

FOREST BATHING ACTIVITY AS A TOOL TO PROMOTE WELLNESS TOURISM IN THAILAND

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ABSTRACT

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This study broke new ground by exploring forest bathing in Thailand, examining its potential to improve health within the country's unique environment and culture. Recognizing the practice's novelty, the research assessed both feasibility and acceptability, along with its effectiveness in boosting well-being. Bespoke activities designed to optimize the experience for Thailand's diverse landscapes were also developed. Additionally, the study evaluated forest bathing's potential as a novel and attractive wellness tourism option in Thailand, highlighting its health benefits. The study engaged 94 volunteer tourists, randomized based on location and availability, who participated in forest bathing activities across varied ecosystems—National Park, Community Forest, and Urban Forest. A significant outcome was the observable decrease in participants' systolic blood pressure levels after engagement. This decrease, averaging approximately 6.6%, sparked discussions on its clinical relevance compared to other health interventions. To understand forest bathing's effects comprehensively, the study tracked systolic and diastolic blood pressure before and after the activity. It also incorporated psychological measures, including the Perceived Stress Scale (PSS) and a happiness assessment. The latter revealed that the vast majority of participants (88.3%) reported high levels of happiness. This research significantly advances forest bathing as a sustainable health tourism model in Thailand by providing early evidence of its effectiveness across diverse landscapes and reinforcing its adoption. The study highlights the importance of merging physiological and psychological assessments, offering a more comprehensive method to evaluate forest bathing's therapeutic potential, thereby enhancing its feasibility and maximizing its benefits within Thailand's unique environmental contexts.

Keywords: Forest bathing; forest bathing activity; tourism for well-being; forest bathing guide; wellness tourism; blood pressure

1. INTRODUCTION

At present, tourism has undergone a transformation due to the increasingly complex and diverse demands of tourists. This has led to the emergence of alternative tourism as a replacement for mass tourism. Alternative tourism allows tourists to "choose" every aspect of their journey, including the selection of destinations, types of travel, accommodation options, and various activities during their travels. As a result,

health tourism has emerged as a key segment of alternative tourism, meeting the demands of travelers focused on physical and mental health restoration and well-being. The global wellness tourism market, growing at an annual rate of 6.5% from 2015 to 2017, far exceeds the growth pace of general tourism, reflecting an increasing preference for health-oriented travel experiences. Wellness tourism focuses on traveling for health-related benefits that contribute to the prevention, recovery, or overall enhancement of health and promoting a better quality of life.

On the other hand, medical tourism primarily emphasizes healthcare treatments or travel activities related to medical care (McGroarty, n.d.). The objectives of health tourism focus on two main aspects: promoting preventive health measures and providing healthcare and recovery services for individuals when they are unwell. This is achieved by engaging in health-related activities at tourist destinations, such as exercising and maintaining proper physical fitness, practising meditation, yoga, tai chi, receiving traditional massages, and utilizing natural therapies. These activities may include receiving services like aroma therapy and hydrotherapy, engaging in mineral or hot spring baths, participating in forest bathing, consuming herbal remedies, and enjoying healthy cuisine.

Moreover, seeking relaxation in locations with pristine natural surroundings has gained significant attention, reflecting a broader trend toward nature-based wellness activities. Recent research indicates a marked increase in interest, with over 60% of global travelers expressing a preference for destinations that offer natural beauty and opportunities for relaxation in natural settings, according to a report by the Global Wellness Institute (n.d.). This aligns with findings from a comprehensive survey, which revealed that 70% of respondents consider access to natural areas and outdoor recreation as a crucial factor in selecting travel destinations (Winter et al., 2020). Utilizing nature as a means of healing is another highly valued approach in health tourism.

Upon reviewing related research works (Kellert & Wilson, 1993; Guan et al., 2017; Li et al., 2009; Lee et al., 2011), several interesting findings were discovered, particularly regarding forest bathing. Forest bathing, a practice that stimulates the immune system, increases vitality, and reduces anxiety, stress, and depression, has been identified as a health-promoting form of tourism enhancing therapeutic treatment (Park et al., 2010; Morita et al., 2007). The benefits of forest bathing include an improved state of mind and a significant reduction in stress hormones by up to 88% (Antonelli et al., 2019), enhancement of the immune system, and improvement in brainwave patterns, contributing to better health and illness prevention. Originating in Japan in 1982, the practice of *Shinrin-yoku* (forest bathing), meaning immersing oneself in the forest atmosphere through sensory perception, has substantial evidence-based benefits gained by participants connecting with nature as means to manage stress (Tsunetsugu et al., 2010; Li et al., 2016a). Indeed, forest bathing has emerged as a popular activity among Japanese individuals seeking to cope with stress and enhance emotional well-being (Hansen et al., 2017).

To quantify the stress-reducing benefits of forest bathing, the Perceived Stress Scale (PSS) offers a valuable tool. Building upon the established qualitative benefits of forest bathing, this study aims to provide robust, scientifically validated measures. By combining the PSS with physiological monitoring, it is possible to demonstrate the therapeutic potential of forest bathing. This comprehensive approach will advance an understanding of how forest environments promote well-being, offering insights applicable to diverse landscapes, including those found in Thailand.

