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# THE ROLE OF FOREST BATHING IN THE TREATMENT OF DEPRESSION- A NARRATIVE REVIEW

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**ABSTRACT**

**Introduction:** Forest bathing (shinrin- yoku) is a Japanese practice, involving immersion in forested areas with engaging all five senses. Its potential preventive benefits have increasingly attracted interest within the international scientific community, since forest bathing appears to be a safe and low- cost complementary approach, while offering therapeutic value. This narrative review summarizes current evidence on the physiological and psychological benefits of forest therapy, with particular focus on its importance in the treatment of depression- a prevalent mental health disorder, that affects approximately 332 million people worldwide. Studies showed that forest bathing alleviates depressive symptoms, reduces stress, increases feelings of relaxation, happiness and overall mental well being, through several biological pathways, including serotonin modulation, oxytocin increase, cortisol reduction and increased parasympathetic activity. However, further high quality research is needed to clarify its clinical value and long term effects in the treatment of depression.

**Methodology:** A narrative review of literature available in the PubMed database was undertaken, incorporating recent randomized controlled trials, cohort studies, and meta-analyses published in peer- reviewed journals. Articles were searched in English using key terms such as: forest bathing, shinrin- yoku, nature therapy, depression.

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**KEYWORDS**

Forest Bathing, Shinrin- Yoku, Nature Therapy, Depression

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**Introduction**

Throughout history, people have been attracted to forest environments because of their calm atmosphere, aesthetic scenery, moderate climate, pleasant aromas and fresh air [1].

Research has demonstrated that people feel more relaxed and less bored in the forest than indoors, and they perceive time as passing more quickly in nature. These findings correspond with the growing interest in nature-based therapeutic methods, particularly forest bathing (shinrin-yoku), a Japanese health practice involving mindful immersion in forest environments. Literature shows that spending time in peaceful forest environments provides extensive health advantages that affect not only physiological, but also psychological benefits, including alleviating depressive symptoms [2].

*Forest bathing- physiological and psychological effects*

Shinrin-yoku (forest bathing) is commonly described as a health-focused practice, which requires people to spend time intentionally in forest environments. The idea was officially introduced in 1982 by Japan's Ministry of Agriculture, Forestry and Fisheries, in response to the growing awareness of the healing benefits of natural settings. Literally translated as "forest bathing", shinrin-yoku highlights the benefits of immersing oneself in woodland environments to promote preventive health care [3].

A key component of forest bathing is the engagement of all five senses: sight, hearing, smell, taste and touch. These multi sensory stimuli can be combined with forest walks, meditation, landscape viewing, recreational activities and cognitive behavioral therapy. Thus, it cultivates a renewed sense of closeness between individuals and the natural environment [4, 5].

Studies have suggested that forest therapy benefits both physiological and psychological health. When it comes to physiological one, forest bathing has been shown to enhance immune system by increasing natural killer (NK) activity, likely due to a rise in NK cell numbers and upregulation of intracellular anti-cancer proteins such as perforin, granulysin, and granzyme A/B-expressing cells. These outcomes may therefore indicate a potential role in cancer prevention [6].

In another study, it was demonstrated that forest bathing lowers blood pressure and pulse rate, showing preventive effects on hypertension and heart diseases. Li et al. found that a day trip to forest increased

parasympathetic activity and reduced sympathetic activity–related markers such as adrenaline, noradrenaline and dopamine, along with enhancement in adiponectin and dehydroepiandrosterone sulfate DHEA-S levels. They also observed improvements in cardiometabolic markers, including reductions in NT-proBNP, indicating potential cardiovascular benefits [7, 8].

Moreover, research by Ochiai et al. showed that after forest therapy, also salivary cortisol level decreases [9]. Alongside reductions in other stress-related hormones like adrenaline and noradrenaline, it supports stress management.

Despite physiological measurements, forest bathing also plays a crucial role in reducing psychological stress and has a substantial beneficial impact on the psychological well-being of adults. By using the Warwick–Edinburgh Mental Well-Being Scale (WEMWBSS), Keller et al. observed a significant improvement in participants' well-being and stress levels, as well as greater sensation of relaxation, mindfulness and happiness after forest therapy. Participants in particular emphasized the pleasure of being away and having a break from everyday routines and stressful life demands [10].

Being away from daily activities is a core idea in Kaplan's attention restoration theory, in which distancing oneself from everyday routines is essential for alleviating mental fatigue, as it does not demand sustained effort or focused attention [11].

The second representative theory explaining how forest bathing provides a therapeutic approach on human mental health is Ulrich's stress recovery theory, which suggests that exposure to natural environments not only influences physiological parameters like heart rate, muscle tension or blood tension, but also evokes favorable emotional responses [12].

#### *Depression- epidemiology, clinical features, and current treatment approaches*

Depression is a common mental health disorder. According to the World Health Organization, it affects approximately 4% of the global population, including 5.7% of all adults and 5.9% of individuals over 70 years of age, which amounts to roughly 332 million people worldwide. It was identified in 2008 as the third leading cause of global disease burden, while projections suggest that it will become the leading cause by 2030. Clinically, the condition is primarily diagnosed based on the presence of anhedonia, accompanied by emotional and neurocognitive symptoms such as suicidal thoughts, sleep disturbances and psychomotor agitation [13] [14].

Depression may manifest itself as fatigue, loss of energy, feeling of hopelessness, excessive guilt, and low self-esteem. It can interfere with daily functioning across all areas of life, including relationships, family life, social roles, education and work. Hence, appropriate treatment is essential to reduce its impact and improve overall quality of life [15].

