

DEPARTMENT OF GEOSCIENCES AND
NATURAL RESOURCE MANAGEMENT

UNIVERSITY OF COPENHAGEN



Dorthe Varning Poulsen

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Summary

The objective of this Ph.D. project is to create knowledge on how Danish veterans suffering from post-traumatic stress disorder (PTSD) experience nature-based therapy. Since 1980, Denmark has deployed more than 30,000 soldiers to war zones. Several studies showed that between 5-8% of the soldiers who are deployed to war zones develop PTSD in the period following deployment. Soldiers who develop PTSD are offered medical and psychological treatment, however a proportion of these veterans (soldiers who have been deployed) do not experience satisfactory recovery effects. A number of studies carried out in other countries indicate that soldiers may experience delayed onset of PTSD symptoms as late as several years after a traumatic experience.

This thesis consists of two parts: a systematic literature review and a qualitative single-case study. The literature review focuses on state-of-the-art research and the evidence for the positive effects of nature-based therapy on PTSD symptoms experienced by war veterans. The literature search included studies in which the target group was soldiers with PTSD, and studies in which treatment took place in nature and contained therapeutic elements. A search strategy was prepared and the search process followed a detailed procedure. Even though a large number of treatment programs that contained the defined elements were identified, only few randomized clinical trials had been performed with the area. Therefore, qualitative studies and grey literature were also included in the literature study. Grey literature refers to reports and project reports that have not been published in a scientific journal. A systematic review and synthesis of the 19 articles included in the study led to the identification of eight themes: Type of intervention; duration of intervention; health target; emotional impact of the intervention on the participants; nature-based therapy helping the individual return to employment; changes in physical health; developing relationships through working together and transparency and transferability. Within each theme, great variation was identified with regard to the design of the treatment, the target, and the measurement tools with which to assess how the participants benefited from the treatment. Overall, the literature study showed an improvement in the participants' physical and mental wellbeing. A number of the studies reviewed used a therapy program to help the veterans return to employment. Being part of a group that consisted of other war veterans was assessed as being positive. Nature holds great therapeutic potential with regard to the treatment of soldiers with PTSD, and it creates a space for reflection and recreation. None of the studies identified any negative effects of the treatment.

The second part of the thesis consists of a qualitative single-case study. The objective of this study was to examine how soldiers with PTSD experience nature-based therapy with regard to living with PTSD in their daily lives, including how they experience nature and the nature-based activities. The term 'nature-based therapy' refers to a type of therapy that is based on the interaction between the *environment* (nature, e.g. a garden with a specific design, or a specific area of the forest, *the target group's special needs* (physical, mental and social needs with regard to PTSD), and *therapeutically designed activities* (mindfulness and nature-based activities such as planting trees and chopping firewood). Together these three aspects constitute a holistic treatment form aimed at rehabilitation.

The project took place in the Healing Forest Garden Nacadia, which is under the Section for Landscape Architecture and Planning, the Department of Geosciences and Natural Resource Management, University of Copenhagen. Nacadia's design is based on evidence-based guidelines for creating spaces that offer recovery to individuals suffering from stress. A total of eight veterans with PTSD participated in the project. The participants were aged between 26 and 47 and had been deployed to the Balkans, Iraq and Afghanistan. Following deployment, all participants had suffered from PTSD symptoms, and these symptoms had had a significant impact on their daily lives. The nature-based therapy (NBT) was designed on the basis of a Ph.D. study by Sus Sola Corazon. Treatment lasted 10 weeks, with three weekly sessions of four hours each. Treatment was conducted by two garden therapists, who had a background in psychology and psychotherapy, and a gardener.

Data consisted of a series of four qualitative in-depth interviews that were conducted at the beginning of the treatment program, halfway through the program, at the end of the program, and one year after the program ended. The transcribed interviews were analyzed using Interpretative Phenomenological Analysis (IPA), and this process resulted in the identification of a number of themes that described the veterans' experiences and reflections. Examples of these themes are: When the body speaks; relationships to others and to take in nature. In relation to the treatment, the soldiers experienced that their PTSD symptoms improved and were easier to deal with. Daily activities became easier, and the tools acquired during the treatment could be used in stressful situations. One year later, all the soldiers used nature differently than they had before the intervention. They sought refuge in nature when they were faced with difficult decisions and when

they needed to find inner peace. They also used activities in nature to restore their mental and physical balance if their PTSD symptoms became too overwhelming. Future research must determine how to design the best courses of treatment so that more veterans with PTSD can receive treatment offers that include nature-based therapy.

Resumé

Formålet med denne ph.d. afhandling er at generere viden om, hvordan danske veteraner med Posttraumatisk stress syndrom (PTSD) oplever Natur-baseret terapi. Baggrunden for studiet er, at Danmark siden 1980 har udsendt mere end 30.000 soldater til krigsområder, og undersøgelser peger på, at et sted imellem 5-8 % udvikler PTSD i tiden efter udsendelse. De tilbydes behandling i form af medicin og psykologisk behandling, men en del af disse veteraner (tidligere udsendte soldater) oplever ikke en tilfredsstillende bedring.

Afhandlingen består af to dele; Et systematisk litteraturstudie og et kvalitativt single-case studie.

Litteraturstudiet ser på 'the state of art' og evidensen for natur-baseret terapi's positive effekt på PTSD hos veteraner. Litteratursøgningen omfattede studier hvor målgruppen var soldater med PTSD, hvor behandling foregik i naturen og samtidig indeholdt terapeutiske elementer, hvor naturen indgik. På trods af, at der kunne identificeres mange behandlingsprogrammer der indeholdt disse elementer var der kun gennemført få randomiserede kliniske studier indenfor området.

Kvalitative studier og 'grå litteratur' blev derfor også inkluderet i litteraturstudiet. Grå litteratur kan defineres som rapporter og afrapporteringer af projekter, der ikke er udgivet i videnskabelige tidsskrifter. En grundig gennemgang og syntese af de 19 inkluderede artikler førte til otte temaer: Type af intervention; varigheden af interventionen; helbredsmål; deltagernes følelsesmæssige påvirkning af interventionen; naturbaseret terapi som en vej tilbage til arbejde; forandringer i fysisk helbred; udvikling af relationer gennem samarbejde; transparens og overførbarehed. Indenfor disse temaer var der stor variation mht. behandlingens tilrettelæggelse, målet for behandlingen og de måleredskaber, der blev anvendt for at vurdere deltagernes udbytte af behandlingen. Generelt peger litteraturstudiet på en forbedring af deltagernes fysiske og mentale velbefindende. Naturen rummer et stort terapeutisk potentiale i behandlingen af soldater med PTSD og den skaber rum for refleksion og rekreation.

Den anden del af denne ph.d. thesis er et kvalitativt *single-case study*. Formålet med dette studie var at undersøge hvordan soldater med PTSD oplever nature-baseret terapi i forhold til det at leve med PTSD i hverdagen, herunder, hvordan de oplever naturen og de nature-baserede aktiviteter.

Begrebet 'natur-baseret terapi' beskriver en terapiform, hvor samspillet mellem *miljø* (naturen, fx et særligt designet haveområde eller et udvalgt område i skoven) *målgruppens særlige behov* (fysiske, psykiske og sociale behov i forhold til PTSD) og *terapeutisk tilrettelagte aktiviteter* (mindfulness

og natur-baserede aktiviteter som at plante og hugge brænde) tilsammen udgør en samlet behandling med et rehabiliterende formål.

Projektet er udført i Skov-og terapihaven Nacadia, som hører under Institut for Geovidenskab og naturforvaltning, Sektion for Landskabsarkitektur og Planlægning på Københavns Universitet. I projektet deltog otte veteraner med PTSD i alderen 26-47 år tidligere udsendt til Balkan, Irak og Afghanistan. Efter udsendelse har de alle lidt af PTSD symptomer, der har påvirket deres daglige liv i væsentlig grad. Den natur-baserede terapi (NBT) var tilrettelagt på baggrund af et ph.d. studie af Sus Sola Corazon. Behandlingen varede 10 uger, tre gange ugentligt af fire timer. Behandlingen blev varetaget af to haveterapeuter med psykologisk og psykoterapeutisk baggrund samt en gartner. Data bestod af interviews, der blev foretaget fire gange; ved start, midtvejs og ved afslutningen af behandlingsforløbet samt et år efter deltagerne var afsluttede. Analysen resulterede i en række temaer som eksempelvis: Når kroppen fortæller; relationer til andre og at tage naturen ind. I forhold til behandlingen oplevede soldaterne en forandring af deres PTSD symptomer som aftog eller blev lettere at håndtere. Daglige aktiviteter kunne lettere gennemføres, og de redskaber, behandlingen havde bidraget med, kunne anvendes i stressede situationer. Efter et år, brugte alle soldaterne naturen på en anden måde end tidligere. Den blev brugt som et godt sted at være, når vanskelige beslutninger skulle tages eller gennem aktiviteter i naturen at komme i fysisk og mental balance når symptomerne fra PTSD blev for påtrængende. Fremtidig forskning må afklare, hvordan det bedst mulige behandlingsforløb kan tilrettelægges så flere veteraner med PTSD kan få et behandlingstilbud hvor natur-baseret terapi indgår.

Abstract

The objective of this Ph.D. project was to explore the impact of nature-based therapy (NBT) from the perspective of veterans suffering from PTSD. The thesis consists of two studies: A systematic literature review and a qualitative single-case study. The review aims to describe state-of-the-art research within the area of NBT, the evidence for treatment offered to veterans with post-traumatic stress disorder, nature-assisted therapy (therapy that uses nature with the purpose of recovery), and the nature setting in which this kind of therapy was conducted. Guidelines from *The Cochrane Handbook for Systematic Reviews of Interventions* were followed when possible. Due to the small number of randomized clinical studies, qualitative literature was also included, as was ‘grey literature’, which can be described as projects and reports that do not qualify as scientific publications. The review process identified 19 studies or reports. The results pointed towards a positive benefit of nature-assisted therapy in relation to the veterans’ mental and physical wellbeing. With regard to several parameters, the therapy activities varied from study to study, for example the length and frequency of the intervention, types of therapy activity, the therapeutic process, and measurements for the study. It was concluded that more qualitative and quantitative studies are needed to contribute with knowledge that will enable us to establish nature-assisted therapy for veterans with PTSD on the basis of the evidence.

The qualitative single-case study was conducted in Nacadia, a forest therapy garden designed as a space for recovery for people with a stress-related illness. The aim of the study was to describe the background for conducting this study in Denmark, that is, the research environment and to explore how veterans experienced NBT, the nature settings and the NBA in relation to living with PTSD. The data was collected through four individual in-depth interviews, which were analyzed using the Interpretative Phenomenological Analysis method (IPA). Seven superordinate themes emerged from the data: bodily symptoms; relationships; identity; the future; taken in nature; nature as an initiator for a life-changing process, and nature as a part of life with PTSD. The overall results showed that the veterans experienced a decrease in their PTSD symptoms and their symptoms were less burdensome. It became easier for them to interact socially with family and friends. Despite these positive effects, it remained difficult for the participants to imagine a future, and they continued to worry that their condition would worsen. They experienced that their ability to be

present in the moment improved through mindfulness activities and the NBA. Nature became an important part of life; it provided a framework for restoration and had a recreational impact.

Preface

Due to my background as a physiotherapist I have been interested in the relations between natural environments and human health for many years. I have followed the research conducted in the Rehabilitation Garden at Alnarp, at the Swedish University of Agricultural Sciences, and I have conducted my own minor ‘experiments’ of physiological training sessions in nature. Later I introduced my patients to physiological training activities in nature settings in the environments outside the hospital. It made a great impression on me to experience how patients suffering from a lung disease were eager to move outside to be in the fresh air, and how geriatric patients, who had often been hospitalized for weeks, found it comforting to feel the sun in their face and smell the roses in the park at the hospital. When I was teaching physiotherapy students at University College Zealand, it was natural for me, to draw on the knowledge I had gained from my personal experiences and continue to develop myself in this field of human health and nature synergies. In line with the increasing extent of evidence of the positive effect of using the outdoor environment for health purposes, my interest became more focused on how different target groups can use nature settings and how activities in nature that use nature elements can be beneficial for the needs of special groups. I was brought a step closer to this Ph.D. study when I conducted a small project at the Antvorskov Military Barack in Slagelse, here, for the first time I met soldiers who had just returned from war. This made a profound impression on me. There was something in their eyes, their body language and their voices that caught my attention in a way I could not ignore. It became very important to me to investigate whether this target group could benefit from being in nature and from performing nature-based activities (NBA). Through meetings with Professor Ulrika Stigsdotter, the University of Copenhagen, who had just establishing the Forest Therapy Garden Nacadia, and with support from University College Zealand, it became possible for me to start this three-year project.

