Exploring the potential of a guided forest bathing programme as a nature-based intervention for well-being, restoration, and nature connection

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Exploring the potential of a guided forest bathing programme as a nature-based intervention for well-being, restoration, and nature connection

Kan ett guidat skogsbadsprogram fungera som en naturbaserad intervention för välmående, återhämtning och naturkontakt?

Jonna Sandin Larkander

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Abstract

Stress-related mental illness is a growing public health challenge worldwide and Sweden is no exception. *Shinrin-yoku* (forest bathing) is a nature-based intervention[1] that was developed in Japan during the 1980s to curb growing incidences of stress-related illness in the society. Shinrin-yoku has spread across the world since the 1980s, and in Sweden, the Scandinavian Nature and Forest Therapy Institute (SNFTI) provide guided forest baths in accordance with the Eco-Forest Therapy theory, method and guiding skills. The aim of this study was to evaluate how a three-week guided Eco-Forest Therapy intervention programme was experienced by participants and if participation increased perceived well-being, restoration, and nature connection and decreased perceived fatigue/exhaustion. To strengthen the study´s results, a sequential mixed methods design was adopted. The results show that the intervention programme had significant positive effects on the participants perceived well-being, fatigue, restoration, and nature connection and that feelings of well-being, restoration and nature connection seem to be of a mutually reinforcing character. The positive effects are confirmed both by the pre-and post-measurements of the whole intervention programme, by the pre-and post-measurements of each forest bathing session and by the results of the interviews. There is particularly strong evidence for the beneficial health effects perceived directly after each forest bathing session, where the standardized mean difference (effect size) is above one standard deviation for all three baths. The beneficial short-term effects are also confirmed in the interviews. The most valued experiences are; finding rest, reminder of personal needs, the guided group sessions became a safe haven and fascinating nature experiences. The least valued experiences are; feeling pressured to share – and reflect on other´s experiences, disturbing sounds and emotional turmoil when slowing down.

Keywords; stress-related mental illness, nature-based intervention, guided forest bathing, well-being, restoration, nature connection, public health intervention

[1] Nature-based intervention is, in this study, defined as an intervention that is "both supported and grounded in the natural environment" (Pálsdóttir et al. 2021:40)

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Contents

Introduction

Stress[2]-related mental illness is a growing public health challenge worldwide and Sweden is no exception. 17 percent of the Swedish population aged 16-84 stated that they had a reduced mental well-being in a public health survey from 2018. More women than men, and more young than old people declared that they had a reduced well-being (Public Health Agency of Sweden 2020). Increased urbanisation, fast-paced technological advancements, and a rapidly changing labour market, require us to quickly adapt to new living conditions that differ significantly from the close-to-nature habitats that the human species has lived in for several million years (Kotera et al. 2022). Despite the fact that scholars have produced convincing empirical evidence for nature´s beneficial effects on our health since the 1980s, especially regarding its stress-reducing and restorative properties (Ulrich 1984; Ulrich et al. 1991; Grahn and Stigsdotter 2003; 2010; Steg and de Groot 2019), there is still a lack of wider practical application of this knowledge supported by evidence-based methods within preventive health measures.

Shinrin-yoku (forest bathing) is a nature-based intervention[3] that was developed in Japan during the 1980s to curb growing incidences of stress-related illness in the society. During forest baths, "people immerse themselves in nature, while mindfully paying attention to their senses" (Kotera et al. 2022:337). Shinrin-yoku has spread across the world since the 1980s, and cultural modifications has been made of the methodology. In Sweden, the Scandinavian Nature and Forest Therapy Institute (SNFTI) provide training for forest bathing guides in accordance with the Eco-Forest Therapy theory, methodology and guiding skills. The guides´ task is to facilitate a forest bathing experience in a way that enable participants to quickly reach a relaxed state with a deepened nature connection[4].

Strong research evidence has been presented for the beneficial effects of forest bathing on people´s physical - and psychological health. There are particularly convincing empirical results that confirm therapeutic effects on the cardiovascular system, the immune system and the respiratory system as well as increased levels of well-being, mental relaxation and reduced levels of stress, anxiety, and depression (Hansen et al. 2017; Rajoo et al. 2020; Stier-Jarmer et al. 2021; Kotera et al. 2022; Antonelli et al. 2022; Gobster et al. 2022). However, there are still challenges that hinder clear empirical results. There is not one, but many definitions of forest bathing, that are interpreted and applied differently, in different contexts around the world (Heród et

[2] Stress is, in this study, defined "as any type of change that causes physical, emotional or psychological strain. Stress is your body´s response to anything that requires attention or action. Everyone experiences stress to some degree. The way you respond to stress, however, make a big difference to your overall well-being" (WHO, 2021).

[3] Nature-based intervention is, in this study, defined as an intervention that is "both supported and grounded in the natural environment" (Pálsdóttir et al. 2021:40)

[4] Petra Ellora Cau-Wetterholm, Licensed Psychologist, Nature and Forest Therapy Guide, Trainer and Mentor, Head of Scandinavian Nature and Forest Therapy Institute, conversation during September 2022.

al. 2022). There is also a wide range of methods associated with *shinrin-yoku/forest bathing/forest therapy/nature therapy*, that include a variety of guided and non-guided practices (Kotera et al. 2022; Rajoo et al. 2020; Cau-Wetterholm 2020; Heród et al. 2022). The lack of consensus regarding definition and methodology makes it difficult to produce research with strong validity and reliability.

More empirical research is needed, especially in the West that lags behind in comparison to Asia, that systematically study applied methods in a consistent and long-term manner (Hansen et. al 2017). The studies should include a combination of quantitative and qualitative methods, as well as pre- and post-measurements of clearly delimited methods, to ensure qualitative and evidence-based practices that can be evaluated, developed, and widely applied as preventive health measures (Hansen et al. 2017; Cau-Wetterholm 2020; Gobster et al. 2022).

In Sweden, the Scandinavian Nature and Forest Therapy Institute (SNFTI) has trained forest bathing guides since 2019 in a delimited methodology (Eco-Forest Therapy). Currently there are approximately 75 certified SNFTI guides, geographically spread across the country, that are applying the same methodology in a variety of green spaces and forest settings. This creates a unique opportunity to systematically evaluate how the method is experienced by participants, in different kinds of green environments, and if the method has the intended effects on well-being and nature connection.

Aim and research questions

The aim of this study is to evaluate how a three-week Eco-Forest Therapy intervention programme is experienced by participants and if participation can increase perceived well-being, restoration, and nature connection and decrease perceived fatigue/exhaustion. The study can provide valuable knowledge about how guided forest bathing interventions can be developed to increase its potential as a public health measure that also can affect our willingness to protect nature.

The research questions are;

How does participation in a guided Eco Forest Therapy intervention programme affect individuals´ perceived well-being?

How does participation in a guided Eco Forest Therapy intervention programme affect individuals´ perceived fatigue/exhaustion?

How does participation in a guided Eco Forest Therapy intervention programme affect individuals´ perceived restoration?

How does participation in a guided Eco Forest Therapy intervention programme affect individuals´ perceived nature connection?

What do participants value the most and the least with the intervention?

Limitations

The period for collecting data was limited to two months (September – October 2022) to be able to finish the thesis within the timeframe for the independent thesis project and to avoid weather impacts on the intervention. No control group was included

since this was a novel study design that hadn't been tried out before. The study focused on group level effects of the intervention and did not make comparisons within the group, since this was regarded as a to big undertaking.

Theoretical framework

Restorative environments

In environmental psychology, *restoration* refers to a psychological and/or physiological recovery process that is generated by certain environments or by specific attributes in certain environments. An extensive number of studies within this line of research have shown that natural environments tend to be regarded as more restorative than built environments. According to the evolutionary theories that are prominent within this field, human´s restorative response to natural settings may be an artefact of the human evolution in a natural world. Certain natural attributes, such as lush vegetation and/or water elements, offered our ancestors resources and safety. Consequently, humans tend to display positive affective responses to such attributes (Joye and Van Den Berg 2019).

The stress recovery theory (Ulrich et al. 1991) proposes that human´s immediate response to an environment, that we either like or dislike, occurs without much cognitive processing. When an unthreatening environment provides us with a positive affective response, a restorative process initiates that reduces arousal and negative feelings. It also provides us with a breather from stress. Ulrich et al. (1991) suggest that the recovery process can be faster and more complete when individuals are subjected to natural - rather than built environments. A rapid, affective response characterises most encounters with natural environments and involve only limited cognition, according to this theory.

The Attention Restoration Theory (ART) proposes that restoration emerges through a slower cognitive-driven process (Kaplan and Kaplan 1989). According to ART, humans only have a limited ability to direct their attention. When this cognitive mechanism is exhausted, directed attentional fatigue may be experienced. The modern society´s increased specialization on single tasks, in cluttered, urban environments, differs significantly from the variety of tasks that our ancestors experienced in natural settings. This vast transition in our way of living can result in mental fatigue. ART highlights four aspects that are needed for us to experience an environment as restorative. 1) *Being away* refers to the need of getting away from the daily routines of life. 2) *Extent* describes the need to move into "another world", i.e., that is large enough in scope for us to experience it as such. 3) *Fascination* refers to how we spontaneously are drawn to fascinating objects in nature, such as clouds, sunsets or snow patterns. The final aspect, 4) *Compatibility*, deals with how well an environment fit a person´s purpose.