Over the past three decades, extensive research on forest bathing has been conducted globally, notably studies by Ulrich et al. (1991), Morita et al. (2007), Guan et al. (2017), Bielinis et al. (2018) and Cook (2020). This body of work reveals that forest bathing, recognized in the 1990s for its health benefits, notably reduces stress. This conclusion is based on analyzing cortisol levels in saliva before and after sessions, highlighting the profound psychological benefits of interacting with nature. The methodologies employed to assess participants' health fall into two primary categories (physiological and psychological measurements), as identified by Suteethorn (2021), ensuring comprehensive evaluation without redundancy. This research underscores the potential role a natural environment can play in alleviating stress and fatigue, thereby contributing to the broader understanding of forest bathing's therapeutic potential.

While the documented benefits of forest bathing, a practice rooted in the broader principle of nature exposure, have been shown to enhance well-being significantly, the exploration of forest bathing as a specific tourism practice within Thailand has been notably limited. Existing literature primarily focuses on general nature exposure, often overlooking the unique dynamics and advantages associated with forest bathing tourism (Kellert & Wilson, 1993; Guan et al., 2017; Furuyashiki et al., 2019; Li et al., 2009; Lee et al., 2011). In response to this gap, this research shifts from mere confirmation of benefits to an exploratory assessment

aimed at uncovering the health-enhancing potentials of forest bathing within Thailand's distinctive environmental and cultural landscape.

This study is at the forefront of not just exploring but carefully adapting forest bathing practices to suit Thailand's unique context, taking into account the potential benefits while addressing the inherent challenges posed by the region's diverse flora and fauna, climate conditions, and socio-cultural factors that may impact the experience and outcomes of such activities. This endeavor positions forest bathing tourism as a promising, health-focused alternative within the larger framework of wellness tourism in Thailand, ultimately contributing to the holistic well-being of participants and carving out a new niche for this therapeutic practice. Additionally, despite the recent Covid pandemic's emphasis on distancing which has intensified isolation, nature offers a solution. Spending time outdoors fosters social connection and mental well-being. Fresh air, sunlight, and friendly interactions uplift spirits, build community, and combat isolation.

2. LITERATURE REVIEW

The evolving complexity and diversity of tourist demands have spurred the growth of alternative tourism, providing a conscious, different choice to other forms of tourism, particularly traditional mass tourism. A notable segment of this trend is health tourism, which focuses on restoring physical and mental health and promoting overall well-being. Recent studies underscore the increasing interest in health-oriented travel experiences, mirroring a broader shift towards wellness tourism.

2.1 Concept of health tourism

Health tourism, an integral component of the broader tourism industry, caters to individuals seeking to enhance their well-being by having an experience away from their usual environment. Unlike traditional tourism, health tourism focuses on physical, mental, and spiritual rejuvenation, offering services ranging from preventive health measures to therapeutic and recovery experiences. Key activities within this domain include exercise, meditation, natural therapies, and engagement within tranquil natural settings, all aimed at promoting health and preventing illness.

Several scholars have provided insights into the nature of health tourism. Smith and Kelly (2006) describe it as tourism dedicated to holistic healthcare, aiming to promote, maintain, and restore well-being across physical, mental, and spiritual dimensions. Similarly, Sheldon and Bushell (2009) view it as recreational travel in natural settings, focusing on learning to harness natural energy for the dual purpose of healing and strengthening both body and mind. This form of tourism encourages immersion in local cultures and applying newfound understandings to improve life quality. Thus, health tourism emerges as a novel, alternative tourism form centered on enhancing physical and mental health while also offering experiences of nature's beauty and cultural enrichment. By fostering a deeper connection with nature through forest bathing, participants gain a heightened environmental awareness, simultaneously promoting responsible tourism practices. This, in turn, emphasizes the importance of preserving natural landscapes for future generations.

Over the past decade, there has been another significant transformation in the increasing trend and popularity of good health—health tourism has evolved into a specific form of tourism that caters to niche markets. The nature of health tourism combines health promotion and disease treatment, also known as "medical wellness" (Erfurt-Cooper & Cooper, 2009). There are two main concepts involved: a) Wellness, (alternative medicine) based on the belief that good health is achieved when the body, mind, and spirit (soul) are in balance. This perspective, derived from alternative medicine, views good health as more than just the absence of illness. Therefore, health tourism activities based on this concept properly focus on promoting both physical and mental well-being, as well as strengthening the spirit to prevent various diseases. Examples of health tourism activities aligned with this concept include massage, wellness retreats, meditation practices, and forest bathing, or b) Wellness (medicine) is an approach that emphasizes good health free from illness and disease. Health tourism activities following this concept primarily focus on treatment and post-treatment recovery to restore and maintain good health. These health tourism activities are often associated with health centers and hospitals specializing in disease or other medical treatment, where tourism activities are incorporated alongside medical care.

2.2 Concepts and theories of forest bathing and nature therapy

The concept of forest bathing originated in Japan in the 1980s as an experimental hypothesis based on the assumption and feeling that being in a forest covered with lush greenery and shade would provide positive energy. The term "shirin-yoku" was coined by Tomohide Akiyama, the Director-General of Forestry and Fisheries in Japan. It was believed that the Japanese population was suffering from work-related illnesses and stress from urban lifestyles and would benefit from natural therapies. This concept also served as a campaign

for forest conservation, based on the assumption that people would more fervently cherish and preserve forests if they believed in their healing power and benefits. In the 1990s, the first experimental study was conducted in the forests of Yakushima, a small island located in southern Japan. This forest was abundant and comparable to forests that existed thousands of years ago. Introducing the concept of forest bathing, the 2010 Yakushima Forest experiment by Tsunetsugu et al. (2010) explored its emotional impact on visitors. The study documented positive effects on participants' emotions and vitality, supporting the existing literature on the potential of forest environments to enhance human well-being. This research aligns with the current project's goals of further exploration in this area.

