

To Stress the Importance of Nature

Nature-Based Therapy for the Rehabilitation and
Prevention of Stress-Related Disorders

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To stress the importance of nature – Nature-Based Therapy for the rehabilitation and prevention of stress-related disorders

Abstract

As a consequence of drastic labour market changes in the late 1990s, many employees experienced more stress in the workplace. Prolonged exposure to stress can lead to physical and mental health problems, and rehabilitation takes a long time. The lack of established rehabilitation programmes for patients with stress-related mental disorders has opened up for the use of garden/nature in a multimodal rehabilitation context (Nature-Based Therapy, NBT).

The aim of Study I was to explore how participants in an Nature-Based Rehabilitation (NBR) experienced their rehabilitation. Study II aimed to explore effects on burnout, work ability, stress-related health symptoms, and sick leave from participation in a nature-based stress management course (NBSC) and to investigate how the nature/garden content was experienced. Study III aimed to explore the effects of NBR in individuals with long sick leave due to stress-related mental disorders and to explore the development of sick leave and health care utilization. Study IV aimed to examine potential environmental effects on directed attention and physiological measures of relaxation in nature and indoors.

Validated self-assessment instruments, data from regional and national registers and semi-structured interviews were used.

Education about nature opened up for new perspectives on life; thus, nature triggered existential reflection, which enhanced the recovery process. Nature and garden were experienced as supportive environments. Results for participants in the NBSC showed decreased burnout-scores and long-term sick leaves, and increased work ability; furthermore less stress-related symptoms were reported. The same pattern was seen for the NBR participants concerning burnout and also for depression, anxiety and well-being, reduced health care utilization, and a movement from ordinary sickness benefit to rehabilitation benefit was seen. Improved directed attention after relaxation in nature was seen. No environmental effects were seen for blood pressure or heart rate.

The results indicate that the NBT in this thesis was successful in both prevention and rehabilitation, and in restarting a stalled rehabilitation process.

Keywords: Nature-Based Therapy, rehabilitation, stress-prevention, stress-related disorders, sick leave, health care utilization, work ability, existential dimensions, education.

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Svensk sammanfattning

Som en följd av drastiska arbetsmarknadsförändringar i slutet av 1990-talet i Sverige, upplevde många anställda mer stress på arbetsplatsen. Långvarig stressexponering kan leda till fysiska och psykiska hälsoproblem, och rehabilitering tar ofta lång tid. Bristen på etablerade rehabiliteringsprogram för patienter med stressrelaterad psykisk ohälsa har öppnat för att använda vistelse och aktiviteter i trädgård och natur för multimodal rehabilitering (Nature-Based Therapy, NBT). Resultaten från studierna i denna avhandling indikerar att NBT var positiv för deltagarna både med avseende på rehabilitering och prevention vid stressrelaterad ohälsa samt för att starta upp en avstannad rehabiliteringsprocess.

Studie I.

Hur upplever och värderar deltagare i en naturunderstödd rehabilitering sin rehabilitering

Bakgrund: Under första decenniet av 2000-talet har det skett en ökning av naturunderstödd rehabilitering (Nature-Based Rehabilitation, NBR) främst riktade till individer med utmattningssyndrom/stressrelaterad psykisk ohälsa. Denna typ av transdisciplinär rehabilitering innehåller dels traditionella metoder för denna patientgrupp såsom sjukgymnastiska aktiviteter, arbetsterapeutiska metoder och terapeutiska samtal men också aktiviteter och vistelse i natur och trädgård.

Syfte: Syftet med denna studie var att öka kunskapen om effektiva rehabiliteringsprogram för individer med stressrelaterad psykisk ohälsa genom att undersöka hur deltagare i en NBR upplever, beskriver och värderar sin rehabilitering.

Metod: Semistrukturerade djupintervjuer gjordes med 8 kvinnor och 3 män under deras avslutande tid i NBR. Intervjuerna analyserades med Interpretative Phenomenological Analysis, IPA.

Resultat: Tre huvudteman framkom:

- 1) Att vara i rätt eller fel fas som var av stor betydelse för rehabiliteringsutfallet. Att få tid för vila under en första återhämningsperiod i hemmet var viktigt.
- 2) Att uppleva existentiella dimensioner. I möte med naturen startade existentiella reflektioner som påverkade deltagarnas självbild och synen på sin livssituation. Upplevda paralleller mellan naturens processer och det egna livet gav tröst och en stark positiv känsla att ingå i ett större sammanhang som man inte kunde/behövde påverka utan fick hämta kraft och vila i.
- 3) Att ändra dysfunktionella mönster. I aktiviteter i natur och trädgård tränande man sig att vara i nuet, att inte skynda på eller forcera skeenden. Andnings- och avspännings-tekniker som regelbundet ingick i programmet kunde användas utanför NBR i situationer där oro, stress och ångest störde individen. De andra deltagarna i gruppen upplevdes som ett stöd. Rehabiliteringsteamets stöd och uppmuntran att lyssna till de egna behoven och till kroppens signaler gav en starkare känsla av deltagarens egenvärde, rätten att säga nej och att sätta gränser.

Slutsatser: En första tid i lugn och ro i hemmet för vila är viktig innan start i NBR. Existentiella reflektioner är viktiga i läkeprocessen. Deltagarna hade fått verktyg och strategier för att bättre hantera sin vardag men behöver fortsatt medvetet träna dessa för

att de ska bli automatiserade beteenden. Naturen är en restorativ miljö och kan ge stöd i återhämtningen för denna patientgrupp.

Studie II

Naturunderstödd stresshanteringskurs för personer med risk att utveckla allvarligare arbetsrelaterad stressohälsa: effekter på stressrelaterade symptom, arbetsförmåga och sjukskrivning

Bakgrund: För att undvika att personer som lever under stress utvecklar allvarliga stressrelaterade och arbetshindrande symptom och sjukdomar, erbjuds olika typer av stresshanteringskurser. En ny metod är att använda naturen och trädgården vid multi-modal stresshanteringsintervention.

Syfte: Denna studie syftade till att undersöka effekter på förekomst av utbrändhets-symptom och stressrelaterade somatiska symptom, arbetsförmåga och sjukskrivning för 33 kvinnor som deltog i en 12-veckors naturbaserad stresshanteringskurs, samt att undersöka hur trädgårds-/ naturinnehållet som ingick i kursen upplevdes.

Metod: Både kvalitativa och kvantitativa forskningsmetoder användes. Deltagarna besvarade frågeformulär vid kursstart och vid kursavslutning samt 6 och 12 månader efter avslutad kurs. Den kvantitativa delen av studien bygger på deltagarnas besvarade självskattningsformulär om upplevd utbrändhet, aktuell arbetsförmåga, grad av sjukskrivning under de senaste 12 månaderna samt en fråga om sömnkvalitet och frågor angående olika stressrelaterade symptom. Den kvalitativa delen består av intervjuer med 13 deltagare baserad på frågor om deras upplevelse av det ”gröna” innehållet i kursen.

Resultat: Efter kursen rapporterade deltagargruppen förbättring avseende symptom på utbrändhet liksom minskning av de långa sjukskrivningarna. Den självskattade arbetsförmågan ökade och antalet stressrelaterade hälsoproblem minskade. De positiva förändringarna kvarstod vid 12-månadersuppföljningen. Deltagarna tillägnade sig strategier och verktyg under kursen för att bättre hantera sin stress och dessa användes i mycket hög grad även efter kursens slut. Trädgårds/naturinnehållet i kursen var av betydelse för stressåterhämtning men också för att strategier och verktyg skulle utvecklas. Guidad avspänning i natur beskrevs i de flesta intervjuerna som överlägset mer effektiv jämfört med avspänning inomhus. Guidade naturvandringar gav deltagarna inspirerande kunskap om naturen som bidrog till att de sökte sig mer ut i naturen efter kursen. Deltagarna uppgav också att de efter kursen hade större glädje av sin egen trädgård.

Slutsats: Resultaten från denna studie visar att det kan vara effektivt att använda trädgårdsaktiviteter samt naturmiljö i en stresshanteringskurs.

Studie III

Att använda naturbaserad rehabilitering för att starta upp en avstannad rehabiliteringsprocess för individer med stressrelaterad psykisk ohälsa

Bakgrund: Det finns ett behov av effektiva rehabiliteringsåtgärder för personer med svår stressrelaterad psykisk ohälsa. Västra Götalandsregionen (VGR) startade en NBR verksamhet för att erbjuda ytterligare rehabilitering för sina anställda som var långtids-

sjukskrivna på grund av stressrelaterad psykisk ohälsa och där konventionell rehabilitering inte hade varit tillräcklig.

Syfte: Syftet med studien var att undersöka om psykisk hälsa och välbefinnande för deltagare i NBR hade förbättrats mellan start och avslutning i NBR samt 6 och 12 månader efter avslutningen. Ytterligare syfte var att undersöka utvecklingen av sjukskrivning och sjukvårdsutnyttjande för deltagare som erhållit rehabilitering enligt NBR-modellen och en modell som utvecklats vid VGRs företagshälsovård (OHS) och som inte innehöll natur/trädgård i programmet.

Metod: Självskattningsformulär avseende tecken på utbrändhet, depression, ångest och välbefinnande besvarades av NBR-deltagarna vid start i NBR och vid de tre uppföljningarna. För båda grupperna inhämtades nationella och regionala registerdata för att undersöka utveckling av sjukskrivning och vårdskonsumtion.

Resultat: Resultaten visade att symptomen på utbrändhet, depression och ångest minskade, välbefinnandet ökade samt kraftigt minskat vårdutnyttjande i NBR gruppen. En stor förflyttning från vanlig sjukpenning till rehabiliteringsersättning observerades, ett steg mot återgång till arbete som inte observerades i OHS gruppen. De två grupperna var i olika rehabiliteringsfaser, vilket begränsade möjligheterna till jämförelser mellan grupperna.

Slutsats: Resultaten visar på positiva effekter av att använda NBR för denna patientgrupp och för att starta upp en avstannad rehabiliteringsprocess.

Studie IV.

Miljöns påverkan på den riktade uppmärksamheten, blodtryck och hjärtfrekvens.

Bakgrund: Uppmärksamhet är en grundläggande kognitiv funktion som krävs i de flesta dagliga aktiviteter. Gynnsamma effekter på kognitiva förmågor efter natur-exponering har rapporterats från forskningen.

Syfte: Syftet med studien var att undersöka om avspänning inomhus och i naturen på olika sätt påverkade den riktade uppmärksamheten samt blodtryck och hjärtfrekvens.

Metod: Femtioen deltagare (39 kvinnor) mättes med avseende på riktad uppmärksamhet med Necker Cube Pattern Control Test före och efter ett 30 minuter långt guidat progressivt avspänningspass utomhus i naturen och inomhus. Systoliskt och diastoliskt blodtryck och hjärtfrekvens mättes före och efter avspänningen. Deltagarnas miljöpreferens undersöktes.

Resultat: Huvudresultatet visade en miljöeffekt på den riktade uppmärksamheten till förmån för naturmiljön. Ingen liknande miljöpåverkan på de fysiologiska måtten kunde ses.

Slutsats: Resultaten tyder på att avspänning i naturmiljöer har en positiv effekt på den riktade uppmärksamheten och att avspänning utomhus i natur kan vara ett effektivt inslag i förebyggande och rehabiliterande insatser vid stressrelaterade symptom.

Dedication

To Stellan

“The task is not to directly impart knowledge but rather bring a sense and curiosity for nature. Knowledge of nature should be based on experience.”

Friedrich Fröbel (1782-1852)

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List of Publications

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

- I Sahlin, E., Vega Matuszczyk, J., Ahlborg, G. Jr. & Grahn, P. (2012). How do Participants in Nature-Based Therapy Experience and Evaluate Their Rehabilitation? *Journal of Therapeutic Horticulture*, vol. 22(1), 8-22.
- II Sahlin, E., Ahlborg, G. Jr., Vega Matuszczyk, J. & Grahn, P. (2014). Nature-Based Stress Management Course for Individuals at Risk of Adverse Health Effects from Work-Related Stress—Effects on Stress Related Symptoms, Workability and Sick Leave. *International Journal of Environmental Research and Public Health*, vol. 11(6), 6586-6611.
- III Sahlin, E., Ahlborg, G. Jr., Tenenbaum, A. & Grahn, P. (2014). Using Nature-Based Rehabilitation to Restart a Stalled Process of Rehabilitation in Individuals with Stress-related Mental Illness. In review.
- IV Sahlin, E., Lindegård, A., Hadzibajramovic, E., Grahn, P., Vega Matuszczyk, J., Grahn, P. & Ahlborg, G. Jr. (2014). The Influence of the Environment on Directed Attention, Blood Pressure and Heart Rate - An Experimental Study Using a Relaxation Intervention. *Landscape Research*, Accepted 2014-08-17. DOI 10.1080/01426397.2014.982079.

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My contribution to the studies included in this thesis was as follows:

- I I prepared the interview guide jointly with my supervisors. I conducted and transcribed all interviews; I analysed most of them, but analysed and compared two of them along with the second author. The analyses of all interviews, as well as the results and their interpretations, were discussed in the authors' group before deciding upon themes. I was responsible for writing the manuscript.
- II Together with my supervisors, I constructed the questionnaires used for the study. I performed the data collection and entered the data electronically. I conducted the analyses jointly with a statistician and the second author. I was responsible for writing the manuscript.
- III I performed the data collection for the participants in the Nature Based Rehabilitation (NBR), and entered all data electronically. The population from the occupational health service (OHS) was selected by the third author. I conducted the statistical analysis together with the statistician at the Institute of Stress Medicine, and interpreted the results jointly with the second and last authors. I was responsible for writing the manuscript.
- IV I contacted various enterprises and institutions to recruit study participants. I conducted the majority of the tests, and entered all data electronically. The statistical analyses were done mainly by the statistician, also a co-author. I interpreted the results jointly with the second and third authors. I was responsible for writing the manuscript, but did so in close cooperation with the second author. The statistician wrote relevant parts.