A more recently developed theoretical perspective, within restorative environments research, suggest that humans feel a sense of meaning and belonging when we feel connected to the natural world. When people develop an emotional bond to nature, several beneficial effects can occur that can increase our physiological, emotional, and social well-being. These research findings indicate that an experiential sense of nature

connectedness also can be a central part of a restorative experiences, besides the more unconscious processes described above (Joye and Van Den Berg 2019).

Several instruments have been developed to measure how connected individuals feel to nature, also referred to as human-nature connection (HNC). One of these is the ACHUNAS framework (Giusti et al. 2017) that was elaborated to investigate how children connect to nature. The framework is inspired by the concepts of embodied ecosystems which is a later formulation of the theory of affordances, that focuses on what the environment offers the individual, what it affords (Gibson 1979). Gibson (1979) was against all divisions of environmental experiences in material, social or cultural worlds. Instead, he proposed a relational approach to human perception and behaviour where human abilities and the features of the environment were interlinked. Inspired by this ontological approach, the ACHUNAS framework describes children´s HNC as a complex set of abilities that grasp the diversity of how children connect to nature through an embodied process. ACHUNAS describes a set of relations between mind, body, culture, and the environment that shape children´s human nature connection, and like most human abilities, HNC progresses dynamically over time. The process starts with "feeling comfortable in natural spaces" and "being curious about nature" and ends with "caring about nature" and "being one with nature" (Giusti et al. 2017:14) In this study, the ACUNAS´ *abilities of human-nature connection* are used to measure adult's HNC, by using Vårhammar´s (2021) operationalization and translation of the ACUNAS framework (Giusti et al. 2017) into survey items (see figure 1 below.)

	Abilities of human-nature connection	**Survey items**
Being in nature	Feeling comfortable in natural spaces	1. I am comfortable being outdoors, even in unpleasant weather.
	Being curious about nature	2. I am curious about how different plants, animals, and ecosystems look and work.
Being with nature	Reading natural spaces	3. I can find something to do everywhere in nature.
	Acting in natural spaces	4. There is an infinite number of activities that I can do in or with nature.
	Feeling attached to natural spaces	5. I feel attached to certain places in nature as they are special to me.
	Knowing about nature	6. I can tell if plants, animals, and ecosystems surrounding me are healthy or not.
	Recalling memories about nature	7. I have vivid memories in or with nature that have shaped who I am.
Being for nature	Taking care of nature	8. I know how to take care of plants, animals, and ecosystems around me.
	Caring about nature	9. I am concerned, care profoundly, and respect all plants, animals, and ecosystems around me.
	Being one with nature	10. I feel a deep connection and love for the plants, animals, and ecosystems around me.

Figure 1. *Vårhammar´s (2021) operationalization of the ACUNAS framework`s (Giusti et al. 2017) into survey items where each human-nature connection ability has been operationalized into statements.*

Methods

Sequential mixed methods study design

To strengthen the study´s results, a sequential mixed methods design was adopted, where the quantitative and qualitative methods´ strengths and weaknesses could be supplemented (Bryman 2018). The first step was to carry out a series of quantitative surveys (eight in total) that all participants answered before and after the three-week intervention programme (baseline survey and post-measurements survey), and before and after each forest bathing session. The second step was to conduct semi-structured interviews with a number of participants that had participated in the programme in different parts of Sweden. The quantitative and qualitative data sets were then first analysed separately and then combined during the interpretation phase to gather all insights from the material.

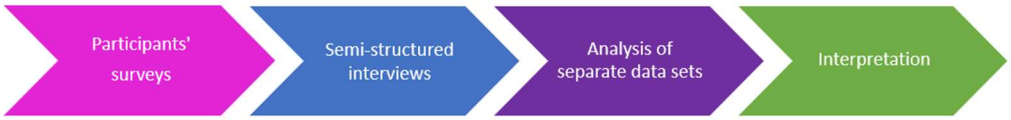

Figure 2*. The steps in the sequential mixed methods study design.*

The intervention programme

The Eco Forest Therapy intervention programme was conducted in collaboration with the Scandinavian Nature and Forest Therapy Institute (SNFTI) and its national Guide Network. The founder of the Eco Forest Therapy methodology and CEO of SNFTI, Petra Ellora Cau-Wetterholm, served as intervention designer, programme coordinator and guide supervisor.

The intervention programme was implemented by 21 certified[5] SNFTI guides in 23 areas in Sweden, spread over the whole country (see more information about the areas in Appendix A and below). It was conducted during September and October 2022 and consisted of three guided forest baths, that each lasted for three hours, and were arranged once a week, during three weeks in a row. The first intervention programme started 18 September 2022 and the last intervention programmes started 16 October 2022. The SNFTI guides used the same areas during all baths[6] and the group size varied between 3-10 participants. All guides followed the same intervention programme that was developed according to the Eco Forest Therapy methodology by the Scandinavian Nature and Forest Therapy Institute.

Eco Forest Therapy is a comprehensive methodology as well as a theoretical framework and a set of guiding techniques, based on science informed theory, method and practical skills. A guided Eco Forest Therapy session consists of a three-hour long

[5] Except for two guides who received their formal SNFTI certification during the intervention period.

[6] Except for one occasion when a guide needed to change environment for her third forest bath due to practical reasons.

intervention, offering a gradual process through four distinct phases. Initially the guide makes sure to create a safe and comfortable setting. In each phase that follows, the guide offers a set of "invitations", corresponding to the particular function and aim of each phase; offering a variety of nature experiences and a gradual immersion of the senses.

The aim of the intervention programme was to facilitate a nature-based experience where the participants could connect to nature through gradual immersion in sensory experiences, allowing for increased relaxation, recovery and "nature beingness". Each sensory experience was carefully introduced and facilitated by the guides. Some experiences were practiced silently, and others were shared orally within the forest bathing groups. Each session started with a group gathering at the meeting place (usually a parking lot near the entrance to the natural area) to make sure that everyone had what they needed and to go through practical matters. After the group gatherings (about 20 minutes), the groups slowly walked to the natural environments where the main sessions were conducted. When the groups had reached the natural area, the guides introduced a variety of sensory experiences, allowing for a gradual immersion of the senses. After about two hours, the sessions ended with a tea ceremony where the participants could share their observations, reflections and express gratitude.

Preparation meetings for participating guides
Three online 1,5-hour meetings were arranged by the Scandinavian Nature and Forest Therapy Institute to thoroughly introduce the intervention programme and supervise the participating SNFTI guides. The meetings contained a step-by-step review of the intervention manual and open time slot for supervision and Q&A. The guides who weren´t able to participate in the online sessions listened to the recorded meetings afterwards. The guides were provided with a manual for the intervention and given private consultation by Petra Ellora Cau-Wetterholm when needed.

Follow-up meeting for guides and researchers
A three-hour long online follow-up meeting for all participating guides and researchers was arranged 2 November 2022 by the Scandinavian Nature and Forest Therapy Institute to share experiences made during the intervention and evaluate how different aspects of it worked, in order to gain insights for future research projects/interventions. The guides that were not able to join the follow-up meeting sent their written comments afterwards.

Areas used during the intervention programme

The areas for the intervention programme were chosen by the SNFTI guides and where 23 in total. The guides´ most common reasons for choosing the environments were accessibility (in terms of parking and transportation), closeness to own dwelling, familiarity, and the aesthetic qualities of the environments. 59 % of the environments were in rural settings, 36 % were in semi-urban settings and 5 % were in the wilderness. 45 % of the settings were dominated by coniferous forest, 36 % were dominated by mixed forest, and 18 % were dominated by deciduous forest. The average walking distance for the sessions were 1-2 kilometres for 55 % of the walks, between 500 metres and 1 kilometre for 27 % of the walks and between 2 -3 kilometres for 18 %

of the walks. All areas had parking, 64 % had access to water elements (i.e., lakes, creeks, or other water elements) and 59 % had access to toilets. The temperature varied between 6-15 degrees Celsius (see a description of all areas and weather conditions in Appendix A).

