The Role of Nature in Rehabilitation for Individuals with Stress-related Mental Disorders

Alnarp Rehabilitation Garden as Supportive Environment

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Abstract

The Alnarp Rehabilitation Garden was established in 2002 as a research and development project involving nature-based rehabilitation (NBR), based on empirical evidence that natural environments (nature) can have a positive effect on human health and well-being. The aim of this thesis was to investigate the Alnarp Rehabilitation Garden as a supportive environment in NBR with a special focus on the role of nature in relation to the rehabilitation process and essential qualities that might affect health outcome.

Through trans-disciplinary joint co-operation, state-of-the-art NBR was described and research gaps for further studies were identified. The participants' perspectives on the role of natural environments in NBR and the essential qualities that support rehabilitation processes were identified in a longitudinal prospective single-case study. In a prospective interventional study, the changes in participants' experienced value of everyday occupations, self-rated health and function in everyday life were assessed after NBR. The results revealed a new quality of supportive environment was i.e. *Social quietness,* which refers to the participants' urgent need for solitary encounters with nature. An explanatory model of a supportive environment is presented, illustrating how nature and nature-related occupations can facilitate and support the rehabilitation process in an NBR context. The most essential qualities of supportive environments in the rehabilitation garden were the Perceived Sensory Dimensions of: *serene*, *nature, prospect*, *refuge* and *space* as well as qualities of *extent*, *being away*, f*ascination* and *compatibility*. Significant positive changes were measured regarding self-rated health, improved function in everyday life and perceived occupational values in daily life, especially the value of *self-reward*. Nature's supported role seems to be extended to everyday life for restorative occupations.

These findings are of importance both when designing outdoor environments and as a springboard in the future work of drawing up certification criteria for supportive environments in an NBR context. However, there is a great need to identify specific features of natural environments that may support health processes.

Keywords: transdisciplinary rehabilitation, exhaustion disorders, evidence-based health design, horticulture therapy, occupation balance, sense of coherence, ValMO.

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Dedication

This thesis is dedicated to everyone who has participated in nature-based rehabilitation at the Alnarp Rehabilitation Garden. You have my gratitude for allowing me to enter and become part of the context, following your journey to recovery and empowerment. Thank you all!

Nature takes us where words cannot.
Anna María Pálsdóttir, 2012.

Contents

List of Publications

This thesis is based on the work discussed in the following papers, referred to by Roman numerals in the text:

I Stigsdotter, U.K., Palsdottir, A.M., Burls, A., Chermaz, A., Ferrini F. & Grahn P. (2011). Nature-based therapeutic interventions. In Nilsson K, Sangster, M., Gallis, C., Hartig, T., de Vries, S., Seeland, K., Schipperijn, J. (eds). *Forests, Trees and Human Health.* Dordrecht: Springer Science+Business Media B.V.; 309-42.

II Pálsdóttir, A.M., Persson, D., Persson, B. & Grahn, P. (2014). The journey of recovery and empowerment embraced by nature – the client's perspective on nature-based rehabilitation in relation to the role of the natural environments. *Journal of Environmental Research and Public Health* (in review).

III Pálsdóttir, A.M., Stigsdotter, U.K., Persson, D., Thorpert, P. & Grahn, P. Client's perspective on supportive locations at the Alnarp Rehabilitation Garden. – A longitudinal single-case study on nature-based rehabilitation (manuscript).

IV Pálsdóttir, A.M., Grahn, P. & Persson D. (2014). Perceived value of everyday occupations after nature-based vocational rehabilitation. *Scandinavian Journal of Occupational Therapy,* volume 21 (1), 58-68, (doi:10.3109/11038128.2013.832794).

My contributions to the papers included in this thesis were as follows:

I Together with co-authors, I planned and decided on the content of the paper and actively participated in the process of writing this peer-reviewed book chapter. The work was carried out during several COST Action (E39, Forests, Trees and Human Health) meetings and workshops as well as through online work. I am the second author.

II Together with the last author I planned study. I carried out the study, including making all preparations and conducting all interviews. I performed the analysis in a joint work with the last author and later critically examined later by the other co-authors. I am responsible for writing the article, and I am the first and corresponding author.

III Together with the last author I planned study. I carried out the study, including making all preparations and conducting all interviews. I performed the analysis in a joint work with the last author and later critically examined later by the other co-authors. I am responsible for writing the article, and I am the first and corresponding author.

IV Together with co-authors, I planned and designed the study. I was partly responsible for the data collection, and treated and analysed both qualitative and quantitative data in joint work with my two co-authors. I had the overall responsibility for writing the paper. I am the first and corresponding author.

Abbreviations

ART	Attention Restoration Theory
ED	Exhaustion disorder
EQ-vas	Euro Quality Visual Analogue Scale
HT	Horticultural Therapy
ICD-10	International Classification of Diseases and Related Health Problems
IPA	Interpretive Phenomenological Analysis
NBR	Nature-based rehabilitation
PSD	Perceived Sensory Dimension
Oval-pd	Occupational value
OSA-F	Occupational Self-Assessment - Function
SET	Supportive Environment Theory
SCI-93	Stress and Crisis Inventory
SOC	Sense of Coherence
WHO	World Health Organization

1 Rationale for the thesis

Today, there is some evidence of nature's potential positive effects on human health and well-being (Hartig *et al*., 2014; Nilsson *et al*., 2011) and of nature being an important therapeutic partner in various kinds of rehabilitation (Annerstedt & Währborg, 2011; Jordan & Marshall, 2010). Nature-based rehabilitation for individuals with stress-related mental disorders has been performed in different kinds of nature settings (Nordh *et al*., 2010; Millet, 2010; Sonntag-Öström *et al*., 2014; Tenngart Ivarsson, 2011). The current knowledge about nature-based rehabilitation (NBR) for this group of individuals, mostly concerns its effects on health, everyday function and in what ways nature can be supportive (Adevi, 2012; Annerstedt & Währborg, 2011; Eriksson, 2011; Sahlin, 2012) while the need remains for detailed knowledge concerning how nature and nature-related occupations can facilitate the rehabilitation process in different phases of rehabilitation (Tenngart Ivarsson, 2011, p. 69). Even though there is some evidence, there is still lack of descriptions oof supportive environments in this kind of NBR context and there is a great need to identify these specific aspects of the natural environments (Björk, 2012; Korpela & Staats, 2014). These needs became evident when the official procurement of NBR was launched early this year by the healthcare authorities in Region Skåne (county of Scania), Sweden. There were questions on what should be required in the terms of supportive natural environments in NBR for individuals with stress-related mental disorders. This highlights the need of further research that describes and explains the role of nature as supportive environment in NBR context.

> Are three potted plants in a parking lot enough or… ?
>
> Ulf Hallgårde, Chief Physician, Region Skåne, 2014.

2 Concepts and theoretical framework

2.1 Stress-related mental disorders

On a global scale, mental health problems are estimated to be among the major contributors to ill health and work disabilities (Vos *et al*., 2012; Salomon *et al*., 2012). The number of cases of sick leave due to mental health problems, in Sweden has increased in recent years (Mulder, 2011) and according to a Swedish Social Insurance Agency report (2013) the most common cause of sickness absence from work are stress-related mental disorders.

Selye (1975, pp 36-38) described the reactions to external stressors whereby the body reacts and mobilizes its resources to meet the acute situation, which he first called general adaption syndrome (GAS) but later came to be known as stress syndrome. He described a triad of stress responses: the initial response is the alarm reaction, the immediate onset of the sympathetic nervous system, which is followed by the stage of resistance, whereby the stress hormones are secreted in order to re-establish balance (ibid). If this stage is prolonged it will eventually drain the body's resources and can result in exhaustion, and at this point the body is highly vulnerable and susceptible to disease (Almén, 2007; Währborg, 2009).

Stress is a normal physiological response to stressful events, or when extra action needs to be taken. In that particular moment, the body responds by mobilizing the sympathetic nervous system with adrenalin and noradrenalin. The situation at hand prepares the muscles for *fight or flight*. The sympathetic system is also involved when strong emotions such as anger and anxiety are present (Almén, 2007). Stress itself is not harmful if sufficient rest and recovery are regularly allowed afterwards (Glise, 2014; Währborg, 2001). When rest and recovery take place the parasympathetic nervous system is activated, releasing the hormone oxytocin, which lowers stress levels and

decreases anxiety (Sofroniew, 1980). These effects can even be induced by tactile contact, heat/warmth, and even interpersonal closeness (Almén, 2007).

Today, our everyday lifestyle contains many occupations (activities of everyday life) in which our sympathetic nervous system is highly activated, both often and over a long period of time. These occupations are related to both work situations and our own leisure time, and less and less time is spent on rest and recovery (Persson & Jonsson, 2009). In the long run this can lead to mental and physical depletion, and in the worst-case scenario, total exhaustion (Glise, 2014) as described above. It is well known that chronic stress exposure, mostly studied as work-related stress, can result in clinical symptoms and mental complaints, often referred to as stress-related mental disorders (Nieuwenhuijsen *et al*., 2010).

The term "stress-related mental disorders" is most commonly used to describe mental disorders mainly caused by psychosocial stress, such as fatigue, burnout, exhaustion, depression, anxiety or adjustment disorder. The clinical diagnosis "Exhaustion disorder" (ED) was proposed by the National Board of Health and Welfare (2003) in Sweden to be used in clinical practice to define patients with exhaustion that has developed as a consequence of identifiable stressor(s) that have been present for at least six month. ED occurs after many years of prolonged stress and an absence of sufficient recovery. The symptoms are severe tiredness and exhaustion, with low executive functions as well as mental, physical and social impairments (Jonsdottir *et al*., 2013).

The effects of stress-related mental disorders like ED are felt on both the individual level, harmfully affecting one's mental and physical condition, as well as on the social level, having negative effects on one's interaction with the surrounding environment (Seyle, 1975; Floderus, *et al*., 2005; Jonsdottir, *et al*., 2013). It is common for individuals suffering from stress-related mental disorders to change their habits and daily routines, often isolating themselves in their own world of refuge. These individuals can be at great risk of disengaging from everyday occupations, resulting in occupational disruption (Eriksson et al. 2012).

Few treatments have had a sufficient effect on improved health and/or return to work, and there is an urgent need to find rehabilitation alternatives (personal communication: Hallgårde, 2014; Arends, 2012; Glise, 2014; Swedish Government Official Reports, 2012, p. 61). The current recommendation for treatment includes a multimodal rehabilitation programme addressing issues like occupational balance in everyday life, stress management, psychodynamic therapy (PDT) or cognitive behavioural therapy (CBT) in-group or individually, and vocational therapy (Åsberg & Nygren,

2012, p. 41). No considerations are given to the milieu in which the rehabilitation takes place.

The rehabilitation process has been described as vulnerable, and recovery can take months or even years (Åsberg *et al*., 2013; Glise, 2014; Perski, 2004). It is recognized that individuals with stress-related mental ill-health are in great need of rest and mental recovery, especially before actively participating in a rehabilitation programme (Perski, 2004). ED is considered not merely a medicinal issue but also a lifestyle-related issue that requires other means of rehabilitation (Åsberg *et al*., 2013; personal communication: Hallgårde, 2014).

2.2 Nature as source of health and well-being

Many studies indicate that natural environments may have a positive impact on human health and well-being (Mitchell & Popham, 2008; Hartig *et al*., 2014), restore cognitive functions (Berman *et al*., 2012; Ottosson and Grahn 2005; Kaplan, 1995), improve self-reported health (Björk *et a*l., 2008; Maas *et al*., 2009) and facilitate stress restoration (Tyrväinen *et al*., 2014; Ulrich *et al*., 1991; Van den Berg *et al*., 2010). Restoration is defined as "the process of renewing, recovering or re-establishing physical, psychological and social resources or capabilities diminished in ongoing efforts to meet adaptive demands" (Hartig, 2004, p 273).

There is increasing scientific evidence that nature-based interventions can be a positive resource for improved health (Annerstedt & Währborg, 2011). Results indicate that occupations performed in nature are experienced a meaningful and have beneficial effects on health and well-being (Sahlin *et al*., 2010; Nordh, *et al*., 2009). It has been argued that caring for plants can foster a life beyond oneself (Relf, 1999), and gardening and horticultural occupations in particular have been measured as having positive effects on life satisfaction (Waliczek, *et al*., 2005) and bringing about changes, such as rediscovering the importance of the enjoyable experiences of everyday occupations (Erikson, *et al*., 2010).

Nature-based rehabilitation for individuals with stress-related mental disorders has been established in garden contexts (Eriksson *et al*., 2010. Grahn *et al*., 2010; Corazon *et al*., 2010), peri-urban agricultural landscapes (Pálsdóttir *et al*., submitted) and rural landscapes (Sonntag-Öström *et al*., 2014, Nordh *et al*., 2009) in combination with meaningful occupations which embrace nature with the intention of facilitating the rehabilitation process. These innervations have been focused on aspects such as e.g. changes in cognitive, emotional and physiological conditions (Corazon *et al*., 2010); perceived levels of stress (Sonntag-Öström *et al*., 2011); return to work rate

and function in everyday life (Nordh *et al*., 2009; Pálsdóttir *et al*., submitted); the client's own experiences of the rehabilitation (Eriksson, *et al*., 2010; Sahlin *et al*., 2010); and how experiences from the nature-based intervention have been integrated into everyday life (Eriksson, *et al*., 2010). Only two of these studies were performed in a specially designed environment based on theories on nature's potential positive effect on health (Grahn *et al*., 2010; Corazon *et al*., 2010).

2.3 The Alnarp Rehabilitation Garden

2.3.1 Research and development of NBR concept

The Alnarp Rehabilitation Garden was established in 2002 as a research and development project involving nature-based rehabilitation (Grahn *et al*., 2010; Stigsdotter & Grahn, 2003). Since the beginning, the purpose has been to investigate and develop the concept of NBR by studying nature's effects on health and well-being. The research project has been supervised by Professor Patrik Grahn. Several PhD students, senior researchers and designers, and not least the rehabilitation team running the NBR on a daily basis, have been involved in the development of the NBR concept. The first concept to be developed was a NBR for individuals with stress-related mental disorders. The concept has been investigated through two main studies during the years 2002-2012, the first one, running from 2002-2008 and the second one, running from 2008-2012. The current study concerns individuals in NBR after stroke (Figure 1).

Figure 1. The Alnarp Rehabilitation Garden was established in 2002 as a research and development project involving nature-based rehabilitation (NBR). During 2002-2012 a NBR concept for individuals with stress-related mental disorders was investigated in two separate studies i.e. Study I (2002-2008), Study II (2008-2012). Currently the NBR concept is investigated in relation to rehabilitation for individuals recovering from stroke.

The NBR concept consists both of the physical environment and the transdisciplinary team. It was performed in a two-hectare rehabilitation garden

that was especially designed according to theories on nature's restorative effects (Kaplan, 2001; Grahn, 1991; Ulrich, 1999) and supportive environments (Grahn *et al*., 2010). These theories (presented below) are based on the assumption that humans are adapted through evolution to function well in natural environments, and further that natural environments can better support restoration than other kinds of environments. Further, the perspective of meaningful occupations was emerged into the design of the garden to support meaningful nature related occupations offered in the NBR (Grahn *et al*., 2010; Stigsdotter & Grahn, 2003).

2.3.2 Supportive Environment Theory

The basic idea of Supportive Environment Theory (SET), (Grahn, 2011) is that humans have evolved over millions of years in the context of a natural, cultural and social environment that has been manageable, understandable and meaningful The theory explains that people need supportive environments to develop physically (senses, muscles, locomotion) and mentally (the ability to feel and think). Supportive environment is regarded as an important part of salutogenesis i.e. the origin of health (Antonovsky, 2007) and the SET argues that people need supportive environment in order to maintain their health (Grahn *et al*., 2010).

