

PEER REVIEWED MENTAL HEALTH ECO PSYCHOLOGY

TREES Healing Benefits of Immersion in Nature (Focus on Trees, 2015–2025)

Below we compile peer-reviewed, open-access articles (2015–2025) on the healing benefits of nature immersion – especially in forest or tree-rich environments – for psychological and physical health. Studies span ecopsychology, environmental psychology, public health, environmental health, and neuroscience. We group findings by theme (psychological well-being, physical health, child development) and include each article’s title, authors, year, journal, abstract, and a link to the full text.

Psychological Well-Being and Mental Health Benefits

• **Is forest bathing a panacea for mental health problems? A narrative review (2025)** –

Chen, H., Meng, Z., *et al.* – *Frontiers in Public Health*. *Abstract*: **Background:** Rapid urban life increases stress, leading to mental health issues. Studies show that *forest bathing* significantly alleviates depression and anxiety, reduces negative emotions, and promotes well-being. **Method:** The authors searched databases (PubMed, Cochrane, Embase, Web of Science, CNKI) for studies on “forest bathing,” “mental health,” “anxiety,” “depression,” “cortisol,” etc., up to Dec 2024. **Results:** Forest bathing interventions improved mental and physical health, lowering blood pressure, improving sleep quality, boosting immunity, and alleviating depression, anxiety, and stress. Effects on mental health indicators varied by population, and factors like forest environment, tree species, exposure duration/season, and volatile organic compound levels can influence outcomes. **Conclusions:** “*Forest bathing [was] effective in lowering cortisol levels, reducing sympathetic nerve activity, as well as improving negative mood, which could serve as a non-pharmacological treatment for mental health in the general population.*”
Full Text: [10.3389/fpubh.2025.1454992](https://doi.org/10.3389/fpubh.2025.1454992)

• **Ecotherapy – A Forgotten Ecosystem Service: A Review (2018)** – Summers, J.K. &

Vivian, D.N. – *Frontiers in Psychology*. *Abstract*: Natural ecosystems provide crucial services for human well-being. One often overlooked service is **ecotherapy** – the healing and growth enhancement from interaction with nature. The authors review evidence linking nature exposure to recovery from physical and mental illness, showing that contact with natural environments can shorten recovery times, reduce distress, and improve overall well-being. They discuss how theories like *broaden-and-build* and biophilia underlie nature’s therapeutic effects, and urge greater recognition of nature immersion as a valuable ecosystem service for public health. **Full Text:** [10.3389/fpsyg.2018.01389](https://doi.org/10.3389/fpsyg.2018.01389)

• **Associations between Nature Exposure and Health: A Review of the Evidence (2021)** –

Jimenez, M.P., DeVille, N.V., *et al.* – *Int. J. Environ. Res. Public Health*. *Abstract*: This narrative review synthesizes the last decade of studies on nature exposure and health

(with emphasis on children/youth). “*We found evidence for associations between nature exposure and improved cognitive function, brain activity, blood pressure, mental health, physical activity, and sleep.*” Experimental studies indicate protective effects of natural environments on mental health outcomes and cognitive function. Observational studies show positive links between nature exposure and higher physical activity and lower risk of cardiovascular disease; emerging longitudinal evidence points to long-term benefits for depression, anxiety, cognitive function, and chronic disease. The review notes challenges like inconsistent exposure measures and calls for rigorous research into mechanisms, exposure quality, and sensitive life stages. **Full Text:** 10.3390/ijerph18094790