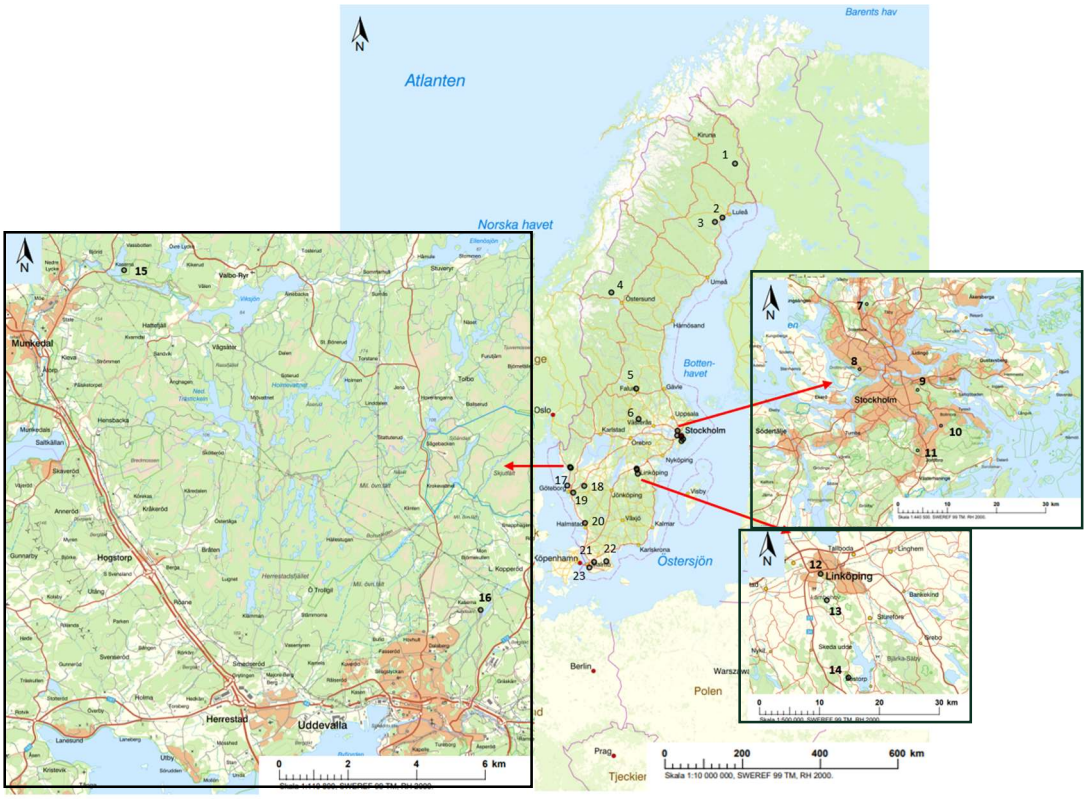

Figure 3. *The national outreach of the study that has been conducted from the northernmost - to the southernmost parts of Sweden in maps.*

Table 1. *The areas used during the intervention, also shown in the maps above, and described in Appendix A.*

1. Palokorva/Pajala	13. Tinnerö Naturreservat/Linköping
2. Blåsmark/Piteå	14. Västerby lövskogar/Linköping
3. Ersnäs/Piteå	15. Kaserna/Munkedal
4. Offerdal Lungret/Krokom	16. Bjursjöns natur – och rekreationsområde/Uddevalla
5. Stångjärn/Falu	17. Guddehjälms Naturreservat/Kungälv
6. Vätterskoga/Skinnskatteberg	18. Ljungås natur och kulturreservat/Vårgårda
7. Södra Törnskogens Naturreservat/Sollentuna	19. Bråtaskogen/Härryda
8. Judarskogen/Stockholm	20. Biskopstorps Naturreservat/Halmstad
9. Nackareservatet/ Stockholm	21. Måryd/Lund
10. Måndalshöjden/Tyresö	22. Verkasjön/Tomelilla
11. Rudans Friluftsområde/Haninge	23. Törringelund/Svedala
12. Vallaskogens Naturreservat/Linköping	

Recruitment

Participants from the general public was recruited by the Scandinavian Nature and Forest Therapy Institute, and the participating SNFTI guides during the first weeks of September 2022. Initially, an information letter was created by the working group[7] that described the aim, the intervention, and the terms for participation in the study. Online advertisement of the study was latter distributed on the SNFTI web site, and in the SNFTI Facebook groups, including a paid online Facebook advertisement aimed at entire Sweden with everyone as a target group. Everyone that was interested in participating received the information letter about the study and were able to ask questions both to SNFTI (Petra Ellora Cau-Wetterholm), to myself and to my supervisor at SLU (Anna María Pálsdóttir). The guides used their own social media accounts, and their professional/social networks to spread the SNFTI online advertisement about the study.

SNFTI functioned as the primary link between participants and guides during the whole recruitment process to make sure that as many individuals as possible were able to join the intervention in an area close to their place of residence. SNFTI´s coordination between the guides and participants were quite substantial during a couple of weeks to sew the whole logistical operation together.

Inclusion criteria

The inclusion criteria for participating in the study was that the participants were adults (18 years or more), and that they were physically able to walk, sit on the ground and get up from the ground by themselves in a forest setting.

[7] More details about the working group are described in "Ethical considerations".

Data collection

Figure 4. *The eight surveys that the participants answered before and after the intervention programme and before and after each forest bathing session.*

Consent

The participants were provided with written information about the study and were able to ask questions by email before they registered. All participants had to accept the terms and give their formal consent to participate in the study through a digital consent form that was included in the baseline survey. They were made aware that their participation was voluntarily and that they were able to withdraw their consent at any time. They were also informed that the results would be presented anonymous on a group level.

Quantitative methods

The surveys were conducted in SLUs digital survey tool; Netigate[8]. After the data collection was finished, all data from Netigate was exported to Excel. Excel (Microsoft Office 2021) was used to process and analyse the data.

Baseline survey

The participants answered the baseline survey 1-3 days before the intervention started. The survey contained questions about the participants´ gender, age, zip code, current livelihood, distance to green space from residence, how often they visit green spaces, how much time on average they spend in green spaces, which SNFTI guide they were assigned to during the intervention programme and in what area their intervention programme was conducted. The survey evaluated the participants perceived psychological well-being, fatigue/exhaustion, restoration, and nature connection before they entered the intervention programme with the support of a number of psychological rating scales.

Perceived psychological well-being was assessed using Välmåendeskalan (Braconier 2015; Ström and Carlbring 2014) that has been validated and replicated (fbanken 2017). The participants were asked to assess 18 statements related to their perceived well-being on a scale from 0-4. A high score indicates a high perceived well-being.

Perceived fatigue/exhaustion was evaluated with the Shirom-Melamed Burnout Measure 12 (Almén and Jansson 2021) that has been validated and replicated (fbanken

[8] https://www.netigate.se/tool/login.aspx?l=1

2021). The scale measure emotional, physical, and mental fatigue with 12 statements on a scale from 1-7. A high score indicates a high perceived fatigue/exhaustion.

The participants capacity to restore was assessed using the Recovery Experience Questionnaire (Almén et al. 2018; Sonnentag & Fritz 2007) that has been validated and replicated (fbanken 2018). 16 statements were used to measure individuals ´capacity to recover from work-related stress during leisure time on a scale from 1-5. A high score indicates a higher perceived capacity to recover from stress.

The participants perceived nature connection was assessed with ten statements that measure people´s abilities to develop a human-nature connection on a scale from 1-10, with the support of Vårhammar´s (2021) operationalization and translation of the ACUNAS framework (Giusti et al. 2017). A high score indicates a high perceived nature connection.

Before and after each forest bathing session
The participants answered a short survey before and after each forest bath that assessed their tension (tense/relaxed), fatigue (exhausted/alert), mood (sad/happy), irritability (irritable/harmonious) and restlessness (restless/peaceful) on a scale from 1 to 10 with a shortened version of the Profile of Mood Scale (POMS), previously used by Sonntag-Öström et al. (2011). A high score indicates a better state of mind.

Post-measurements survey
The participants answered the post-measurements survey 1-3 days after the intervention was completed. The survey assessed if the participants perceived well-being, fatigue/exhaustion, capacity to restore and nature connection had changed after participation in the three-week intervention programme. The same psychological ratings scales were used for this task as in baseline (see description above).

Quantitative Analysis
A two-tailed paired sample t-test was used to determine whether there were significant differences between the participants perceived well-being, fatigue/exhaustion, restoration, and nature connection before and after the intervention programme (baseline- and post-measurements surveys). Two competing hypothesis was adopted for this purpose. The null hypothesis assumed that the true mean differences between the two sets of observations were zero while the alternative hypothesis proposed that the true mean was not equal to zero.

In addition, a two-tailed paired sample t-test was adopted to determine whether there were significant differences before and after each forest bath session of the participants perceived tension (tense/relaxed), fatigue (exhausted/alert), mood (sad/happy), irritability (irritable/harmonious) and restlessness (restless/peaceful). Two competing hypothesis was adopted for this purpose. The null hypothesis assumed that the true mean differences between the two sets of observations were zero while the alternative hypothesis proposed that the true mean was not equal to zero.

The effect size (Cohen´s D) was later estimated to determine the standardized mean difference between the pre- and post-measurements.

Qualitative method

Sample

All participants were offered to be interviewed in the baseline survey, after they had finished the intervention programme. As an extensive number of participants, 89 in total, stated that they wanted to be interviewed, a number of participants were selected to make the workload feasible[9]. 11 interviews were conducted with participants that had experienced the intervention in a variety of urban, semi-urban, rural and wild settings in various parts of Sweden. Nine women and two men in the ages between 36-61 years were interviewed that had experienced the intervention in Palokorva, Blåsmark/Ersnäs, Offerdal/Lungret, Stångjärn, Vätterskoga, Måndalshöjden, Kaserna, Guddehjälms Naturreservat, Västerby lövskogar, Verkasjön, and Törringelund. The interviews were conducted from my home office in Swedish by telephone or zoom within a week after the participants´ last forest bathing session. All interviewees had participated in the whole intervention programme, except one individual that missed one session. The interviews lasted for a maximum of one hour and were recorded, after asking the participants for permission to record. All interviews were later transcribed into word documents. The transcripts range between 7-24 pages, depending on how talkative the respondents were.

