of physical activity (Epstein 1998). Maintaining paths in good condition, especially in winter, is of great importance. In addition to slippery paths, snow was reported as a major hindrance for those who used walking aids or wheelchairs. The notion that women visited outdoors more seldom in winter than men is interesting. Were women more afraid of fear of falling or were there other reasons to restrict outdoor visits during winter? It is important to remove hindrances such as heavy doors and thresholds that prevent outdoor visits of people who are not independently mobile. For those without mobility limitations, increasing the attractiveness and convenience of the outdoor environment may increase the frequency of outdoor visits.

4.6 Summary of the results

This study was designed to research people-plant interactions at different levels of functional and cognitive abilities among the elderly living in long-term care. The study was conducted in three facilities providing sheltered housing, dementia care and

nursing care. In all sub-studies of the research the focus was on subjective experiences of the participants: on meanings which the participants gave to aspects of a green environment and to horticultural activities, on the individual feelings which a green environment and activities created and on their self-rated assessments concerning health.

This study provides evidence that a garden environment and activities related to plants can be associated with psychological and social well-being of the elderly living in long-term care. The major findings of the sub-studies are presented in table 2.

The importance of near-by green environments in retirement communities is indicated in several studies (Talbot and Kaplan 1991, Browne 1992, Stoneham and Jones 1997, and Brascamp and Kidd 2004). Accordingly, in this study the experience of nature, especially seeing and observing plants, appeared to be important for the participants in all levels of functional and cognitive abilities.

Visual exposure to plants was reported to create positive emotions and calm down restless mind enhancing emotional well-being. This finding is similar to the earlier studies of Ulrich et al. 1991, Ottosson and Grahn 1998, Hartig et al. 2003 and Cox et al. 2004 in which the beneficial effects of green environment on the mood were showed.

This study indicated that an environment containing plants is comprehensible for the elderly as they could interpret information provided by a green environment. It is theorised that this might promote their cognitive well-being. Better cognitive performance is associated with green environments as compared to built environments in many studies (e.g. Kaplan and Kaplan 1989, Browne 1992, Lohr et al. 1996, Ottosson and Grahn, 1998, Wells 2000, Hartig et al. 2003).

In sheltered housing and in dementia homes plants were positively associated with social relationships between residents or between residents and staff. Although seeing other people in the garden was regarded important in a nursing care facility, the interaction with others was not as highly appreciated. Garden environment was moreover regarded as a place for privacy. This is in line with the findings of Cooper Marcus and Barnes (1995) who stated that in health care facilities gardens offer a possibility for temporary escape from institutional settings.

Plants stimulated the senses. The aesthetic beauty derived from visual encountering and the scents of plants were mentioned by several participants. The staff reported that for the elderly with dementia green environment provided stimulation of the senses. It is theorised that sensory stimulation afforded by a garden may affect the well-being among the elderly with cognitive deficits since it may prevent emotional outbursts and facilitate connectedness in individuals (Carman 2002).

In a nursing facility the self-rated health of women was positively associated with the frequency of outdoor visits to the garden even when the health related distresses were taken into account. This may indicate that exposure to green environments may have health promoting effects as Grahn and Stigsdotter (2003) have proposed.

Horticultural activities are suggested to promote psychological and social well-being of older people (Mooney and Milstein 1994, Stein 1997, Mackenzie et al. 2000, Barnicle and Midden 2003, Jarrot and Gigliotti 2004). In this study horticultural activities were pursued among participants living in sheltered housing and dementia homes. No special adjustments to facilitate gardening were made in these facilities. So the activity was related to functional abilities. The study showed that caring for plants has meanings which could be associated with emotional, cognitive and social well-being of the elderly living in long-term care.

Caring for plants provided the elderly with reciprocal relationships with both plants

and other people. Emotions, memories, thoughts and conclusions associated with plants were arisen from these relationships. For the elderly with dementia familiar activities with plants offered a way to work off restlessness and aggression. Collective identity as growers and a sense of togetherness derived from shared experiences encouraged social relations and increased social capital.