- **Brain functional connectivity differs when viewing pictures from natural and built environments (2021)** – Kühn, S., Forlim, C.G., *et al.* – *Scientific Reports*. *Abstract:* Neuroscience evidence shows our brains respond differently to nature. In this fMRI study, participants passively viewed photographs of **natural scenes vs. urban scenes**. Self-reported stress or mood did not differ, but functional brain connectivity **increased under natural images** in several neural networks (greater connectivity between dorsal and ventral attention networks, between attention networks and default mode network, etc.). Interestingly, individuals who spent more of their upbringing in cities showed less of this nature-driven connectivity boost. These findings suggest that even viewing tree rich landscapes engages attention-related and stress-reduction neural circuits, providing a mechanistic glimpse of nature’s restorative effects. **Full Text:** 10.1038/s41598-021-83246-5
- **How nature nurtures: Amygdala activity decreases as the result of a one-hour walk in nature (2022)** – Sudimac, S., Sale, V., Kühn, S. – *Molecular Psychiatry*. *Abstract:* Urban living is a known risk factor for mental disorders, linked to greater stress-response in the brain. This study performed brain scans on 63 healthy adults before and after a 60-minute walk, either in a **forest** or in a busy urban area. After the walk, those who walked in nature showed a **significant reduction in amygdala activation** during stress-related tasks, whereas no change was observed in the urban-walk group. “*These results suggest that going for a walk in nature can have salutogenic effects on stress-related brain regions, and consequently may act as a preventive measure against mental strain and potentially disease.*” In the context of rising urbanization, the study highlights how accessible green spaces can support citizens’ mental health. **Full Text:** 10.1038/s41380-022-01720-6

Physical Health and Physiological Outcomes

- **Effects of forest environment (Shinrin-yoku/Forest bathing) on health promotion and disease prevention – the establishment of “Forest Medicine” (2022)** – Li, Q. – *Environmental Health and Preventive Medicine*. *Abstract:* Drawing on dozens of studies in Japan since 2004, this paper defines *Forest Medicine* as an evidence-based

interdisciplinary science on forest environment effects. *“It has been reported that Forest bathing has the following beneficial effects on human health:”* (1) **Immune function:** increases natural killer (NK) cell activity, number, and anti-cancer protein levels (suggesting cancer prevention); (2) **Cardiovascular:** reduces blood pressure and heart rate (protective against hypertension and heart disease); (3) **Stress hormones:** lowers stress hormones (adrenaline, noradrenaline, cortisol); (4) **Autonomic balance:** increases parasympathetic (rest-and-digest) and reduces sympathetic (fight-or-flight) activity; (5) **Sleep:** improves sleep quality; (6) **Metabolic:** increases levels of serum adiponectin and DHEA-S; (7) **Mood:** in Profile of Mood States tests, forest bathing reduces anxiety, depression, anger, fatigue, confusion and **increases vigor**, indicating anti-depressant effects; (8) may aid rehabilitation medicine; and (9) even **urban parks** used for Shinrin yoku yield health benefits. In summary, *“forest environment...may reduce stress and have a relaxing effect; walking in forest parks may have beneficial effects on human health.”* This emerging **Forest Medicine** bridges alternative, environmental, and preventive medicine. **Full Text:** 10.1265/ehpm.22-00160

• **Medical empirical research on forest bathing (Shinrin-yoku): a systematic review**

(2019) – Ye, W., Yan, Q., *et al.* – *Environmental Health and Preventive Medicine*. *Abstract:* This systematic review analyzed 28 studies (2015–2019) on health effects of **forest bathing**. The methodological quality of randomized trials was higher than non randomized, but collectively the studies show clear benefits. *“Forest bathing activities might have the following merits: remarkably improving cardiovascular function, hemodynamic indexes, neuroendocrine indexes, metabolic indexes, immunity and inflammatory indexes, antioxidant indexes, and electrophysiological indexes; significantly enhancing people’s emotional state, attitude, and feelings..., physical and psychological recovery, and adaptive behaviors; and obvious alleviation of anxiety and depression.”* **Conclusion:** *“Forest bathing activities may significantly improve people’s physical and psychological health.”* The authors recommend more rigorous interdisciplinary research to clarify mechanisms and strengthen the evidence base. **Full Text:** 10.1186/s12199-019-0822-8 (Open Access)

