

Assessing the health benefits of forest art therapy – evidence from Bulgaria

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Abstract

Natural heritage increasingly plays a strategic role in contemporary sustainable tourism policies. Forest landscapes provide essential ecosystem services that support both environmental stability and human well-being. There is limited research specifically addressing how forest environments can support psychophysical balance and well-being. Using an interdisciplinary approach integrating forestry science, recreational studies, and wellness tourism research, the study analyses the potential of forest-based wellness practices such as forest medicine and forest art therapy. The obtained statistical value ($p = 0.05$) cover the conventional threshold for statistical significance. Nevertheless, the findings indicate that exposure to forest environments and the implementation of forest art therapy may contribute to the reduction of psychological stress, enhancement of emotional resilience, and improvement of oxygenation status through the restoration of mind–body balance. Wellness tourism is rapidly growing globally, with nature-based programmes that support socio-economic sustainability while simultaneously contributing to the conservation of forest environments. The study suggests that natural heritage should be recognised as a strategic resource for health and wellness tourism. This study aims to assess the effects of forest art therapy conducted in Bulgarian forest environments on key indicators of psychological and physiological well-being.

Key words: forest environments, nature-based interventions, physiological indicators, wellness programmes.

Introduction

Natural heritage has become a central focus within contemporary international environmental policy, biodiversity protection strategies, and sustainable tourism development frameworks (United Nations

Food and Agriculture Organisation 2015, United Nations Forum on Forests 2017, World Bank 2020, United Nations 2024). Countries characterised by rich ecosystems and preserved forest landscapes increasingly recognise the socio-economic and public health value of their natural as-

sets (Robson et al. 2019, United Nations 2018). Mazzoleni et al. (2024) published a scoping review of the scientific literature on forest therapy research in Europe. The review summarized several controlled studies, including those by Bielinis et al. (2018), Muro et al. (2022), Pfeifer et al. (2023), and Meneguzzo et al. (2022) involving participant samples ranging from 40 to 134 individuals (median = 74). These studies primarily assessed psychological outcomes, whereas physiological measures were generally not reported. The review also included six pre-post studies without control groups, namely those conducted by Bielinis et al. (2019, 2020), Bach et al. (2021), Peterfalvi et al. (2021), Borriello et al. (2022), and Muro et al. (2023). These studies involved a total of 167 participants and evaluated physiological and/or psychological outcomes, primarily among healthy individuals. Although none of the studies investigated forest air composition, two studies assessed physiological response and stress hormone levels.

The concept of natural heritage has evolved beyond traditional conservation frameworks, incorporating social, cultural, economic, and well-being dimensions (Dimitrova 2017a, 2025a; Staneva and Marinov 2023; Tomova 2024). Contemporary research increasingly emphasises the multifunctional value of forest ecosystems as providers of biodiversity, and recreational or therapeutic landscapes (Staneva 2019, Staneva et al. 2020, Staneva and Marinov 2022, Dimitrova 2025b).

Bulgaria represents one of the most ecologically diverse regions in Europe. The country hosts a wide range of protected areas, biosphere reserves, and forest ecosystems. High levels of biodiversity and landscape heterogeneity characterise

all of them (Dimitrova 2020, Brown 2021). These natural assets may support the development of sustainable wellness-oriented recreational programmes within the context of recreational tourism (Dimitrova 2017b, Staneva 2018, Aleksandrova 2021, Nesheva 2023). Natural resources have become a fundamental component of contemporary wellness tourism products. Forest landscapes, mineral springs, coastal ecosystems, and mountain environments provide an environmental context for therapeutic recreation and holistic health programmes (Dimitrova 2019, Aleksandrova 2022). Market analyses demonstrate that wellness tourism is among the fastest-growing segments of the global tourism industry (Staneva and Marinov 2023).

The research question is: Can forest art therapy be considered an effective nature-based intervention within the context of wellness and preventive health strategies?

In this study, forest art therapy is understood as a combination of art therapy practices conducted in forest environments, integrating elements of nature-based therapy and creative expression.

Despite the growing interest in nature-based interventions, empirical evidence on the combined effects of forest environments and art therapy remains limited.

The aim of this study is to assess the effects of forest art therapy conducted in Bulgarian forest environments on key well-being indicators of psychological and physiological well-being.

Our working hypothesis is that exposure to forest environments combined with art therapy leads to measurable improvements in selected physiological indicators.

Material and Methods

Study area

Vitosha Mountain is part of the continental biogeographical region of Southeastern Europe, characterised by a temperate continental climate. The mountain influence, includes moderate summers, cold winters, relatively high humidity in forested zones, and good air quality.

