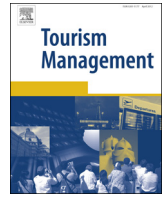




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Evaluating the relaxation effects of emerging forest-therapy tourism: A multidisciplinary approach



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HIGHLIGHTS

- Relaxation effects of forest therapy tourism were studied from physiological and economic multidisciplinary approaches.
- Physiological and psychological evidence of relaxation effects lasted for 3 - 5 days after forest therapy.
- Ageing local population makes it difficult to increase the number of households providing home stay services to tourists.
- Integration of scientific evidence to support viable new rural tourism businesses is necessary with marketing strategy.

GRAPHICAL ABSTRACT

Title (red): To realize rural tourism is expected to play a role in enhancing health. However, objective and subjective scientific evidence of its benefits have not been established.

Aim (green): To investigate the relaxation effects of forest therapy tourism both physiologically and psychologically.

Literature review (green): Confirmed that the topic had not been addressed both objectively and subjectively.

Methodology (yellow): Multidisciplinary approach

- 1) Physiologically and psychologically clarified the relaxation effects of forest therapy tourism.
- 2) Clarified conditions for a viable business.

Findings (purple): 1) Relaxation effects in terms of physiological and psychological aspects were revealed, which lasted for 3-5 days after forest therapy. Lasting effects among those with systolic blood pressure >120 mmHg were weaker than those in the entire group. 2) The ageing and depopulation of the local community made it difficult to increase the number of households that provided home stay accommodation services.

Implications (purple): It is necessary to fully integrate scientific evidence to support a viable new rural tourism business. To achieve that, a partnership with stakeholders outside of the community should be developed.

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ABSTRACT

Considering the increasing demand for rural areas to play a role in easing stress mainly experienced by urban dwellers, we investigated from a multidisciplinary collaborative approach, i.e., physiological, psychological, and rural business management perspectives, the relaxation effects of forest-therapy tourism, an emerging type of rural tourism, on a group of urban office workers. Also investigated were conditions necessary for a sustainable rural business in Chizu, western Japan. First, the results verified physiological and psychological relaxation effects, which lasted from three to five days after forest therapy. The lasting physiological and psychological effects among those with systolic blood pressure ≥ 120 mmHg, however, were weaker than in the entire sample. Second, due to the ageing and depopulation of the local community, increasing the number of households that provided home stay services was difficult. In summary, it is necessary to fully integrate scientific evidence to support a viable new rural tourism business.

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1. Introduction

With the increases in life span in modern society, it is becoming important not only for individuals but also for the entire society to remain fit as long as possible amid soaring national medical costs under tight state financial constraints. Tourism activity based on

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rural resources is expected to play essential and new roles in this context. The connection between wellness or well-being of tourists and rural resource-based tourism has been studied mainly in Nordic countries (Hjalager, 2011; Hjalager & Flagestad, 2012; Konu, Touhino, & Komppula, 2010). Those studies were subjective evaluations of the benefits of such rural tourism by those in the field of tourism. Studies to verify the positive effects of relaxation of body and mind based on physiological evaluations in connection with rural tourism have not been conducted although subjective evaluations by tourists and/or operators are widely available. If physiological benefits in addition to psychological benefits could be verified, such scientific evidence could be used in more effective and more precisely focussed marketing of rural resource-based tourism. Marketing has been considered to be less proficient by rural-tourism operators than by their counterparts in urban areas.

Thus, to demonstrate the significance of the relaxation effects, these effects should be clarified both subjectively and physiologically. A collaborative study between social and natural scientists can more effectively produce novel evidence than a study by a single discipline. To our knowledge such a multidisciplinary collaborative study has not been conducted fully.