Qualitative Analysis

Semi-structured interviews were conducted with the support of an interpretative phenomenological analysis, IPA (Eatough and Smith 2008). The semi-structured nature of the interviews allowed for some flexibility in how the questions were phrased - and in what order - to facilitate a flow in the conversations and to adapt the questions to the respondents´ replies. It also created an opportunity to dwell deeper into certain aspects of the respondents´ experiences (Bryman 2018). The interpretative phenomenological analysis (IPA) facilitated a focus on the participants *experiences* of the intervention and *how they made sense* of this experience. The primary aim with the interviews was to uncover individuals' subjective experiences, also often referred to as *lived experience*, i.e., to uncover how events, objects and people appear to us in a context. Lived experience incorporates the embodied, socio-cultural, and historically situated aspects of individuals´ experiences which affect a person´s interpretation of his/her reality/lived world (Eatough and Smith 2008).

However, access to individuals´ lived experience or personal world is never complete. It is always filtered through the researcher´s own conceptions through an interpretative process, which indeed is required to make sense of these experiences. Hence, the term interpretative phenomenological analysis is employed to describe these two aspects of the analysis (Smith et al. 1999).

[9] An email was sent to the participants that I wasn´t able to interview where I thanked them for wanting to contribute to the study.

The interviews were analysed through careful readings of the transcripts while making notes in the margins of anything that seemed to be significant aspects of the participants' experiences of the intervention. In parallel, a mind map was constructed where keywords were grouped together and summarized.

Ethical considerations

The study design required a close cooperation with the Scandinavian Nature and Forest Therapy Institute. A working group for the project was established early on with the head of the Scandinavian Nature and Forest Therapy Institute; Petra Cau-Wetterholm, the responsible researcher and supervisor for the study; Anna-María Pálsdóttir, Annelie Vårhammar (M.Sc. in Social-Ecological Resilience for Sustainable Development), who has studied the Eco-Forest Therapy methodology before, were appointed assistant supervisor, and myself that wrote my thesis about this topic, was the project leader for the study. The Scandinavian Nature and Forest Therapy Institute has been responsible for the content and quality of the three-week intervention programme and SLU (with Anna-María Pálsdóttir in charge) has been responsible for the scientific content and quality of the study.

Since the intervention programme was conducted during the autumn (September and October 2022) in different parts of Sweden, all participating SNFTI guides were encouraged to seek information about where and when the local hunting period took place to avoid unsafe encounters with hunters in the forest.

During the data collection period, I finished my own training to become a certified SNFTI guide. I had, at the time, experienced many forest baths, learned the Eco-Forest methodology and also practiced the method during forest baths arranged by me during my training period. I believe that my own experience of forest bathing and the studied method gave me important insights and knowledge that supported my theoretical exploration of this topic, both when I conducted the surveys, the interviews and when I analysed my data. However, I think that it was important for the study to keep a clear boundary between the role as an implementer (the guides´ roles) and the role as a researcher (my own role) for the quality and the integrity of the study´s results.

Analysis

Demographic data

124 participants were enrolled in the intervention programme from the start, and they were between 19-68 years old. 90% were women, 9% were men and 1% stated that they had a non-binary gender. 66% were working, 12% were on sick-leave, 9 % were studying or having an internship, 5 % were unemployed, 4 % were pensioners, 3 % were enrolled in a labour market measure and 1 % were managing their own household (see figure 5 below).

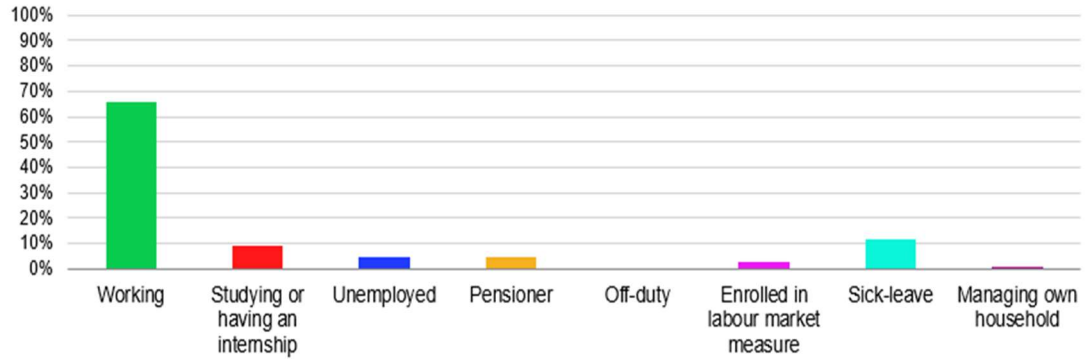

Figure 5. *Distribution of main livelihood. A majority of participants were working.*

Most participants (81 %) stated that they had less than 500 metres to a green space from their dwelling and 60 % of the participants declared that they visit a green space several times a week. 62 % had never participated in a guided forest bath before, 28 % had experienced it ones and 10 % had participated in guided forest baths several times (see figure 6 below). The most common means of transport to the forest bathing-settings was by car. Others used subway, bike (including electric bike) and commuter train to get to the location. The mean average to get to the location was 32 minutes. The most common reported motives for participating in the intervention were to find rest, recuperate, get more energy, feel closer to nature and to learn more about forest bathing.

Figure 6*. Distribution of previous experience of guided forest baths. Most participants had no previous experience.*

Full compliance and drop-out rate

Of the 124 participants that were enrolled in the programme from the start, 75 participated in the whole intervention and answered all surveys in a correct manner, i.e., the full compliance rate was 60 %. 5 participants that had completed the baseline survey dropped out before their intervention started. The most commonly reported motive for dropping out was due to sickness.

44 participants took part in parts of the intervention and/or were not able to fill in all surveys accurately. Data from the 44 participants described above and the 5 individuals that dropped out before the intervention started, were not included in the quantitative analysis to avoid biased results. The most commonly reason reported for not participating in the whole programme was due to sickness. Others reported that they were unable to participate in all forest bathing sessions due to practical reasons.

Results and discussion of the quantitative analysis

Introduction

In the following section, the results from the quantitative analysis will be presented. A two-tailed sample t-test was used to determine whether there were significant differences of the participants perceived well-being, fatigue/exhaustion, restoration, and nature connection before and after the intervention programme. In addition, a two-tailed sample t-test was adopted to investigate whether there were significant differences of the participants perceived tension (tense/relaxed), fatigue (exhausted/alert), mood (sad/happy), irritability (irritable/harmonious) and restlessness (restless/peaceful) before and after each forest bathing session. A discussion of the results will then follow.

Results before and after the intervention programme

Well-being

Table 2. *The two-tailed t-test show significant increased perceived well-being.*
Alpha = 0,01
t-Test: Paired Two Sample for Means

	WB.S1	*WB.S8*
Mean	3,174074074	3,634814815
Variance	0,320514959	0,377975754
Observations	75	75
Pearson Correlation	0,166532354	
Hypothesized Mean Difference	0	
df	74	
t Stat	-5,227758867	
P(T<=t) one-tail	7,66324E-07	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	1,53265E-06	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (1,53265E-06) is smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a significant increased perceived well-being among the participants after the intervention programme. The effect size (Cohen´s D) of the standardized mean difference is medium to large (0,779).

Fatigue/exhaustion

Table 3. *The two-tailed t-test show significant decreased perceived fatigue/exhaustion.*
Alpha = 0,01
t-Test: Paired Two Sample for Means

	F.S1	*F.S8*
Mean	3,966666667	3,42
Variance	2,049174174	1,901546547
Observations	75	75
Pearson Correlation	0,684211007	
Hypothesized Mean Difference	0	
df	74	
t Stat	4,235339476	
P(T<=t) one-tail	3,24239E-05	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	6,48478E-05	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (6,48478E-05) is smaller than the Alpha valuer (0,01) which means that the null hypothesis can be rejected. The results show a significant decreased perceived fatigue/exhaustion after the intervention programme. The effect size (Cohen´s D) of the standardized mean difference is small to medium (-0,388).

Restoration

Table 4. *The two-tailed t-test show significant increased perceived restoration.*
Alpha = 0,01
t-Test: Paired Two Sample for Means

	RE.S1	*RE.S8*
Mean	2,98	3,326666667
Variance	0,4596875	0,499215935
Observations	75	75
Pearson Correlation	0,630681196	
Hypothesized Mean Difference	0	
df	74	
t Stat	-5,041265809	
P(T<=t) one-tail	1,59093E-06	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	3,18186E-06	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (3,18186E-06) is smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a significant increased perceived restoration among the participants after the intervention programme. The effect size (Cohen´s D) of the standardized mean difference is medium (0,500).