Since its initial establishment in Iiyama, there are now 62 certified forest bathing sites throughout Japan, attracting more than 3 million tourists each year, seeking to manage stress and emotional depression. The increasing popularity of forest bathing has provided more data and research on its benefits. For example, forest bathing has been found to improve sleep quality. Sleep disorders from daily life stress affects up to 40% of the working-age population in Japan. This group of participants is reported to sleep less than 6 hours a night. In a study on forest bathing, it was discovered that individuals who engaged in a 2-hour forest bathing activity covering 2.5 kilometers (which is equivalent to their daily walking distance in the city) had improved sleep patterns. This was measured using the Polygraph and Accelerometer tools before and after the forest bathing activity. The data collected revealed that the average sleep duration of the sample group increased from 383 minutes before participating in forest bathing to 452 minutes during the activity, clearly indicating the significant benefits of forest bathing. These benefits were observed even though the activity did not involve an increase in walking distance compared to their urban routines (Morita et al., 2011).

Forest bathing boosts the immune system, a key element in fighting off disease. Stress, a major immune suppressor, makes people more prone to illness, affecting both their minds and bodies. Exposure to nature, however, can positively impact blood pressure, a crucial healthy heart marker. Studies reveal forest dwelling lowers cancer mortality rates compared to urban living, thanks to Natural Killer Cells' enhanced activity (Li et al., 2007; Morita et al., 2007). Such evidence confirms forest environments not only reduce blood pressure but also bolster cardiovascular health, underscoring the value of incorporating nature into health strategies for a holistic well-being boost (Li et al., 2016b; Park et al., 2010).

Presumably, trees play a significant role in human health and well-being, however, the exact mechanisms behind the healing, soothing, and preventive capabilities of the trees require further research (Li et al., 2007). Scientific studies have emphasized the integral role of humans' five senses in the therapeutic effects of forest bathing activities, with sight, hearing, smell, taste, and touch each contributing to the experience. While the aroma of the forest, attributed to phytoncides—natural oils produced by trees known for boosting the immune system—is recognized for its significant health benefits, emerging research suggests that auditory experiences in natural settings, such as the sounds of the forest, may also play a crucial role in enhancing well-being.

This highlights the multifaceted nature of forest bathing, where the combined sensory experience, including the distinct smell of phytoncides and the calming sounds of nature, contributes to its healing effects" (Li et al., 2007; Morita et al., 2007; Tsunetsugu et al., 2010). Inhaling the aroma of the forest is a form of aromatherapy, which introduces substances called phytoncides into the body. Phytoncides are essential components that stimulate the body's immune system. Besides being rich in oxygen, forests are also filled with phytoncides, which are natural oils produced by trees and serve as vital defenses and provide innate protection against bacteria, insects, and fungi. The amount of phytoncides in the air depends on the weather conditions and other changes throughout the year. If the temperature rises, the concentration of phytoncides in the air increases. The highest concentration of phytoncides is typically found at a temperature of 30 degrees Celsius. Terpenes are the main components of phytoncides, and they are responsible for the distinct forest fragrance experienced during forest bathing activities (Komori et al., 1995). The relevant refreshing scent of the trees as well as the smell of the soil inhaled during forest bathing both contribute to the participants' sense of well-being. This scent comes from a non-harmful bacterium called *Mycobacterium vaccae*. This discovery demonstrated a relationship between the body's immune system and *M. vaccae* in the soil. Therefore, it is not surprising that gardening or digging in the soil can create a positive feeling for gardeners (O'Brien et al., 2004).

The proposition that walking in a forest helps clear the mind and improves cognitive function is supported by a study conducted by the University of Michigan. This study compared walking in the city to walking in the forest. The experiment found that walking in the forest resulted in better memory performance compared to walking in the city, regardless of weather conditions. Participants who spent time in a wooded area within the university campus, filled with trees, experienced reduced anxiety and improved mood. It also enhanced problem-solving abilities by up to 50% (Berman et al., 2008).

Research has consistently demonstrated the powerful impact of urban greenery on public health. For example, Donovan et al. (2013) discovered that urban trees promote long-term community well-being,

surpassing the fleeting happiness derived from material gains or life events like marriage. This finding aligns with the work of Kardan et al. (2015) which highlights the link between the density of urban green spaces and reduced prescriptions for anti-anxiety medication. Collectively, this research shows how urban forestry influences perceived well-being and measurable health outcomes, especially for children. This evidence strongly advocates for integrating green spaces into urban design as a cornerstone of healthier, more resilient communities.

3. HYPOTHESIS AND METHODOLOGY

This section details the foundational hypothesis and methodological framework guiding this research on the impacts to health and well-being provided by forest bathing in Thailand. Given the increasing interest in nature-based therapies, this study aims to provide empirical evidence of forest bathing's efficacy in diverse Thai landscapes. The study integrates physiological and psychological assessments, and comprehensively evaluates forest bathing's potential to promote wellness.