When I started these three years of study, my motivation was to contribute with new knowledge about how veterans experience ‘being in’ and ‘doing things in nature’ in relation to their daily lives with PTSD. Through the process of conducting this Ph.D. project I have learned a great deal with regard to the world of research; I have worked with inspiring researchers within my field, and I experienced military culture very different to the Danish military culture during my stay in the US. Now, after the three years have gone, it is my hope that this research can benefit many more

veterans who are in need of an alternative treatment in addition to their existing treatment. I would therefore be very grateful to be able to continue to my work within this field.

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Abbreviations

ART	Attention Restoration Theory
CRT	Clinical Randomized Trial
DSM-5	Diagnostic and Statistical Manual of Mental Disorders developed by the American Psychiatric Association
ICD-10	The International Classification of Diseases developed by the World Health Organization
IPA	Interpretative Phenomenological Method
NAT	Nature assisted therapy
NBA	Nature-based activity
NBT	Nature-based therapy
PTSD	Post-traumatic stress disorder
WHO	World Health Organization

Introduction

This thesis is based on two studies: a literature review and a single-case experimental design. It consists of an introductory part and four papers. The object of this introduction is to describe in brief the settings for the empirical part of the Ph.D. study with a view to introducing the reader to the target group, the environmental framework for the therapy and the nature-based therapy (NBT). The opening in 2011 of the forest therapy garden, Nacadia, was an important stepping stone toward the establishment of a scientific research field, Health Design, within the Department of Geosciences and Natural Resources Management, University of Copenhagen, which focuses on the relationship between human health and nature. Nacadia was designed by Professor Ulrika Stigsdotter on the basis of guidelines for nature-based health design. Nacadia is located in the Hoersholm Arboretum, and constitutes the physical framework for the intervention of this study. The objective of Corazon's (2012) Ph.D. study was to develop a NBT program and an activity manual targeted at individuals with stress related illness. Moreover, the program was theoretically founded in environmental and cognitive psychology and the design integrated therapeutic use of sensory experiences, horticultural activities, and nature-related stories (Corazon et al., 2010). For various reasons, the first group that took part in the nature-based treatment in Nacadia comprised military soldiers who suffered from PTSD as a consequence of their military service. In most cases, veterans with PTSD are primarily offered medical and psychological treatments, and in Denmark the patient group had not previously been offered NBT. The group had a slightly different complex of symptoms compared with the initial target group in the program developed by Corazon (Corazon, 2012) and therefore adjustments were made to the NBT to target the special needs of this particular group. The research was planned and conducted in cooperation with Stress Center Kalmia, who conducted weekly individual therapeutic sessions with the participants. The permanent staff comprised a gardener and two horticultural therapists. A more detailed description will be given in the section of methods.

Structure of the thesis

The introduction part of the thesis begins with an overview of the background for the Ph.D. project and identifies the knowledge gap that has led to the formulation of the aims and research questions for the study. Next is a list of the papers included in the thesis. The theories, concepts, and models that constitute the theoretical foundation for the study follow. The method part thoroughly describes the methods and procedures used in the literature review and the case study. In the single case study, a short description of the environments where the NBT was conducted is added. A summary of the results from the four papers finishes this section. The discussion section has two parts; first, the results are reviewed against the theoretical framework, and additional theories are drawn in when relevant so as to achieve a deeper understanding of the results and a possible implementation of these. Second, the methods used in the study are critically assessed and discussed. Implications for practice and suggestions for future research follow, and finally the conclusion completes the thesis.

Background

The cost of participating in war

Young individuals have been sent to war for thousands of years. Many have died in the battles, but in every war, there are far more wounded than fatalities; millions of soldiers have returned from wars and battles with serious damage to their body and soul (Watson, 2008). Advances in battlefield medicine mean more wounded are surviving their wounds; however, many injuries are not as visible as missing limbs and other physical body injuries, namely traumatic brain injuries and post-traumatic stress suffered by both combatants and civilians. The incidence of these injuries can be, and is still, disputed. Furthermore, the classifications of these injuries have changed over time, affecting the way in which the number of injured is counted as well as the treatment offered (Watson Institute, 2015, Andreasen, 2011). War has big costs for all the parties involved; it has economic costs, social costs and costs to human health. An article in *The Economist* from March 23 2013 focused on the increase in the number of war veterans seeking help due to post-traumatic stress symptoms. The increase was seen among the recently repatriated, but also among ageing veterans of earlier conflicts, and had led to an increase in America's disabled-servicemen

population by almost 45% since 2000. A great deal of research underpins the claim made in the Economist article (e.g. Bilmes and Stiglitz, 2006; Taylor et al., 2012) and research also shows that the long-term costs will be significant (Smith, 2008). Worldwide, an increase number of war veterans are seeking help for mental symptoms that are often compatible with PTSD. (Gates et al., 2012; Paper I). Atkinson et al. (2009) predict that the number of veterans affected with PTSD in 2023 will increase to 313,000 individuals in the US. The same tendency is seen in other countries, and a study from the UK describes delayed onset symptoms among troops (Fear et al., 2010; UK Ministry of Defense, 2013).

Current situation in Denmark

For more than 60 years, Denmark has contributed military troops in times of international crisis. From 1992 to 2012, more than 30,000 Danish soldiers (the Danish population is approx. 5 million.) played a role as part of international peacekeeping forces or were involved in direct combat operations abroad (SFI, 2012). In Denmark, four months of military service is compulsory for all 18-year-old males; women can volunteer and are trained on equal terms with men. After their period of conscript, soldiers can seek employment in the Danish military, and after eight months of training, they may be sent to war zones in different parts of the world.

A survey of 14,000 Danish soldiers deployed to Iraq and Afghanistan revealed that 5% were still experiencing mental problems seven months after returning home. The study also showed that an increasing number of Danish veterans experience PTSD symptoms or other mental problems up to two-and-a-half years after completing their duty (Danish Military Defense, 2013). Another study (SFI, 2010) found the percentage of soldiers who developed PTSD after serving to range between 4-17% with an average of 8.8%.

PTSD seen in a health perspective

PTSD is a mental illness. It is defined and described in the following two systems; The International Classification of Diseases (ICD-10) developed by the World Health Organization (WHO), and the Diagnostic and Statistical Manual of Mental Disorders developed by the American Psychiatric Association (DSM-5). The diagnostic criteria in the two systems are formulated slightly differently, but in general they are considered to be identical. The diagnostic criteria include the following: Exposure to a stressful event or situation, short or long lasting, in which the individual is exposed to

threats of death, serious injury or sexual violation. The exposure is a result of situations with directly experiences the traumatic event or witnesses the traumatic event in person. The behavioral symptoms that accompany PTSD are (from DSM-5):

- Re-experiencing; spontaneous memories of the traumatic event, recurrent dreams related to it, flashbacks or other intense or prolonged psychological distress
- Avoidance; distressing memories, thoughts, feelings or external reminders of the event
- Negative cognitions and mood; myriad feelings, from a persistent and distorted sense of blame of self or others, to estrangement from others or markedly diminished interest in activities, to an inability to remember key aspects of the event
- Arousal; aggressive, reckless or self-destructive behavior, sleep disturbances, hyper-vigilance and flight reactions

Living with PTSD

PTSD causes clinically significant distress or impairment in the individual's social interactions, capacity to work and functioning (European Society for Traumatic Stress, American Psychiatric Association). Therefore, the disorder often has a huge impact on the individual and his/hers relatives. When veterans first begin to realize that their condition has changed after serving, it can be difficult for them to accept that this change may be related to their experiences from the war, and for some it may be even harder to ask for help than to fight the battle (Rosen et al, 2011; Stecker et al., 2013. Stigma was the third most common reason for not seeking treatment (Stecker et al., 2013), and one of the reasons for the low-level of help-seeking behavior for PTSD symptoms (Iversen, 2011). Moreover, studies by Mittal and colleagues, (2013) and Cichocki-Goss (2014) drew attention to a general fear felt by the veterans of being labeled mentally ill and stigmatized by society. This may indicate that the number of veterans diagnosed with PTSD could be even higher.

For some of the veterans with PTSD, abuse of alcohol and drugs becomes a way of dealing with their situation (Iversen, 2009; Jacupcak et al., 2010; Angkaw, 2015). Empirical research has shown that the consequences of various traumatic events are not limited to the traumatized veteran, but may also affect significant others in their environment such as family and friends (Ray and Vanstone, 2009; Dekel and Monson, 2010). Furthermore, a great deal of research points towards a close link between PTSD and general health problems. Veterans with PTSD were found to suffer from a greater number of health problems in general than veterans without PTSD. Beckham and

colleagues (2014) and Ginzburg and colleagues (2010) found almost half of war veterans risk a lifetime of triple comorbidity with anxiety and depression. Finally, increased risks of developing major forms of cardiovascular disease have been found by Coughlin (2011) and McFarlane (2010).

The treatment of PTSD

The common treatment for PTSD in Western countries usually consists of professional counseling, such as psychotherapy and medical treatment (U.S. Department of Veterans Affairs; the Danish Health and Medicines Authority, 2010; Paper I). Although medicine has an impact on the core symptoms of PTSD, there are also adverse reactions for the patient. Different types of psychotherapeutic treatment, e.g. cognitive therapy, have shown a certain effect, however the numbers of randomized controlled trial RCT are still lacking (Bisson et al. 2013). A high percentage of soldiers do not receive adequate treatment, and many veterans quit their treatment after just a few counseling sessions (Hoge, 2014). Therefore it seems relevant to look towards additional types of treatment that could deal with the problems described and contribute to an adequate treatment of the target group. In this regard the relationship between human health and nature could be seen as a relevant possibility to examine.

The historical connection between horticultural therapy and PTSD

Historically, there is a connection between soldiers who are mentally wounded in war and the use of green healing. The first systematic use of nature in the shape of horticultural activities was developed in the years during WWI. When soldiers suffering from shell-shock (later referred to as post-traumatic stress disorder) returned in large numbers to the US and the UK after fighting in one of the bloodiest wars ever seen (Geller and Singer, 1998) a corps of volunteers helped set up gardens, greenhouses and gardening programs.

Developing of horticultural therapy as a treatment and into a profession

The benefits of horticultural therapy programs in military hospitals were observed, and in 1918 the US military introduced gardening programs as additional care for veterans with shell shock. The veterans were offered guidance in how to grow vegetables and flowers, and over time, horticultural therapy evolved from merely being seen as passive “eye pastures” (Selhub and Logan, 2012) to including a variety of activities conducted in the garden. These garden activities gradually became an integrated part related to occupational therapy. In 1927 horticultural therapy was

officially listed as a vocation offered within US Veterans Bureau institutions (Selhub and Logan, 2012; AHTA, 2012) and the development of the profession continued. Today, horticultural therapy is both an education and a profession in several countries, e.g. the US, the UK, Canada, and Australia. The Nordic countries have followed suit, and today horticultural therapy receives huge interest from society and policy makers in these countries. This development has driven an interest in developing this area as a scientific research area to learn more about the impact of nature and nature settings, therapy and activities, and today it is possible to take an MSc in Social and Therapeutic Horticulture in the UK.

Developing of a theoretical framework for the relationship between nature and human health

The ideas concerning the specific design of nature to match the healthcare needs of different target groups is described in the work of Marcus and Barnes (1999), Marcus and Sachs (2013). After Roger S. Ulrich's pioneering research into the restorative effect of natural views on surgical patients (Ulrich, 1984), several studies followed focusing on the preventive and curative impact of nature. De Vries and colleagues (2003) found a relationship between access to green space and self-reported health. Cervinka and colleagues (2011) found an association between wellbeing, meaningfulness, vitality, and 'being close to nature'. Groenewegen and colleagues (2012) stress that an understanding of the quantity as well as quality of green space is necessary to understand the mechanisms of the positive impact of the green environments. In addition, in their research Stigsdotter and Grahn (2011) found that certain qualities of nature settings could have a restorative impact; they recognized that individuals' experiences of nature could be categorized into eight different 'dimensions'. The three dimensions named *refuge*, *nature*, and *rich in species* were found to be the most preferred dimensions by individuals afflicted with stress, and therefore nature settings comprising those three dimensions together could be considered the most restorative nature setting. At the opposite end of the spectrum, the dimension *social* was defined as an environment designed for social activities. This dimension could, according to Stigsdotter and Grahn (2011), be interpreted as adding to the individuals' total stress burden.

Activities in nature and activities involving natural elements should also be mentioned in the context of green healing. Using nature for recreation and health stems from a historical foundation where natural daylight, fresh air, and walks in nature have been recommended as a way to recover

from illness (Marcus and Sachs, 2013). Today, primary focus is on activities in green environments aimed at improving physical and mental health, e.g. heart diseases (Mitchell, 2008), dementia (Gonzalez et al., 2009), depression (Gonzalez and Kirkevold, 2014), and schizophrenia, as well as social inclusion (Sempik, 2005; 2014).