Management of depression typically involves pharmacological and non-pharmacological interventions. Pharmacotherapy includes selective serotonin reuptake inhibitors (SSRIs), serotonin–norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants, and, in some cases, benzodiazepines [16, 17, 18].

Despite the availability of many therapeutic methods, antidepressants remain the primary first-line treatment. However, they also carry notable drawbacks, which may negatively affect daily functioning. For instance, antidepressants can cause side effects such as constipation, hypotension, sexual dysfunction, gastrointestinal disorders, weight gain, and other various metabolic complications [19, 20].

Therefore, it is important to consider additional, non-pharmacological approaches as complementary strategies to pharmacological treatments. These include cognitive behavioral therapy (CBT), mindfulness-based therapy, physical exercise, yoga and music therapy [21, 22, 23, 24].

In recent years, growing attention has also been directed toward nature-based therapies, which leverage the restorative effects of natural environments on stress, mood regulation, and overall mental well-being. Within this field, forest bathing has emerged as a particularly promising approach, offering a structured way to engage with nature and improve emotional balance, ultimately supporting treatment of depression [25].

#### **Forest bathing as a therapeutic strategy for depression**

Despite numerous studies showing that forest activity has beneficial effects on both physical and mental health, research directly examining the relationship between forest therapy and symptoms of depression remains limited.

Experimental and clinical studies indicate that noradrenaline (NA) and serotonin (5-HT) play a key role in the pathophysiology of depression. All clinically used antidepressants are known to rapidly increase the synaptic availability of these neurotransmitters, triggering long- lasting adaptive changes. Therefore, serotonergic and noradrenergic pathways remain the primary targets for modern therapeutic strategies [26].

Focusing on the serotonin system and lower serotonin levels in patients with depression, Li et al. conducted a study on healthy men and found that forest bathing increased serotonin levels, suggesting that it may be a promising preventive approach for major depressive disorder (MDD). However, since this finding was limited only to men and to individuals without diagnosed depression, its broader applicability remained uncertain [27].

More recent evidence begins to address this gap. A 2025 study by Li and colleagues involving women with depression and depressive tendencies showed a significant reduction in depressive symptoms, as well as improvements in mood and sleep quality after forest bathing. Importantly, the intervention increased serotonin levels in women who were not taking antidepressant medication, suggesting that exposure to forest may enhance monoaminergic regulation independently of pharmacotherapy. In addition, the study reported an increase in oxytocin concentrations, indicating a potential mechanism related to improved social bonding, psychological relaxation, and stress reduction [28].

In Jin- Woo Han's study, participants who received forest therapy reported a notable reduction in chronic widespread pain and depressive symptoms, together with a significant improvement in health-related quality of life. Depression levels were measured using the Beck Depression Inventory (BDI), and there were visible differences between the forest therapy group and the control group [29].

Among patients with chronic stroke, forest therapy showed meaningful benefits in alleviating mood-related symptoms like depression and anxiety, and may offer value for individuals who are not suitable candidates for standard pharmacological or electroconvulsive treatments [30].

According to Kim's research, CBT-based psychotherapy delivered in a forest setting proved more effective in achieving remission of depression than the same therapy conducted in a hospital environment or as a part of standard outpatient care [31].

It is noteworthy that in another study, among individuals with alcohol dependence, those who began the forest program with higher baseline depression scores showed greater reductions in BDI scores after completing the forest intervention compared to participants with lower initial levels of depression [32].

A similar conclusion was demonstrated in Akemi Furuyashiki's study, in which individuals with depressive tendencies showed larger improvements in psychological measures than those without such tendencies [33].

Moreover, forest environments appear to reduce depressive symptoms more effectively in adults, particularly those with mental health conditions, than in younger populations [34].

Additionally, there is a correlation between the intervention time and effect of forest therapy on depression. A three-hour intervention produces a greater effect size than interventions lasting less than one hour, one to two hours, or two hours [35].

### **Conclusion and prospects for the future:**

Existing evidence suggests that forest bathing (shinrin-yoku) offers significant benefits for both physiological and psychological health, and increasingly, for mood-related disorders such as depression. Results from observational studies, randomized interventions, and neurobiological data show that forest therapy can alleviate depressive symptoms, improve quality of life, and support emotion regulation through multiple mechanisms- serotonin modulation, oxytocin increase, increased parasympathetic activity, and cortisol reduction, leading to stress modulation. Forest bathing may also be beneficial for the cardiovascular and immune system.

Although the results are promising, the current body of literature remains limited by small sample sizes, heterogeneous protocols, short follow-up periods, and a lack of standardized intervention methods. Evidence is particularly scarce in adults with diagnosed major depressive disorder, women, and older populations, hence recent studies are beginning to address these gaps. Furthermore, most findings suggest that forest therapy should be viewed as a complementary, rather than standalone strategy, ideally integrated with conventional treatments such as pharmacotherapy and cognitive behavioral therapy. Forest bathing requires no special equipment- it is a low- cost and low- risk approach, as it simply involves engaging with nature.

Future research should prioritize high-quality randomized controlled trials, standardized definitions of forest-based interventions, long-term outcomes, and direct comparisons with other nature-based therapies. Determining optimal dosage (frequency, duration, environment type) and identifying populations most likely to benefit are essential.

In summary, current evidence supports forest bathing as a safe, accessible, and potentially effective method for reducing depressive symptoms and improving mental well-being in adults, particularly those

experiencing elevated stress or depressive tendencies. While further rigorous investigation is needed, shinrin-yoku represents a promising addition to holistic, person-centered psychiatric care.

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