3.1 Hypothesis development

Recent widespread dissemination of information about forest bathing that has been provided by various mediums, such as academic journals, documentaries, and online content by environmental organizations, illustrates this growing social trend. This trend underscores an active pursuit among contemporary society members for physical and emotional well-being through natural connections, emphasizing the therapeutic benefits of nature. Notably, Yampiw (2020) highlighted the suitability of forest bathing for urban dwellers, emphasizing its accessibility and therapeutic potential as a form of natural healing. Given this background, the hypotheses of this study were directly informed by the increasing recognition of forest bathing's benefits within the general public, focusing on the potential for these activities to foster a deeper connection with nature, thereby enhancing physical and emotional health. This understanding led to the hypothesis that forest bathing could serve as an effective intervention for reducing stress and improving the overall emotional state of participants. Furthermore, considering the varied landscape and environmental settings in Thailand, the hypotheses explore the specific context of forest bathing activities—whether in urban forests, national parks, or community forests—which may have differential impacts on the participants' health outcomes. Thus, the study aimed to empirically examine these presumptions by exploring the effects of forest bathing on blood pressure and emotional well-being, contributing to a nuanced understanding of forest bathing's role in health promotion.

3.1.1 The first hypothesis

Building on prior studies, the first hypothesis is that forest bathing can lead to a reduction in blood pressure, indicating a physiological response that contributes to a state of relaxation and well-being.

This study employed a combination of physiological and psychological assessment tools to evaluate participant health. Physiological measurements focused on physical parameters, including systolic and diastolic blood pressure. The psychological assessments meticulously delved into the mental state by employing subjective methodologies, specifically questionnaires designed to gauge happiness levels and perceived stress, gauged by the Perceived Stress Scale (PSS). The methodology for the Perceived Stress Scale (PSS) was derived from the seminal study "Perceived stress in a probability sample of the United States," authored by Cohen and Williamson (1988), complemented by the adaptation of the Thai version of the PSS-10, as developed by Wongpakaran and Wongpakaran in 2010.

This study sought to corroborate the established benefits of forest bathing, emphasizing its positive impact on reducing stress and enhancing health, a finding consistent with prior research (Li et al., 2007; Park et al., 2010). The experiment was conducted across diverse Thai landscapes, including urban forests (city parks) and natural settings (national parks) to gain insights into how environmental characteristics modulate the therapeutic effects of forest bathing. The findings suggest that natural forests, with their rich biodiversity and serene ambiance, may amplify the health benefits associated with forest bathing, by enhancing mood and cardiovascular health. This differential impact underscores the significance of landscape diversity in optimizing forest bathing interventions for health promotion. Further discussion and analysis, informed by studies such as Li et al. (2007) and Tsunetsugu et al. (2010), reveal that the type of forest environment plays a critical role in the extent of health benefits realized, highlighting the need for a nuanced approach to promoting forest bathing as a public health strategy.

3.1.2 The second hypothesis

Based on these studies, the second hypothesis was that different natural forested environments would affect participants' blood pressure and happiness levels differently.

3.2 Research method

This study adopted a mixed methods research approach, integrating both qualitative and quantitative methodologies. Within this framework, the qualitative component involved a systematic literature review to identify the key factors that contribute to the success of activities in similar contexts. This literature review was complemented by documentary analysis, involved an examination of existing documents (e.g., reports and previous studies) to design activities. Process facilitators were engaged to ensure these activities designed were appropriate and safe for participants at each location. These facilitators assessed the validity of each proposed activity through expert review and feedback, ensuring they met the stated criteria for suitability and safety.

This study employed quantitative research methods to adapt and validate survey measurements assessing participant responses and used standardized instruments to collect numerical frequency values of blood pressure measurements. The survey tools were carefully selected and modified to fit the context of forest bathing research, ensuring the data's reliability and validity consistent with the specified research objectives. The quasi-experimental design research involved field studies, comparing participants' measurements pre- and post-participation in the activities. Subsequently, statistical tests such as the t-test or other appropriate tests were employed to test the differences in mean.

Psychological well-being was assessed through happiness levels of the Thai Mental Health Indicators, complementing physiological measures to holistically gauge the benefits. The research assessment tool included the Perceived Stress Scale (PSS), which was used to group tourists according to stress levels and measure happiness levels according to the Thai Mental Health Indicators developed by the Department of Mental Health. Each of the groups were led by trained leaders, ensuring a consistent activity set across all sessions. This approach enabled analysis of forest bathing's effectiveness in alleviating stress and enhancing well-being, across varied locations with a diverse group of participants.

The study took place in two natural tourism environments (Ban Tham Suea Community Forest and Kaeng Krachan National Park in Phetchaburi province), and one semi-natural urban destination (Srinakorn Khuean Khan Park). To explore the benefits over a broad demographic, 94 volunteers were selected, ages 18 to 65 and with diverse stress levels. Recognizing logistical challenges and the participants' different schedules, the study did not require individuals to visit all locations; instead, three groups of participants were asked to visit three different sites, geographically convenient to each group: 34 visited Ban Tham Suea Community Forest, 34 visited Kaeng Krachan National Park, and 26 visited Srinakorn Khuean Khan Park. The uneven group sizes reflect logistical considerations and the goal of maximizing participation within the constraints of each setting.