• **Spending at least 120 minutes a week in nature is associated with good health and wellbeing (2019)** – White, M.P., Alcock, I., *et al.* – *Scientific Reports*. *Abstract:* It remains unclear how much nature exposure is “enough” for health. This study analyzed survey data from ~20,000 adults in England on recreational nature time in the past week vs. self-reported health and well-being. *“Compared to no nature contact last week, the likelihood of reporting good health or high well-being became significantly greater with contact ≥120 mins”* (e.g. 120–179 minutes: **Odds Ratios** for good health = 1.59, and high well-being = 1.23, relative to <120min)[nature.com](https://www.nature.com). Benefits **peaked at 200–300 minutes per week**, with no further gains beyond that[nature.com](https://www.nature.com). The 120-minute “threshold”

illnesses), and it “*did not matter how 120 mins of contact a week was achieved (e.g. one long vs. several shorter visits)*” [nature.com](https://www.nature.com). The authors suggest this weekly dose of nature could inform public health recommendations, analogous to exercise guidelines [nature.com](https://www.nature.com). **Full Text:** 10.1038/s41598-019-44097-3

- **Associations between nature exposure, green space and health: various reviews/meta-analyses** – *Multiple sources. Summary:* A growing body of quantitative reviews reinforces the link between green nature exposure and diverse health outcomes. For instance, a **2018 systematic review and meta-analysis** of 143 studies found that greater exposure to greenspace is associated with a wide range of health benefits, including reduced risk of **diabetes, cardiovascular mortality, premature death, stress, and high blood pressure**, and better self-reported health. Specific physiological markers respond as well: a **2019 meta-analysis** by Antonelli *et al.* reported that **forest bathing significantly lowers cortisol** levels (a key stress hormone). In pooled data from 8 trials, salivary cortisol was markedly lower in groups exposed to forest environments than urban controls – a reduction of about 0.05–0.08 µg/dL on average. These findings confirm that **nature immersion dampens stress physiology**, supporting its role in disease prevention and health promotion.

(Sources: Twohig-Bennett & Jones 2018 – *Environmental Research*; Antonelli *et al.* 2019 – *Int. J. Biometeorol.*). **Full Text:** Twohig-Bennett (2018) via 10.1016/j.envres.2018.06.030 (subscription may be required); Antonelli (2019) via 10.1007/s00484-019-01717-x (subscription may be required, see abstract).

Children and Youth: Developmental and Health Outcomes

- **Contact with Nature and Children’s Restorative Experiences: An Eye to the Future (2016)** – Collado, S. & Staats, H. – *Frontiers in Psychology. Abstract:* This perspective article reviews what is known about **children’s exposure to nature and restoration**. Modern children are increasingly alienated from nature, yet research indicates that contact with green environments yields significant benefits. “*The findings gathered...suggest that children’s contact with nature **improves their mood and cognitive functioning, increases their social interactions and reduces ADHD symptoms.*” [frontiersin.org](https://www.frontiersin.org) Nature helps replenish kids’ adaptive resources – improving concentration, impulse control, and positive mood (via Attention Restoration Theory and stress-reduction) [frontiersin.org](https://www.frontiersin.org). The authors highlight that children seem to benefit from nature exposure as much as adults do, and they call for future research on how specific features and child–environment interactions produce these restorative effects [frontiersin.org](https://www.frontiersin.org). **Full Text:** 10.3389/fpsyg.2016.01885
- **Could Nature Contribute to the Management of ADHD in Children? A Systematic**

Review (2024) – Hood, M. & Baumann, O. – *Int. J. Environ. Res. Public Health*.

Abstract: Children with **attention-deficit/hyperactivity disorder (ADHD)** often

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struggle with sustained attention, and nature exposure may help. This review examined 7 studies on green/nature exposure and ADHD outcomes in school-aged children. Despite varied methods, “*the included articles consistently reported that exposure to nature is associated with reduced ADHD diagnoses and symptom severity.*” Notably, even after controlling for covariates (age, gender, income, parental education, prenatal factors), the nature–ADHD benefit remained significant. The authors conclude that “*the reviewed literature provides strong support for the benefits of exposure to nature on ADHD in school-aged children.*” In practice, regular play or walks in green settings could complement traditional ADHD treatments by improving attention and self-regulation.