The empirical research was conducted within Vitosha Nature Park in southwestern Bulgaria. Situated near the capital city of Sofia. Established in 1934, it is one of the oldest protected areas in the country. The study sites were located at approximately 42.56° N latitude and 23.28° E longitude, at an altitude of 470–560 m a.s.l., making the area highly accessible to a large urban population. Its proximity to Sofia creates a unique interface between urban environments and forest

ecosystems, which is particularly relevant for studies on the recreational use of forest-based wellness programmes.

A map of the study area is presented in Figure 1, showing the geographical location of Vitosha Nature Park and the specific sites selected for the forest art therapy sessions.

The forest vegetation in the selected area, situated at 950–1000 m a.s.l. with northern exposure, is characterised predominantly by managed mixed forest stands. The principal tree species are Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) H. Karst.) of artificial origin and aged 75–95 years, together with naturally regenerated European hornbeam (*Carpinus betulus* L.) and European beech (*Fagus sylvatica* L.) aged approximately 160 years. These conditions provide a representative setting for studying recreational and wellness activities in peri-urban forest environments.

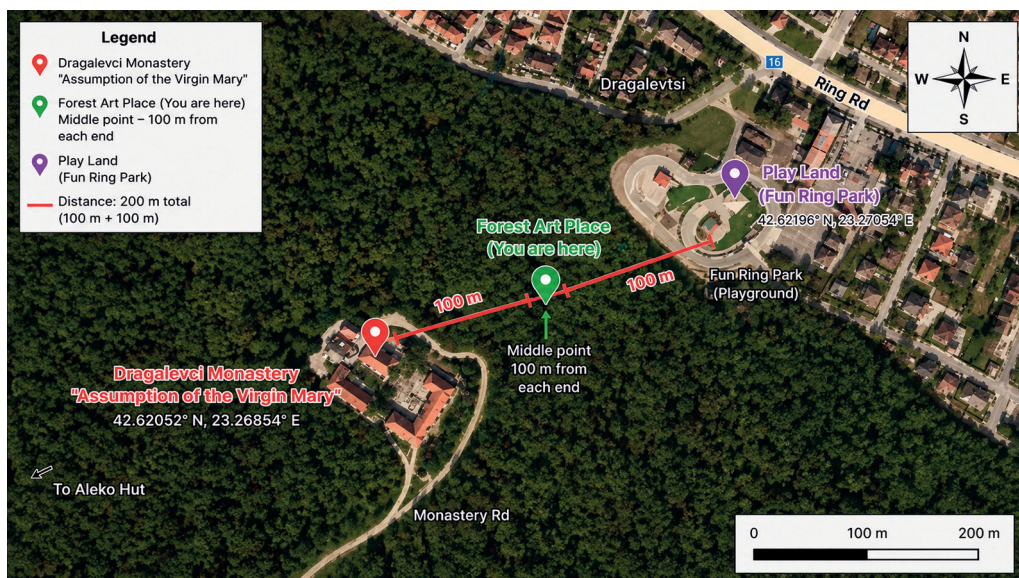


Fig. 1. Vitosha Nature Park: geographical location and study sites.

Study design

The analysis adopts an interdisciplinary methodological framework integrating approaches from forest ecology, recreational science, public health, and wellness tourism studies. The intervention was conducted in designated forest zones within Vitosha Nature Park. The study site was selected based on ecological representativeness, accessibility, and safety. Each session lasted approximately 90–120 min and followed a standardised structure: (1) Introduction and grounding (10–15 min); (2) orientation to the environment and guided breathing exercises; (3) forest immersion (20–30 min), including slow walking and sensory engagement (visual, auditory, tactile stimuli); (4) forest art activity (30–40 min), involving creative expression using natural materials and artistic tools; and (5) meditation and respiration techniques (15–20 min). The control group performed a 1-hour walk inside the Vitosha Nature Park without participating in art therapy. Both groups walked in the same forest environment, and the biomarker measurements were conducted simultaneously, by two separated expert groups. For recording biomarkers in the study, we used the Santa Medical Fingertip Pulse Oximeter for the non-invasive measurement of arterial blood oxygen saturation (SpO_2). The A&D Medical Oscillometer was used for the non-invasive measurement of blood pressure (systolic and diastolic) and heart rate (HR, beats per minute), and pulse intensity. We recorded changes in physiological biomarkers to provide objective measures supporting the subjective psychological assessments of wellness intervention outcomes. We selected well-being indicators with established clinical relevance as of cardiovascular function, autonomic nervous system activity, and stress response

regulation. Together, these biomarkers provide complementary physiological evidence. They support perceived improvements in emotional state, psychological relaxation, and vitality. The integration of subjective self-assessment scales with objective physiological indicators strengthens the validity of the art therapy evaluation framework.

