

Nature-Based Interventions in the Forest Environment: a Review

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Introduction

Nature-based interventions (NBI) are performed in different types of natural environments, and the intervention programmes are both grounded and supported by the natural milieu. In recent years, the concept of using forest sites for NBI has increased. The main idea behind using forest sites revolves around improving people's health and well-being. Concepts such as forest bathing and forest therapy have been introduced, and the terms seem to be used interchangeably. Due to the lack of consensus on the definitions and differences that appear in the described programmes, it is not always clear if an intervention is a forest bathing or forest therapy practice. There is a need for clarity regarding the definitions, the content and the type of practice in order to communicate scientific results and practice to the wider community and health care.

The diversity of definitions of Interventions in the Forest Environment

In literature, forest sites are defined as 'areas covered by trees which are not predominantly under agricultural or urban land use' (Bach Pagès et al., 2020). Forests are multi-sensual natural environments with many valuable qualities to support human health and well-being (Li, 2010). Forest bathing ('shinrin-yoku') is a traditional meditative practice, originating from nature-focused traditions of Shintoism and Buddhism in Japan. In forest bathing, people are invited to immerse themselves in the forest milieu, while mindfully

paying attention to all their senses. It is characterised by walking in a forest at a comfortable pace with stopovers along the way, doing breathing exercises or yoga and contemplating the surrounding nature (Antonelli et al., 2019). Forest bathing often aims to unite humans with a forest and to induce relaxation (Miyazaki, 2018). Developing an evidence-based forest bathing intervention is challenging because no established protocol for the activity exists, but what distinguishes it from an ordinary walk is its structured, embodied and materially mediated nature (Rantala, 2010). Several crucial elements characterise forest bathing and have to be included in the practice: movement at a slow pace and within a short distance, focus on the senses (sensory experience), and connection with the natural world. However, forest bathing can take on different forms, from passive being in the forest and anchoring the mind in the present to active engagement in therapeutic activities, such as for e.g. aromatherapy, music therapy, art therapy or visualisation techniques (Clifford, 2018), often even referred to as forest therapy.

Recently, this ancient practice started to evolve and be used for health-improving interventions, all over the world. While the main idea behind forest bathing still revol-



ves around improving people's well-being, forms of guided forest walks vary depending on geographical region and cultural phenomes unique to them. For example, Finnish forest walks include berry picking (Saimaali, 2020); in Serbia, they are replenished with the relaxing sound of sheep bells (Farkic et al., 2021), while in America, meditation and mindfulness are often incorporated into the practice (Association of Nature and Forest Therapy Guides and Programs, 2020). Due to the lack of a consensus on the definitions and differences that appear in the programmes all over the world, it is of great importance to distinguish between Forest Bathing and Forest Therapy. The clearest distinction of those practices has been made by Cau-Wetterholm (2020), who defines Forest Bathing as 'a nature-based, guided or non-guided

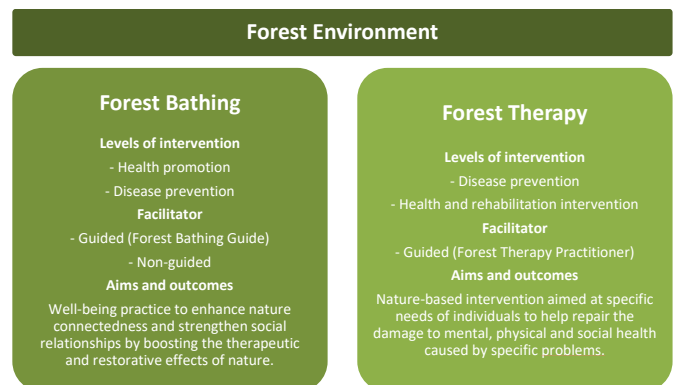


Figure 1. Main assumptions of Forest Bathing and Forest Therapy [developed on the basis of Alex Gesse, 2022]

preventive wellness to achieve a sensory connection with the natural environment for relaxation and sustained health', while Forest Therapy is defined as 'a nature-based, guided and clinically reinforced forest bathing intervention, with additional treatment applications and adapted professional guiding skills to achieve a sensory connection with the natural environment and increased health in specific populations' (Fig. 1).