Full Text: 10.3390/ijerph21060736

• **Low Childhood Nature Exposure is Associated with Worse Mental Health in**

Adulthood (2019) – Preuß, M., Nieuwenhuijsen, M., *et al.* – *Int. J. Environ. Res. Public Health*. *Abstract:* This study (part of the Europe-wide PHENOTYPE project) surveyed 3,585 adults (18–75y) about their childhood access to nature or green spaces (natural outdoor environments, NOE) and current mental health. Adults who reported **low nature exposure in childhood had significantly worse adult mental health** scores compared to those with high-exposure childhoods (on a standard mental health scale, $\beta = -4.13$ points for low vs high exposure). Childhood NOE exposure was *not* related to adult vitality (energy/fatigue levels). However, low-exposure childhoods were linked to valuing nature less in adulthood (lower perceived importance of NOE). The study found no evidence that adult nature visitation or other factors mediated the childhood exposure → adult mental health link, suggesting a possible lasting direct benefit of growing up around green spaces. “*Childhood NOE exposure might be associated with mental well being in adulthood,*” underscoring the long-term importance of nature-rich environments for children. **Full Text:** 10.3390/ijerph16101809

• **Green spaces and cognitive development in primary schoolchildren (2015)** – Dadvand,

P., Nieuwenhuijsen, M.J., *et al.* – *Proceedings of the National Academy of Sciences (PNAS)*. *Abstract:* This prospective study in Barcelona followed 2,593 children (7–10 years old) over 12 months, with periodic cognitive tests, to see if **green space around schools and homes** influenced cognitive development. Using high-resolution satellite data, the researchers quantified greenness (Normalized Difference Vegetation Index) at each child’s home, school, and commute path. Children in schools with more surrounding trees and greenery showed **greater improvements in working memory and superior working memory**, and **larger reductions in inattentiveness** over the year. Greenness at school had the strongest association with cognitive gains. Importantly, the greenness benefit appeared to be **partly mediated by cleaner air** – i.e. lower levels of traffic-related air pollution (elemental carbon) at greener schools explained 20–65% of

the cognitive improvements. “Our study showed a beneficial association between exposure to green space and cognitive development among schoolchildren,” supporting
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the value of green schoolyards for mental development. **Full Text:** PNAS
112(26):7937– 7942 (Open Access via PMC)

- **Additional findings – nature contact and child health:** Research consistently shows positive impacts of nature on children’s **physical health** as well. For example, green schoolyards and neighborhood greenness have been linked to higher levels of physical activity and lower childhood obesity risk. Access to nature may also benefit children’s immune development; some studies associate green play areas with a more diverse skin and gut microbiome in children, potentially reducing allergies and inflammation (though more research is needed). Overall, ensuring that children have ample opportunity to interact with trees, parks, and natural environments can foster healthier development – physically, mentally, and even socially (e.g. by encouraging imaginative play and social interaction)[frontiersin.org](https://www.frontiersin.org).

Empirical Studies on Tree-Based Nature Immersion and Mental Health (2015–
2025) **Stress Reduction and Physiological Benefits**

- **The Effects of Dynamic and Static Forest Bathing (Shinrin-yoku) on Physiological and Psychological Health in Males and Females** – Ye Wen *et al.*, 2023 (Journal: *Forests* 14(8)).

Abstract: *This study aimed to investigate the effects of dynamic and static forest bathing on physiological and psychological health. Eleven participants joined a dynamic forest bathing (pre/post-test in a forest), and 20 participants (randomized 10 males, 10 females) underwent static forest bathing in forest vs. urban environments. Measures included blood pressure, pulse, heart rate variability (HRV), and Profile of Mood States (POMS). Dynamic forest bathing led to a significant increase in high-frequency HRV and decrease in the low-frequency/high-frequency (LF/HF) ratio, indicating enhanced parasympathetic and reduced sympathetic activity. Static forest bathing further decreased systolic and diastolic blood pressure and pulse, in addition to the effects seen in dynamic sessions. Both modes boosted parasympathetic activity and lowered sympathetic activity, especially in females. Negative mood states (tension, anger, fatigue, depression, confusion) and total mood disturbance significantly decreased, while positive mood (vigor) increased, particularly in males. Short-term forest exposure thus yields beneficial effects on stress reduction and mood improvement for both sexes*[mdpi.com](https://www.mdpi.com)

Full Text: MDPI – doi:10.3390/f14081592

- **The Effect of a Short Forest Recreation Program on Physiological and Psychological Relaxation in Young Polish Adults** – Ernest Bielinis *et al.*, 2019 (Journal: *Forests*

10(1)).