Nature connection

Table 5. *The two-tailed t-test show significant increased perceived nature connection.*

Alpha = 0,01
t-Test: Paired Two Sample for Means

	NC.S1	*NC.S8*
Mean	7,44	8,188
Variance	2,144864865	1,599718919
Observations	75	75
Pearson Correlation	0,693102565	
Hypothesized Mean Difference	0	
df	74	
t Stat	-5,971327978	
P(T<=t) one-tail	3,78336E-08	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	7,56672E-08	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (7,56672E-08) is smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a significant increased perceived nature connection among the participants after the intervention programme. The effect size (Cohen´s D) of the standardized mean difference is medium (0,546).

Results before and after each forest bathing session

Before and after forest bath 1

Table 6. *The two-tailed t-test show highly significant increased perceived mood/ state of mind.*

Alpha=0,01
t-Test: Paired Two Sample for Means

	B_S2	*A_S3*
Mean	5,741333333	8,114666667
Variance	2,295971171	1,499646847
Observations	75	75
Pearson Correlation	0,509965491	
Hypothesized Mean Difference	0	
df	74	
t Stat	-14,89919419	
P(T<=t) one-tail	2,8181E-24	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	5,63619E-24	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (5,63619E-24) is a lot smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a highly significant effect on the participants perceived tension, fatigue, mood, irritable and restlessness after the first forest bath. The effect size (Cohen´s D) of the standardized mean difference is very large (1,722).

Before and after forest bath 2

Table 7. *The two-tailed t-test show highly significant increased perceived mood/ state of mind.*

Alpha=0,01
t-Test: Paired Two Sample for Means

	B_S4	*A_S5*
Mean	5,770666667	7,928
Variance	2,619127928	1,630962162
Observations	75	75
Pearson Correlation	0,565969799	
Hypothesized Mean Difference	0	
df	74	
t Stat	-13,51650571	
P(T<=t) one-tail	5,6164E-22	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	1,12328E-21	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (1,12328E-21) is a lot smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a highly significant effect on the participants perceived tension, fatigue, mood, irritability, and restlessness after the second forest bath. The effect size (Cohen´s D) of the standardized mean difference is very large (1,479).

Before and after forest bath 3

Table 8*. The two-tailed t-test show highly significant increased perceived mood/ state of mind.*

Alpha=0,01

t-Test: Paired Two Sample for Means

	B_S6	*A_S7*
Mean	5,864	8,370666667
Variance	2,946118919	1,652641441
Observations	75	75
Pearson Correlation	0,685064945	
Hypothesized Mean Difference	0	
df	74	
t Stat	-17,29492307	
P(T<=t) one-tail	5,18618E-28	
t Critical one-tail	2,37780205	
P(T<=t) two-tail	1,03724E-27	
t Critical two-tail	2,643912872	

The two-tailed t-test of the data shows that the p-value (1,03724E-27) is a lot smaller than the Alpha value (0,01) which means that the null hypothesis can be rejected. The results show a highly significant effect on the participants perceived tension, fatigue, mood, irritability and restlessness after the third forest bath. The effect size (Cohen´s D) of the standardized mean difference is very large (1,653).

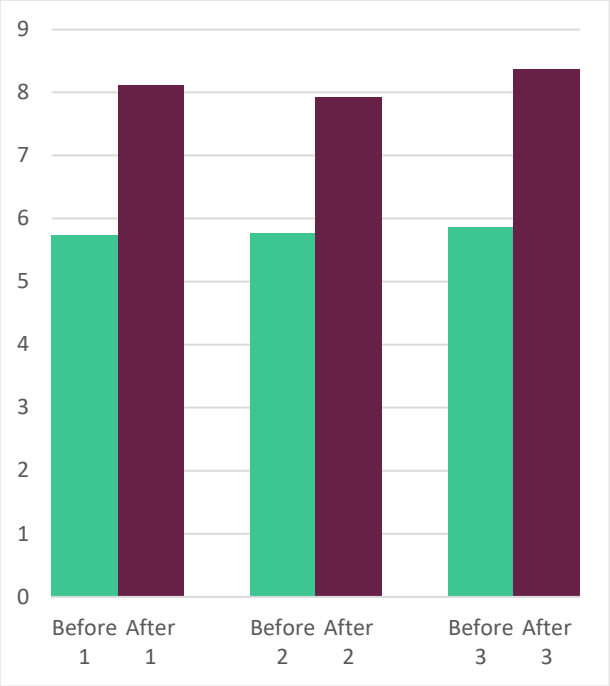

Figure 7. *The mean values for the participants perceived tension, fatigue, mood, irritability, and restlessness before and after each forest bathing session, measured with the support of a shortened version of the Profile of Mood Scale, previously used by Sonntag-Öström et al. 2011. The effect size of the standardized mean difference is very large for each forest bath session.*

Discussion of the quantitative results

In sum, the results of the quantitative analysis show significant positive effects on perceived well-being, mood, fatigue, restoration and nature connection. The findings support the evolutionary claim in restorative environments research, that humans tend to develop positive emotions, and experience stress relief and restoration in nature (Ulrich et al. 1991; Kaplan and Kaplan 1989; Joye and Van den Berg 2019).

The largest effect sizes are shown in the assessments of perceived psychological well-being and mood state, which is evaluated with Välmåendeskalan (Ström and Carlbring 2014, Braconier 2015,) and with a shortened version of the Profile of Mood Scale (POMS), previously used by Sonntag-Öström et al. (2011). The results further strengthen the already compelling evidence on the beneficial effects of forest bathing on well-being and mood that have been assessed with both self-evaluating questionnaires, such as different versions of POMS, and physiological instruments in a large number of studies (Rajoo et al. 2020; Antonelli et al. 2022; Gobster et al. 2022).

Although the results show a significant decrease in perceived fatigue before and after the intervention, the effect size is relatively small (-0,388). Since the mean value for participants perceived fatigue was relatively low at baseline (3,966), it is not that surprising that they didn´t experience a huge difference after the intervention. If the

study would have targeted people with exhaustion disorder, the positive impact on perceived fatigue may have been larger.

The effect size for perceived restoration, that was assessed with the support of the Recovery Experience Questionnaire, was medium (0,5) which is consistent with the results of another study that have used the same questionnaire to measure restoration (Jung et al. 2015). The restorative effect of forest bathing is also evident in other studies (Bielinis et al. 2018; Korcz et al. 2021).

This study used Vårhammar´s (2021) operationalisation of the ACHUNAS framework (Guisti 2017) to assess nature connection, and similarly to her results, there was a significant effect on perceived nature connection. The effect size is medium (0,546), which can be compared to Vårhammar´s findings, where the effect size was large (0,829) for the participants without previous experience of forest bathing and not significant for participants with previous experience of forest bathing. The focus of this study was not to make comparisons between subgroups, but most participants did not have previous experience of forest bathing (62 %), which may have had an impact on the results.

Results and discussion of the qualitative analysis

Introduction

In the following section, the results from the qualitative analysis (semi-structured interviews) will be presented. Four themes were identified that summarize the most valued experiences during the intervention; *finding rest*, *reminder of personal needs*, *the guided group sessions became a safe haven,* and *fascinating nature experiences*. Three themes were identified that summarize the least valued experiences during the intervention; *feeling pressured to share – and reflect on each other's experiences*, *disturbing sounds* and *emotional turmoil when slowing down*. A discussion of the results will then follow.

Table 9. *The most- and the least valued experiences during the intervention*

Most valued experiences	**Least valued experiences**
Finding rest	Feeling pressured to share – and reflect on other´s experiences
Reminder of personal needs	Disturbing sounds
The guided group sessions became a safe haven	Emotional turmoil when slowing down
Fascinating nature experiences	

Most valued experiences

Finding rest

Experiencing the guided forest baths in nature generated positive affective responses among the respondents, such as feelings of safety and calmness, that initiated a restorative process. One respondent describes it as if the guided sensory experiences gave her an opportunity to distance herself from her troubled thoughts for a while and focus on the sensations;

> …because these hours when you are observing moss or feeling bark and everything, it really helps to keep your mind away from the strange things that you think about otherwise. It provides you with a sense of calm and I sleep really well afterwards (1).

The calmness experienced during the baths affected the sleep quality for some respondents and one of them explained that she has visualized memories from the forest bathing sessions when she couldn´t sleep; "I can sort of imagine myself there in the forest, with a lot of trees around me" (5). One woman explained that the intervention has helped her realize how tired she is and how much she needs to rest; "..so it is noticeable that I rest a lot after these sessions because I need it, my body needs rest" (7). The importance of being away from the normal routines of life and getting time for yourself was also expressed as an important aspect of the restorative experience; "I am just glad that I was able to get away for a while and do this on my own" (9). Or as another respondent expressed it; "…now I am here and nothing else matters and if someone wants to reach me, the phone is on flight mode" (10).