SET discusses that the need for supportive environments will be different depending on a person's physical and mental capacity, situation and state of mind; *a scope of meaning*. This term indicates that there exists a scope in which nature, culture and people can change meaning (comprehensibility, manageability, significance) for an individual, depending on his/her mental and physical resources at the moment (Grahn, 1991; Grahn *et al*., 2010). When people become ill or experience a life crisis, they need strong support from the environment in order to regain their health and wellness. However, they often experience a change in how they perceive the environment; their scope of meaning has changed. Phenomena they previously experienced as comprehensible, manageable and meaningful (and that even provided valued support in their daily lives) can suddenly be perceived as chaotic or even threatening (Ottosson, 2007). They often have great difficulty understanding and managing people, while physical environments – especially natural ones – are easier to understand and manage (Ottosson, 2007; Ottosson & Grahn, 2008). The more a person feels pressured, insecure and/or lost, the greater the need is to find salutogenic environments (social, physical) that support healing processes. This is illustrated as a pyramid of supportive environments (Figure 2). Based on their situation, SET argues, people try to self-regulate – find environments they perceive as supportive and secure. Sensory impulses in a

supportive environment can give rise to salutogenic effects regarding, e.g., senses, hormones, emotions and cognition, which affect function, feelings and behaviour (Grahn *et al*. 2010).

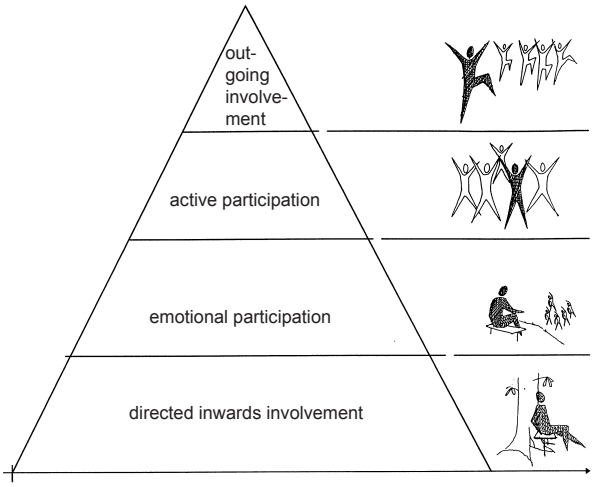

Figure 2. The Supportive Environment Theory (SET) pyramid of executive functions relating to the Scope of Meaning/Scope of action The lower parts of the pyramid symbolizes a low capacity of executive functions and are characterized by inward involvement and a high need for a supportive environment, while the higher levels symbolize higher capacity of executive functions and are characterized by active or outgoing involvement and less need of a supportive environments.

SET entails the surrounding environment and its characteristics communicating with the visitor on many levels: an environment presents so-called affordances of different intrinsic and perceived worth. These values can sometimes be of huge importance to a person's self (Ottosson, 2007; Grahn et al. 2010).

The theory claims that the surrounding environment communicates with each individual on many levels through a non-verbal emotional tone, involving all the senses and a system characterized by a more cognitive structure of communication (Grahn, 1991; Stigsdotter & Grahn 2002 and Grahn *et al*. 2010). The communication can be affected by the individual's mental state and ability to handle external stimuli. This is demonstrated in SET, through the inclusion of physical environment as well as social milieu, and the occupations these can support. SET pyramid (Figure 2), illustrates how the social and physical environments are related to a person's executive functions (Ottosson, 2001). The pyramid is divided into four levels of executive functions. The lower parts of the pyramid symbolizes a low capacity of executive functions and are characterized by inward involvement and a high need for a supportive

environment, while the higher levels symbolize higher capacity of executive functions and are characterized by active or outgoing involvement and less need of a supportive environment (Grahn et al. 2010).

There are eight hypothesized qualities of supportive environment, so called Perceive Sensory Dimension (PSD). These are (Grahn, 1991; Grahn *et al*., 2010):

1. *Serene* - peaceful, silent, safe and secure.
2. *Nature* - fascination with wild nature.
3. *Rich in species* - variety of species of flora and fauna.
4. *Space* - like entering another world, a coherent one.
5. *Prospect* - open space with vistas.
6. *Refuge* - a sanctuary, a secluded place.
7. *Social* - a social arena.
8. *Culture* - signs of human labour and human values throughout history.

In the context of NBR for individuals with stress-related mental disorders, three PSD have been identified as the most important components of a supportive environment: *refuge, prospect* and *serene* (Pálsdóttir *et al*. 2011). Appleton (1975) claimed that *prospect* and *refuge* relate to basic human preferences for certain attributes in the outdoors environment, aiming to satisfy inborn desires for survival: shelter (*refuge*) and views over the surroundings (*prospect*). The theory suggestes that people prefer places where they *can be se but not be seen*.

2.3.3 Attention Restoration Theory

Attention Restoration Theory (ART) focus is on restoration from depleted attention (a cognitive process) and has its origin in psychology. ART attempts to explain how depleted directed attention can be re-energized through restorative experience of effortless soft fascination in nature (Kaplan & Kaplan, 1989; Kaplan 1995), and that nature, particularly, has good potential for directed attention restoration. ART argues that people have two types of attention: directed attention and fascination, the former effortful and the latter effortless. Directed attention is described as an intentional mental process of thoughts and perception. It is used when focusing on a given task or for warding off or inhibiting unnecessary information, such as noise or distracting stimuli. It is a highly limited resource, and can indeed be depleted if one does not have opportunities for recovery. ART argues that depleted directed attention could be recovered through a restorative experience of effortless fascination in natural environments. The theory presents four hypothesized properties that are likely to contribute to a restorative experience. These are

regarded as properties of person-environment interaction and not the physical environment per se (Kaplan, 2001, p 482).
The four properties are:

1. *Being away* - being distinct, either physically or conceptually, from the everyday environment.
2. *Extent* - having scope and coherence that allow one to remain engaged.
3. *Fascination* - containing patterns that hold one's attention effortlessly.
4. *Compatibility* - fitting with/supporting what one wants or is inclined to do.

2.3.4 Psycho-evolutionary Theory

In Psycho-evolutionary Theory the focus is on a quick physiological and affect-driven process of restoration from symptoms of stress. Ulrich (1993, 1999) argues that humans have an inherent inclination to affiliate with nature. He claims that certain natural environments were of crucial importance for survival during most of human evolutionary history, and considers that the stress-reducing effects of nature are a matter of unconscious processes and affects, located in the oldest emotion-driven parts of the brain. These processes, or reflexes, tell us when we can rest or when we should be active, including being prepared to fight or flee. People have an inherent preparedness to rapidly react to qualities in nature, deducing or inducing stress, aesthetically via our senses and our most primitive emotions: our affects. Ulrich's work is inspired by the biophilia hypothesis (Wilson, 1984; Kellert and Wilson, 1983) and the Savanna theory (Orions,1986).

2.3.5 Occupational perspective in NBR

NBR originated in horticultural therapy (HT). The version of HT developed from WWI and WWII in the UK and the US, has a strong focus on the healing effects of occupations in a garden and horticultural context (Relf,1999). The Model of Human Occupation (MOHO) (Kielhofner 1997) is often used in explaining the healing effects of HT. The focus derives from the idea that human beings like to be active, they like to perform meaningful activities that bring about interest and give the energy to exert oneself (Kielhofner, 1997). If a person has a chance to use body and mind in the pursuit of pleasurable and meaningful occupations, he/she feels rewarded. Nature-related occupations such as gardening and horticulture can be particularly rewarding (Haller & Kramer, 2006; Relf 1992).

The model of Value and Meaning in Occupations (ValMO) aims to capture how a person values performed occupation in daily life and is defined as

having three dimensions: *concrete*, *sociosymbolic* and *self-rewarding* values (Persson *et al*., 2001; Erlandsson & Persson, 2014). *Concrete* value relates to the tangible and genuine outcome of an occupation; this can be an actual product of the occupation and/or visibly improved or newly gained skills. *Sociosymbolic* value concerns a less tangible dimension, loading occupations with a symbolic value unique to each person depending on personal experience, cultural background, and/or the environment where the task is performed. This can be an occupation symbolic of the culture a person belongs to. *Self-rewarding* value is characterized by enjoyment of the performance of the occupation itself and the perception of control over the occupation and the environment, in optimal cases also leading to the experience of flow (Persson, 2001; Erlandsson *et al*., 2011; Persson *et al*., 2011; Csikszentmihalyi, 2007). The same person can experience each occupation differently at different times, depending on the circumstances or the person's state of mind or health (Persson & Jonsson, 2009). This is in line with the theory of Supportive Environment (SET) proposed by Grahn (2011) and Grahn *et al*., (2010).

2.3.6 The current knowledge and the scientific output on NBR at the Alnarp Rehabilitation Garden

The scientific output, up to date, on the concept of NBR developed at the Alnarp Rehabilitation Garden for individuals with stress-related mental disorders includes nine peer-reviewed papers and one peer-reviewed book chapter. Some of the papers address the theoretical basis for the design of the NBR programme and design principles for the outdoor environment/garden. Others discuss the content and the qualities of the outdoor environment, the client's perspective on the NBR, and the effects of the NBR on healthcare consumption. The papers are presented in a chronological order of publication years (Figure 3).

The first two publications (Stigsdotter and Grahn 2002, 2003) present the theoretical background of the NBR intervention, including the original design of the outdoor environment, i.e. the Rehabilitation Garden. Paper one presents the main features theorized to be important in and particular to a rehabilitation garden (Figure 3; *1). Paper two presents more applied hypotheses and discusses how these theories are integrated into the actual design of the garden at Alnarp (Figure 3; *2).

Tenngart Ivarsson & Hagerhall (2008) present student's perspective on perceived restoratives of the garden according to the Perceived Restorativeness Scale, and found the garden to possess high possibilities for restorativeness through the characteristics of being away and scope (Figure 3; *3).

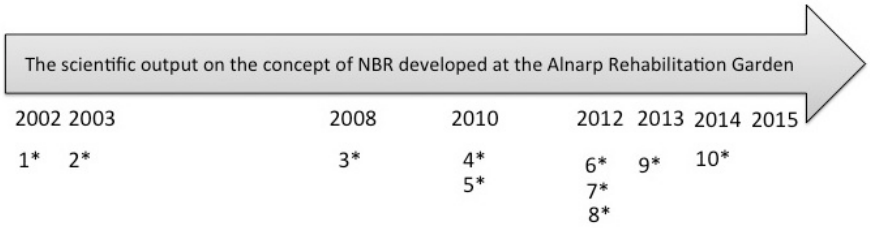

Figure 3. The scientific output, up to date, on the concept of nature-based rehabilitation (NBR) developed at the Alnarp Rehabilitation Garden for individuals with stress-related mental disorders includes nine peer-reviewed papers and one peer-reviewed book chapter.

Grahn *et al*., (2010) present a more developed theory and the concept of NBR at the Alnarp Rehabilitation Garden. The concept is described in more detail than previously, and the authors' own experience of and research on the subject are the basis for the more advanced descriptions of the concept. Here, for the first time, the authors identify and describe four phases of rehabilitation, seen from the researchers' and therapists' points of view. They also state that the outdoor environment enhanced stress recovery and increased attention power. The authors interpret that the following dimensions can be experienced in the garden: i) the Nature Area (*space*, *serene*, *nature*, *rich in species* and *prospect*); and ii) the Cultivation and Gardening Area (*social*, *culture* and *rich in species)* (Figure 3; 4*)

Tenngart Ivarsson and Grahn (2010) present the client's perspective (individual interviews n=10) on use and experience of the garden. Two main themes emerged from the interview with the clients: i) to escape, observe and get sensory stimulation; and ii) to achieve satisfaction, socialize and re-evaluate. Regarding the design of the outdoor environment, the authors highlight the need to increase the dimensions *refuge* and *serene* and decrease *prospect* (Figure 3; *5).

Tenngart Ivarsson & Grahn's study (2012) is based on ethnographically influenced participant observation whereby the researcher (Tenngart Ivarsson) identified two types of walks (introvert and extrovert), and concluded that the first type is mostly performed in the passive parts of the garden and the latter in the more active parts, and thus that different designs support different types of walks. The authors discuss how this knowledge could be used in designing neighbourhoods to stimulate and support physical activity and stress reduction (Figure 3; *6).

Adevi & Lieberg (2012) reveal a complex picture of NBR, presenting the three main factors caregivers consider the most essential for the recovery

process of the client group: i) sensory impressions, ii) self-chosen places in the garden, and iii) interaction between concrete and symbolic activities. Based on the caregivers' accounts, the authors argued that the outdoor environment supported the participants before and after the therapeutic elements by "preparing, receiving and opening them up" (Figure 3; *7).

Bay-Richer et al. (2012) conducted a randomized controlled study on psychiatric patients to examine the effect of NBR on illness and inflammatory state. The results showed that the NBR participants had significantly lower values of markers (cytokines) indicating ongoing attacks of, e.g., viruses, inflammatory or malignant cells (Figure 3; *8).

Adevi and Mårtensson (2013), in a presentation of participants' perspectives on their experience of the NBR (individual interviews, n=5), found that nature, in the garden context, was perceived as a safe arena where self-regulation was facilitated and recovery reinforced (Figure 3; *9).

A retrospective cohort study by Währborg *et al*. (2014) reveals that individuals participating in NBR at Alnarp significantly reduced their healthcare consumption compared to a matched reference group, recruited from the Skåne healthcare register. No significant differences were detected regarding sick-leave status (Figure 3; *10).

Despite the increased knowledge on the concept of NBR, there is still a need for detailed knowledge of how nature and nature-related occupations can facilitate the rehabilitation process in different phases (Tenngart Ivarsson, 2011, p. 69). Also, what remains is a great need to identify specific features and elements of the natural environments that may support health processes (Björk, 2012; Korpela & Staats, 2014).

3 Aim of the thesis

3.1 General aim

The overall aim has been to investigate the Alnarp Rehabilitation Garden as a supportive environment in nature-based rehabilitation (NBR) for individuals with stress-related mental disorders. Special focus has been placed on identifying and describing the role of nature in relation to the rehabilitation process and the essential qualities by which nature can affect health outcomes.

3.1.1 Specific aims of each Paper (I-IV)

I To describe the development of the theoretical framework and the research area of NBR as well as look into the structure of therapy programmes and best practices in evidence-based health design. To identify research gaps and future research projects within NBR.

II To explore and illustrate how participants with stress-related mental disorders participating in NBR experience and describe their rehabilitation process in relation to the role of the natural environments at the Alnarp Rehabilitation Garden.

III To identify and discuss specific locations and their qualities at the Alnarp Rehabilitation Garden that participants with stress-related mental disorders experience as supportive in their rehabilitation process.

IV To describe and assess changes in participants' experienced value of everyday occupations after NBR. Additionally, to assess changes regarding symptoms of severe stress, function and the rate of return to work, in order to study possible associations with experiencing the occupational value of everyday occupations.

4 Research methods

In this thesis a mixed method (Robson, 2011) approach was chosen to investigate the single-case (Yin, 2009) of the Alnarp Rehabilitation Garden as a supportive environment (Grahn *et al*., 2010) and the role of nature in relation to the rehabilitation process (Tenngart Ivarsson, 2011, p 69). This included both quantitative and qualitative approaches without discriminating between the ways of collecting the data and the means of analysis (Shank, 2013). Based on the aim of each study, the appropriate study design was chosen. In table 1, an overview of the study design, data collection and analysis methods is presented.

4.1 A summary of the PhD work process

Paper I – This paper is a peer-reviewed book chapter produced within the EU project COST Action E-39 Forests, Trees and Human Health. Published by Springer Science in 2011. This work was carried out during the period 2007 to 2010, during which time the group met on several occasions to work on the draft, also communicate online to complete the work.

Papers II and III – The data was collected in late 2007, as a pilot study and then as a full-scale study during 2009-2012. The analysis work was carried out in 2011 and 2012. Paper II is in review and Paper III is a manuscript.

Paper IV – The data collection was conducted over a period of, 2006-2008, and analysis and writing of the paper were performed during the period 2011-2013. I joined the work in 2007. The paper is published in 2014.