Aim

The aim of this review was to emphasise the core elements of nature-based interventions in forest environments and to gain an understanding of the difference between Forest Bathing and Forest Therapy practices.

Method

The study was conducted as a literature search, intending to identify: the types of interventions that are performed in the forest environment as well as how the interventions are designed, including the number of participants, intervention site, length of the intervention, type of activities performed during the intervention, and geographic locations, in which research in this field takes place. The Google Scholar database was searched, using the following keywords: "Forest Therapy" and "Forest Bathing". Due to the lack of agreement on the actual definition of Forest Therapy and Forest Bathing, articles on Forest Walking, Forest-based Rehabilitation, Recovery in Forest, and Forest Recreation programmes were also included. Titles and abstracts of the identified articles were reviewed for relevance. Also, the references were manually searched for inclusion of other significant articles. Studies were excluded if they were: Reviews, Systemic reviews or Umbrella reviews; Full-text was not available in English; or, Interventions took place in an environment other than a forest.

Results

The characteristics of all relevant studies such as; study identification, country of performance, population and sample size, intervention type, setting, time period

and intervention design were analysed. References of the studies included in the analysis are listed at the end.

General description of the studies

Twenty-eight studies were included in the review, being published between the years 2007 and 2022. Most of the studies (21) came from Asian countries: Japan (9), Korea (6), China (4) and Taiwan (2). The rest came from Europe (9), including Italy (3), Poland (2), Sweden (2), Hungary (1) and UK (1) (Fig. 2).

Type and design of interventions

Review of the articles revealed six types of interventions: Forest Bathing, Forest Therapy, Forest Walking, Forest Recreation Programme, Recovery in Forest and Forest-based Rehabilitation. Based on the descriptions in the articles and following the guidelines contained in the definitions obtained from the literature, we divided the interventions into two main types: Forest Bathing and Forest Therapy, in which the sub-types distinguished in the research were included (Fig. 3). For this study, we adopt definitions as follows: (1) Forest Bathing is a guided or non-guided well-being practice, aimed at health promotion and disease prevention, achieved by boosting the therapeutic and restorative effects of nature to enhance nature connectedness and strengthen social relationships and (2) Forest Therapy is a guided nature-based intervention for disease prevention or health and rehabilitation intervention, aimed at specific needs of individuals to help repair the damage to

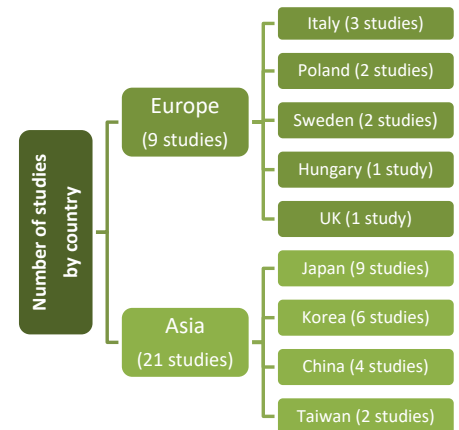


Figure 2. Number of studies included in the review, divided by country of origin

mental, physical and social health caused by specific problems (Geske, 2022). Two sub-types were distinguished from Forest Bathing, which are Forest Walking and Forest Recreation Programme. Also, two sub-types were distinguished from Forest Therapy, which are Recovery in Forest and Forest-based Rehabilitation.

Different programmes proposed different lengths of interventions. The most frequent ones were interventions lasting 1 or 2 days, but interventions lasting from one to twelve weeks also took place. Activities performed during different types of interventions varied. Most frequent ones were walking, breathing exercises, and stimulation and engagement of senses achieved in various ways. Figure 4 presents a detailed description of types of activities performed during each type of intervention and in the literature list, divided into the type of interventions.