Reminder of personal needs

The intervention made the respondents reflect on what they value in life and what they need to feel well. One respondent explained that the sessions made her slow down and reflect over the way she lives her life; "..it was like an eye opener that you wander around in life and stress a lot but you don´t really notice much"(8). Another woman associated the restorative process with a feeling of coming home; "…it was a bit like coming home in a way and realize that, of course, you don´t have to feel this bad" (1). A recurring theme among the interviewees was that they were longing for more time in nature and that this need had been neglected for different reasons. The habit of spending time in nature had, for one person diminished after a move but the forest bathing sessions made her realize that she "needs the green to recuperate" (4). Some felt inspired to spend time in nature in new ways that were perceived as less demanding, and goal oriented. A former military had lived in the boreal forest for extended periods of time during his service and described how he used to view the forest as a "resistance" (3). During the interview he concluded; "..you don´t have to prepare a whole expedition to go out in the woods, I mean just put on the boots and the right type of clothes and go out"(3). Another interviewee drew a similar conclusion; "I don´t have to walk very long and I don´t have to pick mushrooms or berries, I can just simply be and get the rest that I need" (8). After the intervention, one respondent commented that she feel less bothered by the weather; "I`m kind of more eager to go outside and less concerned about the weather" (10).

Except for spending more time in nature, the interviewees also mentioned other needs that the invention had reminded them of. One woman stated that she realized that she

needs more time on her own; "I need more time on my own when I am not doing anything" (5). Another woman reflected that she has stopped adapting to other people needs as much as she used to and have started to listen more to her own needs after the intervention. For her, feeling close to nature is also about feeling close to yourself; "…we need to find the nature within us to feel like natural beings" (7). A similar statement was formulated by another respondent that described the experience like; "you feel closer to yourself and to nature and when you slow down and feel closer to nature (…) and to yourself you let go of some of the troubled thoughts" (5). Hence, feeling attached to nature was also an important part of the restorative experience. One respondent associated feeling close to nature with feeling safe; "…to feel the safety that nature gives. It´s so strange! That nature can give safety to a human being but that`s how I feel" (1).

The guided group sessions became a safe haven

A recurring theme in the interviews is that the respondents felt safe and well taken care of by the guides during the intervention. The guides were perceived as calm, caring, and professional, and provided the participants with a clear framework for the intervention. As one respondent stated; "(guides name) felt safe and calm"(11) and another commented that it was easier to ease into the calmness thanks to the guide. One woman described her guide´s voice as "fantastic" (4) and that she "looked forward to her tea every time" (4). The fact that the guides oversaw the time schedule for the different exercises was also appreciated so that the participants didn´t have to worry about that; "you know what twenty minutes is so I didn´t have to look at my watch every twenty minute" (10). The group setting was also appreciated, like one woman expressed it; "it was a really nice form of togetherness because you didn´t feel pressured to socialize much" (10) and another women stated that "we felt some kind of safety and trust in the group, thanks to (the guide´s name) of course" (2). To experience the sessions together with others and to share a limited amount of thoughts in the group created an intimate and relaxed atmosphere, as one respondent expressed it; "I have sort of been reinforced in that that you can find community in so little communication" (10) and another respondent expressed; "you got like a relation, some kind of trust to the (guide´s name) and after the third time you knew what to expect, you knew your group" (8).

Fascinating nature experiences

The forest bathing sessions provided the respondents with deep sensory experiences of nature that they hadn´t experienced before. During the interviews they recalled fascinating encounters with natural objects through touch, smells, tastes, and visual impressions. A frequently mentioned experience was intriguing encounters with trees; "I sat with my back against it (…) and there was blueberry and also cobweb, small clusters of cobweb that glittered through the dew" (3), "I leaned against the tree and then I felt, well probably my own pulse or maybe I felt the energy of the tree"(10), "we were supposed to recognize a tree and that was awesome. That you could recognize a tree that (…) I only had touched" (5). One respondent explained that he has been working as a photographer for many years and were surprised to notice how many details he was able to perceive when he felt relaxed. He draws the conclusion that it probably wouldn´t have been possible for him to experience so many details during

the first session; "to just immerse in observations like that (…) I don´t think that I would have been able to do that the first time" (3). Feeling connected to nature enhanced the ability to observe details for another respondent; "to come so close to nature has resulted in that I can see details in another way and can appreciate and see things" (9).

Walking around in nature barefoot, was much appreciated by several respondents. One interviewee associated walking barefoot with childhood memories; "that´s something that you don´t do otherwise, to walk barefoot during the autumn. It is sort of like a childhood memory" (1), and another one described it as adding an extra layer to the sensory experience; "Well, it felt like an extra dimension in absorbing and feeling" (2). One woman described an intriguing taste experience of a lingonberry plant; "we talked about tastes and consistencies (…) and I chose to taste the whole lingonberry plant, (…) I started with the root and then the body and the leaves so the berry was really good then (laughter)" (10). The smells of nature were a fascinating experience for another respondent; "…I had no idea what different objects, what they smelled like, so to dive down on the ground and sort of smell different objects, I thought that was so cool" (8).

Least valued experiences

Feeling pressured to share – and reflect on other´s experiences

Some respondents felt pressured to share experiences during the sessions with the other participants in the groups and were not completely comfortable with that. One woman felt pressured to say something smart; "It felt a bit performance oriented or that you were supposed to come up with something really good" (8). Another respondent wanted to experience nature rather than to listen to the other participants´ reflections; "I didn´t go out in nature just to listen a lot, I wanted to experience, I wanted to feel" (9) Similarly, another interviewee thought it was tiring to think about the other participants´ reflections and thought it disturbed the restorative experience a bit;

> …it was difficult not to think about what the others said and it took focus from myself (…) I think that when I'm forest bathing, it should only be about me and nature in some way (1).

Clearer rules about how to share with silence was suggested by one respondent; "Maybe it would have been good to say, put your hand on your chest or something" (10) for the ones that wanted to share with silence. Her assessment was that more participants would have chosen to stay silent if there would have been a clearer routine for it during the sessions.

Disturbing sounds

Sounds from people in the nearby surroundings were regarded as disturbing at times. One woman explained that she didn´t see many people but she heard children during a meditative session and was a bit disturbed by it; "…it was a bit distracting when you are trying to listen to sounds" (6). Another respondent was also distracted by a group of children that were using the same area; "…there were a group of children (…) and they disturbed the calmness in the present moment a bit" (3). One interviewee

explained that there was a retreat arranged in the same area as the forest bath and that he felt a bit distracted by their activities; "we heard them when they talked and that was a bit distracting" (11). Traffic noise was another disturbing element that was perceived as even more apparent in the stillness; "…to still not get away from the traffic noise, it was almost more evident" (8).

Emotional turmoil when slowing down

To slow down and go into a deep relaxed state was described as quite emotional by some respondents. "When you feel that relaxed, things can emerge that haven´t been given any space before" (7). One respondent suggested that participants in these kinds of interventions should be given professional support by a therapist if they need to process things that emerge. But to feel emotional during the intervention were not only regarded as something difficult to cope with. Another respondent felt relieved by her emotional reaction; "…as soon as I started to relax there was a lot of sadness inside me and I really appreciated that I was able to get rid of some of it" (1).

Discussion of the qualitative results

My understanding of the interviewees´ experiences, was that they managed to reach a relaxed state (*find rest*) quite quickly during the intervention. The natural environments, emphasized in the stress recovery theory (Ulrich et al. 1991) and ART (Kaplan and Kaplan 1989) probably facilitated this process, but my assessment is that the guided intervention also enabled this process quite effectively. Igawahare et al. (2015) have compared the psychological and physiological effects of guided versus solo forest walks and found greater stress reduction and more positive emotional effects among participants that experienced guided forest baths, which support this claim. Sonntag-Öström`s et al. (2015) findings of an unguided forest-based rehabilitation programme for patients with exhausted disorder also points in the same direction, since the patients experienced "frustration in adaption to nature" (Sonntag-Öström et al. 2015:610) during their alone-time in forests, before they were able to reach a relaxed state. Vårhammar (2021), that have studied the same methodology, also emphasize the structure of the guided Eco-Forest Therapy sessions, such as the slow pace and the feeling of not have to perform, as contributing factors to the restorative experience.

All interviewees described themselves as nature lovers, and a majority of the participants in the study (79 %) stated that they visit green spaces one or several times a week. There are therefore clear indications that the guided forest bathing sessions were, in ART (Kaplan and Kaplan 1989) terminology, *compatible* with many participants´ interests, which probably also strengthened their restorative experience. The importance of *being away* from the normal routines of life and getting time for yourself was also expressed as an important aspect of the restorative experience for some of the respondents, as suggested by ART (Kaplan and Kaplan 1989).

The reflective thinking process that the interviewees experienced, which *reminded them of their personal needs*, is not emphasized in the restorative environment theories that I have taken into account in this study. However, Sonntag-Öström et al. (2015) describes a similar process among patients with exhausted disorder that experienced a forest-based rehabilitation programme. When they had gotten used to the routine in the forest, they started to reflect on their life situation and how they could cope with it

better. This process resulted, "for some, in hands-on changes in behaviour and attitudes both towards themselves and other people" (Sonntag-Öström et al. 2015:611). Another aspect that seems to have helped my respondents to reflect on their personal needs, was a feeling of being close to nature. In an evolutionary perspective, this finding is hardly surprising since the human species has evolved in natural environments for millions of years (Kotera et al. 2022). Hence, spending time in our original habitat may help us to get in touch with ourselves better and what we need to feel well.