4. EXPERIMENTAL RESULTS

The design of forest bathing activities for research purposes was based on existing experimental literature. The activities provided were categorized and described as follows:

4.1 The Forest bathing activities

4.1.1 The forest bathing activities for the forest of Kaeng Krachan National Park (6 activities)

Activity 1: Sunrise viewing and forest bathing at Khao Phanoen Thung

Participants have the opportunity to start their day at the observation point of Khao Phanoen Thung, where they may witness a sunrise or a sea of mist, depending on weather conditions. This activity includes an optional guided forest bathing session designed to offer an immersive experience in nature. Participants should plan for a total duration of 1–2 hours for this activity, with the option to enjoy breakfast locally. Transport via truck is arranged to facilitate travel through the mountain's terrain. This segment aims to provide a setting where participants can engage with the environment at their own pace.

Activity 2: Stretching and nature observation at Kaeng Krachan Dam

Scheduled for the early morning or evening, this activity combines gentle stretching exercises with nature observation, aiming to create a space for participants to engage in mindfulness practices. Techniques such as breathing meditation are introduced as a method to enhance body awareness and promote a sense of calm. The activity is designed to offer an opportunity for physical activity and mental reflection, emphasizing personal experience in the natural setting.

Activity 3: Butterfly-watching and bird-watching activities at Ban Krang Campsite and the trial of Khao Phanoen Thung

Ban Krang Campsite is located 13 kilometers from Kaeng Krachan National Park, which will take approximately 20 minutes to drive depending on the weather and the driver's experience. Along the path is the tree tunnel of Kaeng Krachan National Park, with its flourishing forest and natural beauty. Visitors can stroll while having bird-watching and butterfly-watching sessions within the vicinity. The number of birds and butterflies in the area will depend on the weather and humidity, and different animal species will appear each season. The activity will take around 1–2 hours, based on the visitor's interest and the number of animals in that session. This may provide an opportunity for visitors to open their senses, connect with the beauty and grandiosity of nature, and become mindful of the movement of organisms surrounding them. Such engagement has the potential to contribute to stress alleviation and blood pressure reduction, possibly uplifting their spirits.

The tree tunnel in Kaeng Krachan National Park, sheltered from sunlight, is perfectly suitable for forest bathing activities. Nearby streams serve as resting spots where visitors can take a stroll and dip their feet for relaxation.

Activity 4: A nature watching at the rope bridge

The rope bridge near Kaeng Krachan National Park is a beautiful observation spot for the dam scenery. Visitors can feed the fish, take a stroll on the bridge that connects a small islet to the mainland, and have forest bathing sessions at any time of the day. Moreover, it is not necessary to get up early or travel by a provided truck, as the visitors can navigate their vehicles and use camping spots near the bridge to rest. This can provide them an opportunity to have a forest bathing session overnight, which is endorsed by the Japanese institute as a more effective mental healing method. Visitors who return to daily life after participating in an overnight session are suggested to be able to work under more pressure than regular daytime session participants, as Mygind et al. (2019) proposed in their comprehensive review of the extended benefits of immersive nature experiences.

Activity 5: A rain bathing session at the camping site in front of Kaeng Krachan National Park

Immerse yourself in the tranquility of a gentle rain shower during this forest bathing session. This activity invites you to connect with the soothing sounds and scents of the forest, potentially reducing stress and heightening the senses. This experience simulates the feeling of a gentle rain shower from a luxurious shower system often found in high-end wellness centers. The rain's temperature, sound, and sensation work in tandem to open the senses, diminish stress, and alleviate anxiety. The result is a calming, joyful feeling that evokes a sense of youthful wonder. For Bangkok residents, who frequently avoid the elements, the refreshing touch of this simulated rain offers a welcome and uplifting change.

Activity 6: A 2 kilometers forest bathing stroll

A 2-kilometer stroll for visitors to find their solitude and embrace natural surroundings. The overall session is between 1–2 hours; visitors will interact with the rain, leaves, and edible flowers using their 5 senses, sight, smell, hearing, touch, and taste, in an isolating experience separated from technology. Reducing their fatigue as they fully intake fresh oxygen. Moreover, forests are a great source of Phytoncide, which refreshes the body and prevents cancer by increasing the number of NK cells.

4.1.2 The forest bathing activities for the greenfield at Baan Tham Suea homestay community, Phetchaburi (5 Activities)

Activity 1: A boating activity at Pranburi River, flowing through Baan Tham Suea homestay community

This location offers a prime setting for marine activities conducive to building interpersonal relationships. The outdoor setting, enriched with sunlight and fresh air, alongside rivers and friendly interactions, serves to elevate the spirits of participants.

Activity 2: Nature connection activities such as feet dipping and walking along the river

Visitors can effectively connect with nature by utilizing their touching senses and dipping their feet into the water, they are connected and intertwined with their natural surroundings. By precepting movements, existence, and temperature varying by the time of the day, visitors will multiply their senses, which were abnormally insensitive to changes in temperature due to being held back by the controlled temperature of their workplace.

Activity 3: Drawing and coloring art therapy

Visitors can participate in freestyle activities such as drawing, painting, writing, gluing, crushing leaves for colors, assembling, or building, which creates freedom of idea and relaxation.