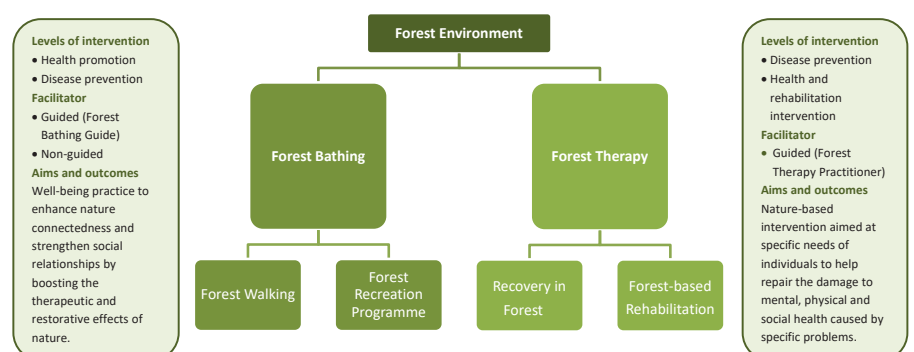


Figure 3. Types of Nature-based interventions in a forest environment. The terminological division into two main types: Forest Bathing and Forest Therapy and four sub-types: Forest Walking, Forest Recreation Programme, Recovery in Forest and Forest-based Rehabilitation.

Conclusion

Spending time in nature is essential to health and well-being. To take full advantage of benefits of Natural-based Interventions in Forest Environment, it is necessary to create clear definitions, guidelines and division between Forest Bathing and Forest Therapy for all practitioners conducting individual practices in the field. This will allow for easier comparison of research results and safe and full use of the health potential provided by the forest environment. This type of action may also result in easier adoption of this type of practice by health care, and thus a wider use of the benefits of nature in the future.

Final words

The study was done as a part of the Erasmus+ student exchange programme and is a collaboration between the University of Agriculture in Krakow and Swedish University of Agricultural Sciences (SLU). The full results are now being prepared for peer-review publication in an international scientific journal therefore no discussion is included here.

References

Introduction

- Antonelli, M., Barbieri, G., Donelli, D. (2019). Effects of forest bathing (shinrin-yoku) on levels of cortisol as a stress biomarker: A systematic review and meta-analysis. *International journal of biometeorology*, 63(8), 1117–1134.
- Association of Nature and Forest Therapy Guides and Programs. (2020). The practice of forest therapy. Retrieved on 15 June 2022, from <https://www.natureandforesttherapy.org/about/the-practice-of-forest-therapy>.
- Bach Pagès, A., Peñuelas, J., Clarà, J., Llusà, J., Campillo i López, F., Maneja, R. (2020). How should forests be characterized in regard to human health? Evidence from existing literature. *International journal of environmental research and public health*, 17(3), 1027.
- Clifford, M. A. (2021). *Your Guide to Forest Bathing (Expanded Edition): Experience the Healing Power of Nature*. Red Wheel.
- Farkic, J., Isailovic, G., Taylor, S. (2021). Forest bathing as a mindful tourism practice. *Annals of Tourism Research Empirical Insights*, 2(2), 100028.
- Gesse, A. (2022). Forest Therapy Interventions: case studies, a grounded approach from more than 20 pilot projects. Retrieved on 20 June 2022, from <https://foresttherapyhub.thinkific.com/courses/take/walk-the-talk-courses/lessons/31801810-forest-therapy-interventions-case-studies-a-grounded-approach-from-more-than-20-pilot-projects-alex-gesse-spain/>.

com/courses/take/walk-the-talk-courses/lessons/31801810-forest-therapy-interventions-case-studies-a-grounded-approach-from-more-than-20-pilot-projects-alex-gesse-spain/.

- Li, Q. (2010). Effect of forest bathing trips on human immune function. *Environmental health and preventive medicine*, 15(1), 9–17.
- Miyazaki, Y. (2018). *Shinrin Yoku: the Japanese art of forest bathing*. Timber Press.
- Rantala, O. (2010). Tourist practices in the forest. *Annals of Tourism Research*, 37(1), 249–264.
- Saimaaliife (2020). Shinrin-yoku with a Finnish twist. Retrieved on 15 June 2022, from <https://www.saimaaliife.com/forest-bathing-shinrin-yoku/>.
- Wetterholm, P. E. C. (2020). Chapter five from forest bathing as a preventive wellness practice to a forest therapy treatment intervention in public mental health care. *Forests for Public Health*, 98.