Table 1. *An overview the mixed-method approach used in this thesis, including a summary of methodological approach for each of the papers. N.B. for Paper II, 43 individuals were included, and for Paper III an additional 16 were included* These were part of Study II (Figure 1). For paper IV – the participants were a group of participants from Study II (Figure 1)*

	Paper I	**Paper II**	**Paper III**	**Paper IV**
Study design	Transdisciplinary learning production	Longitudinal prospective single-case interventional study	Longitudinal prospective single-case interventional study	Longitudinal prospective single-case interventional study
Study population	-	Former participants in Alnarp NBR	Former participants in Alnarp NBR	Former participants in Alnarp NBR
Number of participants	-	n=43*	n=59 *	n=21
Number of females & males	-	35/8	50/9	19/2
Data collection performed	2007-2010	2009-2012	2009-2012	2006-2008
Methods of data collection	Snowballing based on existing literature and current research results	Semi-structured interviews	Narrative interviews and location mapping	Validated questionnaires and semi-structured interviews
Analysis methods		Interpretative Phenomenological Analysis (IPA)-	Narrative analysis -	Wilcoxon signed-rank test & logistic regression and Qualitative content analysis

4.2 Transdisciplinary learning production – Paper I

The joint work of a transdisciplinary research team and practitioners used an integrative stepwise method to formulate a state of the art for nature-based therapeutic interventions (Tress *et al*., 2006a; Hirsch *et al*., 2008). This work was performed as collaboration within the European COST Action E39 Forests, Trees and Human Health. Together, the group of authors developed the framework and decided on the contents of the text based on their own

experience and knowledge, and concluded with a relevant search on the topic. The work was performed at several official meetings within the action, and was followed up through online work and informal meetings. The result of this work is a peer-reviewed book chapter in the book Forests, Trees and Human Health, edited by Kjell Nilsson *et al*., published by Springer-Science, 2011.

4.3 Research design for papers II-IV

4.3.1 Single-case study – the Alnarp Rehabilitation Garden

Case study research covers multiple aspects of a broad variety of subjects. In social science this approach has been recognized for offering in-depth understanding of a certain phenomenon (Yin, 2012). Robert Yin defines case study as follows:

> A case study is an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident
> (Yin, 2009, p18).

The choice of case study was based on its technical definition: many more variables of interest than data points, and as one result is presented it will rely on multiple sources of evidence and converging all data according to triangulation. Case study research follows the current theoretical propositions when methods of data collection and analysis are chosen (Yin, 2009, p 18). Further, case study is appropriate when the research aims to answer descriptive or explanatory questions (often addressing phenomena about which little is known), as was the case for the in-depth investigation of the NBR at the Alnarp Rehabilitation Garden.

A single-case study can be motivated if the case can be defined as something unique or extreme and is thus considered an extraordinary and well-defined event (Yin, 2012). The Alnarp Rehabilitation Garden is a unique phenomenon for its use of a professional healthcare rehabilitation team and a specially designed outdoor environment (the garden). It is a living laboratory for studying, in a real-life context, the interaction between individuals and the environment in nature-based rehabilitation. The whole NBR concept is the subject of SET, in which the individual is the central figure and receives support from the social and physical environment through different occupations. It is a critical case for testing well-formulated theories (Yin, 2009). The NBR at the Alnarp Rehabilitation Garden is defined as a supportive environment consisting of the multimodal and transdisciplinary rehabilitation team, the group of eight participants, the individual him/herself, occupations,

and the specially designed garden (the natural environment). The aim was to increase the in-depth understanding of supportive outdoor environments, especially the role of nature in the rehabilitation process and the essential qualities by which nature can affect health outcomes. In the current work, both descriptive and explanatory approach was applied to investigate the case in question.

Applying three main principles can enhance validity and reliability in case study research: using multiple sources of evidence; creating a case study database; and maintaining a chain of evidence (Yin, 2009). These principles have been applied in choosing the mixed-method approach as regards data collection and analysis methods, investigator triangulation and theory triangulation. A well-documented research database has been kept, including case study notes (interviews, photos observation, ethnographical documentation and analysis), narratives and quantitative data.

4.3.2 The venue

The garden contains places for work as well as rest and contemplation, and can be divided into two major areas: the Nature Area (informal and non-cultivated; see green areas in Figure 4) and the Cultivation and Gardening Area (formal and cultivated; see blue area in Figure 4).

The 2 hectares rehabilitation garden is fenced off with a large gateway as its main entrance, and the area is closed to visitors during the time participants are being hosted there. The main building, the red cottage, is located in the south part of the garden, and close by is a large tool shed. Near the main building the garden is more structured and strict, but further from the house it is less structured and has more "nature" characteristics (Tenngart & Grahn, 2010).

It is further subdivided into different garden rooms, each with special properties of restorative and supportive environment for embracing participants' rehabilitation process. There are also rooms that facilitate meaningful horticulture and garden occupations. The garden contains evergreen and deciduous trees and shrubs, as well as a vast variety of perennials and annuals. The size, height, form, texture and fragrance of plants differ in order to stimulate and awaken the different senses, with an emphasis on seasonal variation. However, the colour scheme is dominated by soft hues, with strong hues limited to certain places in the garden (Stigsdotter & Grahn 2002; 2003; Stigsdotter *et al*., 2011; Grahn *et al*., 2010).

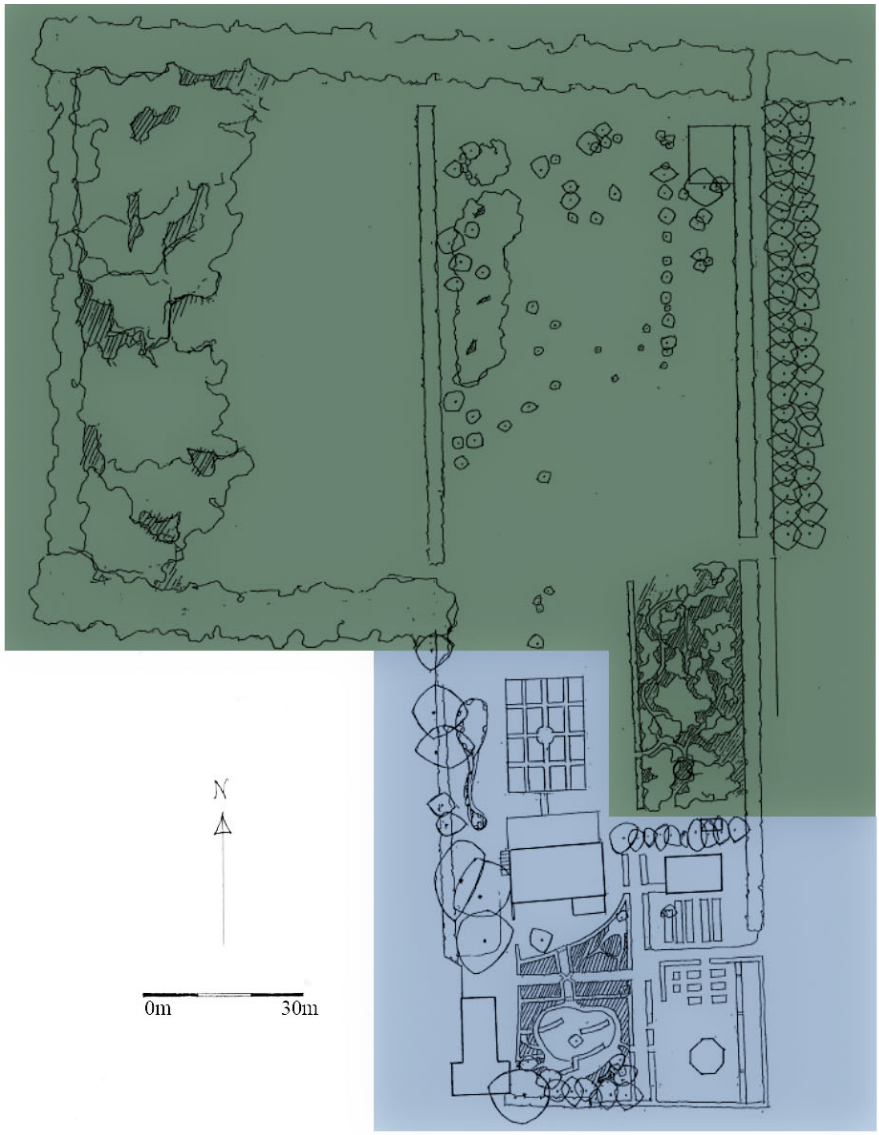

Figure 4. The garden is divided into two major areas: the Nature Area (informal and non-*culti*vated; see green areas) and the Cultivation and Gardening Area (formal and cultivated; see blue area). Illustration Petra Thorpert and Anders Busse Nilssen, 2014).

Figure 5. The entrance to the Alnarp Rehabilitation Garden and the walk way to the main building (the red cottage).

Due to the geographical location of the garden, it is necessary to prolong the period of access to daylight and fresh air at a moderate temperature. Therefore, there are three glass buildings in the garden: a conservatory, attached to the main building (24.5 m2, partly heated); a large greenhouse (100 m2, not heated); and a small domed greenhouse, "Grow-Point" (49 m2, kept frost-free during winter). These differ in size and shape, but all were used for relaxation (in groups or individually) and the production of plants, as well as for different group and individual therapeutic occupations and conversations (Stigsdotter *et al*., 2011, Grahn *et al*., 2010, Tenngart-Ivarsson, 2012).

4.3.3 The participants

The participants were being treated for stress-related mental disorders, and the inclusion criteria for participating in the programme was one of the following International Classification of Disease (ICD-10) codes as the primary diagnosis: psychiatric diagnosis of adjustment disorder and reaction to severe stress (exhaustion disorder) (ICD-F43.8), depression (ICD-F32.0, F32.1). The exclusion criteria were known drug or alcohol abuse. Prior to admission to the programme, a medical examination was performed to ensure

that the inclusion criterion was fulfilled. All participants were Swedish residents at the time of the NBR took place.

Socio-demographic data were collected using a self-assessed questionnaire that included: age, gender, marital status, highest level of education, profession, and postal code. Many of the participants included in the studies were professionals with a high educational level (e.g. medical doctors, lawyers, midwives, IT consultants), and some were university students or practitioners (e.g. chef, carpenter).

4.3.4 The nature-based rehabilitation programme

The NBR was designed as group therapy and was supported by the multimodal and transdisciplinary rehabilitation team, integrating four major therapy forms: occupational therapy, physiotherapy in the form of Rosen therapy, psychotherapy and horticultural therapy (Grahn et al. 2010; Lavesson, 2013). The aim of the NBR at Alnarp was to enhance a salutogenic (curative) process to reinforce individuals' power, by allowing them to connect to their inner self and change their dysfunctional behaviour with firm support from natural environments (Grahn *et al*., 2010). Each year was divided into four rehabilitation periods (I-IV) of 12 weeks each: I winter to spring; II spring to summer; III summer to fall; and IV fall to winter. The weekly programme was managed by an occupational therapist assisted by a horticulturist. All occupations were performed outside, except when the weather was unfavourable; in such cases they took place in the main building or in one of the glass buildings.

The programme was scheduled for four days a week, each day lasting three and a half hours. In the first week, the participants attended the therapy for one day, and over the following weeks increased their attendance to four days a week. Each day had the same basic structure, with four themed sessions led by an occupational therapist assisted by a horticulturist. Sessions 1, 2 and 4 were the same on all four days, whereas the third session varied each day (Table 2).

The first themed session was the morning get-together with a cup of tea, allowing the participants to "catch their breath" and settle down before entering the second themed session, a relaxation exercise performed either indoors or in the garden. The third themed session varied each day. On Mondays, it consisted of creative occupations performed either indoors or in the garden; on Tuesdays, the participants were invited to meet individually with the physiotherapist for a 30-minute session on bodily awareness; on Wednesdays, they were invited to meet privately with the psychotherapist for a 30-minute counselling session. Before and after these sessions on Tuesdays and Wednesdays, the participants could participate in horticultural occupations led

by the occupational therapist assisted by the horticulturist, or stay in the garden, resting or enjoying the surroundings. On Thursday the themed session included garden and horticulture occupations. The fourth and final themed session was "closure" for the day, in which all participants gathered for light refreshments (often something harvested from the garden, fresh or preserved) before going home. Also, at this time the participants could discuss the morning's events, reflecting on their own experiences from the themed sessions.

Table 2. *The weekly schedule for the nature-based rehabilitation, led by an occupational therapist and/or a horticulturist. Note: sessions one, two and four are the same for the whole week but session the varies during the week (different themes).*

	Monday	**Tuesday**	**Wednesday**	**Thursday**
Session one	Morning tea & Gathering	Morning tea & Gathering	Morning tea & Gathering	Morning tea & Gathering
Session two	Relaxing exercise	Relaxing exercise	Relaxing exercise	Relaxing exercise
Session three	Creative occupations, indoors/outdoors depending on weather	Individual meeting with the psychiatrist or physiotherapist (30 minutes). Before and after: garden/horticulture occupation in a group/by oneself	Individual meeting with the psychiatrist or physiotherapist (30 minutes). Before and after: garden/horticulture occupation in a group/by oneself	Garden and/or horticultural occupations in a group/by oneself
Session four	Closure" with light refreshments	Closure" with light refreshments	Closure" with light refreshments	"Closure" with light refreshments

All therapeutic sessions in the rehabilitation programme aimed to strengthen and restore the individuals' inner power and enhance a salutogenic, curative process for better health and quality of life based on each person's own abilities and needs. Resting and "just being" were considered important occupations as they contribute to a slower pace of life, something lacking in the participants' everyday lives. Similarly important was raising their awareness of their habits and daily routines, which might have hindered them from maintaining occupational balance in everyday life.

4.3.5 Longitudinal prospective observational study.

Longitudinal study is an observational research method where by data on a given subject, the single-case, the Alnarp Rehabilitation Garden, are repeatedly collected over a period of time (Robson, 2011). For Papers II and III data was collected over several years. The collection started with a pilot study in 2007 and then data was collected between the years 2009-2012 (Table 1). For Paper

IV, a pre-test-post-test design was applied, including three follow-up occasions: directly after, three months after, and one year after the NBR ended (Figure 6).

4.3.6 Interviews

Interviews – Papers II and III

In order to explore and illuminate how the participants experience their rehabilitation process in relation to the role of the natural environments in this specific context semi-structured interview (Paper II) and a narrative (Paper III) approach was chosen (Kvale 1996; Lantz, 1993). The interview included four main themes:

1. Earlier relation to nature/garden/horticulture.
2. The participants experience of their NBR.
3. Specific occupations perceived as supportive/not supportive in the rehabilitation process in relation to the environment (what was performed and where and how it was perceived).
4. A narrative approach, with the question: *Can you tell me how you used the garden during the time you were in the NBR programme?*

The data collection was carried out over a period of four years, first in 2007 and then from 2009 to 2012 (Table 3). For Paper II, 43 individuals were included, and for Paper III an additional 16 were included; i.e., a total of 59 persons contributed to the empirical data (all belonging to Study II; Figure 1). Each participant was individually interviewed and all interviews were audio-recorded and transcribed verbatim. The approximately hour-long interview was conducted with an informal approach, aided by an interview guide (see above). All questions were followed up with prompts and probes to ensure that all topics and details were obtained during the interview. For Paper III the narrative approach was chosen for gathering a limited description of a certain experience (Dahlberg *et al*., 2008, pp 178-188). Narratives are a retrospective recollection of what happened at a certain time, in which the interviewee's voice is emphasized (Chase, 2006, pp 641-681). In this type of interview situation, it is important that the interviewer give research persons "space" to tell their story, and not interfere by asking follow-up questions too quickly. The interviewer/researcher should "do a great deal of listening" and avoid confrontation – just listen and receive the information given about the topic (Johansson, 2005).