This background section reveals both a growing interest in, and a certain scientific emphasis on the diverse way in which nature contributes to human health. Despite this development, detailed knowledge of how the most rewarding treatment can be composed for special target groups is still lacking. There is an historical link between veterans with PTSD and horticultural activities that is interesting to follow up to today. Due to the prospect of an increasing numbers of veterans with PTSD and the shortcomings of existing treatments, more research is needed in this area. This study provides a step further in this direction by examining how veterans experience a nature-based treatment program.

Main research questions

The general aim for this Ph.D. project was to obtain an in-depth knowledge of the impact of nature-based therapy (NBT) on war veterans with PTSD. This was done by examining the following research questions:

- How can the development, status of research and practice concerning nature-based therapy for veterans with PTSD be described? (Paper I)
- How does a group of Danish veterans experience a ten-week NBT in Nacadia in relation to their daily living with PTSD? (Paper II-III)
- How does a group of Danish veterans with PTSD experience nature, nature settings and NBA during and after a ten-week NBT in the forest therapy garden Nacadia? (Paper II and IV)

The four papers will address these questions.

Specific aims of papers I-IV

- I. The aim was to systematically review: the literature; the accessible research and the research evidence level; the health outcomes for the veterans and the transmissibility of the therapy programs and their results for practitioners.
- II. The aim was to compile a book chapter, seen as a descriptive paper, where the background and prerequisites for the Ph.D. project are presented. The nature settings, the NBT and the therapeutic approach to the target group are reported in a style that meets the criteria for the current book.
- III. The aim was to explore how veterans experience NBT in Nacadia during and after a ten-week program with regard to living with PTSD.
- IV. The aim was to obtain a deeper understanding of the veterans' experiences of the nature, the nature settings and the NBA during and after a ten weeks NBT program.

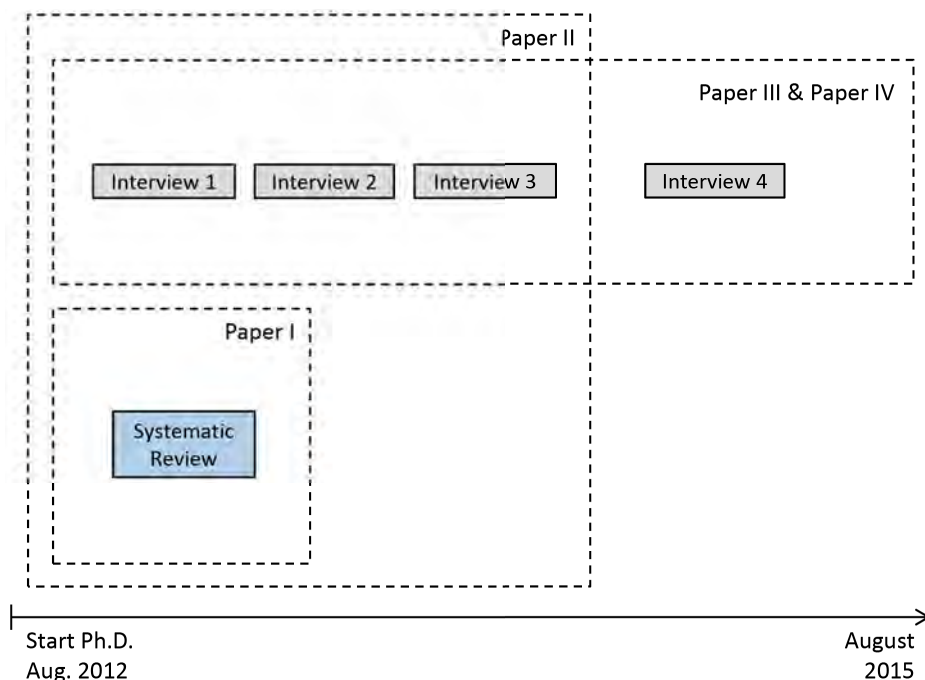


Figure 1 is a model of the process of the Ph.D. Project

The working process of the Ph.D. project

In the month before work on the Ph.D. project was started, it became clear how important it was to gain more knowledge about the target group. Therefore staff members in the military barracks who worked with soldiers coming home from service were contacted for informal talks. Furthermore contact to veteran groups on the Internet was established. This led to a meeting with two veterans diagnosed with PTSD and some very enriching conversations were conducted. Through this preparatory process, the code and language in the military system, and possible reactions to questions posed to the participants became more tangible.

The Ph.D. project started in August 2012, and the three years that have followed have been experienced as a continuous process with appropriate periods for interviewing, analysis and finally the writing phases. During the first month, the general questionnaire for all the interviews was developed and a more detailed part of the first interview was conducted. Then, eight interviews with the veterans were completed. During the ten-week treatment, I participated in two therapy sessions in the therapy garden, to get a deeper insight in the daily program and activities. However, it was important for the staff as well as for me as a researcher conducting this type of study, not to become a part of the therapeutic process or build relationships to the veterans in a way that could influence the treatment or the research process.

During the first year, it was also part of the Ph.D. project to trace back to 'where it all started'. Reading up on the subjects related to veterans and PTSD, I recognized that the soldiers who fought in WWI and subsequently developed shell shock were often offered early types of horticultural therapy. This link between shell shock and horticultural therapy seemed interesting to follow, and it led me to conduct a literature review on the relationship between veterans with PTSD and treatment in, and with, nature (Paper I).

In September 2012, the next interview session was conducted with the veterans, and after 10 weeks the treatment ended with the third round of interviews in November 2012. After this, the analysis process began. This process continued until after the last interviews were conducted November 2013. A total of 27 individual interviews were analyzed following the Interpretative

Phenomenological Analysis process (IPA). Associate Professor, Ph.D., MD, Annette S. Davidsen, who has extensive experience with IPA, assisted me in the analysis.

In December 2013, I was invited to present my current work at three conferences in the US. The first conference, *This Land Is Your Land*, focused on veterans with PTSD and rehabilitation in and with nature. Following the conference, an invitation to contribute to a book aimed at capturing the existing research and expectations for the future for this target group was offered. My contribution was a chapter in a book in which described the NBT and “a day in Nacadia” from the veterans’ perspective. This book chapter was submitted in November 2014 (Paper II).

The next step was to extract the results from the analysis process into several articles. This process resulted in dividing the two clusters of themes; The veterans’ perspective on living with PTSD in their daily lives and their experiences of NBT (Paper III) and the veterans experiences of nature, the nature settings (the Arboretum and Nacadia) and the NBA in relation to dealing with their PTSD symptoms in their daily lives (Paper IV).

List of publications

- I. Poulsen, D.V., Stigsdotter, U.K. & Refshage, A.D. (2015). [Whatever happened to the soldiers? Nature-assisted therapies for veterans diagnosed with post-traumatic stress disorder: A literature review.](#) *Urban Forestry & Urban Greening*, 14(2), 438-445

- II. Poulsen, D.V. & Stigsdotter U.K. (2015) Battles Fought in Nature: Lessons Learned from Nature-Based Treatment in a Forest Therapy Garden for Soldiers with Posttraumatic Stress Disorder, In Dustin D., Bricker K, Negley, S., Brownlee M., Schwab K., Lundberg N. (ed.) *This Land Is Your Land -Toward a Better Understanding of Nature’s Resiliency-Building and Restorative Power for Armed Forces Personnel, Veterans, and their Families.* Sagamore Publishing LLC, USA.

- III. Poulsen, D.V., Stigsdotter, U.K. & Davidsen A. “*That guy, is he really sick at all?*” An Analysis of Veterans’ with PTSD Experiences of Nature-Based Therapy. *Journal of Health Psychology* (Submitted)

- IV. Poulsen, D.V., Stigsdotter, U.K., Djernis D. & Sidenius, U. (Manuscript) “*Everything Just Seems Much More Right in Nature*”: How Veterans with PTSD Experience Nature-Based Activities in a Forest Therapy Garden. *Journal of Health Psychology* (Submitted)

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Theoretical references, concepts and models

This section presents theoretical references, concepts and models that substantiate the current study. The main part of this section focus on descriptions and explanations of relevant phenomena related to the empiric part of the Ph.D. study. It is believed that the theoretical frame for the first part (Paper I), which takes its point of departure in evidence-based medicine, is extensively described in the paper.

The main part of this section is concerned with the theories within the relationship between nature and human; environmental psychology. Environmental psychology is concerned with the environment as a determinant for our behavior and for human scope of meaning (Bell et al., 2001). It aims to study environment-behavior-relationships as a unit, and uses quantitative and qualitative methods as used in other psychological disciplines (Steg et al., 2012). Sociological theories and frameworks seek to describe, explain, and analyze the social world. This involves the individual's experiences and understandings of themselves and their roles in society.

The history of an association between the human use of nature for physical and mental wellbeing can be traced back to the Egyptian gardens and ancient Greeks (Davis, 1998; Marcus and Barnes, 1999) and continues up to this century. In the 1930s there was a decline in the use of nature as of health supporting. As the development of the medical science moved faster, a scientific biomedical approach required scientifically proven evidence based treatment. Though, the dominating theories developed in the 1980's of Kaplan and Kaplan (1989), and Ulrich (1984), regarding of the impact of nature to human health, the research within the environmental psychology gains momentum, and up to now, the interest for this topic is growing and an increasing amount of research are conducted. In the present study, a theoretical foundation contributes to understanding the relationship between human health and the impact of nature, and it especially focuses on the nature setting, the therapeutic process and knowledge of the target group (Stigsdotter et al., 2011).

The Attention Restoration Theory (ART)

This theory is based on the supposition, that humans' have a limited capacity for direct attention to actions demanding high level of awareness, concentration and rational thinking. According to this theory the human mind has two types of attentions: 'directed attention' and 'soft fascination'

(Kaplan, 1995). Directed attention is activated when the individual needs to concentrate and focus on a specific stimulus. When exposed to large amounts of stimuli, the capacity of sorting and selecting between important and unimportant stimuli are very essential. This central inhibition capacity help us keep concentrated and to be able to accommodate events and make efficient decisions. This requires that concurring stimuli, with no immediate relevance are inhibited. This process is demanding for the human system because of its intentional character and our directed attention is used. Therefore, the inhibitory system can be overloaded and become fatigued if recovery is not offered. This condition might, according to Kaplan (2001) be a result of modern living with complex problems and a constant flow of disturbances. Recovery can be found in environments that are perceived as relaxing. Natural environments are considered as having a distinctive relaxing impact on the inhibitory system while it awakes our spontaneous attention - 'soft fascination' which is considered as effortless (Kaplan, 1995). Environments can be considered as restorative if they provided a certain restorative experience to the individual. The four components that Kaplan (1995) found essential for an environment to be experienced as restorative are:

- Being away: The state of mentally or physically getting away from daily hassles and obligations
- Extent: An environment's capacity of providing scope and the same time coherence to the settings
- Fascination: An environment that stimulates the senses and offers exploration without demanding directed attention
- Compatibility: A perceived match between the individual's informational needs and what the environment provides

The Prospect-Refuge Theory

This theory has an evolutionary perspective, and contributes with an explanation of why certain environments seem to be more attractive and others. Appleton (1975) suggested in his Prospect-refuge theory, that human basic psychological needs seems to be fulfilled in environments that provides possibility for the individual to observe without being seen. Such could be a hilltop or other places with prospect, and a shelter or a cave where to seek refuge. Appleton's theory is used consciously by landscape designers, though, there is a considerable level of support for Appleton's theory it still lacks strong supporting evidence (Dosen and Oswald, 2013).

The Supportive Environment Theory (SET)

Human relationship with nature has developed over the past millennium and that relation is the fundament for the SET model developed in 1991 (Grahn, 1991; Ottoson and Grahn, 1998) and was modified by e.g. Stigsdotter and Grahn (2002). The ‘Scope of Meaning/Scope of Action’ theory is part of the SET theory, and illustrates that if nature should be supportive, it must accommodate the individual’s needs for support several levels of health. The more supportive it can be the higher impact the nature environment can have on human health outcome (Stigsdotter et al., 2011). The need for supportiveness depends of one’s physical capacity, mental capacity, and the context and scope of mind referred to as the ‘scope of meaning’. In the SET it is argued that different life situations might change the scope of meaning, and illness or life crises can change the need for supportive environments. The human ability for self-regulation (Korpela et al., 2001; Pálsdóttir et al., 2014) will facilitate the individual’s ability to find environments that are perceived as supportive at the level needed. The theory argues that two systems are activated when humans communicate with nature: an emotional, non-verbal communication that involves the senses, and a more cognitive, reflective system. The relationship between executive functions and the Scope of Meaning/Scope of Action is illustrated in a pyramid. In the bottom of the figure, the individual’s resources are perceived as low, why nature with low demands and high level of supportive elements are preferred. It is thought that this restorative process of being in these environments will decrease the individual’s resources. This might lead to an ascent in the pyramid levels. At these levels, less supportive nature environments are sought, and the individual is able to be with others and participating in more active mental and physical activities.