Activity 4: Group support session

A group support session is an activity that can cultivate empathy and compassion in the listeners. In every session, each participant will take turns sharing their thoughts while the rest will be listening in

silence. This practice provides the best opportunity for them to learn when to speak, how to be a listener, open their listening sense, and use their heart to listen. 'Listening with one's heart' is a perception referred to as the sixth sense, which will lead to understanding and empathy.

Activity 5: Activities provided by Baan Tham Suea homestay community

Baan Tham Suea homestay community provides 4 activities for visitors; making Thai crispy rolls, making salted eggs infused with pandan leaves, making bullets, and a shooting range. The community also provides a resting area, a camping site, a small beverages café, and foods prepared with local vegetables and fish in Pranburi River, these activities are suitable for all ages and groups of families.

4.1.3 The Forest bathing activities for the greenfield near Bangkok at Srinakorn Khuean Khan Park, Bang Krachao, Samut Prakan (5 Activities)

Activity 1: Biking in the park

Srinakorn Khuean Khan Park has a large green space with trees and water sources. With surrounding bike lanes and bike rental service at the entrance, visitors can select one suitable for their size and rent them at their convenience for 20THB per bike. This activity is suitable for teenagers and visitors who would like to enjoy the park scenery without having to walk. The park is peaceful and quiet, especially in the early morning, which will help visitors to be more relaxed, and reduce their stress levels and tiredness from their daily schedule.

Activity 2: A 2-kilometer stroll of forest bathing session

Srinakorn Khuean Khan Park's landscape features a walking pathway filled with trees and natural surroundings. This 2-kilometer walk will take approximately an hour. However, visitors should be aware that there are a lot of mosquitoes, even during the daytime. They need to be cautious and prepare in advance, a repellent or insect bite treatment is needed, especially in the case of allergies.

Activity 3: Marsh area activities

A marsh area located in the Srinakorn Khuean Khan Park is the habitat of many aquatic species, suitable as a resting spot and sightseeing. The sound from waterwheels and tides is like the sound of the rain, soothing the mind of listeners. Walking on the long bridge over the marsh is a calming experience. Visitors can also feed the fish in many spots before completing their walk with a sunset view.

Activity 4: Art therapy by drawing and coloring

A grass field at Srinakorn Khuean Khan Park can be used for an art therapy session. Visitors can participate in a rejuvenation activity that includes writing a gift card to share their wishes with other participants or using materials nearby, such as leaves, twigs, flowers, or grass, to create art pieces reflecting their thoughts. They can let their imaginations run free in a boundless activity, without any skill requirements.

Activity 5: A Group support session of sharing and listening

Living in a big city, including Bangkok, can lead to a stressful lifestyle caused by elements such as anxiety, tiredness, traffic, fear of pandemic, unemployment, and economic crisis. Which could result in both body and mental health issues. A group sharing session, surrounded by great listeners, can ease a troubled mind.

4.2 Experimental forest bathing for validating health promotion benefits and stress reduction

4.2.1 Using the perceived stress scale (T-PSS-10) group division of volunteer participants

Participants' perceived stress levels were measured before they engaged in the forest bathing activities, using the T-PSS-10 scale (see Table 1). The assessment served a dual purpose: to identify stress levels pre-participation and to ensure the participant was suitably matched with the planned activity. This matching aimed to create a harmonious dynamic between participants and the planned therapeutic activities. Ultimately, this preliminary grouping sought to maximize the forest bathing sessions' overall effectiveness and positive experience.

Table 1: Stress and happiness assessment scale*

No.	Stress level	Scores
1	Low stress	1-13
2	Moderate stress	14-26
3	High stress	27-40
No.	Happiness level	Scores
1	High level	42-60
2	Moderate level	36-41
3	Low level	35-1

*The scoring range is established by the assessment tool's source.

Of the total 94 volunteer participants, 10 individuals (10.6%) had low-stress level, 78 individuals (83.0%) had moderate stress level, and 6 individuals (6.4%) had high-stress level. This classification was used to categorize the stress levels of the volunteer participants across the three locations.

4.2.2 Blood Pressure

Blood pressure is the force exerted by the heart to circulate blood throughout the human body. As shown in Table 2, it is measured by two values: (1) Systolic blood pressure: the pressure when the heart is contracting. (2) Diastolic blood pressure: the pressure when the heart is at rest. High blood pressure is a condition where blood pressure is abnormally elevated, equal to or greater than 140/90 millimetres of mercury (mmHg). It may or may not show symptoms but can lead to various complications.

Table 2: Blood pressure values

Category	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)
Optimal blood pressure	Less than 120	Less than 80
Normal blood pressure	120–129	80–84
Elevated blood pressure	130–139	85–89
Stage 1 Hypertension	140–159	90–99
Stage 2 Hypertension	160–179	100–109
Hypertensive Crisis	180 and above	110 and above

Source: Siriraj Piyamaharajkarun Hospital (2024)

Before participating in forest bathing activities, the blood pressure levels of volunteer participants were categorized (based on Table 2): Optimal Blood Pressure—35 individuals (37.2%), Normal Blood Pressure—19 individuals (20.2%), Elevated Blood Pressure—15 individuals (16.0%), Stage 1 Hypertension—19 individuals (20.2%), and Stage 2 Hypertension—6 individuals (6.4%).