Abbreviations

ART	Attention Restoration Theory
BAI	Beck Anxiety Inventory
BDI-II	Beck Depression Inventory
CBT	Cognitive Behavioural Therapy
CI	Confidence Interval
DA	Directed Attention
DAF	Directed Attention Fatigue
ED	Exhaustion Disorder
GPRS	Guided Progressive Relaxation Session
ICD	the International Statistical Classification of Diseases and Related Health Problems
IPA	Interpretative Phenomenological Analysis
ISM	Institute of Stress Medicine, Region Västra Götaland
NBR	Nature-Based Rehabilitation
NBSC	Nature-Based Stress Management Course
NBT	Nature-Based Therapy
NCPCT	Necker Cube Pattern Control Test
OHS	Region Västra Götaland's occupational health service for its own employees
PET	Psycho-Evolutionary Theory
PGWB	Psychological General Well-Being Index
SMBQ	Shirom-Melamed Burnout Questionnaire
VEGA	Region Västra Götaland's health care database
VGR	Region Västra Götaland
WAI	Work Ability Index

1 Forword

My affinity with nature

The forest was my childhood playground – my foot knows and remembers how it sank into clumps of blueberries, moss, lichen ... I loved inhaling and experiencing seasonal fragrances and listening to the sounds of the forest, and in my fantasy I wrote tales about nature's mysterious inhabitants. In the forest, there was nothing scary – just wonderful environments to discover. In my teens I forgot about my nature playground. Just recently, though, I came to remember it for my secondary school graduation thesis, choosing the topic "Landscape images in the light of memory". I wrote, deeply inspired, about emotions I had experienced when hiking in the Swiss Alps, and how different environments emphasized and confirmed my different moods. The paper fell into oblivion and disappeared, but one day during a solitary walk in the park at my university I suddenly remembered, like lightning from a clear blue sky, that long forgotten essay and my immediate thought was, "So that's why I chose this topic for my dissertation".

2 Background

2.1 Stress

2.1.1 Increasing health problems due to stress

Sweden saw a dramatic increase in sick leave spells due to stress-related mental disorders at the end of the 1990s and the beginning of the 2000s, with an all-time high in 2002. This increase has been attributed to the financial situation in Swedish society during the 1990s and the drastic changes that followed on the labour market, such as downsizing (Stefansson, 2006; Stenbeck & Persson, 2006). As a consequence many employees experienced job overload, more demands, time pressure, and therefore more stress in the workplace (National Board of Health and Welfare, 2003; Iwarson, 2004; Theorell, 2006). Similar conclusions regarding the likeliness of negative impact of economic crises, especially on mental health, have also been reported by World Health Organization (WHO, 2011).

After a period of decrease in sick leave in Sweden, the numbers are again increasing. According to a report by the Swedish Social Insurance Agency (2013a), sick leave figures are expected to soon reach the same high level as in 2005. The dominating diagnoses in the new wave of sick leave due to stress-related health problems are adjustment disorder and reaction to severe stress (ICD code F43; about 40%; ICD: the International Statistical Classification of Diseases and Related Health Problems) and depressive episodes (ICD code F32; approximately 30%). Psychiatric diagnoses are most prevalent in professions containing mostly women. Employees in health and social care, a large sector (total 13% of the Swedish labour market) where 85% of the employees are women, dominate in this regard (Swedish Social Insurance Agency, 2014). However, psychiatric diagnoses constitute the largest cause for sick leave for both women and men, according to the Swedish Social Insurance Agency (2013b).

2.1.2 What is stress?

Stress is often described as a threat, challenge or danger experienced by the individual, and the coping strategies available for handling the situation (Heilig, 2005). In casual parlance the word stress has two, sometimes confusing, connotations: the reaction to a threat (the stress response) and the threat causing the reaction (stressor).

Responses to stress are mainly initiated in the brain to prepare the organism in adequate ways for action – for fight or flight, or to play dead (Heilig, 2005; McEwen, 2013; Jonsdottir & Folkow, 2013) – as in the primitive stage of human evolution, adequate stress responses were vital and necessary for survival. Although the human brain has undergone substantial development during evolution, our bodily response systems today are activated in the same way as before to deal with a stressful situation.

In a recently published doctoral thesis by Kristina Glise (2014), stress is defined as (p. 12):

the biological and psychological reaction to different challenges: i.e. the mobilization of resources to cope with demands, referred to as stress exposure. The reaction includes the psychological experience of the exposure, as well as emotional and physiological responses. Both acute and chronic stress exposure that exceeds the capacity for adequate mobilization of resources can, if not sufficiently dealt with, result in negative behavioural consequences and in some case cause somatic and/or mental health problems.

This is the definition used in this thesis.

2.1.3 Prolonged stress exposure

Prolonged exposure to stress can lead to physical and mental health problems such as burnout/fatigue/exhaustion, depression and anxiety disorders (Åsberg *et al.*, 2005; Glise, 2014). It may be accompanied by different somatic symptoms such as nausea, gastrointestinal problems, dizziness, headache, heart palpitation, sleep disturbances and musculoskeletal pain (Åkerstedt, 2005; Nixon *et al.*, 2011; McEwen, 2013; Glise, Ahlborg Jr. & Jonsdottir, 2014) and cognitive impairment (Jonsdottir *et al.*, 2013). This often leads to a gradual decrease in performance and quality of life, and rehabilitation as well as return to work are likely to take a long time (Perski, 2004; Glise *et al.*, 2010). There is also an increased risk of developing more serious somatic illness such as cardiac disease (Glozier *et al.*, 2013); moreover, disturbed circadian rhythm

due to lack of sleep and recovery has been shown to cause a decline in cognitive functions (McEwen, 2013).

2.1.4 Psychosocial stress

The stress our earliest ancestors faced was, somewhat simplified, mainly connected to finding food and shelter for survival and to defending oneself against predators, enemies and nature's manifestations. The most common stress today in modern societies is more connected to psychosocial stressors in private as well as working life than to fighting for survival (Johansson, 2005; Theorell, 2006; McEwen, 2013).

Work-related stress is defined by WHO (Houtman, Jettinghoff & Cedillo, 2007) as a pattern of physiological, emotional, cognitive and behavioural reactions to certain extremely taxing aspects of work content, work organization and work environment. Several models describing work-related psychosocial conditions related to stress reactions have been developed, for example the effort-reward imbalance model (Siegrist, 1996) and the demand-control-social support model (Karasek & Theorell, 1990).

The consequences of long-lasting and unsolved psychosocial stress can include ill health, such as somatic and/or mental disorders (Stoetzer *et al.*, 2009; Nixon *et al.*, 2011; Jonsdottir & Folkow, 2013; European Agency for Safety and Health at Work, 2014).

2.1.5 Stress-related ill health

As mentioned, there are many possible adverse health effects of prolonged stress exposure. The focus in this thesis is on the stress-related mental disorders of longer duration requiring rehabilitation.

Stress-related mental disorders can be categorized based on severity, and have been systemized into ICD codes under the F43 category, of which adjustment disorder (F43.2), exhaustion disorder (F43.8), and reaction to severe stress unspecified (F43.9) are of relevance in this thesis (World Health Organization, 2010; Socialstyrelsen, 1997).

Burnout is a psychological construct without an established clinical definition, is attributed to causes related to prolonged exposure to stress, and was described early on as a phenomenon typically found among professionals, mostly women, active in workplaces connected to care (human services) (Freudenberger, 1974; Maslach & Leiter, 2001). Later, several definitions of and ways to assess burnout have been proposed.

Maslach, Schaufeli and Leiter (2001) described burnout as a response to chronic emotional and interpersonal stressors on the job, defined by the three dimensions of physical and emotional exhaustion: feelings of (1) cynicism and

(2) detachment from the job, and (3) a sense of ineffectiveness and lack of accomplishment. The work criterion was later changed, and other professions besides those within human services were included.

Hallsten, Bellaagh and Gustavsson (2002) defined burnout as a process and a crisis reaction due to stress overload originating from work and/or private life and related to performance-based self-esteem.

Burnout has also been defined from an existential psychological perspective, focusing on the individual's choice of profession for reasons connected to existential qualities, such as the feeling of contributing in a special way through one's work. The feeling of failure to meet these expectations is suggested to be the antecedent to burnout (Pine, 2005).

In Sweden, individuals with symptoms related to those included in burnout are diagnosed with a medical condition referred to as exhaustion disorder (ED), first described in a National Board of Health and Welfare report and formally accepted in 2005 (National Board of Health and Welfare, 2003, 2010). ED is caused by one or more identifiable stressors which have persisted for six months or more without recovery, irrespective of the origin of the stressors. Key symptoms are stress-related physical symptoms of exhaustion, reduced mental energy, impaired memory, emotional instability and insomnia (National Board of Health and Welfare, 2003). Comorbidity commonly occurs, often including pain problems, somatic illness, depression and anxiety (National Board of Health and Welfare, 2010; Glise, Ahlborg Jr., & Jonsdottir, 2012, 2014). Glise and Björkman (2004) described ED as a prolonged process of accelerating symptoms leading to discomfort as well as reduced function in work and personal life, and thus quality of life. Cognitive problems seem to be more long-lasting than other symptoms connected to ED (Åsberg & Nygren, 2012; Glise, 2014), and rehabilitation and return to work seem to take long time (Perski, 2004; Åsberg *et al.*, 2005; Glise *et al.*, 2012, 2014).

2.1.6 Treatment of stress-related disorders: prevention and rehabilitation

The optimal strategy, of course, is to prevent individuals exposed to stress from developing more serious stress-related disorders. The focus in stress prevention has been to offer stress management courses directed at the individual, but efforts are also made on the organizational level to adapt the workplace and routines in order to diminish harmful stress exposure during work. Which type is better? There is evidence that stress management interventions are effective, although the results reported in the literature are not entirely consistent (Van der Klink *et al.*, 2001; Richardson & Rothstein, 2008).

Few studies have used sickness absence or return to work as outcome measures. There are some exceptions to this, but these have shown only a limited, non-sustained effect (Svensson *et al.*, 2009; Svensson *et al.*, 2011).

Guidelines for treatment and rehabilitation have been suggested in the Rehabilitation Council's final report to the government (Swedish Government Official Reports, 2011) and in the DU project (Åsberg & Nygren, 2012). Some county councils in Sweden have developed guidelines for stress-related illness, for example Region Västra Götaland (2008). A multimodal approach is advocated, which includes psychological and physiotherapy treatment entailing stress reduction, relaxation exercises, Cognitive Behavioural Therapy (CBT) or a psycho-dynamic approach; a balance between rest and activity; support for lifestyle changes and physical activity (including prescribed physical activity); along with sick leave and vocational rehabilitation (Swedish Government Official Reports, 2011). According to the status report from 2009 (National Board of Health and Welfare), 80-95% of all patients diagnosed with depression receive pharmacological treatment with anti-depressive drugs. Only 68% of health centres included in a survey could provide CBT.

Individuals diagnosed with ED have traditionally obtained treatment for only some of their symptoms, and treatment success has been highly limited (Grossi & Santell, 2009; Swedish Government Official Reports, 2011; De Vente *et al.* 2008). Today, patients with more severe stress-related mental disorders are increasingly treated with pharmacologic, physiotherapeutic, and psychotherapeutic interventions, along with occupational therapy and prescribed sickness absence, so-called individually designed multimodal treatment (Glise, 2014). However, the results vary and more effective interventions are called for in cases that seem to be long-lasting. Because of this, there is a growing interest in Sweden in including Nature-Based Therapy (NBT) in rehabilitation programmes for individuals diagnosed with stress-related mental disorders. This type of programme was originally developed at the Swedish University of Agricultural Sciences (Grahm *et al.*, 2010).

Because of increasing numbers of employees on long-term sick leave due to stress-related disorders, Region Västra Götaland (VGR), a large public health care organization in Sweden, started an NBT directed at its own employees. The conventional rehabilitation of employees in VGR is handled by the region's own occupational health service (OHS), where a team-based rehabilitation model has been developed for this patient group. The NBT was started to offer additional rehabilitation efforts for employees on long-term sick leave due to stress-related mental disorders, where initial care had not been sufficient. The individuals' rehabilitation process had stalled and no progress

was observed. It was thus of great interest to explore what had happened to the group participating in this new intervention.

2.2 Nature

2.2.1 Nature and garden – a short historical overview of nature's importance to man

The Greek physician Hippocrates (born about 460 BC), referred to as the “father of Western medicine”, is claimed to be the first to describe illness as not a punishment from the gods or something superstitious, but that health and illness are to be found in the interaction between the individual and his/her environment, diet, and living habits (Sakula, 1984; Lindegård & Åström, 1989). Throughout human history, nature has been considered beneficial for physical as well as mental health, as described by Cooper Marcus and Barnes (1999) as well as in Ward Thomson's (2011) historical exposé, taking its starting point in ancient Persia and advancing via numerous ancient cultures including the Greek, Roman, and medieval European epochs to end up in modern time. Especially interesting is Ward Thomson's description of old or even ancient cultures' trust and belief in mental restoration and stress-reducing effects offered by contact with nature, which we may have believed was a modern understanding.