Table 3. *Overview of longitudinal data collection for the single-case the Alnarp Rehabilitation Garden. Each year was divided into four rehabilitation periods (I-IV), and the number of individuals participating in the study is indicated by the number of participants (female:male) each period. The study initiated with a pilot in 2007 and then ran from 2009 to 2012. Altogether, 59 former participants were included in the study*

	Period I Winter/spring	Period II Spring/summer	Period III Summer/fall	Period IV fall/winter
2007				2:1
2009		0:2	3:0	2:0
2010	5:0	5:2	6:1	7:0
2011	3:2	2:0		4:1
2012	6:0	2:0	3:0	

4.3.7 Location mapping: photographs – part of interviews for Papers II and III

An illustration map of the garden area was used to ensure accuracy of the collected data, i.e. that the informant and interviewer were discussing the same location. This showed to be a good means for generating more discussion, as it gave a good overview of the locations mentioned and thereby made it possible to raise questions about the parts not mentioned. During the interview, on the illustration map (a paper sheet) the interviewer wrote some notes on his/her use and experience of the garden/natural environment as well as locations he/she identified as supportive during the rehabilitation process. This method was "accidently" added to the study, since in the pilot interview there was confusion between the informant and the interviewer as to where the discussed location was situated in the garden. The map was thus introduced to pinpoint the location. Once the map was on the table, the informant spoke more freely about his/her use and experience of the garden and interaction with nature.

After the interview, all locations identified as supportive were photographically documented to capture their physical features. Also, during the time the interviews were being conducted, the whole garden was photographed during the different seasons. This was done to follow the changes that occurred over this time.

Interviews Paper IV

In order to describe the changes in the participants' (included in Study I; Figure 1) experiences of everyday occupations, semi-structured interviews (Kvale, 1996) were conducted 10–12 weeks after the participants finished their three-month rehabilitation (follow-up 2, n = 15). The interviews were either face-to-face or by telephone. Dennis Persson performed the interviews. Each interview lasted about 30 minutes and was documented using handwritten notes. The

interview contained themes concerning everyday occupations: (i) what the participant typically did on a normal day and how these occupations were performed; (ii) whether their actual everyday occupations differed from those prior to the start of their illness; (iii) possible differences concerning the perceived value of the occupations prior to the start of their illness and, if differences were perceived, what the most important differences were.

4.3.8 Ethnographic study

As a supplementary method to the interview study for papers II and III and as support to the analysis according to the Interpretative Phenomenological Analysis (IPA), an ethnographical observational study was conducted to experience the NBR (Robson, 2011; Emersson *et al*., 2004). The aim of the participant observational study was to increase the understanding of the intervention as a whole phenomenon, as previous knowledge of the studied phenomenon is recognized to generate deeper and more reflective analytical work, increasing the trustworthiness of results (Smith & Osborn, 2003). On two separate occasions I participated in the whole 12-week NBR (with one group in 2010 and another in 2012). Prior to the observational study the participants were informed of the purpose of me participating, and consent to join the group was obtained before entering the NBR (Dahlberg *et al*., 2008, pp 211-229).

4.3.9 Participant outcome

In order to measure health-related outcomes, several validated instruments (questionnaires) were chosen for the assessment. These were collected pre-post the NBR (Figure 6).

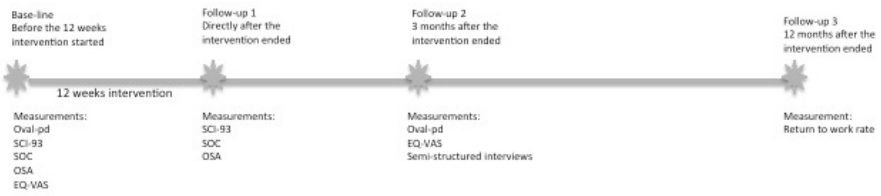

Figure 6. Overview of data collection concerning base-line, follow-up 1, 2 and 3 (Paper IV).

Questionnaires

Occupational Value (Oval-pd). This instrument consists of 26 statements concerning the perceived value of the everyday occupations the participant has performed within the past month. For each statement, four response alternatives are possible: not at all, rather seldom, rather often, and very often. The instrument is intended to reflect the perceived value of everyday occupations composed of three core dimensions: concrete, symbolic, and self-rewarding values. The instrument has been tested for validity in different contexts (Eklund, et al., 2003; Eklund, et al., 2009).

The Stress and Crisis Inventory (SCI-93) measures the individual's symptoms in reaction to severe stress and/or crisis, addressing mental, muscular and autonomic (vegetated) symptoms. The protocol, a 35-item self-report questionnaire, was developed in a Swedish context and is a validated (Nyström & Nyström, 1995, 1996, 2009).The total score can vary from 0 to 140. Scores up to 28 (SD 10.0) indicate a normal capacity to work/perform daily occupations. Scores of 51 and higher indicate difficulty returning to work within a year. A score of 76 or higher means that the person experiences great difficulty managing everyday tasks, and a total score above 101 is considered to reflect a very high level of stress, indicating that the participant is in great need of medical and psychological treatment before entering a rehabilitation programme (Kraft *et al*., 2004; Kraft & Nystöm, 2002).

The short version of the Sense of Coherence scale (SoC-13), including the subscales comprehensibility, manageability and meaningfulness, is considered to be reasonably reliable and valid (Feldt, et al., 2007; Eriksson & Lindström, 2006). Sense of coherence reflects a person's capacity to handle stressful life events, and is a resource that can promote health (Antonovsky, 2007).

The Occupational Self-Assessment-Function (OSA-F) derives from the Model of Human Occupation (MOHO) (Swan, *et al*., 2004) and is a client-centred instrument with 21 items that assess occupational competence (Baron *et al*., 2006). The instrument has been proven to be both valid and reliable (Taylor *et al*., 2011).

The EQ-VAS form was designed for the collection of perceived health states using a VAS rating scale – a vertical 20 cm visual, analogue scale with its end points labelled "best imaginable health state" at the top and "worst imaginable health state" at the bottom, with the respective numeric values of 100 and 0. This scale has been found to be a valid and reliable test concerning stress-related mental disorders. The population norm in Sweden for ages 40–49 is 83.9 (SD 12.5) for men and 79.8 (SD 18.9) for women (Szende & Williams, 2004).

Return to work rate

Return to work rate. Each of the 21 participants was asked to complete a form regarding their work situation a year after the end of rehabilitation. A questionnaire was mailed to them and was followed up with two reminders. The question was: "What was your work situation on xx? (xx being the date one year after they ended their rehabilitation). On this date, it was exactly one year since you left the rehabilitation at Alnarp." The participants were asked to answer according to their actual work situation on the given date, all responses to be rated 100%, 75%, 50% or 25%, according to the level of work performed as: "Paid work as employee", "Self-employed", "Applying for work" "Student/studying", "Vocational training in the workplace", "Continued rehabilitation", or "Sick-listed". The questionnaire was constructed for this study. We treated the data as follows: not available to the labour market (vocational training, continued rehabilitation, or sick-listed) and available to the labour market (paid work, applying for work, self-employed, student/studying).

4.4 Analysing the empirical material

4.4.1 Interpretative Phenomenological Analysis – Paper II

The transcripts were subjected to Interpretative Phenomenological Analysis (IPA), an idiographic and detailed analysis of elements reflecting the participants' lived experiences of the NBR and how they give meaning to it (Smith *et* al., 1999; Smith, 1996). This was an effort to understand the specific and unique subjective experience of NBR at the Alnarp Rehabilitation Garden. IPA entails a hermeneutic approach to interpretation, and does not seek a saturation of themes. In IPA, the researcher's background and previous knowledge of the phenomenon studied are recognized to help him/her more deeply understand and reflect on the newly acquired knowledge and make sense of the phenomenon studied (Smith *et al*., 1999; Smith and Osborn, 2003). The analysis was carried out as a single analysis, i.e. covering the interviews as a current whole phenomenon (e.g. not looking into differences between the seasons, ages or genders).

In the first step of analysis, each manuscript was read while listening to the recorded interview to ensure that the content of the manuscript reflected what had been said. Then, I read each manuscript several times and made notes in the margins, identifying important themes. These were compared with the ethnographic field notes written during participation in the NBR. The themes were extracted into a summary document, including comprehensive extracts supporting each theme. Throughout the whole process of the analysis, the work

was discussed with the main supervisor, who also read some of the interviews to establish his own perception of the content. When we had reached agreement on the main themes, subordinate themes, subthemes and dimensions, the findings were discussed within the entire group of four authors of paper III, who together agreed on the final version. The final version was revealed to the therapists, experts on the client group that was the subject of this study, for discussion of the trustworthiness of the findings that had emerged. The therapists acknowledged that the themes were in accordance with what they encounter in their work.

4.4.2 Narrative - collective story of supportive locations – Paper III

In the first step of analysis, each manuscript was read while listening to the recorded interview to ensure that the content of the manuscript reflected what had been said. This was also a good way to get a feeling for the context, e.g. the participants' mood. In the second step, each manuscript was read several times to build an understanding of the phenomenon as a single whole. Then, all significant events related to the experience of supportive environment in the garden were distinguished and collected into a separate document called *narratives on supportive environments*. As a third step, all the text written on the illustration map sheet as well as the locations marked out as supportive were compared to the distinguished events in the NSE document to ensure that no aspects had been left out, before all the results were inserted into a matrix of supportive environments.

Based on these steps, the narratives were transferred into a matrix and divided up according to: location (and for each location the emotion being processed); social context (alone or with others); occupations performed (e.g. sitting, looking at plants, walking); and description of important components and features the participants mentioned as supportive in that particular location. This was done to get an overview of the contents and functions of each location identified as a supportive environment in the rehabilitation process.

The analysis was summarized in a narrative description (story outcome) of the specific locations identified as supportive during the rehabilitation process. The material was treated as a single general story; i.e., the phenomenon of supportive environment in the context of NBR at the Alnarp Rehabilitation Garden. The qualities of the supportive locations were identified, interpreted and described as the restorative components of Attention Restoration Theory (SRT) and Perceived Sensory Dimension (PSD).

4.4.3 Qualitative content analyses – Paper IV

The semi-structured interviews were analysed with inspiration from Graneheim and Lundman's (2004) overview of important concepts in qualitative content analysis. The three authors working together on Paper IV conducted the process of analysis. I had the overall responsibility for driving the process. Dennis Persson and I (independently), read the handwritten notes several times to get a sense of the whole content, further reading focused on identifying meaning units that corresponded to the informants' statements. The essence of the meaning units were then abstracted, first, into more condensed units, and then into codes. At the end of this process four categories had been discerned. Based on the codes we independently formulated categories that to some extent differed in formulation but not significantly in content. In the next step, Patrik Grahn (the second author) compared these categories and found no discrepancies between the themes concerning content. Finally, we arrived at the final formulation of the themes.

4.4.4 Location mapping and post-photography

All the comments written on the illustration map during the interviews, as well as the locations marked out as supportive, were compared to the distinguished events in the *narratives on supportive environments* document to ensure that no aspects had been left out before the matrix of supportive environment was inserted. Photographs were used as visual help when formulating the description of physical features of identified supportive locations (Paper III).

4.4.5 Statistical analysis

In Paper IV, SAS Release 9.2 was used for analysis, and a level of 0.05 was considered significant. Confounders such as gender, age and socio-economic status were included in the statistical analysis. The Wilcoxon signed-rank test (univariate procedure in SAS) was used to investigate possible changes in measured outcome between baseline and follow-ups (1 and 2, respectively). Logistic regression maximum-likelihood with dichotomized data (logistic procedure in SAS) was used to test the associations between occupational values and, respectively, symptom reduction and return to work. "Symptom reduction", measured with SCI-93 values, was dichotomized at a cut-off of 51; "return to work" was dichotomized as "available to the labour market" and "not available to the labour market"; and the remaining data were dichotomized based on median values. "Symptom reduction" and "return to work" were dependent variables in the two models, while "occupational value", "sense of coherence", "occupational self-assessment – function", "EQ-VAS", gender and age were independent variables. To find the relevant

covariates, stepwise selection was used. Independent variables were included one by one to find the optimal models for symptom reduction and return to work, respectively. We used SAS Proc Logistic regression, stepwise selection, including Hosmer & Lemeshow's goodness-of-fit test. All variables of significance for the aim of the study were included in the models in order to find the best model (SAS/STAT User's Guide, 1999; Vittinghoff & McCullenoh, 2007). The final model concerning return to work rate included the occupational value subscale "self-rewarding" and "age".

4.4.6 Ethical considerations

The ethical principles of the World Medical Association's Declaration of Helsinki (http://www.wma.net/en/30publications/10policies/b3/.accessed 20 March 2013). and the Act concerning the Ethical Review of Research Involving Humans (SFS 2003:460) (Swedish Research Council, 2011; www.codex.vr.se; accessed April 2014) were followed. The regional ethical committee in Lund, Sweden, approved the study for Paper IV (D-nr 2011/31) but the study for Papers II and III was not considered relevant for evaluation as the participants were no longer subjects of the NBR programme and could enter the study of their own free will like any other person who was not a subject of the NBR. However, the committee advised a written consent to be obtained before the participants voluntarily entered the study.

The procedure for Papers II and III: At the very end of the 12-week NBR period, I visited the group in the garden to present information about the interview study. The participants received oral and written information, and had the opportunity to ask questions regarding participation. Those interested in participating left their contact information with the operation manager for the NBR, so that I could get in touch with those who were interested. The participants were informed that when contacted they could decline participation without further explanation. Before the interview took place, all participants signed a written consent of voluntary participation and acknowledged they had received adequate information about the study. The participants could stop the interview at any time, or choose not to answer the questions without further explanation. All individuals were asked for their permission to record the interview, and had the possibility to choose the location where it was conducted. To secure the participants' integrity, all data were de-identified and given a number reflecting the order in which the interviews took place. The data were treated and presented on group level, and were all participants were anonymous.

The procedure for Paper IV: Before entering the rehabilitation programme, the participants received written and oral information about the study and had

the opportunity to ask questions about the study procedure before deciding whether to participate. Participation was confidential, and participants could withdraw from the study at any point without influencing their relationship with their therapist.

4.4.7 Delimitations

The focus of this thesis is on the supportive environment; especially nature's role, and the qualities that might affect health outcomes. It is recognized that the team along with the group is an important part of the supportive environment, but the work in the current thesis is not intended to highlight these important aspects. It also does not focus on the psychological aspect of the rehabilitation process or the aspects of rehabilitation processes not related to the natural environment.

5 Results – summary of Papers I-IV

5.1 Nature-based therapeutic interventions (Paper I)

This peer-reviewed book chapter starts with a brief presentation of the historical perspective on the relation between clients and natural environments, and moves on to the vast definitions of various concepts used to discuss this relation. This work also addresses education, research and practices of nature-based therapeutic interventions (NBTI), and ends with some concluding hypotheses.

5.1.1 On theories and research

This article discusses several theories on the therapeutic and restorative benefits of contact with nature, highlighting three major research areas: i) viewing nature; ii) being in the presence of nearby nature and iii) active participation and/or involvement with nature. The development of theories within these research areas is based on the behavioural sciences, occupational science and landscape architecture. NBTI and rehabilitation programmes have an interdisciplinary approach that seems to result in a merging toward this field's own palette of theories on NBTI (or NBR). As research and empirical work progresses, a more clear integration of these theories (or at least some of them) might follow. The authors' categorized and presented the theories under the following headings: *the Evolutionary approach*, *the Activity approach*, *the Coping-Communications approach* and *the Ecological approach*.

The authors discuss future perspectives on research methods to fill in the knowledge gaps. One longstanding aim of research in this area is to test whether treatment with NBTI achieves something more than other traditional treatments do. Other aims address the quality of the setting in which the therapy takes places and the effectiveness of the activities. Moreover, there is a need to focus on the relationship between the activities and the qualities of the

setting where they take place. The text concludes with recommendations how to study the health outcome and the qualities of the NBR setting. The proposal includes multi-methods with a multi-disciplinary approach, including both qualitative and quantitative techniques. Regarding the evaluation of the health outcomes of NBR a randomized controlled study, and/or a comparison with match control group receiving treatment as usual or other form of rehabilitation, would be preferable. The following aspects of measurements are also recommended, including validated self-assessment forms: Symptom of illness – e.g., SCI-93; Function – e.g., Sense of coherence (SOC) and Occupational Self-Assessment (OSA); and data on Back to Labour Market.