After the participants had completed the forest bathing activities and rested for 20 minutes, their blood pressure levels were measured again. The results indicated an average decrease of 6.6% in systolic blood pressure (absolute values ranging from 4.9% to 7.8%). This average percentage reduction was calculated for the 75 participants who experienced a decrease in blood pressure. However, 19 participants showed an increase in systolic blood pressure, with narrower changes (ranging 0.6% to 2.8%). It was noted that the increase in systolic blood pressure did not correlate with initial low blood pressure levels, suggesting varied responses among participants to the forest bathing intervention.

Moreover, following the activities, researchers evaluated the impact of forest bathing on participants' psychological well-being using the Happiness Assessment Questionnaire (with the assessment scale shown in Table 1). Results revealed a significant elevation in happiness for the vast majority of participants; 83 volunteers (88.3%) reported high levels of happiness, while only 11 (11.7%) reported moderate levels. This stark contrast further highlights the psychological benefits associated with nature immersion.

The forest bathing activity allowed volunteer participants to connect with nature, open their hearts, and appreciate the beauty of nature. They acquired positive energy and experienced a sense of unity within nature. When oxygen molecules released by trees, which carry weak negative charges, are inhaled, they interact with the positive charges of free radicals in the body, resulting in a neutralization effect. This process triggers the release of serotonin, also known as the happiness hormone, promoting a sense of well-being and reducing symptoms of depression and stress. As a result, while appreciating the beauty of nature, the participants felt relaxed, refreshed, and happier.

The need to handle logistical challenges related to travel and the availability of time necessitated the division of participants into groups. Our approach was to assign participants to groups based on geographical locations and their schedule convenience. This strategy led to a diversity in age (18 to 65 years) across all study areas; most participants were between 23 and 44 years of age. A comparison across the three distinct environmental conditions: Ban Tham Suea Community Forest, Kaeng Krachan National Park in Phetchaburi province, and Srinakorn Khuean Khan Park showed no statistically significant differences in stress and happiness levels after the activity (p -value > 0.01) (see Table 3). This indicates that the varied forest bathing environments similarly impacted participants' well-being. This similarity in outcomes, despite the initial non-random group categorization based primarily on easy geographical accessibility rather than pre-existing differences in baseline measures such as stress or happiness levels, highlights the universal benefits of forest bathing activities across diverse settings. Observed stress levels were in the moderate range (18–20), and happiness levels were in the high range (47–48). Blood pressure readings before and after participating in the activities revealed that the systolic blood pressure had a statistically significant reduction (P -value < 0.001).

after participating in the activities, with an average decrease of 6.6% (4.9–7.8). However, the diastolic blood pressure did not show a statistically significant difference, with an average decrease of approximately 1.7% (0.2–3.2).

When comparing all three areas using paired t-tests, a significant difference was noticed in the national park before and after the activities (t-value 7.8) and a statistically significant *p*-value (0.001). This suggests that the activity design, unique environmental characteristics, and serene setting of the national park synergistically contributed to a significant reduction on blood pressure. These findings underscore the importance of considering both the design of wellness activities and the intrinsic qualities of site locations in assessing participants' health benefits.

5. DISCUSSION

The first hypothesis led to the assessment of forest bathing's influence on a physiological marker (blood pressure) as a stress and wellness indicator. Results showed a meaningful decline in systolic blood pressure post-forest bathing, averaging a 6.6% drop (4.9–7.8%), indicating enhanced relaxation and reduced stress among participants. However, the research did not extend to mood, fatigue, or more intricate stress and relaxation metrics, such as heart rate variability, signalling a need for more comprehensive future studies to fully capture forest bathing's effects on these aspects.

To assess the varied forest settings' roles in forest bathing's efficacy, the research noted uniform blood pressure reductions across sites, with national park showing the most significant improvements. This points to specific environmental features potentially amplifying forest bathing's healing effects. Still, the study did not compare heart rates directly, leaving room for future research to broaden the scope to more psychological and physiological dimensions for a deeper understanding of forest bathing's benefits in different locales. Hypothesis 2 proposed that varying forest environments in the activities would influence blood pressure, happiness levels, and stress. The assessments in this study of the three distinct, which paired t-tests and blood pressure measurements, noted significant difference in blood pressure levels before and after the activity in the national park (t-value 7.8 and *p*-value 0.001) indicating that setting had the greatest positive impact. This suggests that the activity design, here within the national park, significantly affects blood pressure. It may be hypothesized that the primary factor influencing this design is proximity to nature, characterized by elements like pristine natural surroundings, a tranquil atmosphere, rain bathing, and optimal conditions for forest bathing specific to each location.