Visiting especially beautifully located health facilities to treat diseases and strenuous lifestyles' became part of health care in Sweden during the 19th and early 20th centuries. These sites were situated in beautiful natural environments, which encouraged healthy activities such as taking walks and hiking (Nilsson, Grahn & Börjesson, 2009).

Gardening as therapy for individuals with mental disorders has a long tradition; it was introduced in the 19th century as a therapeutic tool in psychiatry by the “father of American psychiatry”, Professor Benjamin Rush (1746-1813), and from US the method spread. In the mid-1900s, gardening was used for therapeutic purposes at mental hospitals in Sweden. Occupying oneself with garden activities was considered to mitigate anxiety, but also to give patients an understanding of the rhythm of time and work cycles, and to promote activity. During the 1930s, horticultural therapy became an established aid in rehabilitation (Shoemaker, 2002; Kim, 2003; Söderback, Söderström & Schäländer, 2004). The increasing demand to rehabilitate physically and mentally injured American soldiers from the world wars was one reason horticultural therapy began being used in rehabilitation programmes (American Horticultural Therapy Association, 2014).

The question quite automatically emerges: Well, what happened then? A possible answer to this may be the advances in medical science during the 20th century. New technologies and effective immunization programmes were developed, and the old knowledge of nature's beneficial health effects subsided. After a number of years of silence on this topic, the 1980s saw the publication of two studies that have been of significant importance in rediscovering the benefits of nature for human health and well-being. The American researcher Roger Ulrich (1984) showed that experiencing nature for health benefits was associated with not only visiting or staying in nature, but that even looking at nature through a window may positively affect recovery from surgery. Rachel and Stephen Kaplan (1989) found that participants in a wilderness programme had afterward recovered from symptoms similar to those included in ED. At this point, theories started being developed.

2.2.2 The impact of nature on health

Swedish and international research has shown that exposure to nature has a beneficial impact on individuals' physical and mental health (Kaplan & Kaplan, 1989; Hartig & Staats, 2006; Maas *et al.*, 2006; Mitchell & Popham, 2008) and well-being (Martens *et al.*, 2011; Adevi & Mårtensson, 2013). Moreover, nature exposure has been reported to have restorative and stress-reducing effects (Ulrich *et al.*, 1991; Kaplan, 1995; Staats, Kieviet & Hartig, 2003; Ottosson & Grahn, 2008; Grahn & Stigsdotter, 2010; Hartig *et al.*, 2014).), and to improve cognitive capacity (Hartig *et al.*, 2003; Ottosson & Grahn, 2005, 2006; Berman, Jonides & Kaplan, 2008; Kjellgren & Buhrkall, 2010; Berman *et al.*, 2012).

Nature experiences have been shown to positively influence crisis rehabilitation (Ottosson & Grahn, 2008) and to mitigate anxiety, depression or ED (Thorsen Gonzalez *et al.*, 2009; Kam & Siu, 2010; Berman *et al.*, 2012; Sonntag-Öström *et al.*, 2014; Pálsdóttir *et al.*, 2014).

The research reported thus far has often entailed studies based on manipulated or simulated stress conditions (Ulrich *et al.* 1991; Hartig *et al.*, 2003). Healthy subjects, often students, have been investigated concerning perceived stress recovery when exposed to pictures of nature scenes or videos on natural environments (Annerstedt *et al.*, 2013). But there are some exceptions to this, in which exposure to real nature and effects on stress-related conditions have been studied (Sonntag-Öström *et al.*, 2011; Nordh, Grahn & Währborg, 2009; Thorsen Gonzalez *et al.*, 2009). Some Swedish studies on the beneficial effects of garden rehabilitation have been published (Adevi & Mårtensson, 2013; Sahlin *et al.*, 2012, 2014; Pálsdóttir *et al.*, 2014; Währborg, Petersson & Grahn, 2014), as have some doctoral theses focusing on garden

design (Stigsdotter, 2005; Tenngart Ivarsson, 2011), activities in the therapeutic garden (Pálsdóttir, 2014), and attachment to natural environments (Adevi, 2012). In a review of scientific studies, Annerstedt and Währborg (2011) found some support for the beneficial effects of nature interventions.

To my knowledge, this thesis on the effects of NBT is the only one to include activities and stays in both garden and wild nature in a nature-based therapeutic model.

2.3 Theories and explanations

2.3.1 The Psycho-Evolutionary Theory

The American researcher Roger Ulrich argues that exposure to nature, compared to exposure to urban environments, gives faster stress recovery, manifested in a faster normalization of elevated physical stress reactions such as blood pressure, heart rate, muscular activation and reactions of skin conductance. According to Ulrich (1991), the normalization occurs within a few minutes. This theory, Psycho-Evolutionary Theory (PET), is based on the evolutionary theory of adaptation to fit and the idea that we humans during our development have adapted to survive in nature and therefore react positively and adequately in an environment experienced as non-threatening (Ulrich, 1993). Besides its physiological focus, PET also includes aspects of aesthetic and emotional experiences in a natural, non-threatening environment, claiming that positive emotions of safety and security emerge, which are involved in the speedy recovery following bodily stress reactions. These effects have been explored in earlier studies (Ulrich, 1984; Ulrich *et al.*, 1991; Ottosson & Grahn, 2006). PET has parallels with the biophilia hypothesis, in which the biologist E. Wilson (1984) argues that humans, through evolution, have inherited emotional ties to all other organisms and hence react positively to them. This hypothesis is truly based on the very beginning of all life on our planet. Wilson points out that all organisms living now have their origin in the same first unicellular organism that arose in the water approximately three billion years ago and that all life on earth has developed from that point into today's richness of species. In the Savannah theory the open landscape and nearness to water are in focus, claiming that this type of landscape has been of importance for the survival and reproduction of our species. The theory includes the assumption that inherited appropriate human responses in nature have been developed in close interaction with the habitat that was our original home. The basic evolutionary perspective is that the human species has developed through life as hunters and gatherers in nature, and has survived through adaptation over the approximately two million years since our oldest

known ancestor, *Homo habilis*, lived on the African savannah (Orians & Heerwage, 1992; Orians, 2007).

2.3.2 Attention Restoration Theory

In Attention Restoration Theory (ART), the focus is on the benefits of exposure to nature from a cognitive approach relating to the human's processing of information. Kaplan (1995) argues that the process involves two different attention systems, one voluntary-driven (directed attention, DA) and the other a non-voluntary controlled system (fascination). DA, which can be described as the ability to direct one's attention, shift attention between different objects, and deflect distracting and irrelevant stimuli, is an essential ability required to initiate, conduct and complete most tasks in our everyday life (Lezak, Howieson & Loring, 2004). The capacity to direct attention is easily fatigued when it is overused, and without recovery, directed attention fatigue (DAF) may occur (Kaplan & Kaplan, 1989). DAF may manifest itself as concentration problems, deficiencies in the capacity to shut out irrelevant stimuli, increased irritability, and a greater tendency to make mistakes or misjudgements. The fatigued or overused DA can rest and be restored in a restorative environment, according to ART. Four characteristic features are required to define an environment as restorative. The environment must: 1) provide a sense of being away from the everyday situation, 2) offer the opportunity to experience fascination, especially the type called soft fascination, which leaves room for the individual's reflections on life, goals and priorities and thus allows him/her to dispose of "cognitive garbage", which cause ruminations and mood disturbances, 3) be compatible with the visitor's current needs, and 4) have an extent, a sense of a cohesive whole and simultaneously of being spacious.

According to ART, fascination is used unconsciously in contact with nature or any other environment that offers opportunities to catch one's attention in an undemanding way, and as a result the DA is given rest and recovery. This theory has been tested and supported in a number of studies (Cimprich, 1993; Tennessen & Cimprich, 1995; Ottosson & Grahn, 2005; Staats *et al.*, 2003; Berto *et al.*, 2010). Moreover, meditation in nature may enhance the restorative effect, as may education in how nature provides benefits for the individual (Kaplan, 2001).

2.3.3 The scope of meaning/scope of action theory

A third explanatory model especially relevant in explaining the beneficial effects of NBT is the scope of meaning/scope of action theory (Grahn, 1991), based on the assumptions that the environment transmits affordances to the

individual which are captured by the individual at an unconscious level and are interpreted subconsciously. Their significance for the individual depends on his/her current health status, mood, previous experiences and background. The individual and the environment are thus hypothesized to communicate on an emotional basis, with the individual receiving impressions from the environment through all the senses. In an extension of this theory, the theory of supportive environment, it is assumed that individuals seriously affected by stress-related mental disorders need strong support from the environment, mild sensory stimulation, activities designed to meet the needs and energy of the individual, and support from a multi-professional team. Another aspect here is the need to be in a small group to limit demanding social encounters. This structure is based on a psycho-evolutionary perspective, suggesting that humans originally developed in nature and in small groups. The activity triangle below, constructed by Patrik Grahn (1991), illustrates that the individual's need for support from the environment is greatest when he/she is most affected by mental ill health, and lowest when the individual is in a normal and balanced mental condition (Figure 1).

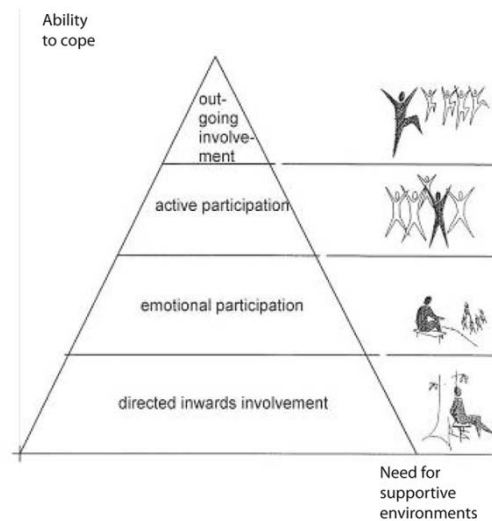


Figure 1. The activity triangle demonstrating the need for environmental support related to mental state.

Closely linked to this theory is the description of eight main dimensions in nature environments which are assumed to afford support in various ways for people's everyday life, both mentally and physically (Grahm & Stigsdotter, 2010). These characteristics are: *serene* (defined as peaceful, silent, safe and secure), *nature* (wild nature not created by humans), *rich in species* (a room offering a variety of animals and plants), *space* (a nature room offering a feeling of entering another world), *prospect* (a view that invites you to stay), *refuge* (safe and secluded place where you can relax), *social* (a social arena or meeting place), and *culture* (with evidence of people's values, beliefs, efforts and toils). These dimensions have been shown to be of varying importance to individuals according to different needs and moods, and some are more necessary than others in the rehabilitation of stress-related mental disorders. The dimensions refuge and nature were demonstrated to be preferred by individuals who perceived themselves as stressed (Stigsdotter & Grahm, 2011).

2.4 Nature-Based Therapy

According to the scope of meaning/scope of action theory described above, a rehabilitation garden should be deliberately designed and constructed in such a way that all senses are stimulated in a mild and non-intrusive way. The NBT includes stays and activities in both garden and nature as the therapeutic environments. A limited number of other people, such as other participants, is crucial, as is a multi-disciplinary team with special competencies relevant to the patient group.

2.5 Definition of nature and garden in the thesis

The concept of nature in this thesis should be understood as wild nature environments with minor visible interference from man. The nature reserve visited by the NBT participants consisted of forest and moorland maintained to different degrees and with a small amount of dead trees and dry twigs and branches on the ground (see Figures 2-3). Walking paths or information boards appeared in the different nature environments included in Studies I, II and III.



Figure 2. Education about nature during a guided nature walk (Photo Gröna Rehab, Gothenburg Botanical Garden).



Figure 3. The nature reserve where the guided nature walks were conducted for participants in Studies I, II, and III (Photo Gröna Rehab, Gothenburg Botanical Garden).

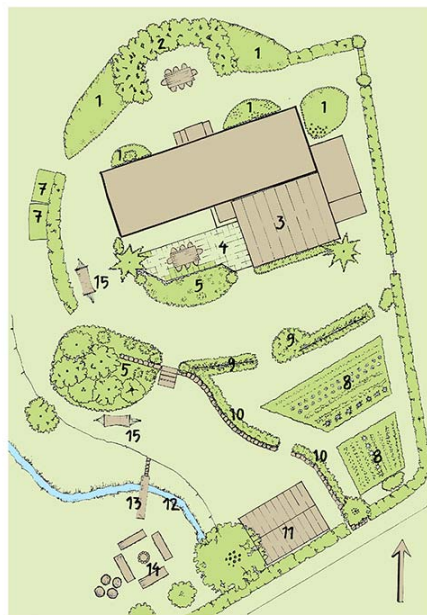
The concept of garden should be understood as a homelike garden, similar to most home gardens in Sweden, including annual and perennial flowers, lawns, bushes, fruit trees, vegetables, and greenhouse cultivations. The therapeutic garden in the thesis had been deliberately designed to support the needs of the patient group by arranging for adequate activities as well as garden rooms for resting and “just being” in the garden (see Figures 4-6).



Figure 4. The NBT house (Photo Gröna Rehab, Gothenburg Botanical Garden).



Figure 5. The south side of the garden (Photo Gröna Rehab, Gothenburg Botanical Garden).



1. Perennials at entrance
2. Arbour of lilacs
3. Conservatory
4. South-facing patio
5. Herb garden
6. Rhododendron
7. Composts, chopping block and woodpile
8. Raised garden beds
9. Trellises with climbing roses, blackberries and clematis
10. Retaining wall with berry bushes
11. Greenhouse

Figure 6. The Venue (Gröna Rehab, Gothenburg Botanical Garden)

3 Aim of the thesis

The overall aim of this thesis was to explore whether Nature-Based Therapy (NBT) for prevention and rehabilitation positively affected participants' health and well-being; that is, their physical and mental health and well-being, as well as their ability to function in everyday life.