5.1.2 Concluding hypotheses regarding nature-based rehabilitation

The authors offer some concluding hypotheses regarding NBR based on the theories and research, as well as their own experience of the subject:

- Being in nature affects health in a positive way. All theories presented strongly maintain this: being able to regularly get away from one's house or the built environment and perform activities (occupations) in a natural setting, or just being able to rest in a natural setting, can restore a person's mental and/or physical capacities. Having a view over a natural setting, even from a window, can also make a significant difference. This hypothesis is supported by several studies, both epidemiological and experimental.
- Certain characteristics in nature affect health in a positive way. Attention Restoration Theory, the Aesthetic-Affective Theory and the Scope of Meaning/Scope of Action Theory all maintain that certain qualities in nature are important. Some studies support the hypothesis that certain qualities in nature affect most people, while other studies indicate that it is a matter of a person-environment transaction.
- Certain horticultural or nature-related activities affect health in a positive way. This is the core of Horticultural Therapy and Ecotherapy, and is also important in the Scope of Meaning/Scope of Action Theory.
- The health outcome of horticultural or nature-related activities depends on the context of the surrounding environment. This is the core of the Scope of Meaning/Scope of Action Theory.
- Certain people will be more affected than others by treatment in nature-based therapeutic settings; some will be strongly affected while others will be affected to a lesser extent. This is strongly asserted in the Scope of Meaning/Scope of Action Theory.

5.1.3 A source of inspiration for studies included in this thesis

This collaborative work was a source of inspiration for choosing research content in each of the articles included in this thesis. The first four concluding hypotheses inspired the formulation of the aims of Papers II-IV.

5.2 The journey of recovery and empowerment embraced by nature (Paper II)

5.2.1 The role of nature as a supportive environment

Three main superordinate themes were identified as the three phases of NBR – *Prelude*, *Recovery* and *Empowerment* – explaining and illuminating the role of the natural environments (nature) in each phase (Table 4). The superordinate themes are presented in sequence in which the participants described the process. The length of each phase was highly individual. The examples presentmented do not fully cover the content of the results presented in the paper, but are representative of the content. For more details, see Paper II.

Table 4. *The three main phases of NBR that participants with stress-related mental illness used to describe their rehabilitation process, in relation to the role of nature as a supportive environment at the Alnarp Rehabilitation Garden.*

Superordinate themes	Subthemes	Dimensions
Prelude	Alliance	Establishing contact
	Permissiveness	Armour off
Recovery	Restoration	Being in the present - in nature
		Being one with nature
		Peace and tranquillity in nature
	Awakening & processing	Entrusting nature
		Inspired by nature
Empowerment	Moving on	Challenging oneself

5.2.2 Prelude

Two subthemes emerged from *Prelude*: *Alliance* and *Permissiveness*. The first phase, *Alliance*, entailed the act of accommodating and feeling safe in new circumstances. The participants needed to experience feeling secure before they could experience the permissiveness in the surroundings:

> First settle in, feel safe and know the others, then start opening up and breaking patterns.

The contributing factors to feeling safe and secure were: the fenced-off garden, offering privacy; the structured weekly and daily scheme; coherent and undemanding environment; other participants with similar experience of the illnesses; undemanding staff, perceived as very skilled and professional.

> When you've found security, you can show yourself to the staff, the environment, the group and yourself.

The participants explicitly expressed that the entrance through the gate into the garden marked the border between their hazardous everyday life and a place of seclusion and security. The garden was closed to others during the time of the intervention, which in turn offered privacy and satisfied the participants' need to feel secure in these new circumstances. The gate became the symbol of a world of sanctuary:

> …it's enough for me to just look at that gate, how can I put it, yeah I mean I don't have to achieve anything here; it's a sanctuary, it's a sanctuary, yeah.

The whole physical environment was perceived as a coherent whole where no odd pieces, materials or colours disturbed the experience of being in a well-balanced and harmonized wholeness:

> It's not cluttered so that you get a whole lot of sensory impressions; instead, it's calm and peaceful somehow.

Once the alliance was under establishment, the participants gradually noticed what they expressed as permissiveness. As they constantly carried the heavy burden of fulfilling other people's needs and demands, the new experience of permissiveness became an important step for further engaging in the rehabilitation programme. The factors that contributed to the experience of permissiveness were: being amongst others with similar understanding of the illnesses; undemanding garden and horticulture occupations; learning to perceive the state of "just being"; and the undemanding parts of the garden – less structured and dominated by nature.

Many participants explained how the tamed and structured parts of the garden, especially in the beginning, were perceived as demanding and as symbolizing demands for and expectations on achievements. In contrast, the more natural and wild parts of the garden were perceived as less demanding, as nature takes care of itself. The undemanding parts gave a sense of freedom to

do nothing. In this phase of the rehabilitation process, participants learned to perceive a state of "just being" as restful and permissive:

> In nature I don't feel like I have to achieve anything. It's enough to just 'be', and that makes me calm.

It seems that if the first phase was not initiated, this would endanger further engagement in the next two phases. Thus, *Prelude* was considered to be the prerequisite for *Recovery* and *Empowerment*.

5.2.3 Recovery

In the second phase, *Recovery*, the interaction between the participants and nature becomes more personal and intimate than before during *Prelude*. Two subthemes emerged from the superordinate theme *Recovery*: *Restoration* and *Awakening & processing.*

> After a while I felt like the garden did a great deal; the team was important, while the garden grew ever more important as time went on.

Restoration

For *Restoration* three dimensions were distinguished: *Being present*, *Being one with nature*, and *Peace and tranquillity in nature*. These described the way nature offered opportunities for rest and recovery, seemingly a prerequisite for moving on.

> Rest first, and then stand up and walk.

Being in the present

The horticulture and garden occupations were used to remind the participants to take breaks during their work. During these breaks, some participants took a walk in the garden while others chose to sit in the garden before returning (or not) to their task. The plants in the garden served to capture the moment; i.e., the team used them for close-up encounters, inviting participants to smell, touch, taste or look at the plants. The participants reported that this helped them maintain the feeling they were experiencing at that moment. After a while they grew accustomed to the slower pace, and frequently stayed in the moment through sensory experiences in the garden:

> I stood still quite a lot. I could sort of be there next to a flower for a really long time and just look at and smell and pet, or how can I put it, feel it.

Being one with nature

The participants' suffered from severe tiredness and their need for mental rest and recovery was supported in the tranquil natural environment in the garden –

preferably alone, so they could engage with nature and reach inner peace and tranquillity. The participants described how nature played an all-embracing role when it was not shared with others, and that it brought "peace of mind" and allowed their tired minds to just be and rest. A strong feeling of being one with nature allowed them to get closer to their inner feelings:

> Nature is the soul's food and drink.

Peace and tranquillity in nature

A balanced sensory interaction was experienced as important in order to reach mental peace. The balance was dependent on, e.g., soft colour schemes, familiar plants, things made of natural materials, and no interference from alienated interiors (e.g., plastic). The stimuli had to be moderate and not overly ordered, so as not to exceed the participants' mental capacity:

> It can't be too chaotic on the walls; the environment has to exude calm, for example there can't be fire-engine red walls. That wouldn't have worked; it has to be quite neutral and quite basic. Nothing that disturbs the brain…

Close encounters with the natural elements were a source of restoration. Water, in all forms, was described as the source of a deep experience of tranquillity and inner peace; as either snowflakes falling from the sky, the morning fog that looked like a blanket gently covering the garden, or raindrops falling on the pond and making circles on its surface. Many participants told how they looked at the water's surface, following raindrops or the fishes in the pond, and that this became a meditative state, a kind of mindfulness that helped them restore their energy:

> When looking in the mirrored surface of the water, I felt how my body was just filled within this calm and was filled with energy. I reach this feeling of meditation where time doesn't matter.

Some sounds that were perceived as positive were the bird twitter, the wind whispering through the tree canopies and grasses, and raindrops falling. These were described as being soothing and calming. Repeatedly, participants commented that the sounds of nature are instinctive and very familiar to us, since humans have lived in nature for thousands of years, but that the new sounds in the urban context are not as familiar and are therefore more disturbing:

> Natural sounds are more acceptable than industrial sounds and cars; they're interpreted differently because man has had them around for thousands of years while other sounds are rather disturbing.

The participants expressed that the total absence of others and the possibility to be alone were very important factors for engaging with nature. The effect of the interaction with nature would be reduced if one were accompanied by others. This was also expressed as a need to "hide" from others and just be alone with one's thoughts and feelings. The garden offered many different locations for the participants to seek out:

> …I've wandered down along the trees here, because here you can also be alone and nobody sees you, and one day when I was especially upset and angry too, and didn't want to be with the group, I wandered down here somewhere…and I guess it's because in some way it's about getting as far away as possible and not needing to relate to anybody else, but just being alone.

5.2.4 Awakening & processing

For *Awakening & processing*, two subthemes were distinguished: *Entrusting nature* and *Inspired by nature*. These described the ways nature supported the participants in their process, inspired their spirit and brought them happiness.

Entrusting nature

The participants described that nature embraced and supported them when they were processing strong feelings and emotions. Their trust of nature was sincere, and very intimate and deep communication emerged when these often painful processes came to an end:

> To cry in despair and let go of all the tension that was inside of me; I felt bad and it felt like there was no point living with this. I didn't want to let go of these feelings in front of other people, but the garden and nature could take it.

The illness had made the participants feel skinless, exposed and vulnerable. They expressed that nature embraced them and became a kind of patch on their wounds. The variation of the garden rooms enabled them to seek out a place that harmonized with their moods and needs. Several participants sought support with nature before and/or after attending a session with a therapist:

> …Especially after the rose therapy; then I walked down here and kicked things and…then I walked down here, down here is where I walked, and then around, so I could walk and I swore and cursed and cried and carried on all by myself to just be alone and sort of try to let off steam and sort of let out everything X had put into motion.

Nature touched the participants on a profound level. Often, when sad or deeply moved, they needed a secluded and secure place, out of sight from others, preferably with a view over the surroundings. Some struggled through

thorny bushes or sought refuge in primitive, rough places. There was a great need for privacy (the absence of others) to scream and/or cry out loud, growl, throw things, kick and stamp on the ground without someone watching or hearing them. For others, being embedded in vegetation comforted them and enabled them to experience feelings of relief deep within:

> I laid in the grass in the sun, smelled the grass, it felt so good. I lay near the grass and could cry, properly cry like a child; I'd been carrying that for such a very long time.

Inspired by nature

The participants described the outside environment as an infinite world with unlimited freedom, a source of creativity where one can discover wonders that evoke delight and joy. Exploring the garden, looking at details and finding new things were experienced as inspiring. There was something enticing about setting out on an excursion to find an unexpected pleasure:

> Walking in the garden offers possibilities to find things you wouldn't normally see: smiley faces in the pistils, how the insects work and move around. See a mini-world that moves along at its own pace. All this arouses happiness you don't find at the hospital.

5.2.5 Empowerment

The third phase was *Empowerment* with the subtheme *Moving on*, including the dimension *Challenging oneself*. In this phase the garden becomes an arena of challenge, where boundaries are broken and new approaches tested before one enters the arena of everyday life with a more sustainable approach to one's way of living.

Moving on - Challenging oneself

Many participants described that towards the end of the programme they possessed an inner strength to be who they are rather than trying to live up to an image based on others' expectations. They were able to face challenges they would have had difficulty encountering before the rehabilitation, and even challenged themselves in different ways to test their newly acquired strengths. Some used the wilder parts of the garden to take a challenging walk, finding it a bit fun as well:

> And here it was also that you stumbled over blackberries, so it was a bit of a challenge; I think I'm the type who likes challenges too in some way. I have to go through all the cracks and I have to go through everything there is. I know I was down here a long time and walked where you basically have to crawl and climb, but I'm a bit that way.

5.2.6 Three types of supportive occupations in nature-based rehabilitation

During the Prelude phase, the occupations were characterized as *introvert or inactive*, as outwardly it appeared as if the participants were not doing anything. However, on the inside they were highly activated. This was also detected during the first phase of Recovery, but in its later phase the participants began to perform *reactive* occupations, which thus became increasingly dominant over the introvert occupations. Reactive occupations can be characterized as a response to external stimuli, e.g., therapeutic conversations and actions in the rehabilitation programme, awakening demanding inner feelings, or other participants' doing and being, which often mirrored their own actions they had not previously reflected on. Also, the natural environment initiated reactive occupations, mainly concerning a participant's reflections on his/her own life. During the last phase, *Empowerment*, the *proactive* occupations came to dominate for most participants as they challenged themselves based on their own needs and desires, by taking the initiative to occupy themselves and, e.g., explore the outer borders of the garden.

5.2.7 Social quietness a new component of supportive environment

A new component of supportive environments was identified and named *social quietness*, an important component facilitating personal and intimate engagement with the natural environment. The absence of others, i.e. *social quietness,* was specifically expressed as an important factor for engaging with nature and experiencing inner peace and tranquillity. Emotional communication with nature was negatively affected when others entered the scene, as this communication entailed subtle emotions and experiences in which nature played an all-embracing role when not shared with others.

5.3 Client's perspective on supportive locations at Alnarp Rehabilitation Garden (Paper III)

5.3.1 Solitary encounters with nature

Altogether, 17 specific locations in the garden were identified as supportive environments. These locations were in the and in the Cultivation and Gardening Area (see appendix - map 2). Nature Area (see appendix - map 3) Though many participants pointed out a specific location they felt had been supportive during their rehabilitation process they also highlighted that the garden at large was supportive because different locations supported different needs during different phases of the 12 weeks of NBR. Some chose the entire

garden as a supportive environment, and did not want to not distinguish one particular location.

At the beginning of the NBR, the participants distinctively referred to the physical environment as outside (the garden) and inside (the house i.e. red cottage). Later the distinction became the garden and the house, and when interacting with the natural environment in the garden they referred to it as nature. The participants were aware that they were in a man-made space, a specially designed garden, and when they spoke of the place as a whole – i.e. the Alnarp Rehabilitation Garden – they used the garden; but when discussing their interaction with the outdoor environment, dominated by natural elements, they referred to it as nature. Hence, the word nature was used as an overall term for the interaction between person and natural environment in this context.

The results identified a strong need to be alone with nature i.e. a solitary encounters with nature (undisturbed by the presence of others) when handling emotions evoked by the NBR. This was labelled *social quietness*, and seemed to be equally important as the physical and perceived features of the supportive locations.

5.3.2 Important qualities of a supportive environment

The most important qualities of supportive environments for solitary encounters with nature were the perceived sensory dimensions (PSD), *nature, prospect*, *refuge, serene* and *space*. The four components of Attention Restoration Theory (ART) that are essential for restorative environment – *extent, being away*, *fascination* and *compatibility* – were all identified as important qualities of supportive locations.

The physical features of the supportive environment concerned particularly shapes, texture, fragrances, sounds and the firm structure of the garden rooms. Soft shapes and curves were perceived as less demanding structures than strict lines and a hard surface structure. A balanced and coherent colour scheme, with soft colours such as lilac, pink, white, blue, was perceived as calming and as not "bothering" tired minds. Pleasant plant fragrances and the sounds of nature, such as birds twittering and the wind sweeping softly through the leaves, were perceived as soothing and calming. Locations with a clear and firm structure and the attributes of *prospect* and *refuge* as well as escape routes were highly regarded as supportive environment.

The main physical features of the supportive locations for relaxation, reflection and/or contemplation: a firm and solid support from the sides and the back as well as a (canopy) roof; alternative paths ("escape exits"); varied ground cover (e.g. soft bark, gravel); sufficient distance from the user to

passers-by with the area in between planted with lush vegetation in a soft colour scheme (e.g. white, purple, blue, variation of green and grey); plants of varied textures and shapes, giving the eye a resting point; comfortable sitting facilities; and a mixture of stone, water and plants. Other important qualities were comfortable temperatures, nice fragrances and considerable quiet (though the sounds of nature were acceptable). The participants frequently mentioned the importance of permissiveness from the surroundings, and that the access to the garden was a vital resource of mental restoration and processing emotions. This was always preferred in solitude, without the disturbance of others. Social interaction demanded attention and depleted their fragile source of energy, but the interaction with nature did not.

The glass buildings were expressed as pleasant, especially during the colder months of the year. Using the glass buildings made it possible to prolong the time spent outside in the fresh air and daylight, during the time of year when days were shorter and the weather colder, which the participants reported as essential. The location, overall, where the NBR takes place needs to be flexible and large enough to support all the phases of the rehabilitation process.