Forest Bathing - review

- Borriello, G., Grazioli, E., Zavarella, P., Pardini, R., Ianniello, A., Silvestri, D., Cerulli, C., Parisi, A. (2022). Experiencing Forest Therapy in the Italian Landscape: Bathing in the Selva of Castelfidardo. *Preprints*, 2022010275
- Furuyashiki, A., Tabuchi, K., Norikoshi, K., Kobayashi, T., Oriyama, S. (2019). A comparative study of the physiological and psychological effects of forest bathing (Shinrin-yoku) on working age people with and without depressive tendencies. *Environmental health and preventive medicine*, 24(1), 1–11.
- Guan, H., Wei, H., He, X., Ren, Z., & An, B. (2017). The tree-species-specific effect of forest bathing on perceived anxiety alleviation of young-adults in urban forests. *Annals of Forest Research*, 60(2), 327–341.
- Li, Q., Morimoto, K., Kobayashi, M., Inagaki, H., Katsumata, M., Hirata, Y., Suzuki, H., Li, Y. J., Wakayama, Y., Kawada, T., Park, B. J., Ohira, T., Matsui, N., Kagawa, T., Miyazaki, Y., Krensky, A. M. (2008). Visiting a forest, but not a city, increases human natural killer activity and expression of anti-cancer proteins. *International journal of immunopathology and pharmacology*, 21(1), 117–127.
- Li, Q., Morimoto, K., Nakadai, A., Inagaki, H., Katsumata, M., Shimizu, T., Hirata, Y., Hirata, K., Suzuki, H., Miyazaki, Y., Kagawa, T., Koyama, Y., Ohira, T., Takayama, N., Krensky, A. M., Kawada, T. (2007). Forest bathing enhances human natural killer activity and expression of anti-cancer proteins. *International journal of immunopathology and pharmacology*, 20(2-suppl), 3–8.
- McEwan, K., Giles, D., Clarke, F. J., Kotera, Y., Evans, G., Terebenina, O., Minou, L., Teling, C., Basran, J., Wood, W., Weil, D. (2021). A pragmatic controlled trial of forest bathing compared with compassionate mind training in the UK: Impacts on self-reported wellbeing and heart rate variability. *Sustainability*, 13(3), 1380.
- Yu, C. P., Lin, C. M., Tsai, M. J., Tsai, Y. C., Chen, C. Y. (2017). Effects of short forest bathing program on autonomic nervous system activity and mood states in middle-aged and elderly individuals. *International journal of environmental research and public health*, 14(8), 897.

tic controlled trial of forest bathing compared with compassionate mind training in the UK: Impacts on self-reported wellbeing and heart rate variability. *Sustainability*, 13(3), 1380.

- Yu, C. P., Lin, C. M., Tsai, M. J., Tsai, Y. C., Chen, C. Y. (2017). Effects of short forest bathing program on autonomic nervous system activity and mood states in middle-aged and elderly individuals. *International journal of environmental research and public health*, 14(8), 897.