Table 3: Summary of physiological and psychological assessments (Mean $\pm$ Standard Deviation, Range [Min-Max], and Percentage Change of Physiological tools) in participants across three forest bathing environments: Ban Tham Suea Community Forest, Srinakorn Khuean Khan Park and Kaeng Krachan National Park in Phetchaburi province (Significant level at 0.001)

Population group/area of study	Age (years)	Level of stress	Level of happiness	Systolic blood pressure (mmHg)		Percentage change	Diastolic blood pressure (mmHg)		Percentage change
				Before the activity	After the activity		Before the activity	After the activity	
Ban Tham Suea Community Forest	44 $\pm$ 18 [18–81]	18 $\pm$ 5 [8–29]	47 $\pm$ 5 [37–59]	126 $\pm$ 18 [98–168]	118 $\pm$ 11 [97–138]	-6.6	74 $\pm$ 12 [45–103]	74 $\pm$ 8 [61–90]	- 0.2
Srinakorn Khuean Khan Park	23 $\pm$ 11 [18–61]	18 $\pm$ 6 [8–30]	47 $\pm$ 5 [39–60]	123 $\pm$ 18 [101–168]	117 $\pm$ 10 [97–138]	-4.9	80 $\pm$ 10 [63–100]	79 $\pm$ 6 [63–91]	- 1.4
Kaeng Krachan National Park	42 $\pm$ 18 [18–81]	20 $\pm$ 5 [13–28]	48 $\pm$ 5 [53–92]	135 $\pm$ 15 [104–164]	124 $\pm$ 12 [100–141]	-7.8	81 $\pm$ 14 [45–105]	78 $\pm$ 8 [53–92]	- 3.2
Combined for all 3 areas	38 $\pm$ 19 [18–81]	18 $\pm$ 5 [8–30]	47 $\pm$ 5 [53–92]	128 $\pm$ 17 [98–168]	119 $\pm$ 12 [97–141]	-6.6	78 $\pm$ 12 [45–105]	77 $\pm$ 8 [53–92]	- 1.7
<i>p</i> -value (ANOVA/ Pair t-test)	<0.001	<0.001	<0.001	<0.001			>0.001		

Remark: The diastolic blood pressure did not show any significant changes as it is within the normal range for human blood pressure, which does not exceed 80. Even if the stress level decreases, the blood pressure will not drop below the specified range. Therefore, it is not statistically significant for the research.

6. CONCLUSION

Forest bathing, a recognized wellness tourism approach, offers potential therapeutic benefits for stress management. Research suggests it promotes relaxation, reduces stress symptoms, and increases happiness. However, this assessment relies on subjective reports and baseline comparisons rather than direct mood or stress level measurements. While the decreases in blood pressure observed in this study are promising, the study did not analyze heart rate variations or directly link relaxation to heart rate changes. These findings indicate forest bathing may support well-being, but future research should include comprehensive measurements of stress, happiness, and heart rate for a complete understanding of its impact.

Building on the potential of forest bathing for stress reduction and happiness increase, promoting it as a form of wellness tourism in Thailand aligns perfectly with the national strategy for tourism development. Sub-plan 3.3 emphasizes wellness, mirroring forest bathing's focus on health and rejuvenation. This aligns with Thailand's strengths in traditional medicine and caters to domestic and high-quality tourism that benefits communities. By leveraging the country's natural healing resources and cultural heritage, government agencies and the private sector can create widespread awareness of forest bathing. This, in turn, will encourage participation, increase nature-based tourism, and contribute to forest conservation, fostering a holistic approach to Thailand's wellness tourism landscape.

7. LIMITATIONS

This study acknowledges several limitations that may affect the interpretation and generalizations derived from its findings. These limitations are primarily associated with environmental variations, scientific measurement constraints, uncontrollable pre-experiment stress levels, facilitator adaptation challenges, and variations in activities and locations.

First, environmental variations presented a significant limitation. The differing environmental conditions of the forest areas used in the experiments, influenced by changing weather patterns during the study period, may have affected participants' overall experiences in forest bathing. For example, the hot and humid weather before rainfall may have led to varying emotional states among participants. Similarly, activities conducted during rainfall may have benefit some participants but not others, introducing variability in the experimental outcomes.

Second, there were scientific measurement constraints. Our reliance on scientific measurements, especially those requiring sample collection, was limited due to maintenance issues and the lack of electricity in experimental locations. Consequently, data collection was often restricted to physical measurements such as participants' blood pressure and behavioral surveys.

Third, the inability to control participants' pre-experiment stress levels poses a challenge. Stress levels vary across different age groups and circumstances, making it difficult to ensure uniformity. Although stress levels may decrease during the evaluation phase, the extent of the reduction can differ significantly, contributing to variability in the results.

Fourth, the capacity of the facilitator to adapt to different locations was another limitation. The forest bathing facilitators needed to adapt their approach to suit the unique needs of the participants at each specific location, which demanded significant preparation time and incurred relatively high costs.

Fifth, variations in activities and locations complicated the interpretation of the study's findings. The study's design included a variety of activities and locations, making it difficult to determine whether the observed effects on participants' blood pressure were primarily due to the location or the specific type of activity conducted. This variation adds a layer of complexity to interpreting the study's findings, as it introduces an additional variable that could have influenced the results. Future studies might consider standardizing the types of activities conducted across different locations to isolate the effect of the environment more effectively.

8. FUTURE RESEARCH DIRECTIONS

In light of the insights gained from this research, future studies are encouraged to expand on the methodology of this study by including consideration of participants' clinical health problems alongside stress levels. While this study grouped participants solely based on stress levels, the interaction between health problems and stress levels represents a promising avenue for exploration. Additionally, future research could benefit from integrating more direct scientific measurements, such as physiological data from sample collection, to deepen an understanding of the impact of psychological well-being on individuals with specific conditions. Furthermore, the application of social science theories to generate new variables can offer valuable

insights into optimizing workplace environments, thereby enhancing employee stress management and overall industry resilience.

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