5.4 Perceived value of everyday occupations after nature-based vocational rehabilitation (Paper IV)

Significant positive changes were measured regarding perceived Occupational Values in daily life (Oval-pd) Sense of Coherence (SOC), reduction of symptoms of severe stress (SCI-93), improved health (Eq-Vas) and function (OSA-function) in everyday life (Table 5). Of the 21 participants asked to reply to the questions on returning to work; two had retired, one was deceased and two did not reply in spite of being reminded twice. Thus, these participants were not included in they study. Of the 16 remaining eligible participants, 10 had returned to work or studies. Six participants were still on sick leave. In this study 62.5% of the participants had returned to the labour market or to studies (within the range of 25–100% participation) within a year of finishing their rehabilitation. Both the return to work rate and symptoms of severe stress were significantly associated with changed experience of everyday occupation, especially as regards the self-reward value.

Table 5. *Number of participants (n), mean, range and standard deviation (SD) at baseline, follow-up1, and follow-up2 after the nature-based rehabilitation at the Alnarp Rehabilitation Garden.*

	Baseline				Follow-up 1		
Variable	n	Mean	Range	SD	Mean	Range	SD	*p*-value
Stress and Crisis Inventory								
SCI-93 general value	21	68.1	30-135	26.1	53.6	18-105	29.6	<.0001
Subscale: Muscular	21	16.7	4-35	7.8	14.1	3-31	8.3	0.0037
Subscale: Mental	21	18.9	10-24	3.3	14.1	6-22	5.1	0.0002
Subscale: Autonomic	21	32.5	10-76	17.0	25.4	5-59	17.7	0.0003
Occupational Self -Assessment								
OSA general function	21	34.5	24-51	5.8	41.8	30-55	7.1	0.0002
Sense of Coherence scale								
Summarised general value	21	50.3	28-71	11.6	55.1	33-79	11.4	
Subscale: meaningfulness	21	16.5	9-24	4.34	17.6	11-27	4.0	
Subscale: manageability	19	17.3	9-32	5.67	20.0	11-27	4.4	0.0274
Subscale: comprehensibility	19	16.5	5-22	4.88	17.6	8-27	4.8	
	Baseline				**Follow-up 2**			
EQ-vas	18	36.6	20-90	16.22	62.0	10-85	18.5	0.0009
Perceived occupational value								
Summarised general value	15	35	22-44	5	44	31-53	8	0.0009
Concrete value	15	12	8-16	2	15	10-19	3	0.0012
Symbolic value	15	7	3-9	2	10	6-15	2	0.0007
Self-rewarding value	15	12	7-19	3	19	3-24	4	0.0005

Notes: Follow-up 1: Stress and Crisis Inventory (SCI-93) ($n = 21$), Occupational Self-Assessment – Function (OSA-F) ($n = 21$), and Sense of Coherence scale (SoC-13), general value ($n = 21$), meaningfulness ($n = 21$), manageability ($n = 19$), and comprehensibility ($n = 19$). Follow-up 2: Occupational Value (Oval-pd) ($n = 15$), and Eq-Vas form ($n = 18$).

5.4.1 Towards more balanced occupational repertoires in everyday life

Four main categories were extracted from the interviews, all concerning change in the participant's occupational repertoires in everyday life after the NBR.

After the NBR they spent more time on nature-related occupations such as long walks at nature sites, gardening and horticulture, either in their own garden, on their balcony, or at an allotment. They stated that being in nature was restorative, and that working in the garden eased their minds.

The participants now had a slower pace in everyday life on their own terms, and daily occupations were not monitored in terms of time but rather delight and joy. They let things "take their time", taking breaks more often and trying not to rush things. They did one thing at a time, avoiding multi-tasking. They consciously turned more to nature to slow down their pace and for mental recovery.

Many participants had either resumed familiar creative occupations or learned new ones. These included gardening, singing, playing an instrument, photography, painting or working with clay/ceramics. In general, the participants expressed that they felt that these changes had had a positive effect on their inner strength, and they consciously chose occupations that contributed to improved health.

5.4.2 Self-reward value predicts return to work and reduced stress symptom

The results of the regression analysis indicated that the most important factors associated with return to work were a young age (in one's 40s) and perceived value of everyday occupations, especially the self-reward value dimension, characterized by enjoyment of and control over tasks and environment, partly related to the concept of flow. Furthermore, the most important factors associated with reduced symptoms of severe stress were younger age (in one's 40s) and overall perceived value of everyday occupations (concrete, symbolic and self-rewarding values).

6 General discussion

In this section, aspects of the main results and methodology are discussed.

The participants were aware that they were in a man-made space, a specially designed garden, but when discussing their interaction with the outdoor environment, dominated by natural elements, they referred to it as nature. Hence, the word *nature* is used as an overall term for the interaction between the participants and all elements of nature (flora; fauna; weather; water; earth; fire etc.).

6.1 Discussion of results

6.1.1 Social quietness – alone with nature

The profound non-verbal communication with nature in the garden seems not only to have been a source of restoration but also to have reconciled complex mental processes throughout the rehabilitation process. The results revealed that the participants had a strong need to be alone with nature, in a self-chosen supportive location in the rehabilitation garden, undisturbed by the presence of others when resting or handling all the emotions evoked in the rehabilitation. Solitary engagement with nature was negatively affected when others entered the scene. This had to do with both noise from other people and the actual presence of another person in their surroundings. This essential quality of a supportive environment is hereby defined as *Social quietness*.

6.1.2 Solitary engagement with nature

Because of their illnesses, the participants in the NBR at the Alnarp Rehabilitation Garden suffered from cognitive and social impairments (Jonsdottir *et al*., 2013). Many participants mentioned having difficulty relating to other people and that social engagement was perceived as demanding whereas engaging with nature was not. This might explain the participants'

critical need of solitary engagement with nature when processing their emotions and experiencing mental restoration. Korpela and Staats (2014) discuss the concept of solitary restoration in nature and the effects on the restorative experience if shared with others. They offer evidence that the company of a friend may enhance the experience of restoration, but also point out the potential risk of degraded restorative effects if one's attention is drawn away from the environment.

The participants described how nature had an all-embracing role when it was not shared with others. This is in agreement with Ottosson's (2007) own experience of solitude in nature. Ottosson claimed that when alone with nature, it is possible to become attuned with nature. Hence, it is possible to start communicating with nature. On the other hand, when you are in the company of others, nature can assume a more passive role, and be "transformed into a backdrop".

The natural setting became a vital source of healing and recovery when free of other people, who disturbed this interaction and communication with nature. It seems as if, in the context of NBR, the absence of demands for social feedback (Korpela and Staats, 2014) appears to be an equally important quality of supportive locations as their actual physical features (Scopelliti et al. 2004). The aspect of social quietness should therefore be considered as an essential quality of a supportive environment in the context of NBR.

6.1.3 The role of nature as supportive environment in the rehabilitation process

The results show that the participants went through three distinct phases during NBR, i.e. *Prelude*, *Recovery* and *Empowerment*. In the current work, the supportive role of nature has been identified, described and linked to the different phases of rehabilitation. This has not been the case in earlier studies in this context (Grahn et al. 2010; Tenngart Ivarsson, 2011, Adevi, 2013). Furthermore, the Prelude phase has not been previously identified as a significant part of the NBR concept.

Prelude

The *Prelude* phase was essential for initiating the participants' rehabilitation process. It was characterized by the themes of establishing alliance (feeling safe and secure in the new surroundings) and permissiveness (the feeling of a non-demanding environment and atmosphere).

The physical feature of *being away* (Kaplan, 2001) was experienced as an essential quality that supported the establishment of alliance. The participants expressed that the gateway (the entrance to the garden) marked a distinction between their world of everyday struggle and a world of sanctuary and safe

Figure 7. The main entrance to the Alnarp Rehabilitation Garden, Scania (Skåne), Sweden (photo: AM Pálsdóttir).

refuge in the rehabilitation garden. Once they were through the gateway and had closed it behind them, the participants expressed having a strong feeling of being in another world, a world of acceptance and permissiveness. Tenngart Ivarsson and Grahn (2010) also identified the participants' need to escape from reality (*being away*) and described the garden as a safe place, a refuge from the unwanted distractions of everyday life, a place offering physiological relaxation and psychological contemplation.

The role of nature as a supportive environment was mostly related to the overall experience of *permissiveness* in the outdoor environment, for example, a *coherent* sensory impression. The intimate and close personal-environment interaction had not been established at this stage but evolved during the coming phases of *Recovery* and *Empowerment.*

It seems that the *Prelude* phase was essential in initiating the rehabilitation process, through the establishment of *alliance* and progressing toward the dimension of *permissiveness.* It is recognized that if alliance is not established within the first few sessions of the therapy, moving forward in the rehabilitation process is a profound problem for the client and therapist(s), and it is even recommended that the therapy be terminated (Duncan et al., 2011; pp113-130 & 370-372; Johansson, 2006). Failure to establish alliance

endangered the progressive move to the next phases of the NBR process and closer encounters with the natural environments. Therefore, the *Prelude* can be regarded as the prerequisite for the following phases of the NBR to take place.

If nature is to act as a supportive environment in the rehabilitation process, there is a great need to consider the aspect of the *Prelude*, i.e. enhancing the feeling of being safe and secure in the NBR situation. This concerns both the physical and the social environments. These aspects should be considered in future work on certification requirements of NBR enterprises for this group of participants.

Recovery

In the next phase, *Recovery*, the role of natural environments became more distinct as a vital source for rest and recovery for the severely tired participants. Particularly at the beginning of this phase, the participants sought out locations for rest and relaxation, alone. A balanced sensory interaction, that did not exceed the participants' mental capacity, was experienced as important in order to reach mental peace. This helped the participants achieve a restorative state. Almén (2007, pp 29-39) states that individuals suffering from prolonged stress reactions have an impaired ability to rest and relax, and that no spontaneous recovery is derived from being home on sick leave, he emphasizes that there is a need for rehabilitation that enhances stress reduction through relaxation and recovery. Perski (2004) also emphasizes the fact that individuals with stress-related mental ill health are in great need of rest and mental recovery before taking an active part in a rehabilitation program. The latest recommendations for treatment for this group of individuals include a multimodal rehabilitation program with considerable focus on cognitive-related rehabilitation (Åsberg & Nygren, 2012, p. 41). Therefore, perhaps, it is no surprise that few treatments have been successful and sufficient regarding health outcomes and/or return to work (personal communication: Hallgårde, 2014; Swedish Government Official Reports, 2012, p. 61). Given the above, how can individuals with cognitive impairments assimilate a therapy involving cognitive processes without having experienced sufficient mental recovery before entering the therapy?

Concerning the *Recovery* phase, the participants described intimate and personal communication with nature that helped them bring an end to different kinds of mental processes. They entrusted nature with both sad and happy emotions. The participants sought out secure places, out of sight of others but with a view of the surrounding area so they would not be taken by surprise, where they, alone, could react based on their needs. The participants expressed that the possibility to instantly act on emotions evoked was crucial in order to

move on with the processes, and not be left with them in their heads. This, the participants often repeated, was not possible in the usual health care facilities. Other studies have also recognized the added value of having nature to turn to during the rehabilitation process and it being an essential factor for handling the ongoing processes (Adevi & Mårtensson, 2013; Berger, 2008; Eriksson *et al*., 2010; Tenngart Ivarsson, 2011).

Adevi and Mårtensson (2012) argued that the emotional communication between a place and a person could, in an NBR context, lead to more than the restoration of depleted minds; i.e., that the garden could be a therapeutic partner resolving more personal issues that have surfaced during the crisis. This has also been described in an introspective study by Ottosson (2001; 2007) in which nature, through non-verbal communication, became a therapeutic partner in rehabilitation after he had suffered a severe head injury. Ottosson describes how the stones talked to him, not in words but in emotions, which made the experience even stronger. He became calm and this gave him a sense of security. In his text, Ottosson seeks an explanation for his experience and refers to Harold Searles (1960), who argued that people in crisis might find support in simpler relations than those with other people (social relations). By this, Searles meant elements of nature such as stones, water, plants and animals.

This is in line with Supportive Environment Theory (SET), which explicitly stresses the importance of nature/natural environments and occupations as part of the supportive environment (Grahn et al. 2010). The theory asserts that because of the participants' low executive function and mental impairments, they are in great need of support, especially from natural environments (Grahn, 1991; Grahn et al. 2010). Kaplan & Berman (2010) hypothesized that nature would be more beneficial for those who are more attentionally fatigued (depleted attention) than those who are less so. Ottosson and Grahn's (2008) findings support this, as they found that individuals in crisis benefit more from only experiencing nature than those who are not.

Grahn *et al*., (2010) stated that contact with plants and natural elements can substantially contribute to people's recovery, and that signals from nature can stimulate creative processes that are important, e.g. in the rehabilitation

Figure 8. The large greenhouse allowed the participants to be outside in the fresh air and daylight even during the colder months of the year (AM Pálsdóttir).

process. The sensory stimuli and the interaction with plants were expressed as joyful and soothing experiences. The participants expressed that taking care of the plants inspired them to reflect on their own life situation and find new ways of handling their life. Relf (1999) mentions the value of observing beauty, e.g. the appealing form and texture of the plants could bring about enjoyment and lead to fascination that in turn changes the focus on everyday problems.

Furthermore, the glass buildings seem to have been an important feature as they allowed the participants to be outside in the fresh air and daylight even during the colder months of the year, which the participants reported as essential. This also allowed sensory stimuli and interaction with plants throughout the year, which is of importance in NBR in this part of the world with cold winter months. Beute and de Kort (2013) recognised the importance of daylight for restorative effects through psychological pathways.

The *Recovery* phase resembles the researchers' perspective on the phases of NBR (Grahn *et al*., 2010) i.e. the phases of Contact, (with the external world and themselves) Breaking the shell (starting to re-evaluate their situation) and Opening (processing).

Figure 9. Many participants told how they looked at the water's surface, or the fishes in the pond, and that this became a meditative state, a kind of mindfulness that helped them restore their energy (photo: AM Pálsdóttir).

Empowerment

The last phase, *Empowerment,* concerns the phase in which most of the participants moved on by challenging themselves.

The participants described how they, towards the end of their 12 weeks of NBR, possessed an inner strength to be who they were rather than trying to live up to an image based on others expectations. Nature had become an arena where they could try things out and break their perceived boundaries – boundaries which held them back from living a good life in accordance with their own needs and they could transfer this inner strength to their everyday life situations.

This phase of *Empowerment* resembles the phase of Growing described by Grahn et al. (2010) where the participants challenge themselves, really "live fully" and act on their needs. This also agrees with Adevi & Mårtensson's (2013) description of how the participants used the rehabilitation garden as a "try-out lab" for improving everyday function and well-being.

6.1.4 IRP occupations in relation to the three phases of NBR

The three different types of occupations identified in this work; *introvert/reactive/proactive* occupations, are known terms within occupational science, but have not previously been used in the context of NBR as described in this thesis, or placed in a theoretical model of a supportive environment. The concept of *IPR occupations* is way of illustrating the different types of occupations included in NBR at the Alnarp Rehabilitation Garden.

During the *Prelude* and *Recovery* phases, most occupations were directed towards just being, lowering one's guard and relaxing, all characterized as *introvert* occupations or outwardly inactive, as outwardly it appeared as if the participants were not doing anything. However, on the inside they were highly activated. SET recognizes inward involvement when a person has a low capacity for executive function, which in this study was the actual state the participants were in when they entered the NBR (Grahn *et al*., 2010) although SET suggests that participants begin communicating with their surrounding natural environment directly from the start – where the natural environment acts as a therapist from the outset. Conversely, in the results from the current work, I find that for this to happen, participants need a firm *Prelude* phase.