Specific aims were to:

- explore how participants in a Nature-Based Rehabilitation (NBR) programme experienced, explained, and evaluated their rehabilitation.
- explore whether participation in a nature-based stress management course (NBSC) could positively change burnout scores, and positively affect sleep quality, somatic symptoms, sick leave and work ability, in individuals with increasing stress-related problems. The study also aimed to explore how the garden/nature content in the course was experienced.
- explore whether the mental health and well-being of the NBR participants had improved at the completion of the rehabilitation and six and twelve months thereafter, compared with the start of rehabilitation.
- explore the development of sick leave and health care utilization after completed rehabilitation according to the NBR model and to a rehabilitation model without nature/garden.
- explore whether an outdoor (in nature) guided progressive relaxation session (GPRS) influenced directed attention, systolic and diastolic blood pressure and heart rate more positively compared to an indoor GPRS.

4 Methods

4.1 Subjects

The subjects in Studies I, II, and III were all employed within administration and health care at a regional county council organization in Sweden. Inclusion criteria for participating in nature-based rehabilitation (NBR) (Studies I and III) and in a group from the occupational health service (OHS) in VGR (Study III) were exhaustion disorder/stress-related mental disorders with or without depression and/or anxiety. Exclusion criteria were other serious mental or physical illness, substance abuse and/or being suicidal. For participation in a nature-based stress management course (NBSC) (Study II), the inclusion criteria were signs of stress and/or repeated short-term sickness absence. An overview of the study subjects in the different studies is presented in Table 1.

Table 1. *Study populations of the studies*

Study	I	II	III	IV
Study population	Participants in NBR with long-term sick leave, due to exhaustion disorder or stress-related mental disorders	Participants in nature-based stress management courses	Participants in NBR and patients from occupational health care (OHS) with long-term sick leave, due to exhaustion disorder or stress-related mental disorders	Participants from the general population
	N=11	N=33	N= 57 (NBR) 44 (OHS)	N=51

For Study I, the results are based on eleven participants (eight women and three men) who have undergone NBR. Mean age for the women was 42 years

(range 26-61) and for the men 43 years (range 27-58). Before starting the NBR, the women had been on sick leave an average of 24.4 months (range 5-72) and the men 41.7 months (range 12-57). Number of weeks in the NBR was between 12 and 44 (mean 31) for the women and between 27 and 29 (mean 28) for the men. The diagnoses were depression (six women and one man), ED (five women and one man) and post-traumatic stress syndrome (one man). Other common health problems were anxiety, pain, sleep problems, cognitive problems, and exhaustion.

The study group in Study II included 33 women from six NBSC held between 2008 and 2010. Fifteen (45%) subjects were below 50 years of age, and 18 (55%) were 50 years or older. Participation in the course was based on the participant's own desire to take the course or the suggestion of the line manager or supervisor.

The study group in Study III comprised 57 individuals (53 women mean age 45, range 26-63; and four men mean age 52, range 35-62) who had participated in an NBR and 45 women (mean age 49, range 32-61) from OHS who had received rehabilitation without garden/nature content. They were all on sick leave because of stress-related mental disorders under the ICD code F43 category (adjustment disorder, F43.2; ED, F43.8; reaction to severe stress unspecified, F43.9).

The study group in Study IV comprised 39 women (mean age 46, range 24-66) and twelve men (mean age 41, range 21-72) recruited from the general population through information sheets at different workplaces such as industry, community service, shops and a university. Eighty-two (82%) had university education.

4.2 Study design

Different methods according to the triangulation principle have been used in this thesis.

For Study I a qualitative approach was used. Semi-structured in-depth interviews were conducted to gain deeper knowledge about NBR and to explore how it was experienced and evaluated by the participants.

Study II is an observational follow-up study with a flexible design for exploring possible changes in mental health, stress-related symptoms, sick leave, and work ability in participants in an NBSC. Self-assessment instruments were used together with interviews. The semi-structured interviews in Study II were not as deep as those in Study I, and had the main purpose of serving as a supplement in the interpretation of the results of the questionnaires and, moreover, of investigating the nature/garden content.

Study III is an observational follow-up study with the main aim of exploring the effects of NBR in patients with exhaustion disorder or stress-related mental disorders, and also of exploring the development of sick leave and health care utilization after completed rehabilitation according to the NBR model and the OHS model.

Study IV has a flexible design, and is a quasi-experimental crossover study with mixed design for examining potential environmental effects of directed attention (DA) and physiological measures of relaxation in nature and indoors.

To construct a battery of questionnaires for measuring the different outcomes in Study II, a pilot study was conducted with one focus group interview with participants from one NBSC. To develop and improve the design of Study IV, a pilot study was conducted with seven participants and, thereafter, some smaller changes were made to the procedure. An overview of the key methods used is shown in Table 2.

Table 2. Overview of methods used in the various studies

	Study I	Study II	Study III	Study IV
Study design				
<i>Quantitative method</i>		X	X	X
<i>Qualitative method</i>	X	X		
Method				
<i>Semi-structured interviews</i>	X	X		
<i>Self-assessment questionnaires</i>		X	X	X
<i>Register data</i>			X	
<i>Directed attention test</i>				X
<i>Blood pressure and heart rate</i>				X

4.3 Two types of Nature-Based Therapy

This thesis contains two types of nature-based interventions. One is focused on rehabilitation, and the other on preventive treatment (Figure 7). As a general

term for these two types of interventions, I have chosen the concept of Nature-Based Therapy (NBT). The NBT included stays and activities in a designed garden and in wild nature (Figures 1-4), and the NBT team included a physiotherapist, an occupational therapist, a psychotherapist, a gardener, and a biologist.

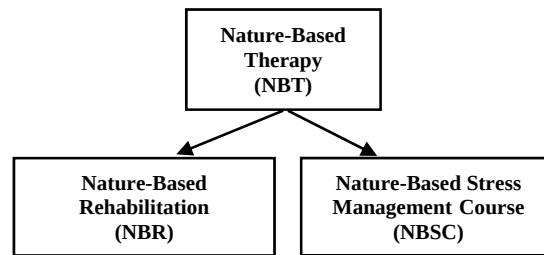


Figure 7. The types of nature-based interventions included in the thesis.

4.3.1 Nature-Based Rehabilitation (Studies I and III)

The NBR programme was planned jointly by the team based on the different professions' evidenced-based methods and theories, and was implemented in a nature/garden context.

There was a continuous admission in the program; participants did not begin and end the program at the same time, when one participant completed the program then another would start. The possible length of the rehabilitation was 28 weeks, with a first phase of 16 weeks with one day of attendance the first week and increased attendance for four weeks until full participation (four half days/week) was reached. If the participants had reached a state of recovery during these initial 16 weeks and were expected to start returning to work/activity during a following period of twelve weeks (Phase 2; Figure 8), continued participation in the NBR was authorized. During this second phase of the NBR the focus was on increased time in activities such as return to work, work training or studies, and a corresponding decrease in time in the NBR.

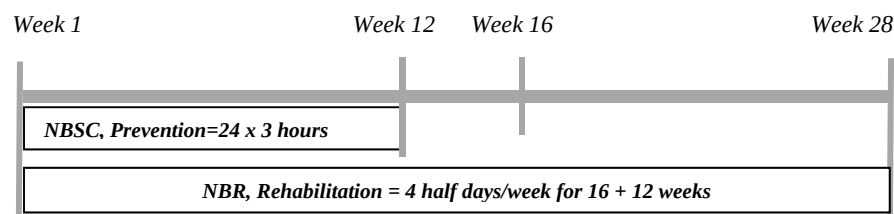


Figure 8. The time frames for the NBSC and the NBR.

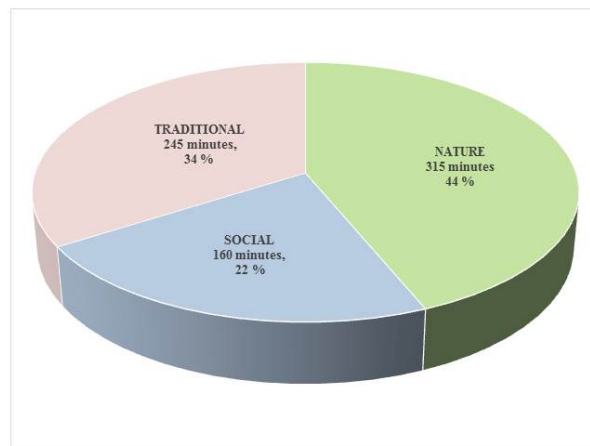
The programme comprised several items (Table 3), which have been grouped into “social”, “nature”, and “traditional rehabilitation activities” to allow an easy overview (Figure 9). However, the single items included in the programme interlock and the merging into broader groups must be understood with some flexibility.

Table 3. Frequency of and time for each item included in the weekly NBR programme, and their grouping according to relation to nature, social interaction and traditionally used rehabilitation activities for this patient group

Items in the weekly programme	Times/week	Minutes/week	Merged into groups
Joint start in the morning including coffee/tea, conversation, and short mindfulness relaxation	4	100	Time for social Interaction: 160 minutes/week
Extended break for coffee/tea, sandwiches, chatting	2	60	
Guided nature walks	1	135	Time for activities connected to nature and garden: 315 minutes/week
Walks	1	60	
Garden activities	1	60	
Handicraft in nature materials	1	60	
Guided relaxation (different techniques)	4	95	Time for the more traditional rehabilitation activities: 245 minutes/week
Guided (therapeutic) group conversations	1	90	
Art therapy	1	45	
Reflections on the week	1	15	
Total time in NBR during one week		720	
		minutes	

For example, the item “relaxation” could also be included under “nature” because relaxation is also performed outdoors in nature. In art therapy the “assignment” was sometimes associated with nature, for example painting a tree or a meadow, and then starting the reflection from the picture created with this motive in focus; thus, art therapy could also be included under “nature”. During nature walks there were spontaneous opportunities for supporting conversations, sometimes of a therapeutic character; consequently, this could be included under “traditional rehabilitation activities” (Table 3). During

garden activities and walks there were opportunities for social interaction with other participants as well as with the team.



Note¹: Guided nature walks, walks, garden activities, and handicraft were merged into the group “Nature”.

Note²: Morning gatherings, coffee/tea, chats and short mindfulness relaxation and extended break with coffee/tea and sandwiches were merged into the group “Social”.

Note³: Guided relaxation (different techniques), guided (therapeutic) group conversations, art therapy, and reflections on the past week were merged into the group “Traditional rehabilitation activities”.

Figure 9. Uniting the single items into the broader groups displaying the proportions of social activities, the more traditional therapeutic activities offered to this patient group, and the nature/garden activities during a week in the NBR.

Individual interviews conducted by the psychotherapist with each participant preceded their start in the NBR. Each participant had one special contact person on the rehabilitation team to turn to when they were in need of support, and who was also responsible, for instance, for arranging the rehabilitation meetings and maintaining contact with the participant’s employer and the authorities. There were also opportunities for individual counselling with the psychotherapist.

All participants were medically examined before starting the NBR. Rehabilitation meetings were also conducted before NBR start, at the end of Period 1 and before leaving the NBR programme. The participant, the

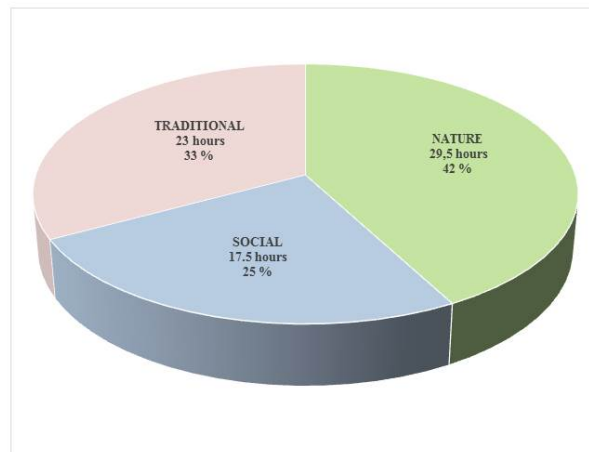
employer/manager, the contact person from the NBR, the participant's doctor, a Human Resources representative, and sometimes a union representative took part in order to plan for further rehabilitation measures.

4.3.2 Nature-based preventive treatment: a stress management course (Study II)

The nature-based stress management courses (NBSC) were held at the same site as the NBR described above, and with the same team. The course comprised 24 sessions: two afternoons a week for twelve weeks in the spring (March to June) or autumn (August to November) (Figure 8). Included in the course content were: guided nature walks, walks, garden activities, guided relaxation outdoors in nature and indoors, body awareness, art work, handicraft, guided group conversations, and lectures on various stress themes such as a healthy lifestyle, the importance of sleep, the benefits of physical activity and education on the relationship between health and nature exposure. The programme comprised several items (Table 4), which have been grouped into “social”, “nature”, and “traditional stress management activities” to allow an easy overview (Figure 10).