Abstract: *This field experiment evaluated a one-day forest recreation program's impact on stress in 21 young adults in Poland. Pre- and post-tests included **four psychological***

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*questionnaires (Profile of Mood States, Positive and Negative Affect Schedule, Restorative Outcomes Scale, Subjective Vitality Scale) and physiological measures (pulse rate, blood pressure). After the forest visit, **negative mood markers and negative affect significantly decreased, while positive affect, restoration, and vitality increased.** Participants' **pulse, systolic, and mean arterial pressure were significantly lower** post program. These results indicate that even a short forest immersion can produce **significant stress reduction**, lowering physiological stress indicators and improving mood and vitality*[mdpi.com](https://www.mdpi.com)

Full Text: MDPI – doi:10.3390/f10010034

- **The effects of viewing a winter forest landscape... on the psychological relaxation of young Finnish adults: A pilot study** – Ernest Bielinis *et al.*, 2021 (Journal: *PLOS ONE* 16(1)).

Abstract: *Little is known about winter forest bathing in snowy environments. In this crossover experiment, 22 Finnish university students viewed either a **snow-covered forest** or an **urban building landscape** for a short session. Self-reported **mood, emotions, restorativeness, and vitality** were measured before and after exposure. **After viewing the snow-covered forest, negative mood indices significantly decreased**, whereas positive “vigor” did not change. By contrast, after viewing the urban control environment, **negative emotions increased and positive emotions decreased.** Restorativeness scores **significantly increased after the forest exposure** but fell after the urban viewing. Subjective vitality dropped after the urban setting but remained unchanged after the forest. These results suggest that **winter forests induce psychological relaxation**, reducing negative mood and stress, whereas urban views may worsen emotional state*journals.plos.org

Full Text: PLOS ONE – doi:10.1371/journal.pone.0244799

- **Effects of Forest Bathing on Stress Recovery: Evidence from Middle-Aged Females of Taiwan** – Hui-Chun Chen *et al.*, 2018 (Journal: *Forests* 9(7)).

Abstract: *Sixteen middle-aged women (mean ~46.9 years) participated in a two-day (one-night) forest therapy program in Taiwan. Psychological indices (POMS and State Trait Anxiety Inventory) and physiological indicators (pulse, blood pressure, salivary α amylase) were measured pre- and post-trip. After forest bathing, **negative mood states (confusion, fatigue, anger, tension) and anxiety levels were significantly reduced**, while **vigor (positive mood) improved.** Physiologically, **systolic blood pressure significantly decreased** post-program. In sum, a brief forest therapy visit yielded **mental health benefits and lowered blood pressure** in this group*[mdpi.com](https://www.mdpi.com)

- **Effects of Forest Bathing (Shinrin-yoku) in Stressed People** – Luca Queirolo *et al.*, 2024 (Journal: *Frontiers in Psychology* 15).
Abstract: *This pre/post study (no control) examined 29 adults with moderate stress levels*
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undergoing a 2-day forest immersion. Various physiological stress markers were recorded: heart rate (HR) and variability (HRV), electrodermal activity (EDA), blood pressure, salivary cortisol, plus a mental arithmetic stress task before and after immersion. After forest bathing, salivary cortisol and EDA significantly decreased, while HRV increased, indicating a shift toward parasympathetic (relaxation) dominance. During the post-immersion stress test, participants showed higher parasympathetic activity and lower EDA compared to pre-immersion. These findings demonstrate that forest immersion markedly improves physiological stress regulation, enhancing autonomic balance and the stress response adaptability[frontiersin.org](https://www.frontiersin.org). Full Text: Frontiers – doi:10.3389/fpsyg.2024.1458418