During *Recovery* phase, the participants began to perform *reactive* occupations, which became increasingly dominant over their *introvert* occupations. *Reactive* occupations can be characterized as a response to external stimuli, e.g. therapeutic conversations and actions in the rehabilitation program, awakening demanding inner feelings, or other participants' doing and being, which often mirrored their own actions which they had not previously reflected on. Also, the natural environment initiated *reactive* occupations, mainly concerning a participant's reflections on his/her own life. This can also be illustrated, as in the SET pyramid of executive functions, as emotional to active participations (Figure 2) (Grahn *et al*. 2010). *Introvert* occupations were important throughout the rehabilitation period, but diminished towards the end of the NBR process as the participants' physical and mental capacity grew.

Proactive occupations came to dominate in the *Empowerment* phase, and the participants challenged themselves based on their own needs and desires by taking the initiative to occupy themselves, e.g. by exploring the outer borders of the garden, illustrated in the SET pyramid of executive functions as outgoing involvement (Figure 2).

6.1.5 An explanatory model of supportive environment in NBR

An explanatory model (Figure 8) that summarizes the three phases of rehabilitation – *Prelude*, *Recovery* and *Empowerment*, the *IRP occupations*

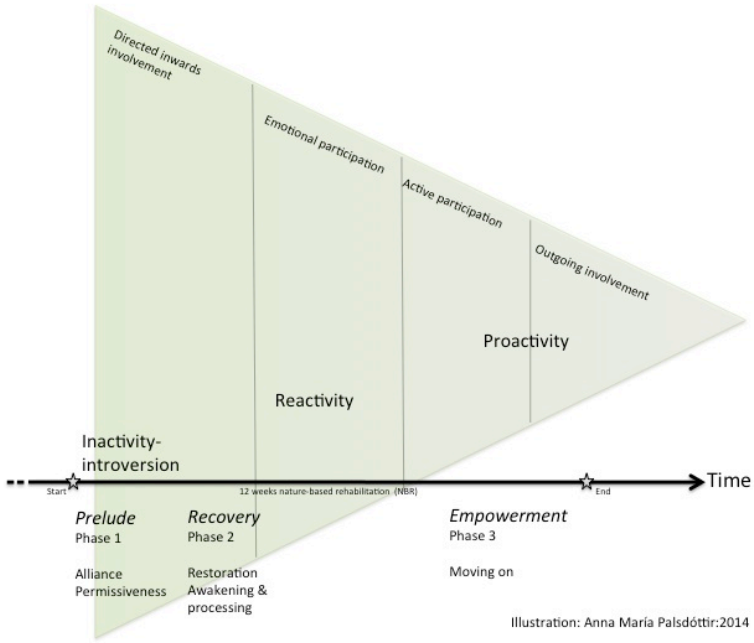

Figure 10. An explanatory model of nature-based rehabilitation (NBR) that summarizes the three phases of rehabilitation *Prelude*, *Recovery* and *Empowerment*, the IRP occupations (introvert, reactive, and proactive occupations) and the SET pyramid of executive functions (illustration: AMPálsdóttir).

(*introvert*, *reactive*, and *proactive* occupations) and the SET pyramid of executive functions.

The *IRP occupations* are connected to the different phases of the rehabilitation process, and correspond to the suggested levels of executive functions in the SET pyramid. For instance, in the *Prelude* phase, the introvert occupations dominate the occupational repertoire, resembling direct inward involvement in the SET pyramid. In the *Recovery* phase, the reactive occupations take over, resembling the emotional participation moving towards active participation. In the last phase, *Empowerment,* the proactive occupations dominate, resembling the outgoing involvement of the SET pyramid. The lengths of the phases varied individually, and are illustrated in the sequence in which the participants described their occurrence. This is an effort to illustrate how nature and nature-related occupations can facilitate and support the rehabilitation process in the context of NBR for individuals with stress-related mental disorders.

6.1.6 Essential qualities of supportive environment in NBR

In all, five of Perceived Sensory Dimension (PSD) were identified as essential qualities of a supportive environment; *nature*, *prospect, refuge*, *serene*, *space*, and the of Attention Restoration Theory (ART) components; *extent*, *coherent*, *being away*, *compatibility*.

Many participants described how the natural appearance appealed to them, and how that was perceived as a calming and safe feature. It was described as a secluded place, embedded in lush vegetation, where one could be alone. Others mentioned the restfulness of the overgrown and wild-like nature, or "wildish" as one expressed it. Many talked about how easily they could find inner peace and rest their tired minds. The *nature* dimension represents the force and power of nature, not man-made but on nature's own terms (Grahn and Stigsdotter, 2010), and seems to neither dominate the participants' thoughts nor demand their direct attention. Instead, mental recovery was facilitated through soft fascination (Kaplan *et al*., 1998).

The participants' own expression of their need to "see but not be seen" resembles Appleton's (1975) definition of *prospect-refuge*, whereby environmental preferences are explained as an evolutionary desire for survival. The *prospect* gives the opportunity for visual control over the open landscape, and the *refuge* is a shelter, a place to hide. Lückman *et al*., (2011) found *refuge* mostly related to locations where one could be alone and these locations being surrounded by trees and vegetation. These are the features the participants described as important in being alone in nature, resting, reflecting on their life situation or handling their emotions, i.e. in sheltered and safe supportive locations with a clear view of the surroundings. Korpela *et al*., (2001) defined such places as favourite places, where one could escape from social pressure for emotional and self-regulation. Gatersleben and Andrews (2013) found that walking through natural environments with a high degree of *refuge* was perceived as less restorative than natural environments with a high degree of *prospect*, due to a lack of feeling safe in the environment. In the current study, the concern for safety was not an issue, as the participants had already established *alliance* and felt safe and secure in the NBR context. However, the locations of *prospect* and *refuge* all have alterative paths (escape routes) leading from the site, giving the participants secure exit if being approached by another person.

The entrance to the garden, the gateway, marked the boundary between the world of safe sanctuary and the outer world of everyday life (Figure 7). This landmark was of the utmost importance for the feeling of being away from everyday life in a safe environment. In this case, it refers both to being physically and conceptually away from the everyday environment, a quality

Figure 11. Forest Garden (Figure 4, the green area), a restful nature-like place where one could withdraw for solitary restoration (photo: AM Pálsdóttir).

also recognized in earlier studies in this context (Tenngart Ivarsson & Hägerhäll, 2008; Tenngart Ivarsson, 2012) This raises the issue of the importance of building up an environment in the NBR context that can be perceived as safe, especially if nature is to offer the most support in the rehabilitation process.

Supportive environments characterized by the PSD, *serene*, (Grahn and Stigsdotter, 2010) were peaceful, calm locations where the participants could rest, relax, and restore their tired bodies and minds without disturbances from others (the component, compatibility). Locations characterized by serenity have a balanced sensory expression (the coherent component) e.g. with a mixture of stone, water and lush vegetation in a soft color scheme (white, purple, blue, variations of green and gray). Previous research has shown that people felt calmer when viewing trees with green canopies than trees with red, yellow or orange canopies (Kaufman and Lohr, 2004). At the beginning of the rehabilitation period, the participants were in the need of a soft color scheme, while later on in the process, as their mental and physical power increased, they could handle stronger colors, e.g. red, yellow or orange. Nonetheless, that could only be in certain limited amounts and in a certain place where they could visit as needed and desired. Thorpert and Busse Nielsen (2014) argue

Figure 12. The hammock corner in the Cultivation and Gardening Area was used for rest and mental restoration i.e. solitary restoration. The plant bed is large enough to create a comfortable distance between a participants and those walking by on the passing path (Photo: AM Pálsdóttir).

that colors give a powerful sensory impression and might contribute to a patient's emotional recovery. The results in the current work emphasize the need to find the right balance of color sensory impression for mental and emotional recovery. The choice of plants, their shapes, colors and textures should all be considered in order to enhance the feeling of serenity and support mental restoration. The sounds of nature were perceived as pleasant and soothing but urban sounds such as traffic noise were not. Ulrich (1991) argued that the humans have an inherent inclination to affiliate with nature and perhaps the sounds nature can trigger unconscious processes of stress-reduction? Recent studies found that the chances of stress recovery were higher when sounds of nature were present (Alvarsson *et al*., 2010; Annerstedt *et al*., 2013).

The dimension of *space* represents a spacious and free room, a restful feeling of entering a *coherent* world (Grahn and Stigsdotter, 2010) and the ART component *extent*; whereby all elements are perceived as a coherent whole and allow one to remain engaged in one's chosen occupations (Kaplan, 2001). The participants clearly expressed their need for space when handling their strong emotions; the space inside a house was not large enough for all

Figure 13. The woodland corner, in the Cultivation and Gardening Area, a supportive location where the participants liked to hide in the corner. There they could sit un-noticed by passers-by on the other side of the pond. The two walking paths gave them the possibility to escape in case of intruders (photo: AM Pálsdóttir).

these feelings. The outer-areas of the garden (Figure 4 – the green areas) were often mentioned in this regard and the PSD space seemed mostly related to these areas. This raises the question how large does the setting in which the NBR takes place need to be to fulfil these needs? The Alnarp Rehabilitation Garden is 2 hectares and there is enough space available for the participants to move freely and enough space to include small sections and a larger area of meadow. For this group of users, space seemed to be of importance for strong emotional self-regulation expressed in extrovert manners, e.g. screaming, shouting or throwing things. Could this be possible in a setting of 500 square meters? It can be concluded that the aspects of space need to be considered when designing the setting for this kind of NBR.

The present findings are in line with earlier findings that have been identified as restorative components in the context of nature-based rehabilitation (Pálsdóttir *et al*., 2011). Interestingly, in an urban context, the preference of the *refuge* and *nature* PSDs was strongly correlated to highly stressed individuals' need for restoration (Grahn and Stigsdotter, 2010) and in an urban forest context, the *prospect*/*refuge* PSD were associated with stress-relief (Annersted et al. 2011).

6.1.7 The effects of nature-based rehabilitation on everyday life

It seems that after the rehabilitation program, the participants managed to alter their daily occupational repertoire toward a more balanced life-style compared with pre-rehabilitation. The participants re-engaged in or introduced new occupations into their everyday life. These occupations were characterized by enjoyment, pleasantness, and creativity, all of which have been described as meaningful (Persson, *et al*., 2001; Leufstadius et *al*., 2008; Hammel, 2004; Hvalsoe & Josephsson, 2003), and identified as essential for recovery from mental illness (Sutton *at al*., 2012). The findings regarding the health outcomes indicate a significant reduction of symptoms of stress, improved function in everyday life, and improved health. A year after the NBR ended, a significant number of the participants had returned to work or studies. The most important factor associated with return to work was perceived value of everyday occupations, particularly the *self-reward* value dimension (Persson, 2001). This value dimension is characterized by enjoyment of and control over the occupation and environment, and in optimal cases can lead to the experience of flow (Persson, 2001; Csikszentmihalyi, 1997).

After the NBR at Alnarp the participants more often chose occupations with a *self-reward* potential. The participants deliberately used nature-related occupations for both restorative and pleasurable experiences, i.e. occupations with *self-rewarding* value. These changes seem to have been initiated in the

NBR and then transferred to everyday life, so that choices and performances of occupations got an addition of nature-based and creative doing, for the participants' own benefit and for sustaining their regained health. Iwasaki *et al*., (2005) found that relaxing leisure occupations were a strong predictor of coping with stress, while social and cultural engagement predicted greater mental health. These findings could support the notion that the significant reduction in symptoms of stress measured after the NBR might partly be explained as the result of more pleasurable and restorative occupations in everyday life, especially occupations with *self-rewarding* value. This change in occupational repertoire has helped the participants find new ways to improve their health though occupations contributing to pleasurable (*self-rewarded*) and restorative experiences. Nature's supportive role seems to be extended to everyday life. But, is nature adequately presented in the participants' everyday green spaces?

This group of users is reported to avoid public urban green spaces (Pálsdóttir *et al.,* 2010) because of what could be interpreted as lack of *compatibility*, i.e. supporting what one would like to do in a certain space – often the need of mental restoration. Therefore, it is of great relevance to include the PSD: *nature*, *serene*, *prospect*, *refuge* and *space* in future urban green space planning and management. In her work, Ling, (2014) tested an assessment tool for PSD in an urban context. The results indicated that the PSD could be successfully used as a landscape assessment tool for urban forests and urban green spaces. An evaluation of this PSD instrument and appropriate evaluation procedures need to be developed for the future work of designing NBR settings and for securing that the desired PDS are found in a given setting.

6.2 Methodological considerations

6.2.1 Mixed-methods approach

The strength of this thesis regarding methodological approach is its overall mixed-method design, including validated questionnaires, interviews, ethnographic study and different kinds of analysis methods for the qualitative data (Robsson, 2011), i.e. the interviews. It was conducted as a single-case, prospective longitudinal study. The main reason for using mixed methods, for both the collection of data and the analysis, lies in the strategy of convergent validity and reliably. If the results from different methods indicate the same general mechanisms at work, it is possible to generalize about the studied phenomenon (Yin, 2012).

A generalization regarding the health outcomes in a single-case study would only be appropriate when dealing with a similar (or the same) NBR with the same type of participants (i.e. the same ICD diagnoses). The team's role in the NBR is considerable and crucial for the participant's rehabilitation process; therefore, NBR with a differently composed team (different professions than here) could lead to different outcomes. Also, the size of the outdoor environment and its content might affect the interaction between the participants and nature (in the garden). For example, if the garden was smaller than half a hectare, how would the need of proper distance for screaming and crying out loud be satisfied? The team also used the garden as an arena for some of the rehabilitation activities, which may have affected how the participants got to know the outdoor environment and later went on their own discovery walks.

Regarding the qualities the participants described as necessary and supportive for the rehabilitation process (e.g., perceived sensory dimension and restorative components), these are likely to be the same regardless of the team constellation, as these findings have theoretical support from other studies as well.

The rehabilitation process, including the three phases described in Paper II, is similar to what is known in other forms of therapy: first building the alliance, then the processing, and then moving on (Duncan et al. 20xx). Hence, this model might therefore be valid for similar NBR for this group of participants, and the offered occupations should follow the IRP pattern to support participants in their rehabilitation process.

In mixed-methods research, single-stage cluster sampling is often used (Meehl, 1967); thus, statistical analysis of 15-20 cases is a useful procedure (Hoyle, 1999). Still, if the sample size had been greater it would likely have offered more certainty as to the effects.

6.2.2 Real-life situations

Preference studies rarely take into account how people feel, or their emotional state, when reporting results. There is no connection to real-life context; i.e., the scope of meaning/action is not considered. The current thesis is based on a data collected from real life, with the research persons acting on actual situations within a rehabilitation context. Their communication with the supportive outdoor environment is affected by the intervention, and their emotions and feelings are "for real". This could be regarded as a methodological strength and as support for the notion that the results are trustworthy, in the sense of presenting the ways nature supports the rehabilitation process. However, NBR is a complex phenomenon that includes

many factors affecting the health outcome. Therefore, it is difficult to predict which part of the intervention has the most effect or is the most important. Of course, what is of importance in the rehabilitation process is highly subjective, but many of the participants stated that the effects of the therapeutic actions would not have been as successful without the access to and interaction with nature. Prior to NBR at the Alnarp Rehabilitation Garden, the participants had taken part in various types of rehabilitation interventions and therefore had some experience as to types of intervention, their effects and results.

6.2.3 Lack of control group

There are some limitations when it comes to generalization, as the NBR context may vary in terms of rehabilitation team, group size and physical location. Further, no comparisons have been made with other types of rehabilitation programmes for this group of participants; therefore, it is difficult to generalize about the importance of access to natural environments in rehabilitation for stress-related mental disorders.

The mixed-methods design does not compensate for the lack of control group for the results of Paper IV. The results only indicate the health outcome of the NBR, giving no indication of how effective it was compared to other rehabilitation means for this group. For instance, a year after the NBR ended a significant number of the participants had returned to work or studies. Can this be considered a satisfactory result, given the fact that all the participants had been on very long-term sick leave (counted in years) before entering the rehabilitation? Many had tried other kinds of rehabilitation, including CBT, but without satisfactory results. But as the sample was small and there was no control group, it is difficult to conclude whether the results could also be obtained in other kinds of rehabilitation for this group with the same rate of return to work and changes towards more self-rewarded occupations in everyday life. Controlled studies on different kinds of rehabilitation means should be conducted in order to determine what could work for this group of clients.

