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Nature-Based Rehabilitation: Reducing Burnout and Enhancing Well-Being with Green Rehab

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Abstract

Background: Burnout and stress-related disorders are significant health issues that could lead to long-term sick leave. Exploring effective rehabilitation methods is crucial to improving individuals' well-being and facilitating their return to work.
Objective: This study aims to investigate the potential health benefits of Green Rehab's nature-based treatment for individuals with long-term sick leave due to stress-related complications such as burnout. The secondary aim is to evaluate the intervention's effects on depression, anxiety, and general well-being.
Methods: Using a within-group measurement approach, thirty-three participants' burnout, depression, anxiety, and general well-being scores were compared before and after a 28-week intervention. The treatment consisted of various activities, including garden therapy, body awareness, nature walks, therapeutic art, and mindfulness, facilitated by a multidisciplinary team. Results: The findings indicate a significant reduction in burnout, depression, and anxiety symptoms, along with an improvement in general well-being post-treatment. The results suggest that the nature-based intervention provided by Green Rehab is effective in addressing stress-related health issues. Conclusion: The study supports the effectiveness of nature-based treatments in reducing symptoms of burnout and improving mental health. These findings underscore the importance of incorporating nature-based interventions into rehabilitation programs to enhance individuals' well-being and support their return to everyday life.

When individuals go through life, a wide range of situations can lead to a stress response. This paper will evaluate whether a specific nature-based treatment could be applicable for people who have endured stress over a longer period. This treatment leverages Sweden's lush natural landscapes to reduce stress and enhance well-being.

Prolonged interpersonal stressors can lead to burnout, which may have work related and interpersonal consequences. Work-related burnout is characterized by overwhelming exhaustion, cynicism, detachment from one's workplace, and a lack of personal achievements (Maslach et al., 2001). More intrapersonal issues related to burnout syndrome include its effects on an individual's emotional, cognitive, and physical well-being (Armon et al., 2012).

According to the National Board of Health and Welfare, people who seek medical help for stress-related exhaustion receive an evaluation ranging from mild acute stress reaction to intermediate acute stress reaction, and lastly, acute stress reaction. In Sweden, people commonly receive a 4-week sick leave as an initial step for mild reactions. If the severity of the stress reaction does not improve during that period, one might get diagnosed with burnout syndrome. The criteria for burnout syndrome in Sweden require patients to examine stress-related problems for at least six months, indicating that the stressor has been a problem for the individual for some time. Burnout syndrome is particularly problematic due to its long recovery time, often spanning six months to a year or more (Socialstyrelsen, 2017). A report by the Swedish Social Insurance Agency presented statistics which highlighted that 36,428 individuals were on sick leave for burnout and 28,238 for acute stress reaction during 2022, accounting for 4715 million SEK in costs for that year alone (Försäkringskassan, 2023).

It is important to find effective rehabilitation practices for individuals on long-term sick leave to help them return to everyday life. A growing body of scientific evidence points to the importance of natural environments in enhancing well-being for individuals suffering from

stress-related problems (Grahn et al., 2017). There are a variety of nature-based interventions, such as horticultural therapy (Gonzalez et al., 2011), the flow with nature treatment (Salonen et al., 2022), and garden smellscape-experiences (Pálsdóttir et al., 2021).

Nature-based interventions

Währborg et al. (2014) investigated nature-assisted rehabilitation for individuals with severe stress and/or depression in a rehabilitation garden setting in Alnarp Sweden. Their objective was to measure sick leave status and healthcare consumption (healthcare contact and/or medication) one year after rehabilitation. The 12-week intervention program included outdoor activities to foster physical activity and exposure to nature's health benefits, such as fresh air and movement.

Comparing sick leave and healthcare consumption one year before and after the intervention, they found no significant reduction in sick leave, but a significant reduction in healthcare consumption compared to the control group. However, the intervention and control group were not compatible, and there was a lack of data on the participants' specific illnesses.