Table 4. *Total time for each item included in the NBSC programme, and how they have been grouped according to their relation to nature, social interactions and traditionally used stress management activities*

Items in the programme	Total hours for the course	Merged into groups
Joint start including coffee/tea, conversation, and short mindfulness relaxation	8	Time for social interaction: 17.5 hours
Extended break for coffee/tea , sandwiches, chatting	9.5	
Guided nature walks	5	Time for activities connected to nature and garden: 29.5 hours
Walks	8.5	
Garden activities	9	
Handicraft in nature materials	7	
Guided relaxation (different techniques)	8.5	Time for more traditional stress management activities: 23 hours
Guided group conversations	7	
Art work	3.5	
Lectures on stress and lifestyle	4	
(excluded from this overview is the time for introduction and evaluation = 2 hours)	(2)	
Total time in NBSC	72 hours	



Note¹: Guided nature walks, walks, garden activities, and handicraft were merged into the group “Nature”.

Note²: Joint start, coffee/tea, chats and short mindfulness relaxation and extended break with coffee/tea and sandwiches were merged into the group “Social”.

Note³: Guided relaxation (different techniques), guided group conversations, art work, lectures on stress and lifestyle were merged into the group “Traditional rehabilitation activities”.

Figure 10. Uniting the single items in the course content into broader groups displaying the proportions of the nature/garden activities, social activities, and more traditional therapeutic activities offered during the twelve course weeks in the NBSC.

4.4 The rehabilitation offered by the occupational health service (Study III)

The rehabilitation model practiced at the OHS was a team-based method that included separate assessments of the patient conducted by a nurse, a physician, a physiotherapist and a psychologist, and a work capacity evaluation (WCE). The WCE method had previously been developed for exploring the patient’s resources, barriers and motivation in work as well as private life factors. After interviews and investigations, an overall assessment was made based on the information obtained from the team members.

The rehabilitation received by the OHS participants was planned individually, based on five key principles:

1. Increased physical activity
2. Counselling
3. Medication
4. Individual, adequately adapted sickness absence, complete or partial
5. Close dialogue with the employer /manager to define the tasks and adaptation of work to facilitate return to work as early as possible, without the risk of progression or recurrence of the disease.

For the majority, rehabilitation meetings were conducted early in the rehabilitation process. The patient, the employer/manager, representatives of the OHS, an Human Resources representative, and sometimes a union representative took part in order to plan for further rehabilitation measures.

4.5 Data collection

The thesis contains questions that need to be treated through both a qualitative and a quantitative approach. Study I has a qualitative approach, while Studies III and IV have a quantitative approach. Study II is a mixed-model involving qualitative as well as quantitative methods.

4.5.1 Study I

The aim for this study was to explore how participants in an NBR program experienced, explained, and evaluated their rehabilitation.

This aim requires an approach that more profoundly elicits individual participant's experiences.

Many qualitative methods were investigated and, ultimately, Interpretative Phenomenological Analysis (IPA) was selected. IPA is grounded in phenomenology and hermeneutics, and has a reflective life world perspective with its aim of describing in detail how individuals experience and give meaning to objects, events and phenomena in their everyday life (Smith & Osborn, 2003). The connection with hermeneutics concerns its interpretative aspect, but is also due to the method including the empathic and understanding role of the researcher (Palmer, 1969). IPA has connections with cognitive psychology in its understanding of the individual as a meaning-seeker.

Semi-structured interviews were conducted. This model is preferred when the aim is to explore a new area, thus offering possibilities for the development of new and interesting angles that could not have been foreseen during the construction of the interview schedule (Kvale, 1996; Willig, 2008; Robson,

2011). An interview guide was constructed, covering background data (age, marital status, education, type of dwelling, country of birth, children, childhood environment and playground), work-related questions, experiences of the NBR, and reflections on the role of the nature/garden course content in the rehabilitation process, as well as the more traditional medical content (relaxation, art therapy, therapeutic group and individual sessions, body awareness). The interviews were recorded and transcribed verbatim.

4.5.2 Study II

The aim for this study was to explore if participation in an NBSC could positively change burn out scores, and positively affect sleep quality, somatic symptoms, sick leave and work ability for individuals with increasing stress related problem. The study also aimed to explore how the garden/nature content in the course was experienced.

The aim entails that both qualitative and quantitative methods need to be used.

Due to the different aim compared to that of Study I, a different analysis method was chosen. Content analysis (Elo & Kyngäs, 2008; Burnard, 1991) was selected to extract the essence and draw conclusions about the content. Central in this method is extracting the meaning units that constitute the foundation for further analysis. As in Study I, semi-structured interviews were conducted. An interview guide was constructed, comprising four themes: (1) choosing to participate in the stress management course; (2) the work situation; (3) experiences of the stress management course; and (4) the nature/garden content. In addition, some background data were collected. The interviews were digitally recorded and transcribed verbatim. All authors were engaged in discussing the results presented by the first author during the analysis, as in Study I, and some interviews were read and analysed separately by one co-author. The results were compared with the first author's results, and no discrepancies were found.

The analyses of the qualitative data underwent several structured steps: reading the interviews several times to grasp the content, making annotations while reading, condensing the text, coding/labelling, creating categories, and merging them into themes and dimensions to stepwise reach a higher degree of abstraction. There are similarities between the procedures of IPA and content analysis, but the main difference is that IPA allowed a deeper interpretation, which was desired in Study I.

Quantitative outcome measures include burnout scores as well as measurements including somatic symptoms, sleep quality, sick leave and work ability. The instruments were collected at baseline and at three follow-ups (see Figure 11 below).

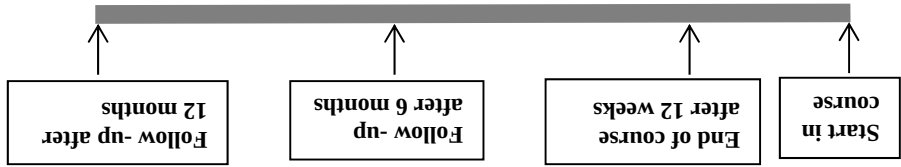


Figure 11. Time frame for collecting the self-assessment instruments: at start in course, at the end of course and six and twelve months thereafter for the participants in the NBSC.

Primary measures

Burnout

Burnout was measured with the Shirom-Melamed Burnout Questionnaire (SMBQ, Melamed, Kushnir & Shirom, 1992), which includes four subscales: emotional and physical exhaustion, cognitive weariness, tension, and listlessness. In total the questionnaire comprises 22 items, each with a seven-point response scale (1 = almost never, 7 = almost always). A validation study has confirmed that the instrument can be used as an overall measure of burnout/stress-related fatigue (Lundgren-Nilsson *et al.*, 2012).

Work ability

The Work Ability Index (WAI; Tuomi 1998) measures self-assessed work ability. Since the effects of long-lasting stress exposure can lead to reduced work performance (Glise *et al.*, 2012; Danielsson *et al.*, 2012), the development of the participants' self-assessed work ability during and after the course was assessed using the first question (WAI 1) in the questionnaire: "Let's assume that your work ability, when it is at its best, is valued at ten points. How many points would you give your current work ability? (Please tick the appropriate digit: 0 means that you are not able to work, 10 means that your work ability is at its best right now)." This single item was dichotomized, based on the assumption that the response alternatives 0–8 were related to reduced work ability, and that 9 and 10 indicated good work ability (Ahlström *et al.*, 2010; Lindegård *et al.*, 2013).

Secondary measures

Stress-related symptoms

Somatic symptoms are often reported in connection to stress-related problems, and five symptoms were chosen for measuring health symptoms: symptoms in the stomach and intestines; pain in the back, neck, knee, etc.; headache; dizziness; heart palpitations, pain/tightness in the chest. The response alternatives were Yes and No.

Sleep quality was included, as there is strong evidence that sleep quality can be affected by stress (Glise, 2014). The single-item question from the Karolinska Sleep Questionnaire was chosen for measuring sleep quality: “How do you find you are sleeping on the whole?” (Åkerstedt *et al.*, 2008). The response alternatives were dichotomized to form two new categories: good sleep and disturbed sleep.

Sick leave

The fifth question on the Work Ability Index (WAI 5) concerning sickness absence was used: “How many days during the past twelve months have you been absent from work because of your own illness or injury (care, treatment or examination)”. Response alternatives to this question were No days, 1–7 days, 8–14 days, 15–24 days, 25–60 days, 61–99 days, and 100–365 days; these were dichotomized, with the values No days, 1–7 days, and 8–14 days forming a category indicating low level of sick leave, and those over 14 days (15–365 days) forming a category indicating high level of sick leave.

Tools and strategies

Acquired tools and strategies were measured both quantitatively and qualitatively with questions constructed for the study. Two questions were asked at the end of the course: “What advice, strategies or tools has the course given you?” (an open-ended question), and “After completing the course will you use something of what you have learned?” (response alternatives: Yes, No, I don’t know). These two questions were followed up at six and twelve months with: “What advice, strategies or tools for managing your stress provided by the course do you still use?”

Qualitative measures

Evaluations and experiences of the course were explored through semi-structured interviews with open-ended questions with two themes: (1) Experiences of the stress management course; and (2) The nature/garden content.

4.5.3 Study III

The aim for this study was to explore if mental health and well-being for participants in NBR had improved at the completion of the rehabilitation and six and twelve months thereafter, compared with at the start of rehabilitation? A second aim was to explore the development of sick leave and health care utilization after completed rehabilitation according to the NBR model and according to a rehabilitation model without garden/nature content.

Primary measures

Burnout measured with the Shirom Melamed Burnout Questionnaire (SMBQ, Melamed, 1992) (see explanations above).

Depression

The Beck Depression Inventory (BDI-II; Beck & Steer, 1987; Beck *et al.*, 1996) is a well-established instrument for measuring the degree of depression and changes in depressive states over time. Since depression is a common co-morbidity with ED, depression was measured (Glise *et al.*, 2012). In the BDI-II, 21 symptoms and attitudes are assessed on a four-point scale from 0 to 3 in terms of severity, and the total scores are interpreted in relation to the established cut-off values. The BDI-II has been used in a large number of intervention studies, including concerning exercise as a treatment for depression (Lawlor, 2001).

Anxiety

The Beck Anxiety Inventory (BAI; Beck *et al.*, 1988). Since anxiety is a common co-morbidity with ED, it was relevant to measure levels and changes in anxiety (Glise *et al.*, 2012). The BAI is a well-established self-report instrument for the assessment of the degree of anxiety and changes in states of anxiety. Twenty-one assertions/symptoms are assessed on a four-point scale from 0 to 3 in terms of severity, and the total score is interpreted in relation to established cut-off values.

Well-being

The Psychological General Well-Being Index (PGWB; Dupuy, 1984) is a quality of life instrument used to measure the level of subjective well-being. For individuals with stress-related problems, well-being is often adversely affected and is thus relevant to study. The PGWB has previously been used for the evaluation of different treatments, and has proven to be sensitive to clinically relevant changes (Revicki, 1994). It includes 22 questions, divided into six subscales: health, self-control, mood, anxiety, vitality and well-being.

For each of the 22 questions there are six possible answers, scored from 1 (the most negative alternative) to 6 (the most positive alternative). A recently published validation study of the PGWB concluded that the instrument is suitable for monitoring well-being during interventions for ED/burnout (Lundgren-Nilsson *et al.*, 2013). An overview of the time frame for collecting the self-assessment instruments is presented in Figure 12.

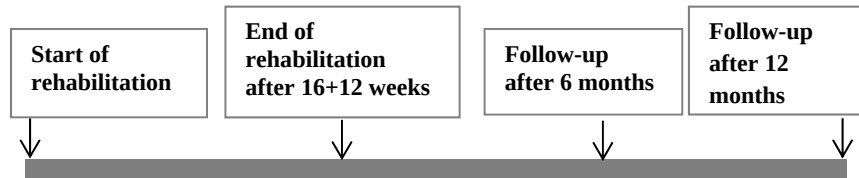


Figure 12. Time frame for collecting the self-assessment instruments: at baseline, at end of rehabilitation, and six and twelve months thereafter for the NBR participants.

Secondary measures

Sick leave

Register data from the Swedish Social Insurance on sick leave were collected to study this issue.

Health care utilization

Stress-related illness can lead to an increased need for health care. To study the participants' visits to medical professionals, data on diagnosis and health care utilization from VGR's health care database VEGA were collected. Data for participants in the reference group were also collected from patient records at the OHS. Concerning measures of sick leave and health care utilization, the three periods of measurement were (see Figure 13):

Period 1 (P1): six months before rehabilitation to start of rehabilitation

Period 2 (P2): from completion of the 16 weeks of rehabilitation and six months ahead

Period 3 (P3): from completion of the 16 weeks of rehabilitation and seven to twelve months thereafter.

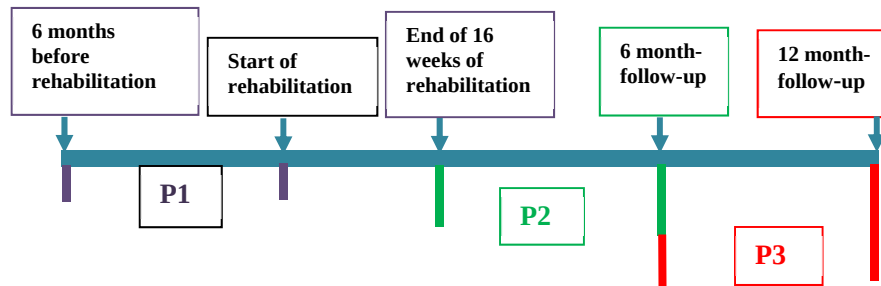


Figure 13. The time frames for the measurement periods concerning health care utilization and sick leave six months before rehabilitation start, as well as six and twelve months after completion of rehabilitation.