The problem of answering the above question of the success rate of return to work is also related to the fact that there seem to be no known “satisfactory” results regarding rehabilitation for individuals suffering from stress-related mental disorders. Today, it is considered a good result if any individual returns to the labour market or studies (personal communication: Hallgårde, 2014). However, the results from a retrospective cohort study by Währborg, Petterson and Grahn (2014) are interesting. The study revealed that individuals who had received NBR at the Alnarp Rehabilitation Garden significantly reduced their healthcare consumption compared to a matched reference group, but no

significant differences were detected regading sick-leave status. This might be due to the fact that the many participants were not listed on sick-leave at the time they entered the NBR in Alnarp.

For further research, it would be more comprehensive to conduct a prospective randomized controlled study to examine the "true" effects of NBR; preferably with the same kind of rehabilitation programme performed by the same kind of rehabilitation team but in a different environment, e.g. nature (any form: garden, forest, beach, etc.) versus the "treatment as usual" environment offered at healthcare facilities.

6.2.4 Interviews

Two types of interview situations were included in this thesis; face-to-face and telephone interviews.

Papers II and III

In Papers II and III data were collected for four years, involving different seasons, weather and group constellations. Yet, similar processes recurred and similar dynamics emerged. Many participants had very little experience working in a garden, or even being in natural areas, while others had more experience. This is likely representative of the patient population.

Several participants wanted to show gratitude for having had the opportunity to participate in the programme, but all offered both positive feedback as well as more critical comments. They were mostly positive about the possibility to be outdoors in "nature" in rehabilitation, but made critical comments about the scheduling of some activities and the traffic noise from the highway, which could be stressful in certain weather conditions which made the noise worse.

The data collection for both papers II and III started in late 2007, with a pilot study to test the question scheme. Between 2009-2012 altogether 60 individuals participated in the interview study. For Paper II, 44 individuals were included, and for Paper III an additional 16 were included.

In 2011, three new members were recruited to the rehabilitation team to replace the three from the "senior team" who had left their work due to age or other personal reasons. Therefore, it was decided to keep the data from the senior team separate from that of the junior team, as the new team would most probably have a "learning curve" at the beginning of their teamwork that might affect the NBR situation. Although it is not included in the papers in this thesis, an extra analysis of the data (n=60) revealed no such differences, but rather showed the same process and generated the same themes.

The strength of the data collection for these papers was its longitudinal approach, as the study was conducted over several years. This was done in order to cover different seasons of the year and, further, so that each season was represented more than once. This was because the weather conditions could vary in different years; e.g. one summer could be very rainy and the next hot and dry. Hence, the collected data would include different conditions and it could not be said that the results were due to, e.g., that particular summer being rainy. This also offers a good possibility to examine whether there are differences between the rainy summer and the hot and dry one regarding nature's role as a supportive environment in the rehabilitation process. (However, this was not an issue here as the overall role of nature was regarded as the first priority in the analysis of the data.)

The negative side of conducting a longitudinal interview study is the amount of time spent on both collecting data and then analysing it. Altogether, 1,190 hours were spent on analysing the data for Papers II and III. Each interview was read at least three times, and some more often, but given the rich data it can be argued that this approach is worth the effort. First, it would have been difficult, or perhaps impossible, to detect the three main phases of the rehabilitation in Paper II without such a long time frame. Second, with so many individuals contributing to the storyline, it was possible to locate the sequence through phrases like "before", "after", "and then", etc., and to achieve confirmability in the work by the large number of informants. Five or ten interviews would not have allowed these kinds of conclusions.

The trustworthiness of reflection on past events can be disputed, as it can be difficult to remember or recall certain events of one's life in previous months. The circumstances did not allow for interviews before or during the 12-week rehabilitation, and therefore no other alternative was available for collecting the sought information than an interview as close as possible to the end of the NBR. The pilot was performed in three steps, including individual interviews with three persons directly after the rehabilitation ended, as well as a year after and one and a half years after it ended. This was done to investigate the type of information given at the different points, using the same main themes. The most detailed descriptions were given at the first occasion, and it seemed as if the research persons could more easily and directly respond to the questions. Therefore, this alternative was chosen as the main approach, including participants from each season, presented at least twice to account for the different weather conditions over the years. Still, it would be of interest to document the long-term effect, i.e. what is recalled and used in everyday life a year after the NBR ended. The pilots will be analysed to study the long-term effect and how the supportive environment is perceived in everyday life.

In the interview situation it is very important to be an active listener and give the research person verbal and emotional space to fill with his/her story. The interviewer needs to maintain a slow tempo, rather than hurrying on to the next question. Informants should be given the possibility to think before answering the questions, which means that the interviewer should be silent for a moment. Respect and empathy for the participants should come before the need (greed) for necessary information and consideration for how well the main question themes are covered. This lesson was learned in the pilots: more space should be given to the interviewee rather than moving on with follow-up questions or such questions the interview moment was not mature for. The questions were changed from being more structured and covering more specific aspects to being more open and covering broader aspects, to allow the informant to answer from his/her own point of view.

6.2.5 Paper IV

The procedure for the interview was either a face-to-face or telephone interview, depending on what the participant preferred. The interviews were semi-structured and lasted about 30 minutes, with the possibility for follow-up questions, albeit not in-depth. The interviews were documented using handwritten notes. Recorded in-depth interviews would have been appropriate in order to gain better knowledge about the extent of the change in everyday occupations. The interviews were conducted three months after the NBR ended, and it was clear that a process of change was still occurring. Therefore, it would had been of value to return to the participants with a follow-up interview some months later to determine whether the changes had been established or were still under development.

Questionnaires

It has been acknowledged that no control group was included in the study. In further studies, it would be more comprehensive to include a randomized control group to evaluate and detect differences between NBR and treatment as usual. Despite the comparatively small sample, the results from the qualitative and quantitative material clearly converged in the same direction. According to Yin (2009; 2012), it is possible to generalize if results from different methods indicate the same general mechanisms at work.

Twenty-one of 27 participants in the rehabilitation programme chose to participate in this study. No differences were found between those who participated in the study and those who did not regarding age, sex or profession. Furthermore, dropouts are not related to sex, age or profession. Before the rehabilitation, most of the participants were “yes people” – i.e.

saying yes to most of the work or requirements placed on them without reflecting on their own needs or desires. After the rehabilitation, however, they had become more aware of their own needs and desires, and more often said no to things they did not wish to do (Sahlin *et al*., 2010). Therapists often comment that, towards the end of a rehabilitation period, clients clearly choose activities and occupations based on their own desires and needs (Grahn *et al*., 2010).

7 Conclusions

Nature's role in nature-based rehabilitation for individuals with stress-related mental disorders has been confirmed to be a crucial part of supportive environments in NBR context. Nature facilitated, enhanced and embraced the rehabilitation process in the three phases of NBR. A new essential quality of supportive environment was identified, social quietness, as support for the participant's solitary engagement with nature.

Some concluding remarks:

- Social quietness refers to the participants' urgent need for solitary encounters with nature in the total absence of others. This quality of supportive environment has not been stated or labelled in previous papers on NBR.

- An explanatory model of supportive environment is presented and illustrates the rehabilitation process of participants with stress-related mental disorders, undergoing NBR at the Alnarp Rehabilitation Garden. The model consists of three main phases of rehabilitation; *Prelude*, *Recovery* and *Empowerment*, as well as the *IRP* (introvert/inactivity, reactivity and proactivity) occupations, and the SET pyramid of executive functions (Figure 8). This is an effort to illustrate how nature and nature-related occupations can facilitate and support the rehabilitation process.

- The Prelude phase illustrates and explains the crucial initial phase of the rehabilitation process, and is not acknowledged or described in previous papers on NBR in this context.

- IRP occupations have not previously been identified or described within the context of NBR. This is a new concept for illustrating the needs expressed through these different types of occupations, along with the proceeding changes of rehabilitation (therapeutic) process in this NBR context.

- The most important qualities of supportive environments for solitary encounters with nature were the dimensions *serene*, *nature*, *prospect*, *refuge* and *space* as well as components of ART – *extent*, *being away*, *fascination* and *compatibility*. These should be considered in the design of supportive outdoor environments.

- Glass houses/greenhouses should be considered essential buildings in NBR context for giving the participants the opportunity to be outside in fresh air and daylight during the colder months of the year.

- Nature's role as a supportive environment was extended into everyday life. The participants actively used nature-related occupations for both restorative and pleasurable (*self-rewarded*) experiences. This might be considered one contributing factor to maintain and improve health and function in everyday life.

- The PSD such as *serene*, *nature, prospect*, *refuge* and *space* should be considered in future urban green space planning. There is a need for supportive environments in everyday urban green space to improve and maintain health and well-being.

8 Practical implications and future research

The results found in the current work identify that nature, as a part of supportive environment, is crucial to facilitate and support recovery process when undergoing NBR due to exhaustion disorders. The environment in which the rehabilitation takes place has been ignored in the up-to-date rehabilitation recommendations for these individuals. The aspects of supportive environment should be given serious considerations as a non-medication alterative in national healthcare.

The healthcare authorities in Region Skåne, Sweden, have taken a new approach to the rehabilitation of individuals with stress-related mental disorders, and now offer NBR, facilitated by peri-urban agricultural businesses providing supportive environments and meaningful occupations, a supplement to the care provided by the primary healthcare centres. This is a new approach to rehabilitation within primary healthcare in Sweden, but no official criteria are found for this type of intervention regarding the supportive environments (essential qualities provided by nature) and/or occupations offered within the NBR. This takes us back to MD Hallgårde's question on the issue of whether three potted plants were enough as a supportive environment in NBR? –He highlights the need for criteria as well as requirement for the certification of establishments running NBR.

Recently, the healthcare authorities in Skåne conducted public procurements of NBR, including a number of requirements based on the results of this thesis regarding the qualities of the outdoor environment and occupation forms to be offered. This represents an attempt toward evidence-based requirements for NBR for this group of users, and will be further developed in joint work with the proper organs of certification.

As for the educational aspect, the new knowledge regarding the health outcome and how supportive environments can facilitate and support therapeutic processes is highly relevant for the educational programmes and teaching on courses, e.g., design of outdoor environments and occupational therapy. It is a multimodal and transdisciplinary rehabilitation team that performs the NBR at the Alnarp Rehabilitation Garden, and thus it is of significance to a broader audience of medical faculties.

8.1 Future research

In this thesis, a qualitative approach has been taken for investigating the role of nature and the essential qualities of supportive environment. Instead of solely relying on narratives about supportive outdoor environments (the garden/nature), it would be interesting to GPS-track the daily movements of participants in the garden. In this way, it would be possible to more accurately document its use and detect any changes over time. The participants could also be allowed to photograph objects of interest in nature throughout the NBR period. A combination of GPS, photographs and interview study would be a feasible way identify supportive environment in relation to the NBR process with more accuracy.

The rich data collected for the work carried out in completing this thesis should be further analysed e.g. for looking into seasonal differences of supportive environment, gender differences regarding the support sought from nature and/or more detailed description of the physical components and the structure of supportive environment.

The sensory stimuli, through all the senses, would also be quite interesting to investigate by taking physiological measurements of the interaction between plants and humans.

Although this thesis brings to the fore some aspects of health outcomes of NBR and the qualities of supportive outdoor environments, it is important to consider further studies on the matter. For investigating the effects of NBR, randomized controlled studies should be considered in order to test the theory of supportive environment; i.e., the same type of intervention as in NBR but a different place/environment in order to detect the significance of adding a supportive outdoor environment (the garden/nature).

There is an urgent need to work further on criteria and requirements for the certification of establishments running NBR and in joint work with the proper organs of certification develop relevant assessment and evaluation tools.

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11 Appendix

Supportive environment (specific locations) in the Alnarp Rehabilitation Garden; i) locations identified as supportive in the Cultivation and Gardening Area (formal and cultivated – map 2); ii) in the Nature Area (informal and non-cultived – map 3). These two maps are illustrations to article III.

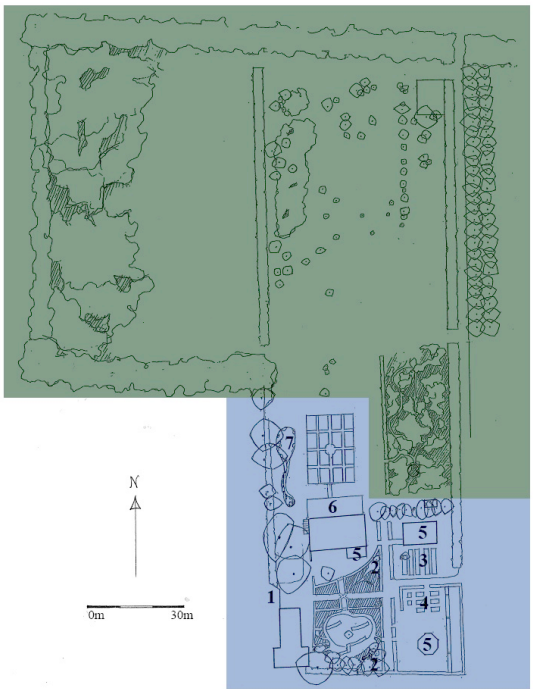

Figure 14. Supportive locations in the Cultivation and Garden Area (formal and cultivated – map 2 for article III). 1 The gateway; 2 The garden swing corner (above) and the woodland corner (below); 3 The cultivations beds in front of the large greenhouse; 4 The raised cultivation beds in front of the Grow Point greenhouse; 5 The tree glass houses; 6 the north terrace and 7 The large pond. Illustration Petra Thorpert & Anders Busse Nielsen, 2014.

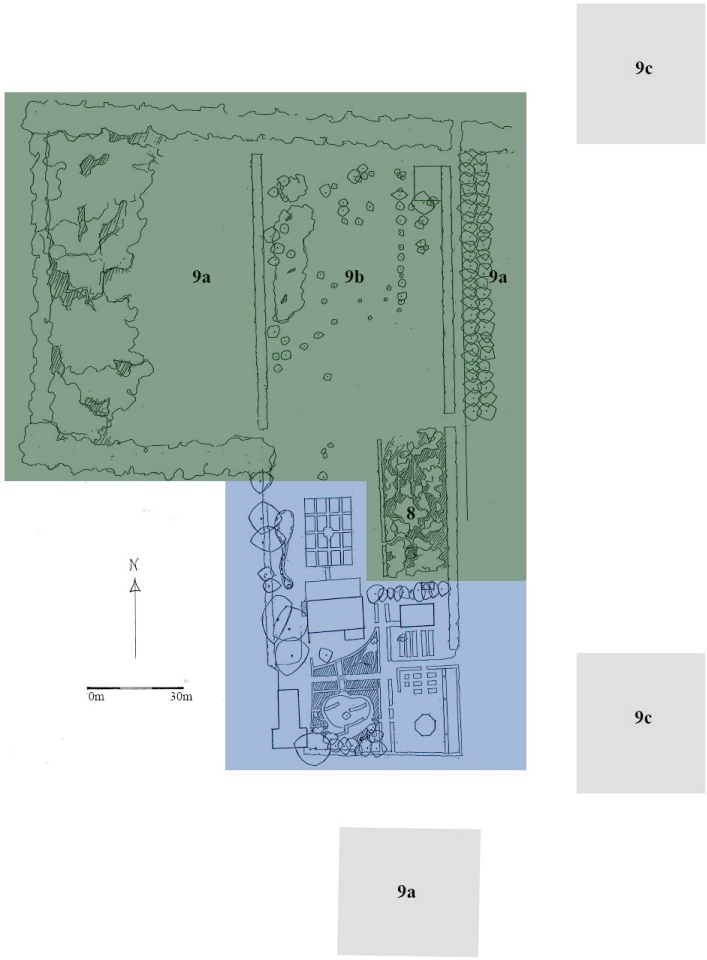

Figure 15. Supportive locations in the Nature Area (informal and non-cultivated – map 3). 8 The wildlife garden room/Forest garden; 9a The orchards fields; 9b; The meadow; 9c The outer fields: experiment fields for fruit and berry plants as well as ornamental tress. Illustration Petra Thorpert and Anders Busse Nilssen, 2104.