How are environments perceived as supportive? In their survey among a broad representative group of the Swedish population, Grahn and Stigsdotter (2010) identified eight different characterized dimensions of green urban spaces. In order of general highest preference, those ‘8 Perceived Sensory Dimensions’ were: Serene, Space, Nature, Rich in Species, Refuge, Culture, Prospect, and Social. Three dimensions were found to have the strongest correlation to highly stressed individuals’ preferences;

- Refuge: The importance of finding shelter in natural environments that provides a feeling of being safe and secure.
- Nature: This value is seen in contrast to ‘non-nature’, and underpins the experience of nature on its own terms as being powerful and important for individuals.

- Rich in species: The importance a wide range of birds, butterflies, flowers that stimulate the senses, and provide a feeling of 'life' in the environments (Stigsdotter and Grahn, 2011).

An amount of literature addresses the relation between the individuals preferences and restorative impact of nature in general e.g. Van den Berg, 2003; 2014 and Staats et al., 2003. The theories have a basic common understanding of the mechanisms and interactions though they differ in others, but looking into the evidence for a restorative impact from nature to human health, an amount of research underpins the connection (Barton and Pretty, 2010; Bowler et al. 2010; Van den Berg et al. 2010; Annerstedt and Währborg, 2011; Annerstedt et al., 2012).

The Model of Human Occupation (MOHO) related and applied into NBA

Horticultural therapy has its origin from occupational therapy (Selhub and Logan, 2012). The model of Human Occupation (MOHO) (Kielhofner, 1997) addresses the motivation for occupation, the routine of occupational behavior, the nature of skilled performance and the influence of environment on occupation. Keilhofner (2002) argues, that volition, habituation, environment and performance capacity are integrated parts of the individual and contribute different but complementary to ones understanding of experiences and doings. Thus, each environment offers potential opportunities, demands and constraints, and human interact with this according to their resources and needs. Keilhofner (2002) argues, that volition, habituation and performance capacity are integrated parts of the individual and contribute different but complementary to ones understanding of experiences and doings. Thus, each environment offers potential opportunities, demands and constraints, and human interact with this according to their resources and needs. Christensen (1999) stresses that identity refers to a composite definition of one self, including roles and relationships, values, self-concept and personal desires and goals. Occupational participation refers to engagement in work, activities of daily living and leisure activities conducted in one's socio-cultural context (Hemphill-Pearson, 2008). Christensen (1999) argues, that participation in occupation helps to create identity, but also, that identity is shaped through relationships with others and through a self-narrative occupational identity is an essential element with regard to the individual's self-satisfaction. The model is frequently used by researchers and horticultural therapists (e.g. Sempik, 2006; 2014; Wagenfeld, 2014; Wise, 2015;) to examine how the impact of social and therapeutic horticulture can contribute with useful understanding of the participant's needs for meaningful occupation; for seeking for an identity and for social interaction.

Everyday life

When a chronic disease strikes an individual this has an effect upon daily living, social relationships, identity and sense of one self. Sociology aims to look upon the individual's experiences of this because the responses to this condition have shown to be shaped and imbued by the social, cultural and ideological context of a person's life story (Nettleton, 1995). From that view, it would be relevant to take in theories of the every-day life perspective. Everyday life is a phrase describing the ways in which people typically act, think, and feel on a daily basis (Jørgensen, 2014). It contains the way people understand them self, others and the world. It involves values, choices and meaningfulness. Theoretically, the science of sociology provides theories for understanding everyday life by attempting to capture life relationships, experiences and practices that might seem straightforward and ordinary, but that imply the ambivalences, the contradictions and possibilities in the individual's interaction with the context and the environments. Seen in this light everyday life can be understood as comprising an outside and an inside life. The outside life is the lived life, which can be described as the organization of daily activities. The inside life is the experienced life where incidents and phenomena, are interpreted and instilled with meaning by the individual. The term 'daily living' is used in healthcare to refer to the individual's daily self-care activities. The term is closely connected to activities of daily living (ADL) in an occupational perspective for describing the individual's ability to perform doings as shopping and personal care (Reed and Sanderson, 1999). In practice, daily living activities can be seen as a part of everyday life, and the two terms are used interchangeably in this study.

The concept of NBT in Nacadia

In this study, NBT is defined as "An intervention initiating a therapeutic process with activities involving natural elements in a specially designed or chosen natural environment, aiming the recovery for a specific patient group". The therapeutic process involved a close insight in the target group and their physically, mentally and socially needs and challenges. The NBT was processed as a group process, though, the needs of the individuals was catered for. While the program developed by Corazon and colleagues (Corazon et al. 2012) was directing the needs of stressed individuals, some changes were conducted in order to encounter the veterans' special preconditions and resources. NBT in this project contained the following elements:

- Nature-based activities
- Mindfulness activities

- Applied mindfulness and individual therapeutic sessions (figure 2).

The individual elements contribute to a whole and they influence each other in a process aiming at strengthening the therapeutic impact.

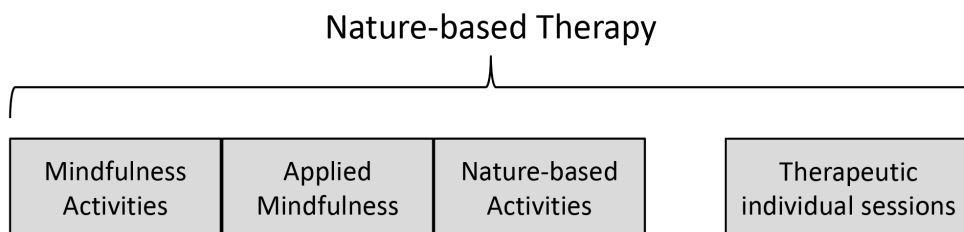


Figure 2. An overview of the NBT and its components; nature-based activities; mindfulness and applied mindfulness; the nature settings (Nacardia and the Arboretum) and individual therapeutic sessions.

Gaining experiences and insights through contact with plants and wildlife in the garden and the Arboretum were used in a concrete as well as in a more symbolical manner. The experience of seeing trees damaged by a storm, or sensing the change of seasons can be treated very concrete, or verbalized in a symbolic way, that bridges a parallel to a participants own life (Corazon 2012). In this study, it was assumed, due to my pre-work of the Ph.D. study, that the veterans was a group that had a strong basis in a concrete being-in-the-world, and it was chased not to initiate the abstract metaphors, but to take care of it, if the veterans needed an issue to be taken up. Though, working with nature, implies a certain degree of unpredictability, which can imply a therapeutic potential; while the rain pours down and changes the plans for today’s activity, it was used as an opportunity for the participants to get insight in their reactions on the world and level of acceptance.

Nature-based activities (NBA)

The veterans and the NBA

The NBA elements in this study were founded in a pre-understanding of the target group. The veterans were considered as a group of men, who had some experiences of living in nature and had some craft skills. They shared a background of military culture and experiences of being in war

zones. In the same time, they were deeply influenced of their PTSD symptoms and had experienced defeats overcoming daily activities. This lead to offering activities with low demands in the beginning of the ten weeks and gradually turn to activities with higher demands or complexity e.g. working together instead of alone or doing projects, lasting for a longer period of time. More physical demanding activities were added to NBA e.g. jogging in the morning and crayfishing. Mindfulness activities were implemented to lower the stress of the nerve system.

Structure of the NBA

The activities were intended to meet the veterans' needs at three levels; 1. They should be meaningful from the veterans' point of view and organized to meet their interests and their mental and physical resources; 2. It should be possible for the participants to create visible and tangible results; like planting and building bird boxes; 3. The activities should strengthen the relation between the individuals in the group. Besides that, it was aimed to bond the relation between the individual and the universal and bring an insight in nature's therapeutic potential. With respect to the participants different (and changing) conditions 'private time' was part of all sessions. Here, the participant individually found a place in Nacadia or the Arboretum, where they could be on their own or, if this was preferred, being with others.



Figure 3. Sitting with the back against a tree was often chosen by the veterans during private time.

The theories of mechanisms in mindfulness

Mindfulness originates from Eastern traditions such as this found in Buddhist psychology (Le et al. 2014) and has received a great deal of attention especially in Western Psychology (Shapiro, et al., 2006; Gu, et al., 2015). Mindfulness is not a protected trademark or treatment, and it is used in many forms. Mindfulness practice has developed into an applied part of treatments of several psychological problems in forms of Mindfulness-based cognitive therapy (MBCT) and Mindfulness-based stress reduction (MBSR), and within the psychotherapeutic area, theories of the mechanisms of mindfulness has been attempted developed. Mindfulness is often defined as the quality of awareness arising through intentional attention to being present in the moment in a non-judgmental and accepting way (Kabat-Zinn, 1994). Gu and colleagues (2015) seek out to find a “causal pathway” between mindfulness interventions and psychological outcomes in their study reviewing meta-analyses concerning how MNCT and MBSR improve mental health and wellbeing. Mindfulness activities are found to be a mediator for initiating processes that influence on the individual’s self-compassion, RNT (repetitive thinking about negative experiences), psychological flexibility, cognitive and emotional reactivity. Hölzel, et al., (2011) add the terms body awareness, fear extinction and change in perspective on the self. The “pathway” ends with the huge amount of evidence showing clinical psychological outcomes on e.g. a variety of mental disabilities as e.g. depression, PTSD, anxiety and psychopathological symptoms. Neurobiological models suggest that mindfulness practice is associated with neuroplastic changes in structure and functioning of part of the brain, e.g. cortex and fronto-limbic network (Hölzel, et al., 2011; Vago and Silbersweig, 2012). It is suggested that the mechanisms work synergistically and thereby establishing a process of enhanced self-regulation. With regard to PTSD, Owens and colleagues (2012) found a link between developing mindfulness skills and lower levels of clinician-related PTSD and depression after treatment. Furthermore Vujanovic and colleagues (2009, 2013) found a significant, negative relationship between post-traumatic stress symptoms and both the “acting with awareness” and “non-judging mental acceptance”.

Mindfulness activities and applied mindfulness

Mindfulness activities were introduced to the participants for targeting their symptoms of anxiety and turmoil and high level of alertness, and to provide a more calming condition in their nerve-system. Furthermore, through practicing mindfulness, it was intended to increase the veterans’ ability to be at a state of slow pace. Many found this difficult. The veterans had few or none

experiences with this type of activities focusing on body-mind relation. The mindfulness activities were inspired of Kabat-Zinns (1995) mindfulness stress reduction program (MBSR). It consisted of sitting or lying activities, where the therapist guided the veterans' attention to the body and respiration. Applied mindfulness was conducted as part of NBA and used in daily activities as a mind setting of being present in the moment and as controlling anxiety through respirations techniques.

The individual therapeutic sessions

The therapeutic sessions were conducted as individual sessions with a psychotherapist or a psychiatrist once a week for one hour. The psychotherapist and the psychiatrist were not part of the staff at the garden. The aim of the conversations in the sessions was to give the participants a possibility to talk about their life situations that might be hard to handle. The therapeutic approach was founded in a psychodynamic method. The sessions took place in the garden or in the Arboretum, and could be conducted when sitting or walking with the aim to establish a sense of coherence for the entire program for the participants. More details about the framework are described in Paper III.

Methods

This section concerns the methodological considerations for the systematic literature review and the empirical part of the Ph.D. study.

Study design for the systematic review (Paper I)

The Cochrane Handbook for Systematic Reviews (Cochrane, 2011) was followed in the process of designing a search strategy. The search was carried out in several steps. First the search terms were defined. Due to the three foci for the search; the target group, the disease and the treatment, many MeSH terms were included. The fact that different terms are used in different countries also expanded the numbers of terms. The literature was also scanned for annotated bibliographies, reference checking and consultation of experts. The databases used in the search procedure, the search terms, and the combinations of search terms are listed in Paper I.