Possibilities to self-expression and individuality (Browne 1992) and to free choice (Rodin and Langer 1976, 1977) are associated with promoted well-being of the elderly living in institutional settings. In this study, horticultural activities enabled the participants to express individuality and to engage in various roles according to their own will and capabilities supporting their identity and autonomy.

Table 2.

The perceived health related effects of passive and active involvement in garden environment and horticulture among the elderly participants representing three different levels of functional and cognitive abilities in long-term care.

	Study population	Elderly with dementia in dementia homes (II)	Elderly in nursing care (III, IV)	Literature supporting the findings
Study findings	Independent elderly in sheltered housing (I)	Elderly with dementia in dementia homes (II)	Elderly in nursing care (III, IV)	
Passive experiences from garden				
• plants were regarded as important and meaningful	yes	yes	yes	Talbot and Kaplan 1991, Browne 1992, Stoneham and Jones 1997, Brascamp and Kidd 2004
• may promote emotional well-being	yes	yes	yes	Ulrich et al. 1991, Ottosson and Grahn, 1998, Hartig et al. 2003, Cox et al. 2004
• may promote cognitive well-being	yes	yes	yes	Kaplan and Kaplan 1989, Browne 1992, Lohr et al. 1996, Ottosson and Grahn, 1998, Wells 2000, Hartig et al. 2003
• may promote social relationship	yes	yes	-	Browne 1992, Cooper Marcus and Barnes 1995
• may stimulate senses	yes	yes	yes	Kaplan and Kaplan 1989, Browne 1992, Carman 2002
• may enhance self-rated health	-	-	yes	Grahn and Stigsdotter 2003
Active involvement in horticulture				
• may promote emotional well-being	yes	yes	-	Mooney and Milstein 1994, Mackenzie et al. 2000, Barnicle and Midden 2003
• may promote cognitive well-being	yes	yes	-	Mooney and Milstein 1994, Jarrot and Gigliotti 2004
• may promote social relationship	yes	yes	-	Stein 1997, Mackenzie et al. 2000, Jarrot and Gigliotti 2004
• may strengthen autonomy	yes	yes	-	Rodin and Langer 1976, 1977, Browne 1992

5 CONCLUSIONS

The role of a green environment on human health and well-being is not well recognized even though it may be a significant health resource. When health is seen in a holistic approach comprising physical, mental and social aspects, environment and social relationship may have an effect. According to this study a green environment and horticulture provide means to promote the well-being of the elderly living in a long-term care. Although health in late life frequently steadily deteriorates, aspects related to a green environment may enhance the well-being of the elderly by providing experiences that promote their perceived health. Persons working in the field of eldercare should be aware of the psychological and social responses the elderly have toward the green environment and caring for the plants.

The study indicated that plants can be a source of a joy and tranquillity for some residents in institutional settings. It was suggested that particularly in the case of the depressed elderly a garden environment provides aesthetic pleasure and may arouse positive affects. The result that seeing the plants may enhance the mood of the elderly and that green environment can be used in emotion regulation, emphasizes the importance of visual access to a green environment which should be made available to the residents in institutional living.

Lack of environmental stimuli in institutional settings is common. In this study, plants created a pleasant, meaningful and familiar environment which the elderly interpreted subjectively. The meanings, which the participants gave to the characteristics of the green environment stemmed from their lives, thus supporting their identity in institutional life. The study suggests that especially for the elderly with dementia, multisensory plants might represent means to maintain connectedness with the outdoor environment since they allow interaction at many levels of cognitive skills. Since plants are regarded as important by the elderly and no major problems restricting the use of plants exist even in the homes for people with dementia, implementation of gardens and indoor plants is recommended at the homes of the elderly.

Horticultural activities were positively associated with the identity of the elderly and their sense of autonomy in this study. Both are aspects threatened by institutional environments. Horticultural activities were pursued by the elderly with good functional abilities. If the elderly felt too frail to manage their plants themselves, they were not willing to grow plants since they wanted to avoid situations that increased their need for assistance from the staff. Adjusted environments enabling and encouraging the residents to participate in horticultural activities in care facilities could increase the number of gardeners among the residents.