Changes in subjective psychological self-perception were recorded to evaluate the effectiveness of the applied wellness interventions. Emotional and physical states were assessed using a standardised five-point positive rating scale. The scale measured perceived emotional balance, physical vitality, relaxation, and stress reduction before and after participation in forest art therapy. Comparative pre- and post-intervention assessments were used to identify perceived recreational benefits. The Subjective Sense of Relaxation Scale (SSUR-5), an author-developed 5-point scale adapted for post-intervention assessment, was applied. Subjective relaxation was assessed using the item: 'To what extent do you experience relaxation following the intervention?' adapted from Rosenzweig et al. (2007).

Correlation analysis was conducted to examine relationships among variables and to assess the effects of forest art therapy. A comparative analysis was applied to evaluate pre and post intervention differences. In this study, the term 'procedure' refers to a single activity (micro-level), while 'intervention' denotes a structured programme consisting of multiple procedures (macro-level).

Participants

The study involved 52 participants (students enrolled in wellness and spa culture programmes and members of NGOs

specialising in recreational practices). The participants were Bulgarian, with a balanced gender distribution. We divided them into two groups: experimental (30) and control (22), with an average age of 26.4 years. Figure 2 presents the specific forest art installations produced with forest elements.

Figure 2 depicts a composition incorporating forest materials, reflecting

the emotional expression and environmental connectedness with collaborative team-building installation. These installations emphasise the social and communicative dimensions of forest art therapy through creative interaction. Participants were first stratified according to sex and age group and subsequently assigned to the experimental or control group using a simple randomisation procedure based



Fig. 2. Outcomes of outdoor forest art therapy sessions: (a) natural material composition; (b) geometric composition; (c) pinecone, bark, leaves, flower arrangement; (d) forest material team building installation with leaves, grasses, moss, sand, and stones (private source).

on sequentially generated numbers. The physiological indicator measurements were performed by two independent groups of researchers.

All participants provided informed consent for the publication of their data. Several limitations should be acknowledged. Despite efforts to ensure internal validity, the practical implementation of forest art therapy introduced some constraints. These include lack of long-term intervention design, varying weather conditions, and environmental variability.

Results

Scientific findings indicate that increased SpO₂ levels may support immune resilience and metabolic health (Borriello et al. 2022). Contemporary health strategies increasingly emphasise personalised wellness programmes grounded in holistic principles, and in relation to forest ecosystems. The results show a clear reduction in systolic and diastolic blood pressure. Perceived stress levels decreased, oxygen saturation increased, and heart rate decreased in the experimental group. In the control group, only minor changes are observed (Table 1).

Table 1 shows favourable changes in the experimental group following the forest art therapy intervention. Systolic blood pressure decreased from 132.5 to

122.6 mmHg, while diastolic blood pressure declined from 82.7 to 72.3 mmHg. Perceived stress levels were markedly reduced from 4.7 to 2 points. Oxygen saturation increased from 95 % to 99 %, whereas heart rate decreased from 70.2 to 57.6 beats per minute. In contrast, the control group showed only minor changes across all indicators. These findings suggest a positive effect of forest art therapy on physiological and psychological parameters.

The results within the experimental and control groups provide insight into the impact of the forest wellness interventions (Table 2).

Our research suggests that forest art therapy leads to measurable physiological changes. We registered positive changes in key physiological indicators, including reductions in blood pressure levels and heart rate and enhanced functional system activity, as indicated by improved SpO₂ levels. The emotional dynamics indicate significant psychological benefits, including reduced perceived stress levels, as measured by the self-assessment scale, which may be associated with improved oxygenation (SpO₂).

The results suggest that there is a statistically significant difference between the experimental and control groups with respect to the studied variables following the interventions, indicating the influence of emotional states on heart rate.

Table 1. Comparison of biomarkers before and after the forest art therapy intervention.

Measure	Experimental group (pre)	Experimental group (post)	Control group (pre)	Control group (post)
Systolic blood pressure, mmHg	132.5	122.6	131.9	131
Diastolic blood pressure, mmHg	82.7	72.3	83.4	83.1
Perceived stress scale (1–5 points)	4.7	2	4.6	4.1
Oxygen saturation (SpO ₂), %	95	99	95	96
HR, beats per minute	70.2	57.6	70.4	69.2

Table 2. Correlation coefficients representing the relationships between the recorded indicators.

Index	SpO ₂	BT1	BT2	Air T	SBP	DBP	HR	Emotion state	Physical state
SpO ₂	1								
BT1	0.46	1							
BT2	0.43	0.21	1						
Air T	-0.76	-0.46	-0.02	1					
SBP	-0.08	0.55	-0.46	-0.393	1				
DBP	-0.3	0.242	-0.61	-0.12	0.70	1			
HR	-0.74	-0.53	-0.49	0.43	0.26	0.36	1		
Emotional state	0.27	0.39	0.45	0.07	0.69	0.62	0.52	1	
Physical state	0.62	0.64	0.45	-0.64	0.09	-0.68	-0.82	0.07	1

Note: SpO₂ – oxygen saturation, %; BT1 and BT2 – body temperature before and after therapy, °C; Air T – air temperature, °C; SBP – systolic blood pressure, mmHg; DBP – diastolic blood pressure, mmHg; HR – heart rate, beats per min; emotional and physical states – rated on a 1–5 scale.