Relevant databases were searched electronically, but due to the small numbers of studies found, it was decided to enlarge the search to include books and projects published in non-scientific form. According to *The Cochrane Handbook for Systematic Reviews*, gray literature is literature that is not formally published in sources as books or journal articles. It is also stated, that unpublished literature may be of lower methodological quality than published studies, and this should be taken into account when the strengths of the review are assessed. Some of the studies had a qualitative design, which meets the lowest level in the Cochrane evidence hierarchy (Cochrane, 2011). Due to the low numbers of randomized controlled studies (RCTs), and because of the need to get an insight into the studies and projects that have been conducted, it seemed important to use this gray literature as well. Two instruments were used to incorporate this; the CASP-guide (Critical Appraisal Skills Program, UK) to access an overview of the general quality of the study, and the ‘Evidence-for-practice-in-qualitative-research’ was used (Daly et al., 2007) to get an indication of the use of the study in practice. The selected literature was carefully scrutinized and relevant information was extracted. Due to the different types of literature, the results are primarily presented in text form, but a more detailed presentation can be found in the appendix.

Study design for the qualitative empirical study (Paper II, III, and IV)

The design of the qualitative empirical study was inspired by the single case design which can be defined as: “*An empirical inquiry about a contemporary phenomenon (e.g., a “case”), set within its real-world context*” (Yin, 2009, p.18). In this study, the ‘case’ is the participants, the context is Nacardia, and the phenomenon is the veterans’ experience of NBT. For this study, the qualitative interviews with the participants constitute the data sources, and data analysis was conducted using the Interpretative Phenomenological Analysis method (IPA).

The researcher’s position

My position as a researcher in scoping the individual’s perspective and the phenomenological ontology is a relevant position in respect to my aim to describe human beings in the world and describe phenomena through the sensed and lived experience (Rendtorff, 2004). Phenomenology can be seen as both a philosophical approach for studying experiences and a method built up by several phenomenological philosophers e.g. Husserl (Welton, 1999), Heidegger and Merleau-Ponty (Gallagher and Zahavi, 2008). In this study, qualitative in-depth interviews were chosen due to the interactive process between researcher and participant. The interview guides were developed for

each interview (can be found in Appendix) with an intention to have an open dialog in which issues could be followed as they appeared.

The environments; the forest therapy garden Nacadia and the Hoersholm Arboretum

The Nacadia forest therapy garden is a constructed in a 1.5-hectare area situated inside the forest-like Arboretum located in Hoersholm, 30 kilometers from the city of Copenhagen. The Arboretum covers almost 40 hectares (99 acres). Nacadia is an enclosed area with differently designed natural spaces in which stays in nature, activities and therapy sessions can take place. The design of Nacadia and the NBT concept were developed by an interdisciplinary group at the University of Copenhagen, led by Professor and landscape architect Ulrika Stigsdotter. Health design is concerned with planning nature settings or gardens for the improvement or maintenance of people's health. According to Stigsdotter (2014) it relies on three elements; landscape architectural skills and experience; knowledge of existing research in the field, and understanding of the specific target group's needs. NBT is closely connected to the design. Here, a certain setting, specially designed or chosen, in combination with special activities, are applied to meet the needs of the target group.



Figure 4. The veterans were in Nacadia in September to November and they experienced the changes of the season as fascinating

Participants

Sampling

Inclusion criteria were veterans diagnosed with PTSD or with symptoms compatible with PTSD. Exclusion criteria were psychotic conditions, known abuse of alcohol or drugs, personality disorders and suicide risk.

The participants were recruited voluntarily from adverts in newspapers and websites for veterans and by means of the Danish Military Rehabilitation Unit. All the veterans who applied for participation were assessed by a team of psychologists and psychiatrists from the Danish Military Rehabilitation Unit, staff from the therapy garden and the Stress Center Kalmia.

Characteristics of the participants

Eight male veterans, age ranging between 26 and 47 years, were included in the project. They had served in war zones for one to four periods in the Balkans, Iraq and Afghanistan. Onset of symptoms ranged between a few months and more than three years after homecoming. Seven of the included veterans had received medical care for PTSD symptoms such as anxiety, anger, and sleeplessness. Drugs (not prescribed by physicians) formed part of the self-medication for four of the participants. Three participants from the group were working part time at the military barracks. The remaining five were on sick leave. Most of the veterans received medical treatment in advance and they continued this treatment during the ten weeks' NBT.

During the intervention following interruptions occurred: One of the participants developed psychotic symptoms, and was excluded from the study after four weeks. One participant attended only part-time in the last two weeks due to start of an education program. In the fourth interview conducted one year after the NBT had ended, just five veterans participated.

Data collection

Individual, in-depth interviews

The individual's experience of having a chronic disease, and the influence of this on the many facets of life, are emphasized when everyday life is studied. A person's life story can be seen as mirroring the individual's experience how much he or she has been able to influence their own life.

In this study, qualitative in-depth interviews were chosen due to the interactive process between researcher and participant. The aim was to capture experiences, detailed descriptions and narratives from participants' lived life in the context it takes place, as recommended by Giorgi and Giorgi (2003).

Interview guides

Interview guides were created to explore the veterans' experiences of nature and the nature-based activities in relation to living with PTSD. The interview guides were thematically structured with open-ended questions applying the principles of Kvale and Brinkmann (2009) and Kruse (2003). Four semi-structured open-ended interviews were conducted with each participant; at baseline; after 5 weeks NBT, after 10 weeks of NBT and finally one year after the treatment. The participants used a logbook for reflections during the NBT (they brought this logbook to the interviews to help their memory (elaborated in the text below) and experiences in the period from one interview to another, but the logbook was not directly available for the researcher to read. The interviews were carried out between August 2012 and November 2013 (figure 5). Interview-guides can be found in the Appendices.

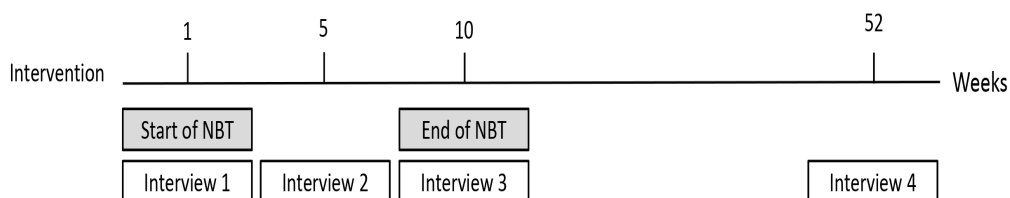


Figure 5. Flowchart of the study design

Settings for the interviews

The first interview took place at the participant's home, in the military barrack or at the interviewer's office. It was important to provide a setting they could feel safe in; e.g. it was essential for the participants to have a seat with their back against the wall and with a view to the door and window. The second interview was planned as a walk in the Arboretum led by the participants to present locations with a special meaning to them. The third interview took place in the garden on a location chosen by the participants; the greenhouse, the bonfire or in a cottage. The fourth interview took place at the veteran's home or in the interviewer's office. All interviews were transcribed verbatim. Total number of interviews was 27.

The analysis process

The procedure described below was carried for all of the interviews. The analysis process was conducted by using the IPA method. IPA was chosen as a relevant method for the research questions and the study design; the method has its foundations in three major theoretical approaches; the phenomenological, the hermeneutic and the ideographical. The phenomenological approach examines the participants' 'lifeworld'; that is their experience of a particular phenomenon. The idiographic part of IPA is concerned with the distinct experience of particular people and the particular context in which those experiences occur (Smith et al. 2009). The person is seen as sense-making in a cognitive, linguistic, affective and physical being and it is assumed to have a connection between people's talk and their thinking and emotional state. With my background as a physiotherapist and my understanding of the individual as a complex whole, this approach was important to my understanding of the participants. As the meaning is constructed through the person's experience, it can be said to represent the experience itself (Smith et al. 2009). IPA involves a double-hermeneutic approach (Smith and Osborn, 2003) where the researcher is making sense of the participant, who is making sense of an experience. The aim is not only to observe and interpret what is said, but also notice how it is said, as well as the body language and facial expressions so as to interpret the full meaning for the participant. Thereby, the researcher observes the person behind the façade. This process demands a dynamic, active role for the researcher, and this was needed for this group of veterans; their words did not always come easy because of their general condition.

The analysis was carried out by the procedure described of Smith et al. (2009). However, it should be noted that the authors describe the strategies for the analysis as having "considerable room for maneuver" (Larkin and Thompson, 2012, p. 106) and they encourage researchers to be innovative in their approach. Therefore, a transparent description of the procedures is presented below. First, I listened to the interviews several times as a way to experience the atmosphere and accentuation of the words. The interviews were read several times. Hereafter, a complete and detailed set of notes on the data was drawn up; the leading question in this process was: What are they saying, and what are they actually talking about? When identifying connections and patterns between the notes the emergent themes were developed. These were further settled by connecting them to the research questions. This process was conducted for all the interviews and it led to construction of super-

ordinate themes. It was an extensive process, and it was done in close cooperation with an experienced researcher.

Due to the large amount of data, which was recorded over a time period for more than a year, and the construction of the research questions, it seemed reasonable to divide the results of the analysis into two parts with two different foci: the veterans' experience of living with PTSD, before, during and after the therapy (Paper III), and the veterans' experience of the nature setting and MBA during and after the intervention, related to living with PTSD (Paper IV).

Results; summaries of the papers

The findings of this study are presented in the four articles previously mentioned. In this section, it is the intention to give a broad picture of the results and their interdependencies and connection to the research questions in this thesis. It is also intended to establish a foundation for discussion of the results and the theoretical framework.

Paper I

Paper I was conducted as a systematic review of literature and practice relevant in the field of soldiers with PTSD and treatment involving a nature setting and nature-assisted therapy (NAT). This term was used as an umbrella term for different variations of therapy conducted in and with nature described by Annerstedt and Währborg (2011) in their review of available scientific evidence for NAT. Paper I concentrated on the part of NAT used for health purposes for soldiers with PTSD. The aim of the study was to construct an overview of the extent, overall content and quality of research. A rather small number of studies support the appropriateness of this treatment for the target group, and no studies found negative impacts.

The systematic search and selection process revealed 953 publications. An evaluation of abstracts revealed 46 potentially qualified papers. After full analysis of these articles, the final number of articles included was 19. Out of these, three studies were randomized controlled trials (RCT) and non-randomized controlled studies (NCS), and 16 had mixed or solely qualitative study design. The overall results point towards a positive impact of NAT on soldiers with PTSD. There were no studies showing negative effects of the treatment. One study, using mixed methods, found no effect of treatment in the quantitative part, but positive impact of NAT in the qualitative part of the study. The rest of the studies reported positive impact of NAT in the findings. In general, all the studies focused on creating appropriate environments for the veterans to improve their health

conditions. The nature settings varied, from very organized locations (e.g. designed therapy gardens) to more informal wild nature. However, the environments were all selected specifically in relation to the aim of the project and were closely related to the activities that were planned. PTSD has many burdensome symptoms and it has many implications for the affected veterans, and their lives with family, work and activities. This was reflected in the range of measurements used in the 19 studies, spanning from PTSD symptomatology; social functioning and activity level to experiences of archived control, work skills, intimate-couple relationships and drug use. The measurement tools differed correspondingly from standardized questionnaires and scales to open-ended interviews. A detailed presentation of the results can be found in Paper I. The table (1) below gives a brief overview of the most important findings from the reviewed literature.

Environment	Evidence-based designed garden
	Garden or park
	Wilderness;
	-Forest -Sea or lake -Mountains
Organization of study (when specified)	Five days consecutive
	2-3 weeks
	11-14 weeks
	2 months, once a week
	12 months, once a week
Treatment, often additive to medical care, psychiatric support and occupational therapy	Garden activities
	Therapeutic activities
	Farming, hunting, fishing in a therapeutic setting
	Walking trails, and debriefing
	Backpacking and canoeing
	Adventure rehabilitation
	Sea-related activities
Measurement tool, relation to the study category and set up	Surveys
	Standardized questionnaires scales
	Open-ended interviews and informal talks with target group and staff
Outcomes	Significant impact on psychological, intellectual, social and physical factors
	Significant reduction in PTSD-level, depression, and better emotional quality of life
	Stimulates a healing process
	Changes physical reactions (to experienced threats)
	Nature experienced as a safe place

Table 1. The table shows an overview of important issues from Paper I.

Paper II

The paper was conducted during and after a study trip to the University of Utah in Salt Lake City, US. It proceeds from a short historical description of veterans with PTSD to the use of NBT to treat

those veterans. The current situation for soldiers in Denmark is that more than 30,000 personnel served abroad from 1992 to 2012. Out of these, it is estimated, that 5-8 percent developed PTSD in the short or long term. The paper describes a “day in the therapygarden” as it can be in Nacadia. The theoretical framework employed in designing the forest therapy garden and planning for the therapeutic activities is discussed, and preliminary results from the study are presented. As the data analysis was not finished at the time, writing the paper contributed to a reflection process of the structure of the analysis, and this was later utilized in Papers III and IV.