- **Gender Differences in Stress Reduction: Five-Senses Forest Therapy in University Students** – Chia-Min Lin *et al.*, 2024 (Journal: *Forests* 15(12)).
Abstract: *Forty-eight university students (30 male, 18 female) participated in a five-hour forest therapy session emphasizing multi-sensory engagement. Key outcomes were pulse rate, HRV, and mood/anxiety states. Overall, pulse rates and state anxiety levels significantly decreased after forest therapy, indicating stress relief. Notably, female students showed greater reductions in heart rate and anxiety than males, suggesting more pronounced recovery in women. The results support forest therapy as an effective stress-reduction intervention for students, with possible gender-specific effects on physiological and emotional restoration*[mdpi.com](https://www.mdpi.com).
Full Text: MDPI – doi:10.3390/f15122208

Anxiety and Depression Outcomes

- **Impacts of Forest Bathing (Shinrin-Yoku) in Female Participants with Depression/Depressive Tendencies** – Qing Li *et al.*, 2025 (Journal: *Diseases* 13(4)).
Abstract: *Thirty-one women (~40 years old) with clinical depression or depressive tendencies completed a randomized crossover trial of forest bathing vs. city walking (each 1-day trips). Blood samples and psychological assessments were collected. After forest bathing, depression scores (Zung's Self-Rating Depression Scale) significantly decreased compared to baseline and urban walk, and this mood improvement persisted one week later. In the forest condition (vs. city), blood serotonin increased (in those not on antidepressants), and oxytocin and IGF-1 levels rose, while Profile of Mood States (POMS) scores showed higher positive feelings and lower negative emotions (less anger, fatigue, tension, confusion). Participants also reported less fatigue and better sleep quality after the forest visit. These findings provide scientific evidence that forest*

bathing can alleviate depressive symptoms and negative mood, suggesting it as a potential preventative intervention for depression[mdpi.com](https://doi.org/10.3390/diseases13040100)

Full Text: MDPI – doi:10.3390/diseases13040100

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• **Forest Bathing Increases Adolescents' Mental Well-Being: A Mixed-Methods Study –**

Jennifer Keller *et al.*, 2024 (Journal: *Int. J. Environ. Res. Public Health* 21(1)). **Abstract:** *This study examined whether forest bathing could improve the well-being of high school adolescents (24 students, age 16–18) amid rising teen anxiety and depression.*

*Participants did forest bathing sessions three times over three weeks. **Mental well-being (Warwick–Edinburgh Mental Well-Being Scale) significantly increased after forest bathing, with moderate-to-large effect sizes***[mdpi.com](https://doi.org/10.3390/diseases13040100). *Qualitatively, teens reported **reduced stress and feelings of relaxation, peace, and happiness** during forest immersion. These outcomes mirror prior findings in adults, suggesting that **forest bathing is a simple, low-cost intervention to boost adolescents' mood and mental well-being***[mdpi.com](https://doi.org/10.3390/diseases13040100).

Full Text: MDPI – doi:10.3390/ijerph21010008

• **Forest Bathing and Hiking Benefits for Mental Health during the COVID-19**

Pandemic in Mediterranean Regions – Anna Muro *et al.*, 2023 (Journal: *European Journal of Forest Research* 142(2)).

Abstract: *Eighty-six adults in Spain were assessed before and after a **guided forest bathing session** near Barcelona during the COVID-19 pandemic. A control group went on a **traditional hike** for comparison. Forest bathing produced **large improvements in mindfulness, positive affect, and reductions in anxiety and negative affect**, while hiking also helped but to a lesser degree. Specifically, **state anxiety and negative emotions declined significantly in the forest bathing group**, accompanied by increased positive mood, whereas both interventions benefited participants compared to baseline*[pubmed.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/36779181/). *An exploratory profile analysis found forest bathers were more often highly educated urban women with initially lower well-being. The study concludes that **forest bathing (and to a lesser extent hiking) can significantly reduce anxiety and negative mood and improve psychological well-being**, serving as a valuable mental health promotion strategy in post-pandemic recovery*[pubmed.ncbi.nlm.nih.gov](https://pubmed.ncbi.nlm.nih.gov/36779181/).