A similar study was conducted years later by Grahn et al. (2017), focusing on Alnarp's treatment effectiveness on return to work rather than healthcare consumption. This study included three intervention groups: 8 weeks, 12 weeks, and 24 weeks. The authors hypothesized that a longer rehabilitation period would result in a higher return-to-work rate. The participants in this study also had long-term sick leave due to severe stress-related problems, such as burnout. While the results supported their hypothesis, showing that the effect (return to work) was stronger for the 24-week group compared to the 8- and 12-week groups, it is important to note that without a control group, it is not possible to determine if the observed differences were due to the intervention itself or other external factors (Grahn et al., 2017).

A study by Solonen et al. (2022) conducted another nature-based intervention for participants with depression, the flow with nature (FWN) treatment. This treatment is based on theories about nature's restorative properties (Kaplan & Berman, 2010) and stress reduction theory (Ulrich, 1983), to name a few. FWN combines social interactions with natural environments, where support from facilitators and the participant group is combined with exercises like mindfulness to enhance awareness of natural surroundings. The treatment included 12 meetings (one and a half hours each) in a natural setting like a park or forest. The study found that participants experienced a decrease in depressive symptoms, an increase in restorative experiences, and improved work or study abilities compared to the control group (Solonen et al., 2022). A similar study by Hyvönen et al. (2023) also investigated the FWN treatment. The study measured changes in depression (BDI-I), psychological distress (CORE-10), restorative experiences (ROS), and self-reported ability to work/study (WAI). Participants were randomly allocated to the nature-based intervention group and a control group, both continuing their usual treatment during this time. Measurements were taken before the intervention, after 12 weeks, and at a 3-month follow-up (Hyvönen et al., 2023). The results showed a significant decrease in depression for both treatment and control group over the three measurement times. The treatment group experienced a larger decrease in depression compared to the control group. However, there was no significant interaction effect between group and time, indicating no overall significant difference between groups. The treatment group also showed a significant reduction in psychological distress, an increase in restorative experiences and the ability to work/study compared to the control group. While the overall reduction in

distress and increase in restorative experiences were stronger in the treatment group, the pairwise differences in change from pre- to post and from post- to follow-up were not significant. Interestingly, for work/study ability, a significant pairwise group and time interaction effect was observed at post, showing that work/study ability was better in the treatment group than in the control group. These mixed results suggest that a nature-based approach could complement usual treatment for people with depression by reducing psychological distress, enhancing restoration, and improve work/study abilities. However, the intervention does not provide clear support for its effectiveness compared to regular treatment, as significant differences were not consistently observed between the treatment and control groups (Hyvönen et al., 2023).

The effectiveness of nature-based interventions is mixed, stretching beyond the articles presented in this study. To further investigate the effectiveness of nature-based interventions, two meta-analyses are included.

Firstly, Tu (2022) conducted a meta-analysis of 18 randomized controlled trials assessing the mental benefits of horticultural therapy (HT), including cognitive and social skills, emotional regulation, empathy, flexibility, social roles, and a harmonious relationship between body and mind. The HT groups showed a significant effect on mental health compared to control groups, providing evidence for the effectiveness of HT. Tu (2022) argues that combining conventional treatment with HT could achieve better results for participants.

Secondly, Lu et al. (2023) conducted a systematic review and meta-analysis of 31 studies on HT for stress reduction, examining if HT had physiological and psychological impacts, and the influence of specific environmental settings. Their results showed that HT groups had a significant effect on stress levels compared to control groups. An indoor setting for HT had a better effect on physiological indicators, while a virtual environment was most effective for psychological indicators. For outdoor settings, gardens were the most effective for stress reduction. Additionally, individuals above 60 or below 18 showed the best effects on both physiological and psychological indicators. Participants from Asia benefited most from HT in terms of physiological stress reduction, while those from North America benefited most psychologically (Lu et al., 2023).