In September 2014, the National Center for Veteran Studies at the University of Utah held a seminar: “This land is your land”. The purpose of the seminar was to bring scientists, practitioners, and other stakeholders together by the proposition that outdoor recreation experiences have therapeutic value for the public in general and for veterans and their families in particular. The seminar led to a publication: *This land is your land -Toward a Better Understanding of Nature’s Resiliency-Building and Restorative Power for Armed Forces Personnel, Veterans, and their Families*. This was driven by a strong need to gather existing research about nature's resiliency-building and restorative power for Armed Forces personnel, veterans, and their families, but also the need to use this understanding in future research and to implement it in practice. Paper II was my contribution to this publication.

Paper III

In Paper III, the IPA revealed four superordinate themes that all reflected the changes the veterans experienced as a consequence of having PTSD reflected into the impact of NBT. The themes are presented in table 2. Note that the themes are related or have an impact on each other.

Superordinate themes
When the body speaks
Relationships, imperative and unbearable
Identity –construction of a self
The future, fears and hopes

Table 2. The table presents the superordinate themes in Paper III

In the following examples of the analysis will be presented. More details can be found in Paper III. ‘When the body speaks’, describes the veterans’ perception and interpretation of the signals they received from their bodies. They described a range of bodily sensations, e.g. chest pains, heart-attack symptoms, but caused by anxiety. A feeling of turmoil and being in a condition of constant alert, as well as many years with disturbed sleep, were also mentioned as a strain. For the veterans, changes occurred at different paces during and after NBT, but by the end of the intervention, most of the veterans experienced better sleep and ability to get their body to relax. Anxiety was no longer present to the same extent as before the NBT.

‘Relationships, imperative and unbearable’ was brought up in the interviews addressing two different groups of people; comrades within the military and secondly family and friends. The veterans experienced a strong bonding with comrades in the military developed during service. Being outside this fellowship due to PTSD and sick leave was seen as a huge contrast, and it was reinforced by a feeling of being perceived as a ‘cheater’ by others within the military. The relationship with other participants in the project was emphasized by everyone as important; they all told about a “shared understanding”, ”talking the same language” and “having had the same experiences during service”. Relationships to family were experienced as both imperative and unbearable; also it was “the most important” but also led to conflicts triggered by what the participants experienced as a lack of interest and understanding from their relatives. The veterans also recognized the difficult connections as a result of anger and aggression stemming from PTSD.

Nearness and skin contact were often perceived as uncomfortable, and led to a feeling of being estranged from one's own body, from wife and children and from the world.

The theme "Identity – construction of a self" was derived from the veterans' experience of having lost something as a consequence of suffering of PTSD. It was related to their identity; the sense of belonging into the military system was expressed as a huge part of their identity and it was hard to let go of. One expressed it as "no longer being a master in one's house". Through the NBT and in the time afterwards, some veterans expressed the coherence between a strong identity and being respected by others. For those who were able to start work or education, this was expressed as important; "I've got my professional pride back".

'The future, fears and hopes' emerged as a theme that was experienced as difficult because hopes of a new treatment and a better life were often broken. There was anxiety about the future and for the risk of becoming "a weirdo walking the streets". They expressed the need for "an instrument" to help them gain control of themselves. After the treatment, viewing the future in another time-perspective was mentioned; "Things must come as they are, the more I hurry, the more I stress myself". During the ten weeks of NBT, the veterans experienced becoming more accepting towards themselves, their situation and their relatives. Tools (e.g. breathing techniques) acquired from the NBA helped them deal with difficult situations and gain more control.

Paper IV

Paper IV focuses on the veterans' experiences of the nature settings and the NBA in relation to their condition and living with PTSD. Very specific descriptions of the veterans' perceptions of nature and NBT and their reflections on the perceived impact formed the foundation for the analysis process. The interpretative phenomenological analysis revealed three superordinate themes, with seven subthemes that can be seen in table 3.

SUPERORDINATE THEMES	SUBTHEMES			
Taking nature in	Finding the places that feels right	Sensing the nature	Nature seems inclusive	
NBA as an initiator to a therapeutic process	Meaningfulness by doing things in and with nature	The therapeutic settings of NBA	Knowledge increases fascination about nature	Getting things done by oneself
Nature as a part of a life with PTSD	Transferability of features from the therapy-garden to one's own environment			

Table 3. The table shows an overview of the superordinate themes and related subthemes

The first superordinate theme; ‘taking nature in’ focused on the veterans’ experience of nature during the NBT. They expressed how they were able to find places that met their needs at different stages. In the beginning, some veterans preferred sheltered places where they could feel safe and secure. One veteran stayed in the greenhouse and described how he felt safer inside where he could hear the other veterans nearby. After some weeks, the bonfire or locations near public places or in company with others were chosen. When sitting in nature, they felt able to be present in the moment and take in nature; one said about the trees; “The big ones, they move, no big movements, but a predictable rhythm to follow. And trust. And your brain doesn’t have to use energy to analyze it.”

The second theme was ‘NBA as an initiator to a therapeutic process’, and it had several components. One was the veterans’ experience of the NBA. They emphasized the variability in the activities; the possibility to rest in a hammock or tend the fire was used of some who had a lack of energy. For others, a specific task was preferred. One expressed the sense of wood chopping: “It is kind of zen-like ... you have to be focused to get the precision in the chop and find the exact force in the motion”. When a small task was completed in the garden, it brought a feeling of success, and some told how it helped them get things done at home.

One year after the intervention ended, the veterans expressed how nature had become an important part of their lives with PTSD (superordinate theme three); one described how being at the sea helped him solve private problems. Another felt he could work with his lack of bodily control by performing mindfulness on a daily basis. They experienced positive changes due to starting work or

education; an improved relationship with their family. The veterans also experienced that their PTSD was less burdensome, e.g. because they had tools to help them cope with difficult situations. Paper IV concluded that the veterans found their own way of using nature and NBA after the intervention, and this was seen as an indicator of the positive impact of NBA for veterans with PTSD.



Figure 6. Lighting the fire was the first thing the veterans did, when arriving at Nacadia in the morning

Discussion

Based on the findings in Papers I-IV, I will discuss the results in relation to the research questions and the theoretical framework. Findings, including identified patterns and unexpected findings, will be deliberated. The methodical decisions will be thoroughly discussed as well and the implications of this research for practice and further research will be given.

How can the development, status of research and practice concerning nature-based therapy for veterans with PTSD be described? (Paper I)

One of the aims of this thesis has been to describe the development and status of practice and research concerning nature-assisted therapy for veterans with PTSD. The main results of this review

are in line with the results of a review conducted by Annerstedt and Währborg (2011), in which the evidence for nature-assisted therapy in relation to human health (including studies dealing with veterans with PTSD) was evaluated. Annerstedt and Währborg's research points towards a positive impact of involving nature in the treatment of veterans with PTSD, even though the number of included studies dealing with this group was low. Nevertheless, in the present review, a large number of projects that take a qualitative approach to improving the life conditions for veterans with PTSD by using nature in the therapy were identified. Often, these projects were conducted by volunteers and non-profit organizations, and the scientific methods used were not always described in detail. This highlights the necessity for more scientific studies within this field; practitioners need clear recommendations for treatment, and policy makers require clear evidence before they initiate projects funded by the public sector. To achieve this knowledge, it is needed to know what questions to ask and what parameters to measure with regard to capturing the impact of nature and its use therapeutically and systematically. Exploring the multiple impacts of nature is one step in the right direction. However, assessing how veterans experience different types of therapies and nature settings, including designed gardens, also seems important. The studies included in the review show that many forms of nature-assisted therapeutic activities ranging from sailing to therapeutic horticulture seem to have an impact on e.g. the veterans' quality of life and degree of PTSD symptoms. It was not possible to emphasize one type of nature as having more impact on veterans' PTSD symptoms than another, and the nature-assisted therapy was generally evaluated positively of the veterans. However, it seems there is a need for more detailed knowledge about the benefits of nature-assisted therapy. Moreover, the studies reviewed also indicated that the connection between the type of nature-assisted therapy offered and the cultural context in a specific location could be significant. For example, wilderness leisure activities might be more a common recreational activity in the US than in Denmark, where walking in a nearby forest or park is widely used. Horticultural activities used for recreational purposes have a long tradition in the UK that might be different from Israel. More knowledge in this area could add to our understanding of the positive impacts of the many types of nature-assisted therapy found in this review. To sum up, there is a need for more knowledge about the mechanisms involved in the process that take place between the target group, the nature settings, and the nature-assisted therapy, and this knowledge must be used to establish randomized clinical studies. This Ph.D. study can be seen as a contribution to this mission.

How does a group of Danish veterans experience a ten-week NBT in Nacadia in relation to their daily living with PTSD? And

How does a group of Danish veterans with PTSD experience nature, nature settings and NBA during and after a ten-week NBT in the forest therapy garden Nacadia? (Paper II, III, IV)

The two research questions targeting the veterans' experiences of NBT in relation to their PTSD symptoms and their experiences of nature and NBA have led to several results, some of which will be emphasized and discussed in the following.

The bodily symptoms and the use of mindfulness

The veterans reported experiencing different bodily symptoms due to their PTSD; the symptoms they describe are in line with the literature (e.g. Hoge et al., 2007; Pacella et al., 2014) and common reported complaints by veterans suffering from PTSD. PTSD is a condition where the onset of the condition and the treatment can be seen from a neurophysiological, a psychological, and a sociological perspective, because they all contribute to the individual's condition. There is a shared understanding that the different components are implicit in the understanding of the complexity of PTSD (Ruden, 2008; Bosco et al., 2013). In the single-case study, the focus is on how the symptoms from PTSD are experienced by the veterans and the meaning and consequences PTSD may have on their lived lives. Merleau-Ponty's philosophy offers an interesting perspective on this issue. He states (Merleau-Ponty, 1945) that we are embodied subjects, and we perceive the world through our bodies. Only our body appears to us from the inside, but it can also, as other bodies appears to us from the outside; the *touchant-touché element*. Pains, turmoil and anxiety are perceived from the inside and can change our perception of the world we are in. When the sensations from inside are invisible to others, it might lead to, what the veterans described as 'being seen as a cheat' by the surrounding world (Paper III). It can be assumed that a symptom such as alertness may affect the participants' perception of the world, where sounds, lights, and fast movements increase their alertness (in a very bodily way, e.g. increased heart rate). Conversely, restorative environments are perceived as calming and as having a direct impact on the body. According to Duesund (2001) a change of our body leads to a change of our perception of the world. Most of the time, the focus of our attention is directed out to the world and the consideration of the body exists only in the back of our mind. A change of the individuals' physical (and mental) condition brings focus on the body and away from the world. In line with this, the bodily symptoms

experienced of the veterans draw their full attention and affect their relationships, their way of thinking about the future and their perception and understanding of their identity (superordinate themes in Paper III). This might also offer a key to understanding how mindfulness might constitute a valuable contribution to the restorative process. One could ask why not let the nature ‘do the job’ through its restorative impact? Looking at the results presented in the review (Paper I) where the target group and the diagnosis match this study whereas different types of nature-assisted therapy were described, we see that several of the included studies have an additive therapeutic effort to e.g. medical care (Duvall and Kaplan, 2014). Moreover, one could argue that the importance of being confident with one’s bodily reactions and the ability to be present in one’s body is necessary in order to be able to embrace the restorative impact of nature. The most recent literature on the impact of mindfulness on veterans with PTSD (no nature-element included) reports positive findings: Kearney (2012) and Bergen-Cico (2014) found clinically significant improvements in PTSD symptoms and lower levels in cortisol. Serpa (2014) found, that MBSR reduced anxiety and depression and improved mental health functioning. Mindfulness is defined by Kabat-Zinn (1994, p. 4) as a way of: "paying attention on purpose, in the present moment, and nonjudgmentally, to the unfolding of experience moment to moment". Being mindful is characterized by the ability to consciously observe current experiences without judging and evaluating them. Kaplan (2001) addresses mindfulness in his work when dealing with the use of meditation as a beneficial element with regard to supporting processes in which soft fascination might be involved. He states that mindfulness cannot be done without practice, which may in itself be demanding. Despite this, Kaplan hypothesizes that individuals experienced in meditation will be able to experience more recovery of their directed attention capacity than individuals with no training in this area. He concludes that what not is “taken into the mind” (p. 498) from nature is unlikely to influence one. He suggests that a synthesis of the ways of thinking might be promising. Moreover, it must be noted that, in addition to using mindfulness activities as guided meditation, that the NBT studied in this current Ph.D. project also used implied mindfulness as part of the NBA to support the veterans in transferring the mindfully attitude into the NBA and into their everyday lives.

Veterans with PTSD: Are they different from other vulnerable groups?