The correlation analysis identified associations between physiological, emotional, and environmental variables. The effect on the oxygenation showed more than moderate positive correlation with physical state ($r = 0.62$) and a weaker positive correlation with emotional well-being ($r = 0.27$). A strong negative correlation was observed between oxygen saturation and air temperature ($r = -0.76$).

Heart rate was negatively correlated with oxygen saturation ($r = -0.74$) and physical condition ($r = -0.82$). Emotional state demonstrated positive correlations with DBP ($r = 0.69$), SBP ($r = 0.62$), and heart rate ($r = 0.52$), indicating interactions between emotional and cardiovascular responses.

As expected, DBP and SBP were strongly positively correlated ($r = 0.70$). Air temperature also showed weak negative correlations with blood pressure parameters, suggesting a potential environmental influence on cardiovascular function.

The results suggest a measurable difference between the pre- and post-intervention values within the experimen-

tal group. The obtained p -value ($p = 0.05$) reaches the conventional threshold for statistical significance. The findings should be interpreted with caution and considered indicative trends with the potential for stronger statistical significance in future studies involving a larger experimental group (Table 3).

Table 3 presents the results of the paired samples t -test conducted to evaluate the effects of the wellness procedure before and after the forest art therapy intervention. Prior to the analysis, the assumptions for the paired samples t -test were examined. The distribution of paired differences was assessed for approximate normality and no substantial deviations from normal distribution were identified, supporting the applicability of the parametric test. The obtained statistical value approached the conventional threshold for statistical significance. The results suggest a tendency towards improvement following the intervention. The observed pre–post differences are very close to being interpreted as statistically significant.

Table 3. Wellness procedure effect analysis – paired samples *t*-test.

Paired differences	Mean	SD	SE	95% CI of the lower difference	95% CI of the upper difference	<i>t</i> -value	<i>df</i>	<i>p</i> -value
Before–after	72.61	5.69	1.34	-0.05	5.45	2.01	29	0.05

Note: SD – standard deviation; SE – standard error of the mean; CI – confidence interval; *df* – degrees of freedom; *p*-values < 0.05 are considered statistically significant (two-tailed).

This finding suggests that the intervention may have practical relevance, even though the study limitation within the present sample. Overall, the analysis supports the working hypothesis that regular interaction with natural environments, combined with forest art therapy, has the potential to contribute to measurable changes in physiological indicators and indicators of mental and physical well-being, but a larger sample is needed. Our study suggests that forest art therapy may to improved physiological functioning and perceived well-being.

Participants in the forest art therapy reported: (1) reduced stress levels; (2) improved emotional balance; (3) increased vitality; and (4) better sleep quality.

Discussion

Previous research has reported positive effects of forest therapy on stress reduction, cardiovascular regulation and mood improvement.

The present study contributes preliminary evidence regarding the application of forest art therapy as an integrative wellness intervention. The combined evaluation of physiological indicators and subjective psychophysical self-perception represents an underexplored methodological approach in international literature.

The findings should be interpreted cautiously due to the exploratory character of the study. The observed trends

are consistent with previous international studies suggesting that structured interaction with forest environments may support emotional regulation and physiological adaptation.

Conclusion

These findings support the aim of the study by suggesting that forest art therapy conducted within Bulgarian forest environments may contribute to improved health balance and overall well-being through measurable changes in physiological indicators and body-mind balance.

The present findings provide preliminary evidence that regular exposure to forest environments may constitute a beneficial component of a wellness-oriented lifestyle. Forest ecosystems may therefore be considered not only as natural resources, but also as functional environments with potential applications in preventive health and health promotion.

The integration of environmental conservation with innovative therapeutic approaches, including forest-based art interventions, appears to represent a promising and sustainable approach for supporting human well-being while preserving ecological integrity. To the authors' knowledge, this is only the second application of an integrated assessment model of this type in Bulgaria, following the work of Staneva (2017). Our updated model incorporates objective physiologi-

cal indicators, as described in the Methods section, alongside subjective measures of emotional state. The findings may provide preliminary evidence relevant to the Balkan region. However, larger randomised controlled trials with longitudinal follow-up are required to confirm the reproducibility of the observed effects and to further evaluate the potential role of forest art therapy as a wellness-oriented lifestyle intervention. Further research involving larger samples is required to confirm the effectiveness of forest art therapy.

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