Similarly to Vårhammar´s (2021) study of the same methodology, *the guided group sessions became a safe haven*, or as Vårhammar describes it "a safe space" (Vårhammar 2021:29) where the participants felt well taken care of by the guides and the structure of the intervention. After the first session, they knew what to expect and they gradually started to feel more comfortable in the group setting as they got to know each other better. Feeling comfortable in nature is also emphasized as a central aspect in order to connect to nature, according to the ACUNAS framework (Giusti 2017) which indicate that feelings of well-being and nature connection can be an integrated, and mutually reinforcing, part of a restorative nature experience. My understanding of the interviewee's experiences is that these feelings progressed gradually during the regular guided forest bathing sessions.

Fascination, (*fascinating nature experiences*), suggested by ART (Kaplan and Kaplan 1989), is an important part of the restorative experience in my findings. But the experiences are more multisensory than how I understand the Kaplan´s (1989), primarily visual descriptions of it. The interviewees gave rich descriptions of fascinating encounters with natural objects through touch, smells, tastes, and visual impressions that made them pay attention to details and experience nature in new ways. These deep sensory experiences also made some of them feel more connected to nature, which confirm the reinforcing character of well-being, restoration and nature connection, proposed in restorative environments research (Joye and Van Den Berg 2019). Vårhammar`s (2021) study of the same methodology also shows how important the engagement of the senses was for the restorative experience. Involving one sense at a time, made the participants able to notice more details, such as specific sounds and smells and feel more relaxed. Similarly, Pálsdóttir et al. 2021 study showed that nature smells had a beneficial effect on mental health recovery among individuals with stress-related mental disorders that participated in a 12-week forest therapy program.

Several of the least valued experiences identified in this study has also been noted in Vårhammar´s (2021) study of the same methodology. Particularly *disturbing sounds* from external people (other people using the same forest) and traffic noise has also been observed by Vårhammar (2021) and *feeling pressured to share- and reflect on other´s experiences,* that Vårhammar describes as *social pressure*. The latter is a methodology matter, that probably quite easily could be modified to suits a greater variety of personalities. My impression of the interviewee's statements is that the groups sharings were a bit challenging for some individuals, particularly those who were severely stressed and for those with a more self-critical personality. To reduce the amount of groups sharings and/or modify them to make them feel less demanding, might be a relevant

methodological modification. The noise levels in an outdoor environment, on the other hand, is less easy to influence, but might be considered when choosing a suitable natural environment. *Emotional turmoil when slowing down*, was not identified in Vårhammar´s (2021) study, but Sonntag-Öström et al. (2015) recommend that forest-based rehabilitation for patients with exhaustion disorder is complemented by cognitive behavioural therapy to improve the recovery process for this group of patients. When targeting the general public, as this intervention did, it might be considered as an option for individuals that express a need for it.

Conclusions

In sum, the intervention had a significant positive effect on the participants perceived well-being, fatigue, restoration, and nature connection. The positive effects are confirmed both by the pre- and post-measurements of the whole intervention programme, by the pre- and post-measurements of each forest bathing session and by the results of the interviews. There is particularly strong evidence for the beneficial health effects perceived directly after each forest bathing session, where the standardized mean difference (effect size) is above one standard deviation for all three baths. The beneficial short-term effects are also confirmed in the interviews, where several respondents described how they quickly recovered from initially quite poor well-being, as a result of the sessions.

The results from the interviews indicate that feelings of well-being, restoration and nature connection may be of a mutually reinforcing character, as suggested by restorative environments research (Joye and Van Den Berg 2019). *Finding rest* in nature seem to have initiated a restorative and reflective process that reduced arousal and negative feelings (Ulrich et al. 1991) and *reminded the participants of their personal needs*. The beneficial effects on mood and well-being are also particularly confirmed in the quantitative analysis, where the effect sizes were medium to large (for well-being) and very large (for mood). The restorative experience was, most likely, facilitated by the natural environments, as suggested in restorative environment research (Joye and Van Den Berg 2019) and by the structure of *the guided group sessions that became a safe haven*. My interpretation is that the guides and the structured intervention created a comfortable setting in nature, that to a large extent contributed to the participants restorative experience and to their ability to connect to nature. Feeling comfortable in nature is also emphasized as an essential aspect of human-nature connection, according to the ACUNAS framework (Giusti 2017) which, in turn, appear to have increased the interviewees´ abilities to indulge in *fascinating nature experiences* (Kaplan and Kaplan 1989) in a multisensory way. The fact that the intervention was *compatible* with many of the participants´ interest (79 % of the participants reported that they visit green spaces one or several times a week in the baseline survey) and that it provided them with an opportunity of *being away* from the normal routines of life, probably also had a positive impact on their restorative experience, as suggested by ART (Kaplan and Kaplan 1989).

As a preventive health intervention, the programme was short, containing only three, three-hour long sessions during three weeks in a row. But the shortness of the intervention probably also made it attractive for more people that may have had

difficulties of attending longer programmes during their spare time. To obtain so positive results from a rather time-restricted programme is encouraging and shows that it is indeed possible to achieve beneficial health effects within limited timeframes and with limited resources. However, more research is needed to explore the long-term effects of this kind of intervention. The lack of evaluation of sustained effects of forest bathing is also identified as one of the biggest limitations in most studies (Rajoo et al. 2020). It would be interesting to follow participants during an extended period and assess if they would be able to establish healthier daily routines, such as spending more time in nature, listening more to their own needs, finding new ways to recuperate etc. as a result of it. My understanding of the interviewees is that they are on the right path of establishing healthier routines in their lives, but the question remains if the intervention was long enough and if it provided the participants with enough tools to translate these experiences into healthier habits in their everyday lives.

For some reason, this intervention mainly attracted women (90%) in different ages and stages of their lives. Since women are overrepresented among Swedes with a reduced well-being in health statistics (Public Health Agency of Sweden 2020), it is indeed encouraging that a lot of women wanted to participate in the intervention. Considering the positive results, it would be interesting though, to explore how it could be designed in a way that also would attract men to a larger extent and more research is needed on that topic. Most of the participants (62 %) had never experienced guided forest baths before, so it reached a lot of people that was new to the practice, which mean that they tried something new to increase their well-being.

To my knowledge, this is the first time that a guided forest bathing intervention, with regular sessions targeting the general public, has been implemented in Sweden, and the results are promising for the future. Hopefully, this study can serve as an inspiration for other nature-based interventions that can have real impacts on people`s well-being, restoration, and nature connection.

Methodological reflections

The collaboration with the Scandinavian Nature and Forest Therapy Institute was a huge asset in several ways for this study. The institute´s and the guides´ many information channels and networks made it possible to recruit many participants, spread over the whole country, in a short period of time. The institute´s dedicated work with providing potential participants with relevant information and connecting them with guides in their areas was also a huge logistical undertaking that made it possible to expand the outreach of the study. The SNFTI guides spread across the country made it possible to implement the intervention in a variety of green environments, from the northernmost, to the southernmost parts of Sweden. Their dedicated work also made the data collection process a lot easier, since they were able to support their participants on site when they were answering the surveys. The survey-errors would, most likely, have been a lot more common without their diligent support.

The fact that the recruitment was done through SNFTI´s and the guides´ information channels, may have limited the scope of participants. However, the majority of the participants (62 %) had never tried forest bathing before so the outreach among the

general public was better than what might have been expected. Many that I interviewed had seen the advertisement about the study on Facebook, which seem to have been a successful way of reaching many people during a short amount of time.

The collaboration with the Scandinavian Nature and Forest Therapy Institute also ensured that all participants were able to experience the same, well-defined and delimited method, and the same sessions, in the same order, during the same time-period, in a variety of green environments across the country. This would not have been possible to achieve without the institute´s dedicated work with creating a qualitative intervention programme and the institute´s committed work with making sure that it was professionally implemented by certified SNFTI guides. The high quality achieved in the intervention would not have been possible to accomplish without this collaboration and it has strengthened the validity of the study considerably.

I believe that my own training as a SNFTI certified guide also has facilitated my exploration of this topic since it has given me a deeper understanding of the methodology and a practical experience of how it is implemented. I have also learned a lot through my personal experiences of being a participant at guided forest baths that has helped me go deeper into the topic during the interviews. I do think, though, that it was important that I did not confuse my role in this study by participating in it both as a guide (implementer) and as a researcher. The fact that I wasn´t responsible for the implementation of the intervention supported my independent exploration of the topic.

The psychological rating scales that were used (see more information about the rating scales in section "Quantitative methods") were thoroughly discussed in the working group (see more information about the working group in section "Ethical considerations") before decided upon. I had also tried them on myself to investigate if the questions/statements were easy to understand and answer. The study used the exact same wording and scales as the original rating scales, but two clarifications were made in the instruction for the Shirom-Melamed Burnout Measure 12 (Almén and Jansson 2021) and the Recovery Experience Questionnaire (Almén et al. 2018; Sonnentag and Fritz 2007). Since some of the questions/statements in these scales were related to work, I added that if the respondents did not work, they were able to relate the statements/questions to their everyday responsibilities in order to make them applicable for everyone that answered the surveys.