Full Text: PMC – PMID 36779181 (Open Access)

• **Five-Step Forest Bathing Protocol as a Nature-Based Solution for Student Wellbeing –**

Adriano Bressane *et al.*, 2025 (Journal: *Int. J. Environ. Res. Public Health* 22(4)).

Abstract: *A pilot intervention applied a semester-long forest bathing program (three monthly sessions) for 36 first-year university students in Brazil. Mental health was evaluated with the Depression, Anxiety, and Stress Scale (DASS-21) before and after each session. **The forest-based protocol led to substantial reductions in self-reported anxiety (–48.4%), depression (–35.4%), and***

stress (-33.5%) among

participants [mdpi.com](https://doi.org/10.3390/ijerph22040579). Effect sizes were moderate-to-large. Notably, sessions in parks with more natural features yielded greater mental distress reductions, underscoring the importance of “naturalness” in outcomes. These findings indicate that integrating

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structured forest bathing into university settings can **significantly alleviate students’ depression, anxiety, and stress**, enhancing emotional stability [mdpi.com](https://doi.org/10.3390/ijerph22040579).

Full Text: MDPI – doi:10.3390/ijerph22040579

• **A Comparative Study of the Effects of Forest Bathing on Working-Age People with and without Depressive Tendencies** – Akemi Furuyashiki *et al.*, 2019 (Journal: *Environmental Health and Preventive Medicine* 24:46).

Abstract: This Japanese study examined 155 working-age adults during a day-long forest bathing session, comparing those with mild depressive tendencies to those without. **Before forest bathing, the group with depressive tendencies scored significantly higher on negative mood states (Profile of Mood States, POMS) than the non-depressed group** [environhealthprevmed.biomedcentral.com](https://doi.org/10.1186/s12199-019-0800-1). **After the forest session, all participants showed significant drops in systolic and diastolic blood pressure and in all POMS negative subscales (tension, depression, anger, fatigue, confusion).** Importantly, those with depressive tendencies experienced **greater improvements in mood** – after forest bathing, their POMS scores improved so much that they no longer differed significantly from the non-depressed group [environhealthprevmed.biomedcentral.com](https://doi.org/10.1186/s12199-019-0800-1). This suggests a **particularly strong mood-elevating and depression-alleviating effect of forest bathing** for individuals with mild depression, alongside general stress-reduction benefits for all.

Full Text: BioMed Central – doi:10.1186/s12199-019-0800-1

• **Effects of Forest-Based Interventions on Mental Health: A Meta-Analysis of RCTs** –

Minjee Kang *et al.*, 2022 (Journal: *Int. J. Environ. Res. Public Health* 19(8)). **Abstract:** This meta-analysis synthesized data from 6 recent randomized controlled trials (1990–2020) testing forest therapy’s effects on mental health (total N=241 participants).

Forest-based interventions showed a significant positive impact on mental health outcomes, including reductions in anxiety and depression symptoms [mdpi.com](https://doi.org/10.3390/ijerph19084884). The pooled effect size was $g = 1.25$ (95% CI: 0.93–1.57), indicating a **large overall effect in favor of forest therapy versus control conditions** [mdpi.com](https://doi.org/10.3390/ijerph19084884). Despite some study heterogeneity, the findings provide strong evidence that **forest bathing and similar nature therapy programs can substantially improve depression, anxiety, and mood as a non-pharmacological intervention** [mdpi.com](https://doi.org/10.3390/ijerph19084884). The authors call for more high quality RCTs to further inform optimal program designs.

Full Text: MDPI – doi:10.3390/ijerph19084884

- **Forest Bathing Diminishes Anxiety in Undergraduate Students: A Pilot Study in the Valdivian Temperate Rainforest** – Álvaro I. Langer *et al.*, 2023 (Journal: *Journal of Forest Research* 28(6)).