Burnout

The term burnout as a stress-related phenomenon was first introduced by psychologist Freudenberger (1975) in the mid-70s, following observations of health care professionals experiencing a decreased ability to feel positive, engaged, and effective in their work. Freudenberger (1975) described burnout as a state where an individual loses the ability to function in all areas of life due to overextension in the workspace. Committed individuals who strive to do their best when serving those in need are at risk of falling into the “burnout trap” if they are not careful. Through interviews, Freudenberger identified physical and psychological signs of burnout. Physical symptoms included: exhaustion and fatigue, a weaker immune system, frequent headaches, sleeplessness, and depression, among others. Psychological complications seemed to stem from emotional fatigue, with signs such as withdrawal from social engagement, an inability to discuss their struggles with others, boredom, hopelessness, and resentfulness.

Later research continued investigating the term burnout quantitatively, and in 1981, the Maslach Burnout Inventory (MBI) was developed (Maslach & Jackson, 1981). The MBI emerges as a conceptualization of burnout as a psychological syndrome resulting from chronic interpersonal stressors. It identifies three core components of burnout: Emotional exhaustion, depersonalization, and reduced personal accomplishment, making it a multidimensional construct (Maslach et al., 2001).

Exhaustion is arguably the main factor of burnout. It is the most common feature individuals describe when discussing their own or others' symptoms of burnout, and thus the most researched. This dimension sufficiently describes stress in relation to burnout, encompassing both physical and emotional exhaustion or depletion. For healthcare professionals suffering from exhaustion, it might result in adopting a coping mechanism through depersonalization (Maslach et al., 2001).

Depersonalization is the dimension of burnout, which describes the phenomena of distance the individual from others, the workspace, or the world. It is seen as a coping mechanism to distance the individual from the emotional or cognitive demands of their work to preserve limited resources, often leading to a cynical attitude (Maslach et al., 2001).

Reduced personal accomplishment is the last dimension of burnout and is considered more complex due to its relationship with exhaustion and depersonalization. Exhaustion and depersonalization can cause individuals to lose their sense of effectiveness, and in some cases, reduced personal accomplishments stem from either exhaustion or depersonalization (Maslach et al., 2001).

MBI was originally constructed for human services (MBI-HSS). As research progressed, it was reconstructed twice, as emerging evidence suggested that burnout wasn't exclusive to human services. The second version was developed to assess burnout in educational settings (MBI-ES), and the third and latest version took a more general approach to include work settings without a people focus (MBI-GS). A common feature of all versions of the MBI is the workplace focus. It is important to note that the differences among these inventories lie in how the questions are framed (Maslach et al., 2001). The MBI is arguably the most used assessment for burnout to this day, often seen as the 'gold standard' (De Beer et al., 2024).

Another common measurement for burnout is the Shirom-Melamed Burnout Questionnaire (SMBQ) (Melamed et al., 1992). The SMBQ is based on Malamed et al. (1992) conceptualization of burnout as a mixture of emotional exhaustion, physical fatigue, and cognitive weariness. Together, these dimensions represent burnout. Emotional exhaustion is the effect burnout has on interpersonal relationships, characterized by a lack of energy and motivation to engage with others. Physical fatigue is described as tiredness and having low energy levels or feeling "burnt out", making daily tasks more demanding. Cognitive weariness is reduced cognitive capacity, often described as slow thinking or an inability to think clearly (Melamed et al., 1992).

Their framing of burnout takes a different approach to the phenomenon and results in different measurements. SMBQ measures overall mental and physical exhaustion rather than workplace-specific implications of burnout. This measurement shares aspects of Maslach's conceptualization of burnout, specifically emotional exhaustion, which is positively correlated with SMBQ (Grossi et al., 2003).