Among rural resource-based or rural tourism, “forest bathing” and “forest therapy” are often used interchangeably although forest therapy has been considered to be more advanced in terms of evidence-based disclosure of the multifunctionality generated by producers in forestry and agriculture. Miyazaki, Ikei, and Song (2014) described this type of tourism as forest therapy rather than forest bathing. The difference between the two concepts is quite clearly defined because the effects of forest therapy are evidence-based in contrast to those for forest bathing (Lee, Park, Tsunetsugu, & Miyazaki, 2012). Along with the progress in studies of forest therapy, tourism activity combined with forest therapy has been emerging, which this paper defines as “forest therapy tourism”. In Japan a “forest therapy program” (Ochiai et al., 2015a, 2015b) has been implemented as a revitalization measure in remote forest communities and has been explored as a new rural business opportunity. Thus, we define forest therapy tourism as a type of rural health tourism in forest areas to achieve mental and physical relaxation based on evidence of its effects psychologically and physiologically. From this definition, we can say that forest therapy tourism aims at preventive medicine rather than medical treatment. This evidence-based new feature is the reason why we focus on forest therapy tourism among rural tourism.

The traditional social science approach, however, is likely to have limitations in exploring the potential of this new type of rural tourism. To overcome these limitations, it is necessary to take a multidisciplinary approach with natural science, which enables us to explore evidence-based effects of rural tourism combining an understanding of physiological and psychological relaxation effects. This evidence can then be integrated into a viable business management and marketing strategy.

Thus, this paper sheds light on the relaxation effects generated by forest therapy tourism in terms of physiological and psychological aspects from a multidisciplinary perspective. In particular, we investigated the effects of forest therapy with a group of urban office workers with systolic blood pressure (SBP) ≥ 120 mmHg who were presently in good health but whose health could potentially deteriorate in the future. This included the duration of the effects. Additionally, the issues to be overcome in the development of forest therapy tourism as a sustainable rural business were also examined.

2. Literature review

This literature review focusses on the demand side in tourism

and how tourists evaluate tourism experiences and gain satisfaction in subjective or objective physiological terms. How tourists view tourism under a given social context has been a main research interest (Urry, 1990). Tourism research that explores issues of tourists' satisfaction is logical because it is widely believed that the aim of tourism is to maximize tourists' satisfaction, resulting in subsequent profit maximization. Rural tourism, which is the focus here, is not the exception. Table 1 summarizes the results of our literature review, which provides an overview of research trends, topics of study, and methodology in rural resource-based tourism focussing on tourists' satisfaction and well-being. In Table 1, the first column from the right shows topics that were not dealt with in the reviewed study. From this table it is evident that previous studies focussed mainly on tourists' subjective satisfaction, providing a rationale for our multidisciplinary approach.

Studies on rural tourism have drastically increased, with topics being highly diversified. For our purpose, we focussed on tourists' satisfaction and well-being, especially the mental health aspects of rural tourism. First, based on the definition by Ohe (2003, 2011) and Ohe and Kurihara (2013), this paper defines rural tourism as an economic activity that internalizes multifunctionality, i.e., positive external effects on society generated by agriculture and rural resources including forestry, which means that rural tourism aims to create income opportunities and establish viable rural businesses. To this end, although Ohe and Kurihara (2013) verified the positive correlation between rural tourism and local farm brand products in Japan, no reference was made to the relaxation effects of rural tourism, especially tourism in forests. From this perspective, forest therapy tourism is defined here as an emerging type of rural tourism that tries to internalize the multifunctionality of forestry, especially focussing on relaxation effects, to create income opportunities.

Generally, rural tourism is comprised of two essential components: nature-based and heritage-based. Although every rural tourism area has one or two of these components or a mixture of the two, the degree of the combination depends on the geographical and historical contexts of the rural areas. Compared with the surge in heritage and cultural tourism research also in the rural tourism field (Ohe & Ciani, 2012), nature-based tourism has been studied less extensively. In contrast to the large number of demand analyses of rural tourism, supply side studies are scant. From the authors' perspective, there have been no strategic assessments of rural tourism on the supply side based on objective evidence from the demand side. As to studies on the demand side, these studies have included a wide range of perspectives ranging from analyses of preferences and segmentation to analyses of tourist satisfaction and well-being.