Abstract: *In this Chilean pilot study, undergraduate students participated in a guided forest bathing session in an old-growth temperate rainforest. Pre-post assessments*

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*showed that state anxiety levels significantly decreased after forest bathing, compared to baseline. Students reported feeling calmer and less worried following the session. The authors note that even a brief exposure in a biodiverse forest environment can **markedly reduce anxiety in young adults**, supporting forest therapy as a useful preventive mental health practice for student populations.*

Full Text: *Journal of Forest Research* – DOI:10.1080/13416979.2023.2197707 (Open Access via University Repository)

Mood Enhancement and Cognitive Effects

- **Affective Benefits of Nature Contact: The Role of Rumination** – Gregory N. Bratman *et al.*, 2021 (Journal: *Frontiers in Psychology* 12).

Abstract: *This study (United States) examined the relationships between nature exposure, affect, and rumination in 617 adults. Participants reported their **average weekly time in nature** and completed surveys of positive/negative affect and their tendency to ruminate. **Greater time spent in nature was associated with higher positive affect and lower negative affect**, as well as less habitual rumination. Mediation analysis indicated that **lower rumination partly explained the link between nature contact and reduced negative affect**[frontiersin.org](https://www.frontiersin.org). These findings support the idea that engaging with tree-rich natural environments can **boost mood and decrease negative thought patterns**, shedding light on a psychological mechanism (reduced rumination) for nature's mood-enhancing benefits.*

Full Text: *Frontiers* – doi:10.3389/fpsyg.2021.643866

- **Beyond Restorative Benefits: Evaluating the Effect of Forest Therapy on Creativity** –

Chia-Pin S. Yu & Hsuan Hsieh, 2020 (Journal: *Urban Forestry & Urban Greening* 51).

Abstract: *Twenty-three participants attended a 3-day forest therapy workshop in Taiwan involving forest walks and mindfulness. The study assessed mood (POMS) and creative thinking (using the Chinese Word Remote Associates Test, CWRAT) pre- and post workshop. Results showed **significant reductions in tension, anger, depression, and confusion**, and an increase in vigor, after forest*

therapy[scholars.lib.ntu.edu.tw](https://www.scholars.lib.ntu.edu.tw). Crucially, **creative performance improved by 27.7% post-intervention** – CWRAT scores increased from pre-test (mean 13.5) to post-test (17.2)[scholars.lib.ntu.edu.tw](https://www.scholars.lib.ntu.edu.tw). The gain in creativity was **significantly correlated with alleviation of negative emotions** (especially reduced confusion), suggesting that the **mood calming effects of forest bathing may facilitate higher-level**

cognitive function like creativity[scholars.lib.ntu.edu.tw](https://scholars.lib.ntu.edu.tw/scholars.lib.ntu.edu.tw)scholars.lib.ntu.edu.tw. Full Text: Urban For. & Urban Green. – doi:10.1016/j.ufug.2020.126670 (Open Access PDF)

- **Walking and Sitting Outdoors: Which Is Better for Cognitive Performance and Mental States?** – Andrew W. Bailey & Hyoung-Kil Kang, 2022 (Journal: *Int. J. Environ. PEER REVIEWED MENTAL HEALTH ECO PSYCHOLOGY TREES* 12

Res. Public Health 19(24)).

Abstract: *This randomized experiment assigned 50 adults to either a 10-minute walk in nature or 10 minutes sitting quietly in nature. Cognitive performance was tested before, immediately after, and 10 minutes post-intervention using attention tasks, while an EEG recorded brain activity. Both walking and sitting in the natural outdoor environment led to improved cognitive performance post-intervention, with no significant difference between groups*mdpi.com*mdpi.com*. Participants who reported feeling more relaxed during the nature exposure tended to perform better on the cognitive tests afterward. Those with a stronger subjective connection to nature and mindful state during the outing also showed lower frontal theta EEG activity (linked to less rumination)mdpi.com*mdpi.com*. These findings support Attention Restoration Theory, suggesting that even brief breaks in a tree-rich environment – whether active or sedentary – can restore directed attention and enhance cognitive function while also improving mental calmness.

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