Since Melamed et al. (1992) take a different view on burnout than Maslach et al. (2001), focusing on physical fatigue and cognitive weariness rather than depersonalization and reduced personal accomplishment, the SMBQ is considered more useful for a clinical population rather than a working population. This distinction makes SMBQ a better fit for clinical cases, as it

addresses the physical and cognitive symptoms that are more prevalent and severe in such populations (Lundgren-Nilsson et al., 2012; Sundström et al., 2022). In contrast, MBI's categories of depersonalization and reduced personal accomplishment require the individual to be currently working to make sense, whereas a clinical population might not have been able to work for a long time due to burnout often resulting in extended sick leave (Glise et al., 2012). Although both MBI and SMBQ include work-related questions, SMBQ's concept of burnout does not depend as heavily on the work context as MBI's (Lundgren-Nilsson et al., 2012). Lundgren et al. (2012) compared Melamed et al. (1992) original SMBQ and the latter version, SMBM, which uses the sub-domain of listlessness instead of emotional exhaustion and concluded that SMBQ was a better fit for a clinical population.

Maslach et al. (2001) and Melamed et al. (1992) seem to agree on the fundamental origin of burnout: it results from a prolonged stress response where an individual's resources for dealing with stress become depleted over time, leading to exhaustion. The condition of burnout is viewed differently among experts. Some consider it a part of depression (De Beer et al., 2024), and this could be due to common co-morbidity with depression and anxiety, highlighting the need for comprehensive assessment and treatment (Glise et. al., 2012). Others argue that it is unclear whether burnout should be classified as a specific psychiatric disorder (Maslach & Leiter, 2016). Additionally, some researchers advocate for burnout to be recognized as a distinct psychiatric diagnosis for stress-induced exhaustion (SED, F43.8A) (Socialstyrelsen, 2025).

Anxiety and Depression

Both anxiety syndrome and depression can present with anxiety and depressive symptoms. Depression is defined as a state that has persisted for a minimum of two weeks and includes symptoms such as persistent low mood, low energy levels, and a lack of interest in activities that usually bring joy. Other symptoms include loss of self-esteem, feelings of shame, and guilt. Clinical diagnosis of depression requires an individual to exhibit a variety of symptoms, with mild depression requiring fewer symptoms than moderate or severe depression.

Anxiety syndrome, distinct from anxiety as a symptom of depression, is characterized by recurring and intense feelings of anxiety. Anxiety syndrome makes it more challenging to manage anxiety symptoms, resulting in significant restrictions in everyday life (Socialstyrelsen, 2019).

Theoretical explanations

The classical study by Ulrich (1979) investigated the effect of natural landscapes (high vegetation) and urban landscapes (low vegetation) on individuals with stress-related problems. The aim was to test if green spaces had any effect beyond the evolutionary claims of humans' inherent preferences for the aesthetics of natural landscapes. Participants exposed to the "green" view showed a reduction in stress and anxiety, and increased well-being, marking a significant step forward in research in this area. What is it about green spaces that improve our well-being? Ulrich continued his research in this area and formulated the Stress Recovery Theory (SRT) (Ulrich, 1983; Ulrich et al., 1991), which suggests that spending time in nature can enhance well-being through positive effects such as calmness, due to nature's aesthetic and preferred

properties. This has been confirmed by Bowler et al. (2010) and McMahan & Estes (2015) which found that natural environments promote positive changes in affect and emotion.

Attention restoration theory (ART) distinguishes between voluntary and involuntary attention. Voluntary attention is focused and more cognitively demanding, depleting our resources, whereas involuntary attention is spontaneous and less cognitively demanding (Kaplan & Berman, 2010). The core principle of the theory is that our resources for directed attention are more likely to be restored if they are allowed to take a break. To facilitate this shift in attention, one could engage in an environment that fosters involuntary attention (Kaplan & Berman, 2010). Natural landscapes such as parks, gardens, and beaches can provide this environment. The restorative aspect of the theory is that these natural environments can capture our involuntary attention through soft fascination and the lack of stimuli that engage directed attention (Kaplan & Berman, 2010). This aligns with Ulrich's (1979) study, which provided evidence for the restorative properties of natural landscapes. Another crucial factor for the restorative effect to take place is that the environment and goal need to be aligned. A person needs allowance both from their surroundings and themselves to relax into the situation for soft fascination to occur (Kaplan & Berman, 2010).