Studies from the Swedish University of Agricultural Sciences on individuals on sick leave due to stress disorders also point to a beneficial impact of nature-assisted therapy (Pálsdóttir et al., 2014; Währborg, 2014). It can be discussed whether the target group (the veterans) in this Ph.D. study experiences the nature in a slightly different way. Pálsdóttir and colleagues (2014) reveals that the

participants needed time to establish alliance and permissiveness in the first phase of the treatment, the so-called ‘prelude phase’. In the present study, the participants expressed no need for particular habituation or adaption. However, they did express a need for seeking out places, where they could feel safe and secure (discussed in next section). This need did not seem to be related to a certain period, but more to their general condition and daily fluctuations. This might indicate that veterans, as a target group, differ from other groups suffering from other mental illnesses. Due to their military background they might already have experienced and gained knowledge about nature and being in nature; nature is a natural location for them. Moreover, in light of their earlier experiences with nature, e.g. lighting a fire, finding water, one might argue that therapies involving NBA could have a special positive impact on the recovery of this group. This is supported by the results of traditional American wilderness therapy. For example, Harper and colleagues (2014) point at the 40 years of experiences of utilizing wilderness-based adventure courses for veterans struggling with operational stress injuries and transition issues. These results are confirmed by others, e.g. Ewert, (2014), Duvall and Kaplan (2014). Finally, it can be argued that it may be a good starting point for NBT to address the soldiers' previous knowledge and experience of nature as a resource in the treatment.

Veterans and the nature setting

A central theme in this Ph.D. study is the relationship between the participants and nature (Paper IV). The participants emphasized the experience of finding places that met their needs in the current situation. Some searched for locations in the therapy garden where they could hide and be sheltered from others. Appleton's (1975) prospect-refuge theory suggests an interpretation for understanding this finding. The work of Van der Kolk et al. (2007; 2012) on traumatized individuals' need for protected places supports the prospect-refuge theory. Korpela (2001) finds that individuals' favorite places are related to their experiences of a restorative impact and emotional self-regulation. He also mentions the dimension of ‘privacy’ as a possible restoring factor. When the veterans found the right place for them, nature was experienced as being restorative for several reasons. The ART theory (Kaplan and Kaplan, 1989) with its four characteristics of restorative elements in the environment can be used to elaborate this finding. The three elements (being away, fascination, and extent) are recognized in the veterans' experiences. Being away relates to those of the veterans who preferred locations that were far away from disturbing factors. The veterans experienced nature as fascinating in several ways. When they were in Nacadia, they heard birds singing, and certain plants captured their attention in a non-demanding way. To be fascinated by nature seemed to break

through the relatively encapsulated physical and mental position they were in due to their PTSD. Due to the design of Nacadia, several spaces could be chosen, and this might have contributed to the participants' feeling of extent. Furthermore, the garden could be seen as being 'semi-permeable'; it was closed to others who could be seen as intruders, but open to the veterans, who could choose to use the Arboretum as well.

Over time, the needs of the veterans seemed to change. They went from wanting to be alone and preferring locations that were away from others, to preferring locations with a view or that were closer to the veteran group, and finally to seeking out areas open to the public. The need for being in an environment that matches one's mental and physical condition can be found in the concept of compatibility in ART (Kaplan, 1995). Here the experience of fitting into the nature setting or being supported is seen as a valuable restorative element. The SET (Stigsdotter and Grahn, 2002) can be seen as supporting this finding. As illustrated in the pyramid model of SET, the lower parts of the pyramid represent states where the individual has low capacity for executive functions and requires supportive environments and inner involvement. In the present study, some of the veterans had a high level of activity, and they felt uncomfortable keeping their body at rest or being alone focusing on an inner process; they needed to be active before the body could relax. This was done by performing physical activities and by using mindfulness activities. This pattern of reactions does not seem to be illustrated in the SET model. Instead, the reactions observed in the present study could be seen as a process of being aware of, understand and react on bodily symptoms combined through mindfulness activities and applied mindfulness. This process enables the individual to take in nature when being in nature and participate in the NBA, which, in a longer perspective can lead to managing daily living. This correlation can be illustrated graphically (figure 7). It cannot be seen as a goal in itself to achieve either full attention to nature *without* having bodily awareness (x-axis) or a high level of bodily and mental control (y-axis) without impact from nature. Mindfulness activities and applied mindfulness in combination with NBA could be seen as being beneficial for the veterans in the managing of their daily life with PTSD.

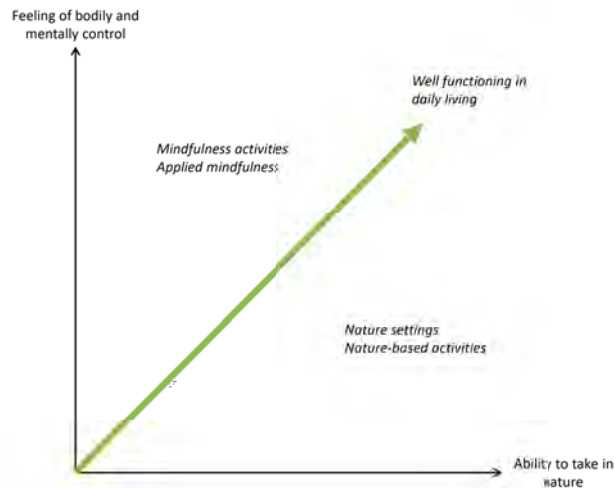


Figure 7. The figure illustrates a connection between the awareness of the body, and the ability to take in nature.

The NBA

It was found that the veterans experienced the NBA as being motivational and having a positive impact on their conditions. Therefore, it is reasonable to discuss the content, the organization, and the pedagogical-psychological approach of the NBA. The NBA comprised a broad range of activities. They aimed to offer activities that could be done alone, two by two, with the staff or in groups, which required the group to work together. Also, the variation in duration and grade of complexity in activities were considered. This argue for, the veterans experienced the NBA as motivational and easy to participate in; regardless of what their condition was, they were given the possibility of getting a positive experience. Though, the participants' very different approach to some of the NBA, e.g. wood chopping, was an unexpected finding (the example is described in detail in Paper I). One participant felt stressed just by looking at the wood stack that reminded him of the things he could not get done at home, while another veteran described the activity as bringing him into a 'zen' state of mind. This example emphasizes how the life experiences, the role of social factors and individual preferences have on the veterans' attitude to e.g. activities. It stresses the meaning of embracing the daily lives of the participants when planning NBA.

NBA as a life-changing process

The participants described how they felt they had lost some of their identity when they could not perform their jobs as soldiers, and how their ability to overcome every day activities (e.g.

housework, leisure activities and socializing) decreased. When young soldiers join the military system, they build an identity as a soldier, and a strong bond to the military system is established (Erikson, 1968; Giddens, 1991). Building this new 'foundation' is described as being very challenging by veterans (Paper II and III). Part of this process seemed to be initiated through the NBA. The importance of occupation is described by Kielhofner (2002), who stresses the importance of activities that are adjusted to suit the participant's needs. In the present study, the occupation is the NBA, which contributed to the veterans finding a role and, quite possibly, a new identity (Paper III). When activities (not only tasks, but also leisure activities) that were pleasant or challenging in a joyful way before the onset of the PTSD symptoms, suddenly cannot be performed due to e.g. lack of concentration or inner turmoil, this is found to affect the self-esteem of the individual and to lower the motivation to begin activities (Mittal et al. 2006; Marmar, 2015).

The changes that appeared during the ten-week NBT can be discussed using Bandura's 'self-efficacy' theory (Bandura, 1994). Self-efficacy expresses an individual's belief in his or her ability to succeed in a particular situation. It is developed from early childhood, and is an important determinant of how people think, behave, and feel (Bandura, 1994), and therefore it plays a major role in how goals, tasks, and challenges are approached. Self-efficacy is found to have impact on a broad spectrum of psychological, behavioral, and life-changing processes. The participants' experiences of a decreased ability to perform certain activities could be thought to have an impact on their self-efficacy and contribute to a vicious cycle where more and more activities are abandoned. When NBA was offered with respect to the participants' own perceptions of their ability, and adjusted to their individual level, it became possible for the participants to get an experience of success. How can the 'self-efficacy' term be used as a psychological-pedagogical strategy? Bandura (1994) stresses four strategies for increasing self-efficacy: 'past performance'; 'vicarious experience'; 'verbal persuasion'; and 'emotional cues'. These elements can be found in the NBA due to the content, the organization, and the pedagogical-psychological approach: the veterans had a special knowledge about, and military experiences with, nature and nature activities; being in a group where the individuals shared the same military background and suffered from the same symptoms gave an opportunity for vicarious experiences; seeing comrades improve their condition brought hope for oneself. The foundation for verbal persuasion might be created in the group and with the staff, e.g. through activities with an element of play or joy. The participants' reported how they started taking small initiatives in the therapy garden and experienced how daily

activities became easier to conduct. This was experienced as satisfying in a mental (joyful) and bodily way (natural tiredness). Also, coping tools were used successfully in stressed situations and this contributed to positive experiences. It is nearby to assume that the NBA raised the participants' level of self-efficacy and thereby contributed to a changing process that led to a more positive perception of living with PTSD.

The data collection was completed one year after the veterans had ended the NBT. At that time, it could be argued that the impact of the NBT should have manifested itself in the veterans' lives. Even though many happenings can impact one's experiences of life, e.g. divorce or having a child can change one's scope for better or for worse, it was interesting to see that every veteran had found his own way of dealing with life situations. They had all implemented nature elements in a broad way (detailed described in Paper IV) that matched their different needs; for some nature was used as a place for reflection, for others it was a place to perform mindfulness activities, or a place to live in, whilst for others it was a place to share with other veterans.

Discussion of methods

Obtaining and analyzing the data

Paper I

A strategy for conducting systematic qualitative reviews described in *The Cochrane Handbook for Systematic Reviews of Interventions* was followed when possible with the aim of conducting a stringent review. Finding and selecting appropriate literature so as to answer the research questions as precisely as possible proved to be challenging for several reasons. Following research over time link was interesting however due to the need of the today-picture sources with more historical approach were used as a part of the background for understanding the development of the field. Another challenge was the wide dispersion of terms used for the tree elements; target group, treatment, and disease. The use of many terms resulted in a large numbers of 'hits' in the search history that had to be rejected later on due the irrelevant context in which the word was included. It was decided to include grey literature because of the lack of relevant randomized clinical trials and the relatively few qualitative studies. This decision may have affected the strength of the study

(Booth et al., 2011; Mahood, et al., 2014). To address this potential weakness, the *CASP Guide* (Oxford Public Health Resource Unit, 2006) and the *Evidence-for-practice in qualitative research* (Daly et al., 2007) were used to access qualitative reports and grey literature. This approach can be seen as beneficial when exploring a new research field (Booth et al., 2011), and for me as a researcher, it added a broader perspective and a pre-understanding to the empirical part of this Ph.D. study. It drew my attention to the fact that an important part of a researcher's responsibility is to provide clear and understandable guidelines to stakeholders and decision makers.

Paper II, III and IV

Qualitative studies are useful when questions like *why* and *how* are asked because of the qualitative method's ability to capture everyday attitudes and patterns of behavior in a psychological, socio-cultural setting. By asking questions about the participants' experiences and their views of the changes that occur in their life at times of personal life transitions, the researcher has the possibility to generate knowledge about 'lived through experience' (Henwood and Lang, 2003). In the single-case study, the focus was on the veterans' experiences of NBT during a ten-week program and a one-year follow up, and the use of qualitative methods for collecting data seems to be appropriate.

The sampling procedure

The sampling of participants was conducted by a psychologist in the military and by staff from Nacadia. The inclusion and exclusion criteria were clear, but due to the relatively little group of applicants, it might be considered as a convenience sampling. In this case, the group of participants was composed so it was possible to assume that more facets and perspectives related to the phenomenon, that is studied could be obtained. The phenomenon is the veteran's experiences of NBT in relation to living with PTSD. Sargeant (2012) and Smith et al. (2009) recommend using purposive sampling when working with a group for whom the research question will be significant in an IPA study because of the idiographic approach. In the current study, the similarity between the group members is their shared background as veterans with PTSD. The variation between the individuals that accommodate a broad perspective on the phenomenon might be found in their different ages and their participation in different wars. Also diversity in family background was seen. Finally, the fact that only male participants were represented in the study must be taken into account. Female veterans might have had other experiences of the NBT, or they may have contributed to the therapeutic process in a different way.