4.5.4 Study IV

The aim of this study was to investigate whether an outdoor (in nature) guided progressive relaxation session (GPRS) influenced directed attention, systolic and diastolic blood pressure and heart rate more positively compared to an indoor GPRS.

The aim includes two kinds of primary outcomes: attention capacity; and physiological measures of systolic and diastolic blood pressure, and heart rate. In addition, there are two explanatory factors to consider: the participants' psychological status with reference to burnout, and their preference for relaxation outdoors or indoors.

Directed attention capacity

Directed attention was measured with the Necker Cube Pattern Control Test (NCPCT). The Necker Cube is a line drawing of a cube with no depth cues (Figure 14). It can be interpreted with the front or the back of the cube in focus, and spontaneously changes regarding which perspective (front or back) the viewer perceives. It is a demanding task to hold one perspective and to avoid reversals. Hindering the shifts in perspective through an effort of will is considered to be a measure of an individual's directed attention capacity. The test has been used in a variety of studies to capture the capacity for directing attention (Cimprich, 1993; Tennessen & Cimprich, 1995; Hartig *et al.*, 2003; Ottosson & Grahn, 2005).

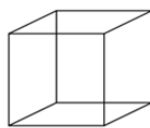


Figure 14. The Necker Cube.

The NCPC test:

1. Brief time allowed to become familiar with the characteristics of the cube.
2. The first instruction was to look at the cube for 30 seconds and to tap a pen on the table surface when the cube shifted perspective.
3. The second instruction was to look at the cube again for the same time frame, this time holding one perspective as long as possible, but to tap if/when the perspective shifted.

The taps were registered by the test leader on a protocol. The NCPC test was performed before and after guided relaxation.

Physiological measures

Systolic and diastolic blood pressure and heart rate were measured several times during the entire test procedure, using a digital automatic blood pressure monitor (OMRON M7).

Explanatory factors

The SMBQ subscale cognitive weariness (Melamed, 1992) was used to check whether the level of self-reported cognitive weariness was of significance for the effects on directed attention.

Environmental preferences: Participants' environmental preferences were measured with one oral question: "Which of the relaxation sessions, the outdoor or the indoor one, did you like better?"

4.6 Procedure

Study I

Semi-structured interviews about the NBR participants' experiences and evaluation of their rehabilitation were conducted based on an interview guide. The interviews lasted 60-90 minutes, and were held at the end of rehabilitation or shortly thereafter. Verbatim transcriptions were made shortly after the interviews. All interviews but one were held at the NBR site in the morning.

Study II

For evaluating the NBSC, a questionnaire was constructed. Data from these questionnaires were used for Study II, and were distributed at baseline and course end by the course team. Information about the study was given towards the end of each course when the first author visited, at which point information

was also given about ethical issues and the participants had the opportunity to ask questions. Written information and a form for informed consent were distributed, together with the first follow-up questionnaire, at the end of the course. The follow-up questionnaires after six and twelve months were sent by post to the participants who had consented to participate in the study. All participants were invited to interviews about their experiences of the course. Semi-structured interviews following an interview guide were conducted at the end of the courses with all who had consented to such participation. All interviews were digitally recorded, and were transcribed verbatim shortly after each interview opportunity.

Study III

NBR participants had previously (2007-2012) participated in an evaluation of the NBR, and the data used for this evaluation were also used in Study III. This data included self-assessment questionnaires on mental health and well-being (as described earlier). All previous participants were contacted by phone and asked permission to send them information about the study, an informed consent form and a pre-paid return envelope. Participants still in the programme (2012-2014) were given an information sheet, a form for informed consent and a sealable return envelope along with the self-assessment questionnaires at the end of their rehabilitation, all distributed by the NBR team. Data on health care utilization and sickness absence were collected from regional and national registers. Additional information on diagnoses was collected from patients' records at the OHS. Only participants who had consented to participate in the study were included.

The group from the OHS model was selected from patients' registers/journals by staff at the OHS. A majority of the selected patients were contacted by phone and given information about the study and to request permission to send them written information and the informed consent form by post along with a pre-paid return envelope. For a smaller number of patients not available by phone, the information and consent form were sent by post. Only the patients who returned the signed consent form and thus consented to their data being used were included in the OHS group.

Study IV

The study comprised two test occasions for each participant, with one guided relaxation session indoors and one outdoors in a nature environment at an interval of usually 7-14 days. The tests were conducted from July to the beginning of October. Upon arrival to the test occasion, the participant was

connected to a blood pressure cuff for registration of blood pressure and heart rate during the test; they answered a burnout questionnaire (SMBQ; only at the first test occasion); and directly thereafter the directed attention test (NCPC) was conducted. Registration of diastolic and systolic blood pressure and heart rate were conducted before and after the guided relaxation session that followed completion of the NCPC test. Dr. Lars-Eric Uneståhl's muscle relaxation programme on CD, read by Dr. Uneståhl was used. The participant sat in a comfortable lounge chair, outdoors in the shade under a tree or indoors in a room with bright walls with no decoration or indoor plants, and any window view was blocked using covers and curtains. After the relaxation the directed attention test was conducted again. Two different nature environments were used: the park site and the wood edge (Figure 15 and 16). Participants were randomly assigned to having the first session outdoors or indoors.



Figure 15. The “park site”

The “park site” is situated in a smaller part of the Gothenburg Botanical Garden with primarily different kinds of mature, mostly deciduous, trees, green grassy slopes, and gravel pathways (Figure 15). Constant noise could be heard from the heavily trafficked street nearby, and the sound of maintenance work in the park could occasionally be heard.



Figure 16. The “wood-edge”

The “wood edge”, at the border of a large nature reserve, had uncultivated wild nature with rocks, ferns, wild flora, and mixed deciduous trees (Figure 16). This nature site was quiet with birdsong and the rustle of the leaves, and only faint sounds from traffic and city noise could be heard from far off.

4.7 Ethics

All studies included in this thesis were approved by the Regional Ethical Review Board in Gothenburg, Sweden: Study I approval number 473-08, Study II approval number 472-08, Study III approval number 566-12, and Study IV approval number 398-09.

Only participants who gave written informed consent to the use of their data for research purposes were included.

4.8 Data analysis

The SPSS (Statistical Package for the Social Sciences) versions 20.0 (Study IV) and 22.0 (Studies II and III) were used for analysing quantitative data. Descriptive statistics are given in terms of means and standard deviations (continuous variables in Studies II, III, and IV). For Study II, differences in proportions with 95% confidence intervals (CI) between the baseline measures and each of the follow-ups (course end and at 6 and 12 months) were calculated for SMBQ ≤ 3.75 WAI 1 above 8, WAI 5 over 14 days, having good sleep quality, and favourable answers to the symptom variables (Newcombe, 1998).

For Study III, the BDI-II and BAI were analysed using the Wilcoxon Signed-Rank Test and paired sample t-test. Furthermore, differences in proportions with 95% confidence intervals (CI) between the baseline measures at start in NBR and each of the follow-ups were calculated for SMBQ < 4.4 according to the method suggested by Newcombe (1998). For PGWB, a transformation of raw scores into metric values according to Lundgren *et al.* (2013) was performed and paired sample t-test was used to compare the baseline measure with each follow-up.

For Study IV, the General Linear Model for repeated measures design with two nest factors was conducted separately for each outcome (NCPCT, systolic and diastolic blood pressure, and heart rate). For an overview of the methods used for analysing the data, please see Table 5.

Table 5. *Methods used for analysing data in the different studies*

Analyses	Study I	Study II	Study III	Study IV
General Linear Model				X
Paired sample t-test			X	
Wilcoxon Signed -Rank Test			X	
Differences in proportions with 95% confidence intervals (CI)		X	X	
Interpretative Phenomenological Analysis	X			
Content analysis		X		

The analyses of the qualitative data underwent several structured steps: reading the interviews several times to grasp the content, making annotations while reading, condensing the text, coding/labelling, and creating categories and merging them into themes and dimensions to stepwise reach a higher abstraction degree. To secure trustworthiness, all authors were engaged in discussing the results presented by the first author during the analysis. Some interviews were read and analysed separately by one co-author. The results were compared with the first author's results, and no discrepancies were found. To verify that the interpretations were correct, each interviewee quoted in the articles was contacted and asked to read and comment on the text, to confirm or contest the way their quotation was used and interpreted.

5 Results

5.1 Study I

How do participants in Nature-Based Therapy experience and evaluate their rehabilitation?

Three super ordinate themes emerged (Study I): *Being in the right or wrong phase of recovery*; *Experiencing existential dimensions*; and *Changing dysfunctional patterns of thought and behaviour* (See Figure 17).

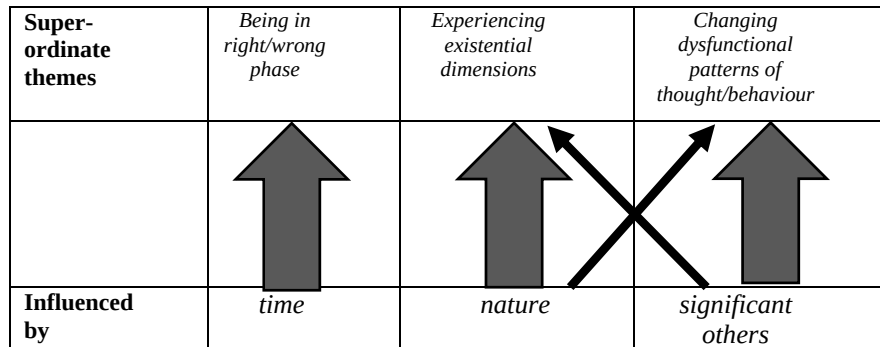


Figure 17. Superordinate themes and what influenced them. Broad arrows indicate a strong influence and thin arrows indicate influence to a lesser degree.

Being in the right or wrong phase for starting NBR was vital for how a participant opened up for the programme. Participants who were in the right phase were motivated to change, had an openness to what was offered by the team and the environment during the programme, and reached better self-efficacy. The participants who felt they were not in the right phase for rehabilitation asserted that they had started too early.

The theme *Experiencing existential dimensions* comprises two subthemes: the influence of nature and acceptance (Figure 18). Education about nature's

details and processes mediated by the biologist during these walks led to greater openness, fascination and pleasure from nature. This in turn opened up for existential reflections. Nature's pace, the changing of the seasons, the death, decay and rebirth of vegetation, and the interdependence of everything could be transferred to images of their own lives, their recovery, and their entire existence, which conveyed hope and self-acceptance. Spiritual and religious remarks were frequent. In nature the participants found peace to reflect on their own lives, and to begin to come to terms with their situation.

Through the support of the multi-disciplinary team, the non-demanding attitude in the programme and meeting with others in the same situation, the participants gained self-acceptance. They felt accepted by others, and could restore their self-confidence and self-image because they were treated with a tolerant, non-judgmental and permissive attitude. Through the NBR they came to a better understanding of themselves and of the necessity to change their previous performance-based view on their value as human beings.

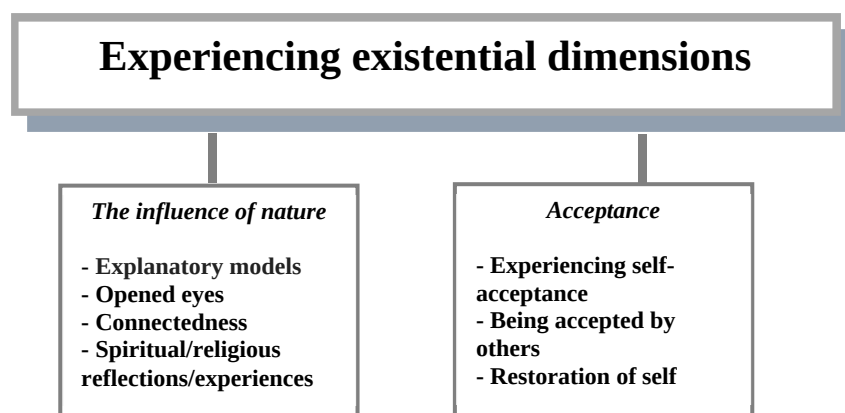


Figure 18. Super ordinate theme Experiencing existential dimensions and its two subthemes.

The theme *Changing dysfunctional patterns of thought and behaviour* comprises two subthemes: strategies and tools (Figure 19). During activities in the garden the participants practiced and learned to be in the present moment, find concentration and do one thing at a time. They were encouraged by the rehabilitation team to take breaks, to leave an unfinished task to be accomplished later, and to listen to signals from their body and mind and adapt their engagement accordingly. Discovering and becoming aware of nature's pace helped them accept their human limitations.

Relaxation and breathing techniques practiced during the NBR were of great help to the participants in stressful situations outside the NBR or when they experienced anxiety.

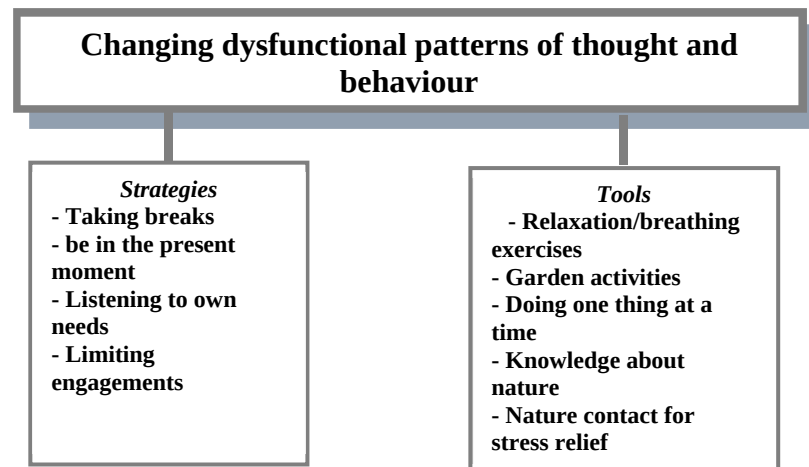


Figure 19. Superordinate theme Changing dysfunctional patterns of thought and behaviour and its two subthemes.