Nature-based treatment in the present study

This study aims to investigate the nature-based treatment (NBT) of Green Rehab (Gröna Rehab). It is a rehabilitation facility for individuals on long-term sick leave due to acute stress, which has led to burnout or PTSD. Green rehab consists of a multidisciplinary team: a psychotherapist, a physiotherapist, an occupational therapist, a gardener, and a biologist (Larsson et al., 2020).

Participants are offered a variety of activities during the 28-week intervention. These activities range from guided relaxation, artwork, stress and lifestyle lectures to nature walks and garden activities (Sahlin, 2014).

Green Rehab incorporates nature's health benefits, based on theories such as stress recovery theory (STR) and Attention Restoration Theory (ART), in combination with more conventional treatments. This integration is achieved through the various activities mentioned above, along with the natural environment surrounding the facility.

The facility covers an area of 800 square meters and includes a main building and a garden. The garden features different sections for specific purposes, such as a greenhouse, herb garden, fire pit area, and raised garden beds. Additionally, the surrounding area includes a cultivated association with allotments and a natural reserve (Änggårdsbergen and Gothenburg's botanical garden). The placement and construction of this rehabilitation facility are designed to create a natural environment that promotes activity and rest. The design is inspired by research on garden therapy, healing gardens, and the role of nature in rehabilitation (Sahlin, 2020).

Green Rehab's combination of various activities, including nature experiences, mindfulness, and artwork, is designed to synergistically reduce stress and enhance participants' ability to cope with stress and emotions. By engaging in these activities, participants are being brought into the present moment, often with the calming and restorative aid of nature.

Research question

The primary aim of this study is to evaluate the potential health benefits of Gröna Rehab's nature-based treatment for individuals on long-term sick leave due to burnout. Specifically, this study seeks to determine whether this treatment can effectively reduce burnout symptoms. The secondary aim is to assess the treatment's impact on depression, anxiety, and overall well-being, given the common co-morbidity of these conditions with burnout. Given the existing body of research, I hypothesize that participants will experience a significant reduction in burnout symptoms following the treatment.

To achieve these objectives, I will utilize a within-group measurement approach, comparing participants' burnout scores before and after the intervention.

Hypothesis

Participants will exhibit a significant reduction in burnout symptoms post-treatment.

Methods

Participants

Green Rehab continuously gathers data for each group participating in their treatment. Upon arrival at Green Rehab, participants completed pre-treatment surveys, and they filled out the surveys again after completing the treatment. In collaboration with the staff at Green Rehab, we sent an invitation to participate in the study to individuals who had already completed the treatment. These individuals received information about the study's purpose and were asked to provide their consent, with the option to withdraw at any time. Of the most recent participants with complete surveys, 40 individuals were invited to participate in the study. Of these, 33 responded and were included in the study, with 32 out of 33 being women. To ensure anonymity, the staff at Green Rehab removed personal information such as names, age, and occupation before providing the surveys.

The participants suffer from acute stress, such as burnout and PTSD. The staff at Green Rehab did not provide specific information on which participants had either condition, but the majority were noted to have burnout. These participants were on long-term sick leave and were referred to Green Rehab as a step towards returning to work. To be selected, participants had to be in contact with a doctor who confirmed burnout or stress-related dysfunction. An expression of interest could then be sent to Green Rehab by the participant's superior, doctor, employer, or the individuals themselves.

Green Rehab Method

The Green Rehab treatment starts gradually. In the first week, participants have one session. In the second week, two sessions, and in the third week, three sessions. By the fourth week, participants have four sessions. For the remaining 24 weeks, participants attend Green Rehab four days a week, with each session lasting three hours.