The results of this study suggest that it may be possible to enhance the subjective health among the elderly in institutional settings by increasing the frequency of their outdoor visits. Since the outdoor visits in residential care are often dependent on the availability of assistance, emphasis should be placed on the accessibility to a green environment. Both physically and mentally accessible, safe environments would encourage the elderly to go out independently without burdening staff. Medical staff has authority over the health of the elderly in long-term care. The elderly generally have limited possibilities to promote their own health. In many facilities visiting outdoors may be the only way the elderly can affect their subjective well-being themselves.

Although the results of this study are only indicative as they concern the associations

between depression, self-rated health and outdoor visits in a garden environment, it can be concluded that interaction with plants, in both active and passive ways, benefits the health of the elderly. Ensuring access to a green environment for the elderly in long-term care would likely promote positive health outcomes. However, more multidisciplinary empirical research is needed to clarify the ways in which a green environment is associated with health. It remains to be determined which health outcomes are suitable and sensitive enough to gauge the effects of a green environment. Environmental intervention studies would provide more accurate knowledge about the extent of the beneficial health effects and support the introduction of more gardens into institutional settings.

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FINNISH SUMMARY

Kasvien hoitamisen ja viherympäristön vaikutus laitoksissa asuvien vanhusten koettuun hyvinvointiin

Vanhimpien ikäluokkien osuus Suomen väestössä lisääntyy lähitulevaisuudessa samoin kuin useimmissa läntisissä maissa. Siitä huolimatta, että vanhusten kotihoitoa pyritään tukemaan, laitoshoidon tarve tulee vanhusten määrän lisääntyessä pysymään korkeana, mikä osaltaan kuormittaa terveydenhuoltojärjestelmää. Terveyttä tukeva ympäristö voi edistää asukkaiden hyvinvointia laitosoiloissa alentaen siten terveydenhuoltomenoja. Kasvit voivat olla yksi terveyttä tukevan ympäristön peruspiirteistä, sillä ympäristöjen, joissa on kasveja, on todettu vaikuttavan myönteisesti ihmisten hyvinvointiin. Tämän työn tarkoituksena oli tutkia, voiko viherympäristöllä ja kasveihin liittyvillä toimilla olla myönteisiä vaikutuksia pitkäaikaishoidossa olevien vanhusten koettuun hyvinvointiin.

Tutkimuksen aineisto kerättiin kolmesta erityyppisestä vanhusten hoitopaikasta, jotka olivat palvelutalo, dementia koti sekä vanhainkoti. Tutkimukseen pyrittiin valitsemaan toimintakyvyiltään erilaisia vanhuksia, sekä päivittäisistä toiminnoista itsenäisesti selviytyviä että avustettavia. Aineisto kerättiin haastattelujen ja kyselomakkeiden avulla. Aineiston avulla tutkittiin, millaisia merkityksiä vanhukselle liittyvät kasvien kasvatukseen, miten kasvit vaikuttivat dementiaan sairastuneiden vanhusten hyvinvointiin ja millaisia kokemuksia henkilökunnalla oli kasveista dementoituneiden vanhusten hoitoympäristössä, kuinka usein vanhukselle ulkoilivat, millaisia vaikutuksia he kokivat ulkoilulla olevan ja mitkä seikat viherympäristössä olivat heille tärkeitä. Lisäksi mitattiin itsearvioitun masennuksen yleisyyttä käyttäen Zungin depressio -mittaria (The Zung Self -rating Depression Scale). Itsearvioitua elämänlaatua mitattiin Nottingham Health Profile -mittarin (NHP) avulla. Aineisto analysoitiin käyttäen sekä määrällisiä että laadullisia menetelmiä.