5.2 Study II

Nature-Based Stress Management Course for Individuals at Risk of Adverse Health Effects from Work-Related Stress—Effects on Stress Related Symptoms, Workability and Sick Leave.

5.2.1 Burnout

At course end, 48% scored SMBQ ≤ 3.75 , showing only a minor increase compared to baseline. However, greater improvement was observed at six-month follow-up (73%) and twelve-month follow-up (69%). The mean scores decreased at every follow-up. Statistically significant changes were observed for comparisons between start of NBSC and six- and twelve-month follow-ups, respectively.

5.2.2 Stress-related symptoms

An increase in participants reporting an absence of stress-related symptoms was seen when baseline was compared to the three follow-ups. Sleep quality accounted for the largest improvement, followed by heart palpitation and dizziness. Pain in the back, knee, etc. showed the smallest improvement.

5.2.3 Work ability and sick leave

The proportion of participants assessing their work ability (WAI 1) as good increased gradually and reached significant difference when baseline and twelve month follow-up were compared. A similar pattern was observed for sickness absence (WAI 5), with a reduction found in the proportion reporting more than 14 days of sick leave during the past twelve months at the last follow-up.

5.2.4 Interviews

Three themes emerged from the interviews: *Education about nature and garden*; *The impact of the environment*; and *Tools and strategies for managing stress*.

The education during guided nature walks awoke participants' curiosity and opened up for the emergence of existential reflections. A deeper awareness about nature, nature processes and details led to greater pleasure in working in one's own garden and during one's own nature walks, activities that for several participants became more frequent after the course. The knowledge they gained was of use in social contexts, as conversation topics during coffee breaks at work, during nature walks with family or friends, or even in quizzes, thus enhancing their self-esteem and self-confidence.

The impact of the environment was mainly expressed as the benefit of being outdoors during daylight and the experienced calmness, peacefulness and stress relief when spending time in nature or in the garden.

Tools and strategies for better managing stress were acquired, and were still used by the majority of the participants after the course. Relaxation and breathing techniques learned and practiced in the course were most frequently described as being used after the course for handling stressful situations at work or in one's private life. Relaxation outdoors in the garden or in nature was described as superior to the same relaxation indoors. Focus and concentration were enhanced through garden activities. Other often described acquired tools and strategies were an awareness of the importance of being responsive to the body's signals, and limiting one's engagement accordingly.

5.3 Study III

Using Nature-Based Rehabilitation to restart a stalled process of rehabilitation in individuals with stress-related mental illness.

5.3.1 Burnout

Burnout score, measured with the SMBQ, decreased between baseline measure and follow-ups. The differences in the proportion scoring below the cut-off of 4.4 between start and all three follow-ups were statistically significant.

5.3.2 Depression

The mean value of the BDI-II decreased between the start of NBR and the three follow-ups, showing a movement from moderate to mild depression for the group. The number of participants scoring “moderate” or “severe” depression decreased from 52% at start of NBR to 26% at six-month follow-up, and decreased further to 21% at twelve-month follow-up. Most participants (88%) had lowered their depression score after rehabilitation.

5.3.3 Anxiety

The mean values of the BAI decreased at all follow-ups compared to baseline values, showing a movement from moderate to mild anxiety for the group. All comparisons showed statically significant decreases at each follow-up compared to start of NBR. Most participants (63-71%) had lowered their anxiety score after rehabilitation.

5.3.4 Well-being

The PGWB mean values showed a gradual increase at all follow-ups. Comparisons between start of NBR and all three follow-ups showed statistically significant improvements.

5.3.5 Sick leave

A clear movement was seen in the NBR group from sickness benefit to rehabilitation compensation, which was being received by 71% of this group at the last follow-up. No such large movement was observed for the OHS group, in which only 13% were receiving rehabilitation compensation at the last follow-up (Table 6).

Table 6. *The total numbers of days with sickness and rehabilitation compensation (partial or full) for participants in the NBR and OHS groups at P11, P22, and P33*

Total numbers of days of partial or complete sick leave compensation and rehabilitation compensation	P1 ¹ 6 months before rehabilitation start	P2 ² 6 months after competed rehabilitation	P3 ³ 7-12 months after completed rehabilitation
NBR n=44			
- sick leave	7204	5335	3982
- rehabilitation compensation	16	1983	1379
OHS n=45			
- sick leave	3897	6997	3951
- rehabilitation compensation	0	50	481

5.3.6 Health care utilization

For the NBR group the mean number of visits decreased concerning health care utilization, comparing six months before rehabilitation (P1) and the follow-up for the six-month period that followed completed rehabilitation (P2). This difference was statistically significant. The visits remained at the same level for the last follow-up period (P3). For the OHS group the mean number of visits increased between P1 and P2, but the mean number of visits decreased between P2 and P3 (Table 7).

Table 7. *Visits to medical professionals for the NBR and OHS groups, displaying mean values and standard deviations (SD) for the measures P1¹, P2², and P3³*

Visits to medical professionals	P1 ¹ 6 months before rehabilitation start	P2 ² 6 months after competed rehabilitation	P3 ³ 7-12 months after completed rehabilitation
<i>Mean (SD)</i>			
NBR n=44	19.2 (11.4)	10.8 (8.9)	10.7 (9.4)
OHS n=45	13.2 (15.0)	17.6 (11.5)	11.0 (9.6)

5.4 Study IV

The Influence of the Environment on Directed Attention, Blood Pressure and Heart Rate - An Experimental Study Using a Relaxation Intervention

5.4.1 Directed Attention

A significant environmental effect on the directed attention capacity in favour of the outdoor condition was obtained but no interaction between relaxation and environment was found. Participants scoring high on the SMBQ subscale cognitive weariness performed better on the NCPC after relaxation in the nature environment compared to indoor relaxation.

Differences in NCPC scores were seen for the two different nature environments, with lower scores for participants tested at the park site compared to the wood edge group. The wood edge group showed the largest difference between the outdoor and indoor tests, while the park site group showed a greater reduction of reversals after relaxation. No significant differences were observed between before and after relaxation in either group.

5.4.2 Physiological measures

The physiological effect of the relaxation was shown in lower blood pressure and heart rate, thus confirming that the relaxation method worked indoors as well as in outdoor nature environments; however, no significant changes due to environmental conditions were seen.

5.5 Environmental preference (Studies I, II and IV)

A majority (71%) of the participants preferred relaxation in nature environments compared to relaxation indoors (Study IV).

In the interviews (Studies I and II), clear and positive effects were observed from nature and garden experiences during the NBR and NBSC, leading to more frequent use after the interventions of nature for walks as well as more pleasure in one's own garden for stress reduction.

6 Discussion

6.1 Discussion of the results

The main results from the studies included in this thesis showed that participants in the rehabilitation group (NBR) as well as in the prevention group (NBSC) improved concerning burnout scores, comparing their start in the interventions and the follow-ups. The same pattern was seen for the NBR participants concerning scores on depression, anxiety and well-being, which all indicated significant improvement. This may partly be explained by the continued, conscious use of nature for stress recovery and for sensory experiences, and also by the use of tools and strategies acquired by both groups (NBR and NBSC) for stress management. This explanation is in line with results from several other studies reporting the beneficial effects of nature exposure on stress recovery (Grahn & Stigsdotter, 2010; Adevi & Grahn, 2011; Stigsdotter & Grahn, 2011; Sahlin *et al.*, 2012; White *et al.*, 2013).

The nature and garden content of the NBT comprised a large part of the time, more than 40 % in the schedules, which may have been of significance for the participants' improvement in mental health and may have resulted in positive effects of a more profound and long-lasting character. Some studies have demonstrated the beneficial effects on mental health of nature interventions lasting between 10 and 16 weeks, which may support this interpretation (Thorsen Gonzalez *et al.*, 2009, 2011; Sonntag-Öström *et al.*, 2011; Sahlin *et al.*, 2012, 2014; Pálsdóttir *et al.*, 2014). Thorsen Gonzalez and colleagues assumed that the restorative components *being away* and *fascination* may be the active mechanisms for the results shown, both are included in the four components of ART (Kaplan, 1995) for a restorative environment, and both were also present in the NBT nature environments included in this thesis. However, Sonntag-Öström (2014) found no differences in burnout scores for participants in a forest intervention (lasting 3 months)

compared to a control group without nature content, and Nordh, Grahn and Währborg (2009) showed improvement in burnout scores but not well-being, depression or anxiety after a ten-week forest intervention.

Enhanced emotional balance and well-being through nature exposure have been reported (Johnsen & Rydstedt, 2013; Martens *et al.*, 2011), offering further support for the interpretation of the beneficial results on self-assessed mental health in the thesis as having a connection to nature experiences. An additional explanation could be that NBT led to increased physical activity in nature, which has been shown to beneficially affect stress recovery (Hansmann, Hug & Seeland, 2007).

The education about nature during the guided walks may also have played an important part in the improvement of the participants' mental health, by offering possibilities to distance themselves from a problematic health situation and focus on some fascinating detail in nature, and allow room for new perspectives of importance for recovery.

Beneficial effects may also be connected to being in a social coherence after having been on sick leave in the home a long time. Being treated with tolerance and acceptance by a professional rehabilitation team and other participants in the same situation as oneself has previously been shown to be important for the recovery of individuals with ED and other stress-related mental problems (Pálsdóttir, 2014).

A large proportion of the NBR participants increased their level of activity by moving from ordinary sickness benefit to rehabilitation benefit, an important step towards return to work. Considering that the NBR group comprised employees with severe stress-related mental disorders, leading to a history of long-term sick leave despite initial treatment by ordinary health care providers, these results seem very promising, for the individual as well as from an organizational and societal perspective.

A similar pattern was seen for health care utilization as for sick leave. Interestingly, visits to medical professionals decreased significantly for the periods 6 months and 12 months after the rehabilitation compared with 6 months before rehabilitation start. Comparing the results for sick leave and health care utilization in the two cases, the period 6 months before start of rehabilitation has the highest values for the NBR group and the period 6 months after completion of the rehabilitation for the OHS group, indicating that the two groups are in different phases when starting the respective rehabilitation process.

The exploration of register data on sickness benefits and consumption of care among patients entering the rehabilitation provided by the in-house OHS as well indicated that some still were in need of additional efforts twelve

months after end of the usual rehabilitation programme, in order to be able to return to work. Thus, it seems that the organization's investment in NBR as a complement to the conventional OHS may also be rewarding from a content employer's perspective. The benefits of a strong and continuous coaching available to the NBR participants four half days/week may have facilitated return to activity for this group. The close involvement with manager/workplace during the whole rehabilitation may also have contributed to this, but such contacts were also prevalent during the OHS rehabilitation. This is in line with Sandahl and colleagues' (2011) suggestions for promoting return to work in this patient group, which include engagement from the manager/supervisor, gradual return, and group treatment. However, weekly coaching to support the next step after completing a 10 weeks forest intervention did not lead to work or any further work-related activities (Nordh *et al.*, 2009), and Sonntag-Öström (2014) found no differences in sick leave for participants in a forest intervention (lasting 3 months) compared to a control group without nature content. Perhaps, again, the long period of firm support in the NBR in this study may be one explanation for the successful results in this respect.

In Study II, there was a substantial change from longer to shorter sick leave. However, the reduction in longer sick leave in favour of shorter leave at twelve-month follow-up may disguise a coping behaviour, as suggested by Kristensen (1991). According to the results of Study II, the participants were more responsive to their own needs after the NBSC; thus, short-term absences may have been used to reduce work strain and for recovery. However, what speaks against this interpretation is that nothing attesting to such reasoning emerged in the interviews. Contrary to Willert *et al.*'s (2011) results for effects on sick leave in the longer run, our results showed a positive development, indicating a beneficial long-term effect of the NBSC.

Results for the NBSC also showed increased work ability and improvements regarding stress-related symptoms. Significantly improved self-assessed work ability was seen for participants in the NBSC at the twelve-month follow-up, but not at the earlier follow-ups. One plausible explanation for these changes emerging from the longer perspective may be that it takes time to change dysfunctional patterns of behaviour and reaction, and develop and manifest new (healthier) habits and experience positive consequences from changes in one's approach to stress. Hence, the non-significant result between course start and end/six-month follow-up may not be surprising.

Concerning directed attention, the results of the NCPCT showed an environmental effect in favour of the nature environment compared to the indoor one, in line with Ottosson and Grahn (2005) and Hartig and colleagues (2003), thus supporting ART. Kaplan (2001) suggested that relaxation through

meditation may enhance the restorative effect of a restorative environment, but the results from this study did not clearly reveal whether a progressive relaxation session in nature may give the same effect. While most participants expressed a preference for the relaxation in nature, no environmental effects on the physiological measures were observed. Thus, the study (IV) offers no support for PET (Ulrich, 1991). Several other studies have reported lowered physiological values after relaxation (Kjellgren & Burkhall, 2010; Benson, 2000). But in our study, any effects on blood pressure and heart rate early in the relaxation in nature may have subsided because of the long period between the measurement of blood pressure and heart rate and the nature exposure; according to Ulrich (1993), the physiological reactions occur within minutes.