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Appendix A

Table 10. *The SNFTI guides´ descriptions of the areas used during the intervention and the weather conditions.*

Area	Municipality	Description of environment	Temperature and weather
1) Palokorva	Pajala	Mainly coniferous forest (pine trees and spruce) with some deciduous trees and marsh. Ground mainly covered by moss, blueberry, and lingonberry. Outcrop with pine trees. A variation of young and very old trees (some around 300 years old). Some fallen trees and dead wood.	First session: 6-7 degrees C. Cloudy and a bit windy. Second session: 7 degrees C. Cloudy and some drizzle at the end. Third session: 9-10 degrees C. Mostly cloudy and some sunshine
2) Blåsmark[10]	Piteå	Tall pine heaths with some coniferous trees, moss, blueberry sprigs, lingonberry sprigs. Relatively flat landscape.	First session: 10 degrees C. Sunny and airlessly. Second session: 11 degrees C. Sunny and windy.
3) Ersnäs	Piteå	Mostly pine heath and mixed forest, mostly pine and spruce and some birch trees. Blueberry sprigs, lingonberry sprigs, moss.	Third session: 9 degrees C. A lot of rain and wind
4)Offerdal Lungret	Krokom	Mixed forest, younger trees, and older, taller trees. Moss, blueberry sprigs, lingonberry sprigs. Meadows.	First session: 11 degrees C. Cloudy. Second session: 11 degrees C. Cloudy. Third session: 7 degrees C. Cloudy.
5) Stångjärn	Falu	Mixed forest, younger and older trees, lingonberry, blueberry, and crowberry. Heather and moss.	First session: 8 degrees C. Rain. Second session: 8 degrees C. Cloudy. Third session: 10 degrees C. Sunny.
6) Vätterskoga	Skinnskatteberg	Mostly pine trees and some spruce at an esker by a smaller lake and marsh. Elements of deciduous trees such as birch and asp. A mixture of mostly younger but also some older trees. The ground is covered by moss,	First session: 11 degrees C. Sunny. Second session: 7 degrees C. Cloudy. Third session: 8 degrees C. Cloudy.

[10] The last forest bathing session for this group was conducted in Ersnäs (described below Blåsmark) in the table.

		blueberry sprigs and lichen. Marsh tea is growing at the marsh.	
7)Södra Törnskogens Naturreservat	Sollentuna	Mixed thinned forest. Many paths and moss-covered rock slabs. Mostly coniferous forest in a variety of ages. Ground mainly covered by moss, lingonberry, and blueberry.	First session: 15 degrees C. Sunny. Second session: 13 degrees C. Cloudy. Third session: 14 degrees C. Sunny.
8) Judarskogen	Stockholm	Old pine trees and spruce mixed with hanging hazel bushes. Some deciduous trees such as birch, asp, and maple. Embankments limit traffic noise. The terrain has some height differences but is relatively easy to access. Large amounts of moraine in some parts. The ground is mainly covered by moss and brushwood.	First session: 12-14 degrees C. Cloudy. Second session: 15 degrees C Cloudy. Third session: around 14 degrees C. Sunny.
9) Nackareservatet	Stockholm	Mixed forest with a varied terrain and three lakes. Both tall and old trees and young trees. Both an open and flat landscape and dramatic rock formations, hills, and slopes. Mountains and hills have short pine trees and are mostly covered with moss. In the hills and the slopes there are mainly older spruce and asp. The main part of the south side of the nature reserve has paths and walkways through the mixed forest. The ground is mainly covered by moss, blueberry, lingonberry, and grass.	First session: 16 degrees C. Sunny. Second session: 14 degrees C. Rain. Third session: 15 degrees C. Sunny.
10) Måndalshöjden	Tyresö	Mainly coniferous forest (pine trees and spruce) with some deciduous trees and marsh. Ground mainly covered by moss, blueberry, and lingonberry. Outcrop with pine trees. A variation of young and very old trees (some around 300 years old). Some fallen trees and dead wood.	First session: 15 degrees C. Sunny and dry weather. Second session: 15 degrees C. Dry weather and scattered clouds. Third session: 13 degrees C. Cloudy and rain at times.
11)Rudans Friluftsområde	Haninge	Clear signs of the ice sheet with dramatic slopes and smooth rock slabs on the heights. A mix of older and younger trees, some very large. Mixed forest with mainly coniferous	First session: 11 degrees C. Cloudy and some sun. Second session: 13 degrees C. Windy and sun between clouds. Third session: 12

		trees. The ground is covered by moss, heather, and lichens.	degrees C. Cloudy but bright.
12)Vallaskogens Naturreservat	Linköping	Mixed older forest. Tall and low trees.	First session: 16 degrees C. Cloudy. Second session: 11 degrees C. Sunny. Third session: 8 degrees C. Sunny.
13)Tinnerö Naturreservat	Linköping	Mixed forest mainly with oak and pine trees (but also some spruce, birch and hazel). Not very dense. A mixture of old and young trees, tall and low.	First session: 10-12 degrees C. Sunny. Second session: 12-14 degrees C. Cloudy. Third session: 8-10 degrees C. Cloudy.
14)Västerby lövskogar	Linköping	Oak trees, groves, coastal forest with mainly deciduous trees. A lot of old and tall trees, mainly oak and asp. Slightly hilly terrain with meadows near the water. Grass, flowers, and moss in some parts.	First session: 14 degrees C. Cloudy. Second session: 12 degrees C. Rain. Third session: 13 degrees C. Sunny.
15) Kaserna	Munkedal	Mixed forest near water. Medium-tall, relatively young trees in different callipers. Fairly hilly terrain with some mountains and slabs of stone. Also a spruce plantation.	First session: 7-12 degrees C. Sun, clouds, drizzle. Second session: 10-12 degrees C. Cloudy and windy. Third session: 12-13 degrees C. Cloudy and windy.
16)Bjursjöns-natur och rekreationsområde	Uddevalla	Mostly fairly large and old spruce and some deciduous trees such as oak, beech, birch and hazel. The ground is mainly covered by moss and blueberry sprigs. Some older stubs and fallen trees.	First session: 8-10 degrees C. Changing weather from sun to rain. Second session: 10 degrees C. Cloudy no wind. Third session: 13-14 degrees. No wind, cloudy and some sun.
17) Guddehjälms Naturreservat	Kungälv	Older oak and beech forest with some streams. Tall beech and pine trees with armoured bark (lovely scent). Swamp forest with fallen trees. Ground mainly covered with leaves. Moss covered stones, tree fungi and lichens.	First session: 10-15 degrees C. Fog, sun and light clouds. Second session: 10-13 degrees C. Light clouds, sun and some rain. Third session: 9-12 degrees C. Sun and light clouds.

18) Ljungås natur- och kulturreservat	Vårgårda	Older forest with some deciduous trees in different ages. Clearings and nice light penetration. Partly hilly terrain. Meadows with some rare flowers. Ground covered by moss and blueberry sprigs in some areas, other areas have a smoother ground surface. Many small and large animal trails that cross each other. Cows roam free in the area	First session: 13 degrees C. Sun, clouds and light wind. Second session: 12 degrees C. Cloudy with a light wind. Third session: 12 degrees C. Mostly cloudy and sunny at times. Fresh breeze.
19) Bråtaskogen	Härryda	Mostly tall mixed forest with younger and older trees. Pine trees, spruce, beech, birch and oak trees. A lot of dead wood and ravines with fallen trees. Moss covered big rocks. A lot of blueberries and juniper berries. Hilly terrain.	First session: 11 degrees C. Sunny, cloudy, windy and thunderstorm. Second session: 11 degrees C. Fog, some wind and drizzle. Third session: 12 degrees C. Cloudy and some sun. No wind.
20) Biskopstorps naturreservat	Halmstad	Many tall and old trees (some more than 300 years old). Quite a lot of beech forest mixed with spruce, and pine trees. Old trees with tree fungi. Ground covered by leaves, moss, grass, clover, blueberry sprigs and lingonberry sprigs.	First session: 14 degrees C. Cloudy. Second session: 14 degrees C. Cloudy. Third session: 10 degrees C. Cloudy.
21) Måryd	Lund	Fairly tall deciduous trees, mostly birch, oak, beech, and alder. Some pine trees and dwarf beech. A small waterfall and ponds. Pastures with heather, juniper bushes, cows, and sheep. Ground covered with moss, blueberries, ferns, and a lot of fungus. Quite hilly terrain with nice view over the Vomb howe.	First session: 11-13 degrees C. Mostly clouds and some sun. Second session: 10-14 degrees C. Sun and some wind. Third session: 11-14 degrees C. Sun and wind.
22) Verkasjön	Tomelilla	Mixed forest with a lot of pine trees, oaks, and beeches. Great species richness. Lake with clean fishing water. A lot of fungus.	First session: 14 degrees C. Partly cloudy, no wind. Second session: 14 degrees C. Partly cloudy, some wind and some drizzle. Third session: 12 degrees C. Partly sunny. No wind.
23) Törringelund	Svedala	Large old oaks and beeches. Alder and some willow trees near the pond. A lot of ferns. Nice paths.	First session: 12-14 degrees C. Cloudy. Second session: 14 degrees C. Sunny. Third session: 14 degrees C. Sunny.