Forest Walking

- Horiuchi, M., Endo, J., Akatsuka, S., Uno, T., Hasegawa, T., Seko. (2013). Influence of Forest Walking on Blood Pressure, Profile of Mood States and Stress Markers from the Viewpoint of Aging. *J Aging Gerontol*, 1, 9–17.
- Li, Q., Kobayashi, M., Kumeda, S., Ochiai, T., Miura, T., Kagawa, T., Imai, M., Wang, Z., Otsuka, T., Kawada, T. (2016). Effects of Forest Bathing on Cardiovascular and Metabolic Parameters in Middle-Aged Males. *Evidence-Based Complementary and Alternative Medicine*, 2016.
- Li, Q., Otsuka, T., Kobayashi, M., Wakayama, Y., Inagaki, H., Katsumata, M., Hirata, Y., Li, Y. J., Hirata, K., Shimizu, T., Suzuki, H., Kawada, T., Kagawa, T. (2011). Acute effects of walking in forest environments on cardiovascular and metabolic parameters. *European Journal of Applied Physiology*, 111(11), 2845–2853.
- Mao, G. X., Cao, Y. B., Lan, X. G., He, Z. H., Chen, Z. M., Wang, Y. Z., Hu, X. L., Lv, Y. D., Wang, G. F., Yan, J. (2012). Therapeutic effect of forest bathing on human hypertension in the elderly. *Journal of Cardiology*, 60(6), 495–502.
- Mao, G. X., Lan, X. G., Cao, Y. B., Chen, Z. M., He, Z. H., Lv, Y. D., Wang, Y. Z., Hu, X. L., Wang, G. F., Jing, Y. A. N. (2012). Effects of short-term forest bathing on human health in a broad-leaved evergreen forest in Zhejiang Province, China. *Biomedical and Environmental Sciences*, 25(3), 317–324.
- Morita, E., Imai, M., Okawa, M., Miyaura, T., Miyazaki, S. (2011). A before and after comparison of the effects of forest walking on the sleep of a community-based sample of people with sleep complaints. *BioPsychoSocial Medicine*, 5(1), 1–7.
- Peterfalvi, A., Meggyes, M., Makszin, L., Farkas, N., Miko, E., Miseta, A., Szereday, L. (2021). Forest bathing always makes sense: Blood pressure-lowering and immune system-balancing effects in late spring and winter in central Europe. *International Journal of Environmental Research and Public Health*, 18(4), 2067.

Forest Recreation Program

- Bielinis, E., Bielinis, L., Krupińska-Szeluga, S., Łukowski, A., Takayama, N. (2019). The Effects of a Short Forest Recreation Program on Physiological and Psychological Relaxation in Young Polish Adults. *Forests*, 10(1):34.

• Bielinis, E., Jaroszewska, A., Lukowski, A., Takayama, N. (2020). The Effects of a Forest Therapy Programme on Mental Hospital Patients with Affective and Psychotic Disorders. *International Journal of Environmental Research and Public Health*, 17(1):118.

Forest Therapy

- Chen, H-T, Yu, C-P, Lee, H-Y. (2018). The Effects of Forest Bathing on Stress Recovery: Evidence from Middle-Aged Females of Taiwan. *Forests*, 9(7):403.
- Han, J. W., Choi, H., Jeon, Y. H., Yoon, C. H., Woo, J. M., & Kim, W. (2016). The effects of forest therapy on coping with chronic widespread pain: Physiological and psychological differences between participants in a forest therapy program and a control group. *International journal of environmental research and public health*, 13(3), 255.
- Jung, W. H., Woo, J. M., Ryu, J. S. (2015). Effect of a forest therapy program and the forest environment on female workers' stress. *Urban forestry & urban greening*, 14(2), 274-281.
- Kim, J. G., Khil, T. G., Lim, Y., Park, K., Shin, M., Shin, W. S. (2020). The psychological effects of a campus forest therapy program. *International journal of environmental research and public health*, 17(10), 3409.
- Lee, H. J., Son, Y. H., Kim, S., Lee, D. K.

(2019). Healing experiences of middle-aged women through an urban forest therapy program. *Urban Forestry & Urban Greening*, 38, 383-391.

- Lee, K. J., Hur, J., Yang, K. S., Lee, M. K., Lee, S. J. (2018). Acute biophysical responses and psychological effects of different types of forests in patients with metabolic syndrome. *Environment and Behavior*, 50(3), 298-323.
- Lyu, B., Zeng, C., Xie, S., Li, D., Lin, W., Li, N., Jiang, M., Liu, S., Chen, Q. (2019). Benefits of a three-day bamboo forest therapy session on the psychophysiology and immune system responses of male college students. *International journal of environmental research and public health*, 16(24), 4991.
- Meneguzzo, F., Albanese, L., Antonelli, M., Baraldi, R., Becheri, F. R., Centritto, F., Donelli, D., Finelli, F., Firenzuoli, E., Margheritini, G., Maggini, V., Nardini, S., Regina, M., Zabini, F., Neri, L. (2021). Short-term effects of forest therapy on mood states: a pilot study. *International Journal of Environmental research and public health*, 18(18), 9509.
- Ochiai, H., Ikei, H., Song, C., Kobayashi, M., Miura, T., Kagawa, T., Li, Q., Kumeda, S., Imai, M., Miyazaki, Y. (2015). Physiological and psychological effects of a forest therapy program on middle-aged females. *International*