Tutkimukseen osallistuneet vanhukselle liittyvät kasvien kasvatamiseen merkityksiä, jotka voitiin yhdistää heidän psyykkiseen ja sosiaaliseen hyvinvointiinsa. Kasveja kasvatessaan vanhukselle saivat mahdollisuuden käyttää kognitiivisia kykyjään monipuolisesti. Erilaisten tunteiden ja ajallisen jatkuvuuden kokeminen liittyi kasvien kasvatukseen niin miehillä kuin naisillakin. Kasvit ja niiden kasvataminen ilmenivät myös asukkaiden välisessä vuorovaikutuksessa erilaisina rooleina ja kasvattajaa koskevinä päätelminä. Aineiston perusteella kasvit ja niiden kasvatukseen voitiin liittää erityisesti sellaisiin laitoympäristössä uhattuihin hyvinvointiin vaikuttaviin tekijöihin kuten itsemääräämisoikeuteen, hallinnan tunteeseen ja identiteettiin.

Tutkittaessa kuinka kasvit vaikuttavat dementoituneiden vanhusten hyvinvointiin, aineisto kerättiin kyselylomakkeen avulla henkilökunnalta, koska kielellinen kommunikaatio vanhuksien kanssa ei ollut mahdollista heidän vaikean sairautensa vuoksi. Henkilökunnan havaintojen mukaan kasvit edistivät merkittävästi dementoituneiden vanhusten hyvinvointia tuottamalla aistivirikkeitä, synnyttämällä myönteisiä tunteita ja luomalla mahdollisuuksia palkitsevaan toimintaan. Vaikka kasvit vaikeuttivat jonkin verran työskentelyä, henkilökunnan mielestä kasvit kuuluivat olennaisena osana dementoituneiden vanhusten hoitoympäristöön.

Useimmille pitkäaikaishoidossa olevista vanhuksista kokemukset viherympäristössä olivat merkityksellisiä. Kasvien näkeminen ja luonnon tarkkailu koettiin tärkeäksi. Viherympäristössä ulkoilun koettiin parantavan erityisesti mielialaa. Ulkoilu tuotti iloa ja piristi mieltä. Erityisesti vanhukselle halusivat nähdä kasveja, puita, pensaita ja kukkia. Yli puolet osallistujista kertoi ulkoilun parantavan unen laatua ja keskittymiskykyä. Samoin

se palautti voimavaroja ja rauhoitti mieltä. Ulkoilun affektiiviset vaikutukset korostuivat itsensä masentuneiksi arvioineilla vanhuksilla. Masentuneet vanhukset eivät kokeneet järjestettyyn toimintaan osallistumista tai sosiaalista vuorovaikutusta kovin tärkeäksi.

Viherympäristössä ulkoilu oli vahvasti yhteydessä pitkäaikaishoidossa olevien vanhojen naisten itsearvioituun terveyteen. Mitä useammin naiset ulkoilivat, sitä parempi oli heidän koettu terveytensä. Yhteys oli tilastollisesti merkitsevä myös silloin, kun ikä ja terveyteen liittyvät NHP -mittarin avulla arvioidut elämänlaadun ulottuvuudet oli vakioitu. Tuloksesta voidaan päätellä, että viherympäristössä ulkoilu voi edistää vanhusten koettua terveyttä huolimatta heidän sairauksistaan.

Tärkein ulkoilua rajoittava tekijä pitkäaikaishoidossa oli ulkoiluun tarvittavan avun saamisen vaikeus. Toiseksi yleisin rajoittava tekijä olivat epämiellyttävät ilmasto-olot, erityisesti kylmyys, liukkaus ja lumi talvella. Ympäristön rakenteelliset ominaisuudet, kuten jyrkät kulkuväylät tai lukitut ovet, häittäsivät ulkoilua melko harvoin. Vain viisi vanhusta tutkimukseen osallistuneista 55 vanhuksesta ilmoitti terveydentilansa rajoittavan ulkoilua. Aineisto antoi viitteitä siitä, että masennus olisi yhteydessä vanhusten kokemuksiin ulkoilun esteisiin.

Vaikka tutkimuksen tulokset ovat pääosin vain suuntaa-antavia tutkimukseen osallistuneiden vanhusten vähäisen määrän ja poikkileikkausasetelman vuoksi, voidaan niiden perusteella kuitenkin todeta, että sekä aktiivinen että passiivinen vuorovaikutus kasvien kanssa voi edistää pitkäaikaishoidossa olevien vanhusten koettua hyvinvointia.