Carrying out the interviews

Interviews can be conducted using different approaches that reflect the research questions. A more pure phenomenological approach with a completely neutral interviewer might have resulted in slightly different answers from the participants. I initially planned to conduct the interviews, but during the very first interviews, I had to reassess this decision. Firstly, the veterans gave very short answers and it was difficult to coax them to elaborate on their short responses. I understood this as being a consequence of their PTSD. Secondly, the latency time from the time the question was asked until the answer was given was prolonged, which might have been caused by adverse reaction of the medication or the occasional use of cannabis. I experienced that a more dialog-based form of interview had a positive influence on atmosphere and inspired more reflection from the veterans. In the IPA approach, the interviewer has an active role in the interview (Smith et al., 2009), and therefore it seemed as a suitable approach for the interviews. During the period of data collection I had some reflections on my role. I became confronted with my previous work as a physiotherapist and my experiences with interviewing people with chronic disabilities or pain. When listening to the first interviews I had conducted with the veterans, I became aware of a tendency of shifting my role from being a researcher to being a therapist when difficult subjects were brought up. This may have resulted in me avoiding certain issues or questions because of a wish to protect the participants. On the other hand, my experiences as a therapist may also have contributed positively to the participants' inclination to share their thoughts with a person who showed an interest in their condition and who wished to understand them.

The use of supplemental methods

Other methods could have contributed to answering the research questions, for example observation might have elaborated knowledge about the level of the participants' interaction and physical and mentally participating in NBA (Reeves et al., 2008). On the other hand, observation of the veterans could have been seen as disturbing, especially in the part of the therapy when they were alone in nature. Early in the process of planning the study, it was recognized by the staff and the researchers that physiological measuring equipment was not ethically acceptable due to the wires and electrodes, as they might have had a negative influence on the participants' conditions. So even though this kind of equipment could have added information about physical changes in the level of PTSD and added a new perspective on the veterans' experiences, it was decided not to use this equipment. However, as the technical equipment for obtaining this kind of data is developing very fast and can be used without disturbing the participants, it might be relevant to consider in future

research. The logbook was introduced to the veterans as a personal tool for make notes or drawings. The participants were asked to bring their logbook with them to the interviews to support their memories. They made great use of the logbook, and in hindsight, it would have been valuable to the research process to gain insight into this material. However, this was not possible as it was introduced as a personal tool for private use only.

The analysis process

The analytical process was conducted as suggested by Smith et al. (2008), and due to the hermeneutic influence on the process, a reflective attitude was attempted to be implemented in each of the steps. The method, though, is criticized for being advocating for a clear, auditable, systematic process (Smith et al., 2009), whereas Giorgi (1995) has a more descriptive approach (Pringle et al., 2011; Qu and Dumay, 2011). My years of experience working as a physiotherapist aiming to understand the patients' needs in the context of their lives helped me with regard to analyzing the interviews, to move from the factual into the essence and finally reach some points of the existential matter.

Reliability and validity are closely related to quantitative research. However it is important to reflect at these parameters in qualitative research as well; Lincoln and Guba (1985) define a set of trustworthiness criteria consisting of credibility, transferability, dependability and confirmability. These criteria can be seen as paralleling the more positivist notions of validity, reliability and objectivity. Credibility was sought when working with the data material from the interviews. Notes were taken during the interviews, and my reflections were discussed with other Ph.D. students. All procedures were stringently noted. Working with a trained researcher into IPA in Paper III was another way to improve the credibility because of the possibility to compare our work. Moreover, this developed my own skills in relation to the analysis process used in Paper IV. Here, the quality of the analysis was strengthened by involving the co-authors in the analysis process by comparing and discussing notes and themes. Transferability refers to the degree to which the results of the research can be generalized or transferred to other contexts or settings. In qualitative research, the study itself cannot be reproduced, as the exact same process never can be repeated. However, Smith et al. (2009) refer to the "theoretical generalizability" that enables the researcher and professionals in practice to "assess the evidence in relation to their existing professional and experiential knowledge" (p.4). Flyvbjerg (2006) argues for the possibility to generalize from a single-case study as well. However, as a researcher, one must be careful in my choices of what to generalize on; the

different aspects of the veterans' experiences must be included to give a full picture of the results of the study. Also, the need for a specific adjustment related to the individual veterans' needs within the framework of NBT has been stressed in this thesis, and this, in itself, speaks against a generalization, at least, if it is based on a rigid and rigorous way of conducting NBT. According to Bitsch (2005), dependability refers to the stability of findings over time. In this study, where data was collected over a time period of more than one year, the changes in the veterans' experiences of the impact of NBT and a possible change in their perspective in relation to their daily lives can be said to be contained in the data. Confirmability refers to the degree to which the results of an inquiry could be confirmed or verified by other researchers (Baxter and Eyles, 1997). According to Malterud (2001), the researcher's background and position will always affect all parts of the research process. It was my intention to be aware of my position and to use reflexivity at every step of the research process, ask questions regarding my process, and to discuss decisions with my supervisor and colleagues. Due to the fact that we have different backgrounds, this approach forced me to present arguments to support my choices, which can be seen as having strengthened the confirmability. My own role as a researcher must be seen in critical light; was I able to keep a balance between a professional distance and a caring researcher? Though, going through the interviews, there was no indication that the veterans produced answers to satisfy the researcher.

Ethical considerations

In the systematic literature study, the ethical considerations were focused on presenting a trustworthy and transparent strategy that could easily be followed by others (Wager and Wiffen, 2011). Also it is important that a review finds and accesses all studies within the field. This was done by using several sources in the search procedure and by establishing 'alerts' from all search bases. This enabled me to follow published literature during in the working period of the review.

The ethical principles of the *WMA Declaration of Helsinki, Ethical Principles for Medical Research Involving Human Subjects*, were followed in single case study. Prior to the data collection, the study was granted ethical permission by The National Committee on Health Research Ethics. All participants were informed about the study both orally and verbally. They had the opportunity to participate in the treatment program without participating in the study or they could terminate their participation at any point. All veterans were anonymized in the written parts of the project. All participants signed written statements of informed consent. The participants in the single case study

were experienced as being in an exceptionally vulnerable situation. Due to the risk of their conditions deteriorating, it was important not to ask questions about subjects that might induce an increase in their PTSD symptoms that, in worst case, could lead to a disruption of the project, or could cause a situation where more specific therapeutic skills would be needed. Therefore, it was made clear before the interviews that episodes from their time in active military service in a war zone were not a focus area for the conversations/interviews. Furthermore, it was arranged so the psychotherapist could be contacted if needed.

Reflections and conclusions

The systematic review (Paper I) drew my attention to the many parameters that influence the process of developing clear evidence-based recommendations for praxis. In the present review, a broad range of nature settings were used and these settings seemed to be beneficial for the veterans. However, it cannot be concluded that the choice of setting is immaterial. In fact, the opposite seems to be true; the empirical data of this study (Paper IV) deepens our knowledge because it points to the importance of nature providing a range of possibilities for the individuals to find locations that match their needs. As these essential changes take place during the recovery process, the nature environment (a designed setting or a specific chosen location) must sufficiently accommodate those needs. This required that the therapist have deep insight into target group's needs with regard to their disease and to the impact their condition has on their lives. Also, it points to the fact, NBT is a process starting with the design of the environment, and it involves cooperation between professions as landscape architects, experienced therapists and gardeners.

Being in a group with other veterans was experienced as positive; shared cultures and memories led to an understanding of each other that was experienced as beneficial. The understanding of each other without words was stressed as important, as was the possibility bring up problems with people 'who know'. The frame of nature and the NBA were experienced as enhancing the recovery (Paper III, IV).

A most optimal frequency and length of the NBT cannot be selected on the base of the review (Paper I); whether once a week for four hours is better than three times a week may depend on the

mental and physical condition of the individual, as well family obligations and deployment. The single case study points towards a certain total length of the NBT as necessary for the treatment to work (e.g. calming of the nerve system, achieving tools) and for the veterans to experience the changes. Because the life-changing processes happened over a time period, and because none of the participants wanted to stop before time (several participants even applied for a longer stay), a fixed treatment period of at least a ten weeks cannot be recommended as the only way to go. Instead it could be argued that a slower phasing out of the NBT would allow the veterans to have an expanded contact to the staff and the place. This could reduce the anxiety for the future some veterans felt when the project ended.

What did the veterans experience as an impact of the NBT? When only looking at the elements in the treatment, each element contributed with different parts to the NBT, but they can also be seen as enforcing each other positively. The participants pointed to the mindfulness activities as be able to provide internal calmness, both when they were practicing mindfulness, but also in other situations where being in a calm state of mind was experienced as a precondition for being able to take in the nature and being present in the moment. Applied mindfulness e.g. respiration techniques (Paper III) were used in stressful situations and brought experiences of being able to maintain control of both body and mind. Participating in the NBA was made less demanding because of the multiple possibilities of adjustments to the individual's needs. NBA was reported as giving scope of meaning and providing an informal way of doing things together with others. Moreover, it inspired a curiosity in the participants about the plants in the Arboretum and possibilities for the participants to experience reaching a goal by performing a task. What is important to note here is that an activity can be considered as beneficial for some and stressful for others, which underpins the need for the staff to acknowledge the personal preferences of the participants. Mindfulness activities met the target group's need for bodily awareness, which was negatively affected due to their PTSD. Concrete tools such as breathing techniques helped them maintain mental and physical control when exposed to stressful situations. The approach of the staff was accepting and acknowledging in relation to the veterans' everyday condition. This was experienced as releasing not to feel a need to justify oneself. The adaptation of the therapy and the way in which it was organized seemed to afford an increase in the participants' self-efficacy and to support a life-changing process. After one year, most of the veterans had found their own way of managing a life with PTSD, and the symptoms were experienced as less burdensome due to an improved feeling of control of bodily and

mental symptoms. All the participants had made life-changes, and nature had become an integrated part of their daily lives.

Implications for practice and future research

It is tempting to make a concept when finishing a project, which turned out to have a positive impact for the participants. Also, from a practitioner's perspective a concept is convenient to follow, not least, as in this case, when it is based on a scientific study. However, it is important to make clear that a number of preconditions must be met. First of all, this is a small study, and more research is required before a concept can be developed. Such a concept must be a result of several professions working together and this must be an ambition for the University of Copenhagen. This Ph.D. study can be seen as an important step in that direction. The NBT in this study is described in details and has a setup that can be followed and implemented in practice. This therapeutic approach builds on adapting the NBA to meet the individual needs of the participants, and this requires psychological and sociological knowledge of the veterans with PTSD. Finally, it would be interesting to explore a possible correlation between the length and frequency of the NBT program to the degree PTSD symptoms. Some veterans seem to need a longer period of treatment and slow phasing out as recovery require more time for some than for others.

To clarify some of the questions raised here, future research should focus on the following questions. This study was conducted with male veterans, can it be assumed that the same treatment will be appropriate for female veterans as well? If the needs turn out to be slightly different, how can NBT accommodated female veterans in practice? As seen in the review (Paper I), several types of settings and activities are provided worldwide. It might be valuable to see, if, and in what way, the preferences of activities are culturally embedded. It would be interesting to examine how a population in a specific area has traditionally used nature for recreation and restoring. The answer could lead to identifying activities that have a special beneficial impact.

This study has found a connection between a certain degree of knowledge of one's own body and the ability to take in nature. More research regarding this suggested relationship would be interesting in a process of taking care of some of the most vulnerable participants. In continuation

of this, it seems logical to advocate for a study that looks at a possible impact of this kind of NBT with regard to traumatized refugees. Finally, it must be considered if NBT in a short form could be beneficial for homecoming soldiers in general, as a part of their debriefing and habituating to civilian life. This initiative should be discussed with the Danish military.

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List of publications

- I. Poulsen, D.V., Stigsdotter, U.K. & Refshage, A.D. (2015). [Whatever happened to the soldiers? Nature-assisted therapies for veterans diagnosed with post-traumatic stress disorder: A literature review.](#) *Urban Forestry & Urban Greening*, 14(2), 438-445

- II. Poulsen, D.V. & Stigsdotter U.K. (2015) Battles Fought in Nature: Lessons Learned from Nature-Based Treatment in a Forest Therapy Garden for Soldiers with Posttraumatic Stress Disorder, In Dustin D., Bricker K, Negley, S., Brownlee M., Schwab K., Lundberg N. (ed.) *This Land Is Your Land -Toward a Better Understanding of Nature’s Resiliency-Building and Restorative Power for Armed Forces Personnel, Veterans, and their Families.* Sagamore Publishing LLC, USA.

- III. Poulsen, D.V., Stigsdotter, U.K. & Davidsen A. “*That guy, is he really sick at all?*” An Analysis of Veterans’ with PTSD Experiences of Nature-Based Therapy. *Journal of Health Psychology* (Submitted)

- IV. Poulsen, D.V., Stigsdotter, U.K., Djernis D. & Sidenius, U. (Manuscript) “*Everything Just Seems Much More Right in Nature*”: How Veterans with PTSD Experience Nature-Based Activities in a Forest Therapy Garden. *Journal of Health Psychology* (Submitted)

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