journal of environmental research and public health, 12(12), 15222-15232.

- Pichler, C., Freidl, J., Bischof, M., Kiem, M., Weisböck-Erdheim, R., Huber, D., Squarra, G., Mrschetz, P. C., Hartl, A. (2022). Mountain Hiking vs. Forest Therapy: A Study Protocol of Novel Types of Nature-Based Intervention. *International Journal of Environmental Research and Public Health*, 19(7), 3888.
- Shin, W. S., Shin, C. S., Yeoun, P. S. (2012). The influence of forest therapy camp on depression in alcoholics. *Environmental health and preventive medicine*, 17(1), 73-76.
- Song, C., Ikei, H., Miyazaki, Y. (2017). Sustained effects of a forest therapy program on the blood pressure of office workers. *Urban Forestry & Urban Greening*, 27, 246-252.

Recovery in Forest

- Dolling, A., Nilsson, H., Lundell, Y. (2017). Stress recovery in forest or handicraft environments—An intervention study. *Urban forestry & urban greening*, 27, 162-172.

Forest-based Rehabilitation

- Sonntag-Öström, E., Nordin, M., Dolling, A., Lundell, Y., Nilsson, L., Slunga Järholm, L. (2015). Can rehabilitation in boreal forests help recovery from exhaustion disorder? The randomised clinical trial ForRest. *Scandinavian journal of forest research*, 30(8), 732-748.

Activities performed during different types of interventions in forest environment					
Forest Bathing	Forest Walking	Forest Recreation Program	Forest Therapy	Recovery in Forest	Forest-based Rehabilitation
<p>1 day long guided programme</p> <ul style="list-style-type: none"> - walking - nature observation - stimulation and engagement of senses - breathing exercises - mindfulness - meditation - sharing circle - yoga - hammock experiences - barefoot walking - grounding - solitude in forest setting - lectures <p>2 days long non-guided programme</p> <ul style="list-style-type: none"> - walking 	<p>2 days or 8 weeks long guided programme</p> <ul style="list-style-type: none"> - walking - breathing exercises - stimulation and engagement of senses (noticing scents of the forest) <p>1, 2 or 7 days long non-guided programme</p> <ul style="list-style-type: none"> - walking 	<p>1 day long guided programme</p> <ul style="list-style-type: none"> - walking - stimulation and engagement of senses (listening to the sounds of the forest, viewing at the forest, touching forest items, cuddling up to a tree) - stretching 	<p>1 to 11 days or 4 to 8 weeks long guided programme</p> <ul style="list-style-type: none"> - walking - blind and back walking - sitting/ lying down - nature observation - stimulation and engagement of senses - breathing exercises - mindfulness - meditation - sharing circle - counselling and cognitive therapy - music therapy - yoga - stretching /exercising - hammock experiences - barefoot walking - talking to nature - therapeutic activities e.g. natural artwork, nature-related games, forest folk dance, clapping exercise, aromatic hand massage, taking pictures of nature, story-telling, tree hugging - lectures 	<p>12 weeks long guided programme</p> <ul style="list-style-type: none"> - walking - breathing exercises - relaxation by the fire - woodcutting - gathering twigs and branches after forest clearance - solitude in forest setting 	<p>12 weeks long guided programme</p> <ul style="list-style-type: none"> - relaxation exercises (e.g. breathing and focusing on an object) - solitude in forest setting

Figure 4. Activities performed during different types of interventions in forest environments. See also Figure 3.

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