The treatment consists of various activities, including garden activities, body awareness, nature walks, therapeutic group discussions, therapeutic art, creative activities, and mindfulness (Sahlin, 2014). Green Rehab's multidisciplinary team includes a psychotherapist, a physiotherapist, an occupational therapist, a gardener, and a biologist. The activities may vary depending on the day and season, and a schedule is in place to create stability and foresight for the participants. Some days include mindfulness and nature walks, while others include garden therapy and group discussions. Common to all activities is the presence of two staff members to instruct, help, and provide support if needed. Participants are also offered psychotherapy and physical therapy every week.

Measurements

Four surveys were used to measure burnout, depression, anxiety, and general well-being in individuals before and after treatment (28 weeks).

The Shirom-Malamed burnout Questionnaire (SMBQ) (Melamed et al., 1992) is used to measure burnout. The measurement contains 22 items (e.g., I'm feeling burned out. 1: "Almost never – 7: "Almost always"), which includes questions about burnout, tension, and cognitive weariness. The Cronbach's Alpha for the SMBQ was 0.87 at pre, 0.93 at post.

Beck's Depression Inventory (BDI-2; Beck et al., 1961) was used to measure symptoms of depression. This inventory contains 21 items (e.g., Sadness. 1: "Not at all severe" – 4: "Very severe"). Depression is commonly co-morbid with burnout, making it important to measure this variable (Glise et al., 2012). The Cronbach's Alpha for the BDI-2 was 0.82 at pre, and 0.88 at post.

The Beck Anxiety Inventory (BAI; Beck et al., 1988) was used to measure symptoms of anxiety. This inventory contains 21 items (e.g., Nervous. 1: "Not at all" – 4: "Very much"). Anxiety often co-occurs with burnout, emphasizing the need to assess this aspect (Glise et al., 2012). The Cronbach's Alpha for the BAI was 0.89 pre, 0.85 at post.

The Psychological General Well-Being Index (PGWB; Dupuy, 1984) was used to measure subjective well-being to assess quality of life. It contains 22 items (e.g., How have you been feeling in general the past week? 1: "The most negative alternative – 6: "The most positive alternative"). Measuring well-being is relevant as it allows us to see how participants' overall well-being changes as a result of potential improvements through the treatment. The Cronbach's Alpha for the GWB was 0.84 pre, and 0.88 at post.

Results

To test the study's hypothesis that there is a significant difference between pre- and post-treatment on burnout, the main analysis used was a paired-samples *t*-test (see **Table 1**). The results revealed a significant reduction in burnout after the 28-week intervention period (M = 4.00, SD = 0.93) compared to pre-treatment levels (M = 5.19, SD = 0.70); $t(32) = 8.68$, p = .<001. Levine's test for homoscedasticity was significant, leading to the use of the non-parametric test Wilcoxon signed-rank test, which also showed significant results. Thus, the results from the paired-samples *t*-test can be interpreted as valid.

There was also a significant reduction in depression post-treatment (M = 1.71, SD = 0.36) compared to pre-treatment levels (M = 2.19, SD = 3.35); $t(32) = 8.88$, $p = .<001$. Anxiety levels showed a significant decrease (M = 1.59, SD = 0.33) compared to pre-treatment (M = 1.86, SD = 0.41); $t(32) = 4.12$, $p = .<001$. Additionally, general well-being significantly increased post-treatment (M = 3.89, SD = 0.50) compared to pre-treatment (M = 3.36, SD = 0.47); $t(32) = -5.18$, $p = .<001$.

Table 1 Changes in health outcomes following Green Rehab treatment: Pre- and post-treatment comparisons

Measure	M-1	SD-1	M-2	SD-2	*p*-value (2-tailed)	M-diff	95% CI M-diff	*d*-RM
Burnout	5.19	0.70	4.00	0.93	<.001	1.18	0.90, 1.46	0.82
Depression	2.19	0.35	1.71	0.36	<.001	0.47	0.36, 0.58	0.35
General well-being	3.36	0.47	3.89	0.50	<.001	-0.52	-0.72, -0.31	0.48
Anxiety	1.86	0.41	1.59	0.33	<.001	0.27	0.13, 0.40	0.37

M-1, Mean for time 1; M-2, Mean for time 2; SD-1, Standard deviation for time 1; SD-2, Standard deviation for time 2; M-diff, Mean difference; 95% CI, Confidence interval; d-RM, Cohen's d for repeated measures.