Looking at the difference in NCPCT score, the relaxation indoors and outdoors elucidated that in the “more weary” group (with high points on the SMBQ subscale cognitive weariness) the outdoor relaxation resulted in better performance than the indoor relaxation with respect to directed attention. This indicates that performing the relaxation outdoors was more effective (although not statistically significant) than performing the same relaxation indoors for the “more weary” group. This is in line with findings from a previous study by Grahn and Stigsdotter (2010), showing that individuals experiencing stress preferred environmental characteristics described as serene, nature, and refuge. Since the environments present in Study IV were similar in characteristics to those mentioned above, our study indicates that relaxation in such an environment could have a beneficial impact on directed attention in this type of population.

The physiological effect of the relaxation was clear, thus confirming that the relaxation method worked in both conditions. No environmental effect could be seen in the analyses of the physiological measures, although a large majority of the participants preferred to perform the relaxation in the outdoor condition.

We had assumed that an interaction between environment and relaxation would appear, but found no support for the interaction hypothesis.

Regarding the two different outdoor environments, the reduction in the number of reversals after the relaxation was somewhat greater in the park site group, but the wood edge group showed the largest difference between the indoor and outdoor tests. We assumed that this latter site would contain more characteristic features necessary for mental restoration according to Kaplan and Kaplan (1989). The more wild and serene nature type may contribute to explaining why the directed attention showed better capacity at the wood edge compared to the park site. This can partly be explained by the suggestion by Grahn *et al.* (2010) that specific characteristics in nature or in a garden may

affect individuals in various ways, or may be preferred differently depending on factors such as the individual's level of stress or mood at the moment. Previous studies have found that individuals highly affected by stress preferred the characteristics nature, refuge, and rich in species, especially when rest activities were needed (Grahn & Stigsdotter, 2010; Stigsdotter & Grahn, 2011).

All stress-related symptoms showed improvement; i.e., a larger proportion of participants reported an absence of symptoms. At the baseline measure almost half of the study population reported impaired sleep. Sleep disturbances have been reported to predict future long-term sickness absence, and may play a role in the development of fatigue and burnout (Åkerstedt *et al.*, 2007; Ekstedt *et al.*, 2003). The results of Study II indicated better sleep quality from a longer perspective, which may be explained partly by participants using relevant tools from the NBSC such as relaxation, walks in nature and being more physically active, which have been shown to promote sleep. Being outdoors during daylight may also play a role, as daylight is vital to our circadian rhythm and in regulating sleep and alertness. The inclusion criterion for the course was the existence of accelerating stress symptoms over a longer time period, and it could be assumed that an intervention was likely necessary to alter this development.

Being in the right or wrong phase for rehabilitation was important for the rehabilitation outcome. Participants in the wrong phase explained that the start was too early for them, and limited more beneficial results from the rehabilitation. Being in the right phase was characterized by participants' awakening inner need to belong to a social context and their strong desire to change their situation, which were expressed as main reasons for wanting to join the programme. This is in line with Perski's (2004) description of the rehabilitation process for stress-related disorders in terms of phases, the first of which is characterized by a need for firm support and rest before starting more directed rehabilitative actions. Being attuned to receiving rehabilitation is expressed as being of crucial importance, and this was clearly stated by the study population. Phases during NBR rehabilitation have been suggested by Grahn and colleagues (2010) and Pálsdóttir and colleagues (2014); however, these are phases that occurred within the NBR rather than before it.

The NBT participants acquired tools and strategies for better handling stress (Studies I and II). Breathing exercises are considered to enhance an individual's connectedness inward and to be a mental anchor and stabilizer (Kabat Zinn, 2004), and the technique taught in the NBR as well as the NBSC was of help in handling stressful situations and anxiety outside the interventions as well, as were different relaxation techniques. Relaxation outdoors in nature was experienced as superior to relaxation indoors, due to

deeper sensory experiences contributing to a deeper relaxation. The participants learned and adopted supportive strategies from other participants as well as from the rehabilitation team, which is in line with Bandura's (1977) learning theory, which states that learning takes place by modelling through observation and imitation. By watching other group members' improvements, the participants started to believe that their own progress was possible and hence became motivated and open to their own possibilities to adopt new and change old (dysfunctional) behaviours.

The nature and garden content was of importance for stress relief and for the development of these tools and strategies, as well as for the continued use of nature and garden activities for stress relief after completing the course.

In addition to what is obtained from ordinary stress management courses—e.g. listening to one's own needs and bodily signals, limiting engagement, and using breathing techniques and relaxation in stressful situations and for insomnia—the participants stored mental images from joyful or peaceful situations in nature or the garden, which could be evoked in problematic situations and thus serve as a tool for reducing feelings of stress. This was also described by participants in the NBR (Study I).

One of the most prominent subjects that frequently surfaced in the interviews was the beneficial effects gained through the education about nature's details and processes during the guided nature walks. This was evident for the participants in Study I (more deeply affected by stress-related disorder) as well as those in Study II (with stress problems to a lesser degree). However, the existential dimensions and reflections connected to experiencing nature in a new way were not as pronounced for the participants in the NBSC as for those in the NBR. This may be a parallel to Ottosson and Grahn's (2008) finding that individuals deeply affected by crisis were supported the strongest in their recovery by nature experiences, while those less affected by crisis found more support in social contact.

Through guided nature walks and education about nature, a deeper awareness of nature's manifold details and sensations fascinated the participants and made them forget about their own situation, which made room for new ideas to develop. The education opened their eyes to nature's beauty and detailed interplay, and helped them find meaning and coherence in life and existence, which, according to Antonovsky's (2003) salutogenic model, are important factors for staying healthy but also for regaining health. Finding meaning in life is a basic human need and is of importance for health and well-being, which has been described by, for instance, Jacobsen (2000) and Melder (2011) and expressed by Frankl (1962, p.98) in the lines: "*man's search for meaning is the primary force in her life.*" and "*this meaning is unique and*

specific in that it must be searched by the individual himself and realized by him” (my translation).

Melder (2011) described the importance of human health related to the presence of eight existential dimensions extracted from the WHOQOL–SRPB field-test instrument (WHO quality of life – aspects related to spirituality, religiousness and personal beliefs, 2002). Contributing to overall health (physical, mental and spiritual), the presence of the following dimensions is important: *feelings of connection to something greater* (spiritual connection); *meaning and purpose in life*; *a feeling of wonder at life* (feeling inspired and grateful in the presence of our environment, nature, art and music); *unity* (a conviction that thoughts, feelings, actions, psyche and the spirit are united); *spiritual strength* (finding ways to get over difficulties and feel calm); *harmony and inner peace*; *hopefulness and optimism*; and *a personal faith* (not necessarily religious). All these dimensions were found within the NBR participants’ narratives. The relationship between nature experiences and peak experiences (often described as feelings of great happiness, ecstatic moments, moments of awe at, e.g., a beautiful nature experience) has been reported by Wuthnow (1978) in a large study on the frequency of peak experiences, with a majority of the thousand individuals in the study experiencing being deeply moved by nature’s beauty. The deep fascination experienced in the education about nature was sometimes described as the NBR participants having become addicted to nature experiences and consciously seeking more of them outside the NBR as well; hence, these experiences could have similarities with what Wuthnow (1978) and others call “peak experiences” and are also in line with Talbot and Kaplan’s (1986) description of spiritual experiences in a wilderness project as a major contribution to enhancing well-being and self-image among their study population. Feelings of connectedness to a larger whole emerged for the NBR participants in nature, whereby they expressed a sense of coming home and a kinship with nature in which they felt accepted as they were and could achieve a restoration of self (Ulrich *et al.*, 1991; Wilson, 1984). Restoration of self and gaining self-acceptance were also possible because one was treated with understanding, respect, empathy, and a non-judgmental attitude by the team as well as the other participants. Similar results were found by Halting, Wahl, and Heggdal (2010) and Pálsdóttir *et al.* (2014).

6.2 Strength and limitations

An advantage in this thesis is that several different designs have been used to answer the research questions and examine them from different perspectives, thus offering a more solid illumination of the questions in focus.

Another strength is that the results are based on validated instruments and data from regional and national registers; furthermore, twelve months of follow-up is a longer time frame than several other studies have used to follow-up effects. There were established clinically relevant cut-off levels and norm values for all instruments for measuring mental health. The instruments used were selected at an expert clinic and research institution for exhaustion disorder and severe stress-related disorders.

It would have been desirable to have held initial interviews with the same participants as those interviewed at the end of their rehabilitation, in order to understand and describe the progress and development during the NBR. However, with respect to the participants' need to be left in peace without interference from outside, this was deemed inappropriate as it may have disturbed the fragile recovery process.

Larger populations in Studies II and III would have been preferred, but were not available within the time frame at hand. However, the response rate was high and there were few dropouts by the NBT participants. Also, these studies had an explorative design as no control or reference groups were used. This limits the possibilities to draw firm conclusions about how effective NBR is for this kind of patient group compared to other rehabilitation interventions without nature content. Indeed, it was our initial intention to have a controlled design, but despite strong efforts this was not possible. It is therefore important that such controlled studies be performed in the future.

The NCPCT was easy to administer, but it became obvious during the test period that the instruction for the first part of the test was easily misunderstood: instead of simply allowing spontaneous reversals for 30 seconds, some participants tried to force an increase in number of reversals. However, no such misunderstandings were found for the second instruction, the holding condition. There are at least two ways to analyse the NCPCT (Ottosson & Grahn, 2005; Hartig *et al.*, 2003), and because of the risk of misinterpreting the instructions we chose the analysis model using only the number of reversals in the holding condition.

There was a skewed gender distribution; however, this mirrors the dominance of female employees within the health care sector.

The register from the Swedish Social Insurance Agency was not as complete as expected. Due to statistical limitations in the register, no data were available on the specific diagnosis in the F43 categories and data for participants known to be on prescribed sick leave were missing in the returned data from the Swedish Social Insurance Agency.

Although most of the results indicate the advantages of using the NBT for stress-related disorder, it has not been possible in this thesis to isolate the

nature/garden effect or determine the extent to which nature/garden contributed to the recovery process. Overall, the results indicate a favourable interaction between the three components described in the background section (social, nature and traditional rehabilitation).

6.3 Contribution to the field

The knowledge and explanations of the benefits of nature are rather well explored; however, when it comes to the effects of rehabilitation models supported by nature there are still gaps to be filled and still larger holes to be filled concerning NBT for prevention. This thesis work has contributed in several ways to this research field and some points are listed below:

- * The thesis points to the importance of nature as an arena for the emergence of existential dimensions and reflections. Nature had an impact on the participants' thoughts about their lives, future and work, and enhanced their spiritual well-being, which also helped them gain acceptance of their situation. Hence, nature had a mediating function that encouraged the start of existential reflection. This seems to enhance the recovery process for stress-related mental health problems at different levels of severity.
- * Education about nature may open up for the start of existential reflection, and the important influence of the education connected to the nature walks must be stressed as very important for the recovery process. This is one of the main findings and a key element of this thesis contributing to new knowledge in this field.
- * NBT in an adapted design like the one presented in this thesis, the NBSC, can also be successfully used for prevention in individuals at risk of developing more serious and work-inhibiting stress-related mental disorders.
- * The two-phase model of NBR – with a first period of multimodal support in a non-demanding programme at a slow tempo to get used to being in a social coherence after a long period of sick leave, followed by a period during which a gradual return to work/studies is coached – seems to be a successful concept.

7 General conclusions

Knowledge that can be drawn from this thesis is that existential reflections were important for the study population in their process of recovering from ED and stress-related mental disorders. Nature was an important source for the emergence and development of existential reflection.

Through education about health benefits connected to nature exposure and fascinating experiences of nature, the rehabilitation process for stress-related mental disorders may be enhanced. According to Kaplan (2001, p. 491), if an individual is equipped with the knowledge to “recognize, anticipate, and manage potentially costly situations and to recognize, seek, and intensify restorative situations”, this would be beneficial for the person’s directed attention and enhance the recovery potential of a restorative environment. Kaplan asserted that it is important to educate individuals in a way that evokes fascination and thus tempt them to be more willing to adapt to this new knowledge, which seems to be the case for the study populations in both Studies I and II.

Time to reach the right phase, and thus gain more from the rehabilitation, was experienced as vital, and for this group of patients (Studies I and III), sufficient time for an initial recovery period while resting at home is necessary before starting rehabilitation.

The results indicated that relaxation in natural environments had a positive effect on directed attention and could hence be an important component of preventive and rehabilitative interventions for stress-related symptoms. Nature, in combination with a professional multidisciplinary team, seems to offer a supportive environment for participants.

8 Clinical implications

The results in this thesis point to beneficial effects of using garden activities and natural environments for prevention and rehabilitation in individuals with different degrees of stress-related mental disorders. Based on the beneficial effects demonstrated in this thesis, it can be recommended that NBT be established more widely than it is today; i.e., not as isolated short-lived projects but rather as a permanent alternative to other models for the rehabilitation/prevention of stress-related mental disorders. The additional rehabilitation intervention including nature/garden (NBR) may reinforce the rehabilitation of individuals with stress-related mental illness still on long-term sick leave who have received initial rehabilitation but have not made progress.

8.1 Future studies

Although this thesis points to beneficial results, it is desirable that future studies use a controlled design, with larger populations comparing NBR and NBSC interventions with standard prevention and rehabilitation models without nature/garden content. It would be of great value to explore health economic aspects. More advanced studies are recommended in order to explore the role of education about nature's processes and about health benefits connected to nature exposure. In-depth explorations concerning the importance of existential dimensions in recovery from stress-related mental health problems, and their connection to nature experiences, would also be of great interest.

9 References

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