To further investigate these findings, exploratory regression analyses were performed for both pre- and post-treatment measurements. These analyses were conducted to explore the relationships between burnout, depression, anxiety, and general well-being, given the common co-morbidity of these conditions with burnout. As shown in **Table 2**, depression had a significant effect on burnout both pre- and post-treatment, with a slight increase post-treatment (pre $\beta = 1.33$ $p = <.001$; post $\beta = 1.47$ $p = <.001$). General well-being, which had no significant effect in pre-treatment, showed a significant negative effect on burnout post-treatment (pre $\beta = .01$ $p = .96$; post $\beta = -.55$ $p = .02$). This suggests that the treatment alters the relationship between general well-being and burnout, indicating that increased well-being results in lower burnout levels.

Table 2 Regression analysis of burnout outcomes: Baseline measurements before Green Rehab intervention

	b	*CI L*	*CI U*	*β*	*t*	*p*
Constant	1.74	-1.54	5.02		1.08	0.28
Depression	1.33	0.63	2.02	0.67	3.91	<.001
Well-being	0.01	-0.53	0.55	0.008	0.04	0.96
Anxiety	0.26	-0.23	0.76	0.15	1.08	0.28
$R^2 = 0.54$						

Regression analysis of burnout outcomes: Post-treatment measurements after Green Rehab intervention

	b	*CI L*	*CI U*	*β*	*t*	*p*
Intercept	3.0	0.18	5.82		2.17	0.03
Depression	1.47	0.87	2.07	0.57	5.04	<.001
Well-being	-0.55	-1.01	-0.92	-0.3	-2.45	0.02
Anxiety	0.39	-0.27	1.07	0.14	1.20	0.23
$R^2 = 0.75$						

Not: β = Unstandardized Beta, CI L = Lower confidence interval, CI U = Upper confidence interval, Beta = Standardized Beta, t = *t*-value, *p* = sig.

Discussion

This study aimed to examine Green Rehab's method for treating individuals with long-term sick leave due to stress-related complications such as burnout. Designing meaningful and effective interventions requires understanding which methods are more beneficial. The results from this study suggest that Green Rehab's intervention is effective in reducing burnout, depression, and anxiety while improving general well-being.

General well-being, which had no significant effect pre-treatment, showed a significant negative effect on burnout post-treatment. This suggests that the treatment alters the relationship between general well-being and burnout, indicating that increased well-being relates to lower burnout levels. One factor that is likely to contribute to the participants' health improvements is the treatment duration of 28 weeks. This is supported by Grahn et al. (2017), who found that their more extensive 24-week program had a stronger effect on participants' ability to return to work compared to shorter programs. The importance of treatment duration may be related to the stress-reductive properties of nature, as described by Ulrich. Spending time in nature can enhance well-being through its calming aesthetic and preferred properties (Ulrich 1979; Ulrich 1983; Ulrich et al., 1991).

The significant reduction in depression observed in this study aligns with Solonen et al. (2022), who found a decrease in depressive symptoms after the 12-week Flow With Nature (FWN) treatment. However, Hyvönen et al. (2023) found no significant effect when comparing the FWN treatment group with a control group in terms of changes in depression, psychological distress, and restorative experiences. This highlights a limitation of the present study, which lacks a control group. Consequently, drawing definitive conclusions about the treatment's effectiveness is challenging, as the observed changes may merely reflect participants returning to their baseline state over time, rather than the effect of the treatment itself. This limitation is further underscored by Währborg's study, which included a control group and found significant improvements in burnout symptoms attributable to the intervention. However, they did not observe a significant difference in sick leave compared to the control group, highlighting the importance of having a control group to accurately assess intervention outcomes (Währborg et al., 2014).

Furthermore, the study's findings underscore the common co-morbidity of burnout, depression, and anxiety. The significant reductions observed across all three conditions highlight the interconnected nature of these mental health issues. By exploring these conditions simultaneously, this research provides initial insights into how improvements in one condition, such as burnout, may potentially be associated with positive changes in related conditions like depression and anxiety. This interconnected approach suggests the potential benefits of considering multiple aspects of mental health in treatment strategies.

As mentioned earlier, the definition of burnout varies, but Maslach et al. (2001) and Malamed et al. (1992) agree that burnout is caused by a prolonged stress response where an individual's resources for dealing with it become depleted. If this consensus holds, the significant improvements in burnout, depression, and anxiety observed in this study could be partially explained by the Attention Restoration Theory (ART) and Stress Recovery Theory (SRT) which provides further evidence that natural environments can facilitate psychological recovery (Kaplan & Bergman, 2010; Ulrich, 1983; Ulrich et al., 1991). The natural surroundings of Green Rehab and the treatment itself focus on creating a symbiotic relationship between participants and nature. Kaplan & Bergman (2010) argue that natural landscapes

capture one's involuntary attention, which is less cognitively demanding, thereby restoring available resources. This could explain the positive effects found in the meta-analysis by Tu (2022), where individuals in horticultural therapy showed mental health improvements. However, most studies had a shorter treatment period (2-15 weeks, with one treatment lasting 1 year), which contradicts Grahn et al. (2017), who stated that longer treatments were more effective in improving health outcomes. An interesting finding by Lu et al. (2023) was that an indoor setting for horticultural therapy had a better effect on physiological indicators.

The result from this study suggests that Green Rehab's intervention is an effective method for treating individuals with burnout as well as reducing depression, anxiety, and improving general well-being. Interestingly, the improvements in other domains indicate potential treatment applications for issues other than burnout. For example, other organizations could adopt the Green Rehab method to treat individuals with depression and anxiety, as well as to help those showing early warning signs of burnout. This approach could be adopted to create similar facilities to support a wider range of individuals, not just those on long-term sick leave due to burnout.

The economic burden of stress-related sick leave in Sweden is substantial, with direct costs related to healthcare and indirect costs due to lost productivity and prolonged absence from work. By adopting nature-based treatments like those provided by Green Rehab, healthcare providers and policymakers may reduce these costs. For example, the long-term benefits of improved mental health and well-being could lead to a decrease in healthcare utilization, reduced need for medication, and shorter recovery times, thereby facilitating a quicker return to work. The reduction in burnout, depression, and anxiety symptoms suggests that nature-based treatments can be an effective complementary approach to traditional mental health, creating a more holistic approach to mental health care, particularly for those who have not responded well to conventional treatment. These findings can encourage the creation of similar rehabilitation facilities that utilize natural landscapes to enhance well-being and promote overall mental health.

Limitations and future research

One limitation of this study is the lack of a control group, which affects the conclusions that can be drawn due to the absence of a comparison with a 'treatment as usual' group. Moreover, another limitation is the reliance on self-reported measures, which can introduce bias. For example, participants might want the treatment to have an effect and therefore answer the surveys in a way to show good results. Another limitation is the homogeneity of the sample (32 women and 1 man), which may limit the generalizability of the findings to the broader population.

Yet another limitation of this study is the lack of measurements for nature's part in the health improvement after treatment. According to theory and previous research, nature's part in participant health improvements suggests that nature does have a part in it, yet the study lacks sufficient means to factually prove it.

Future research should address these limitations by including a control group and a more heterogeneous sample. It would be interesting to explore what makes rehabilitation effective by adding or controlling, for other variables. For example, investigating the role of social support could be valuable, as individuals on long-term sick leave are likely to have reduced social life due to being absent from coworkers and potentially isolating themselves due to illness. Lastly,

examining the long-term effects of nature-based treatment by including follow-up measurements could further examine the effectiveness of Green Rehab.

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