In the field of rural tourism, Sharpley and Sharpley (1997, pp. 45–65) mentioned that rural tourism is a niche and up-market due to the high income profile of rural tourists. Ohe (2003, pp. 146–161) confirmed the same profile for tourists to rural areas in Japan. Schmitz, De Aranzabal, and Pineda (2007) categorized visitor preferences in the rural cultural landscape in Central Spain. Park and Yoon (2009) revealed various segments of motivations for rural tourism through a Korean case study by a factor-clustering method. Kelley, van Rensburg, and Jeserich (2016) quantitatively evaluated the determinants of demand for walking trails in Ireland. With respect to studies on tourists' satisfaction with rural tourism, Devesa, Laguna, and Palacios (2010) dealt with an orthodox relationship between motivation and visitor satisfaction with rural tourism in Spain. Loureiro (2010) applied the concept of customer delight for rural tourists in Northern Portugal by a partial least squares (PLS) approach. Likewise, Loureiro and Kastenholz (2011) investigated satisfaction, delight, and loyalty towards rural lodging units in Portugal by PLS. Frías-Jamilena, Del Barrio-García, and

Table 1
Features of studies on evaluation of satisfaction, well-being, wellness in rural, nature-based, forest tourism.

Topic	Supply/ demand side	Subjective satisfaction	Focus of study	Methodology	Topics not addressed in the study from authors' perspective
Rural tourism	supply side	Ohe, 2003, 2011; Ohe & Kurihara, 2013; Ohe & Ciani, 2012	supply side analysis of rural tourism	regression models	exploration of strategy based on objective evidence on demand side
	supply and demand sides	Sharpley & Sharpley, 1997	demand characteristics	descriptive holistic approach	evaluation of objective evidence in addition to subjective evaluation and how long relaxation effects last
Quality of life, well-being, life satisfaction Quality of life, well-being, life satisfaction Quality of life, well-being, life satisfaction	demand side	Schmitz et al., 2007	visitor preference	spatial-coincidence analysis	
		Park & Yoon, 2009	segmentation of rural tourism	PCA and cluster analysis	
		Kelley et al., 2016	demand determinants	regression analysis	
		Devesa et al., 2010	motivation	ANOVA	
		Loureiro, 2010; Loureiro & Kastenholz, 2011; Frías-Jamilena et al., 2012	loyalty	Partial Least Squares (PLS)	
		Peña et al., 2012	perceived value, loyalty	quantitative evaluation	
		Cho et al., 2014	loyalty	5-point Likert scale	
		Matarrita-Cascante, 2010	community satisfaction	qualitative methods	
		Dolnicar et al., 2012	heterogeneity	sequential mixed methods approach	
		McCabe & Johnson, 2013	subjective well-being, social tourism	non-parametric tests	
		Morgan et al., 2015	economically disadvantaged older people	qualitative method	
	Tourism and mental health		Chen et al., 2013	subjective well-being	statistical tests
		Chen et al., 2016a	life satisfaction	path analysis	
		Chen et al., 2016b	stress relief	quantitative analyses	
		Filep, 2014	subjective well-being	psychology	
		Su et al., 2015	subjective well-being	Structural Equation Model (SEM)	
		Uysal et al., 2012	quality of life, tourists and host communities	38 multidisciplinary research papers	
		Uysal et al., 2016	quality of life and well-being	literature review	
		Lin, 2014	subjective well-being and self-health perception	SEM	
		Lin et al., 2014	we-being and work-leisure conflict	SEM	
		Coghlan, 2015	tourism and mental health	psychology, conceptual approach	
Nature-based tourism		Dash & Cater, 2015	tourist gaze and the conception of nature	Lacanian-Marxist framework	
		Tangeland, 2011	motivation to purchase	factor-cluster approach	
		Fung & Jim, 2015	market segmentation	factor-cluster approach	
		Sievänen et al., 2011	intention to revisit	factor-cluster approach	
		Kim et al., 2013	community residents, life satisfaction	SEM, Hierarchical multiple regression	
		Kim et al., 2015	motivation and subjective well-being	SEM	
		Lee et al., 2014	consumer well-being and loyalty	multiple regression models	
		Wolf et al., 2015	visitor satisfaction and loyalty	ANOVA	
Wellness, well-being tourism		Little, 2012	bodily therapeutic practice	holistic approach	empirical evaluation on both objective and subjective relaxation effects.
		Konu et al., 2010	a new service developing a well-being and wellness experience as "lake wellness"	concept presentation	
	supply and demand sides	Hjalager, 2011; Hjalager & Flagestad, 2012	well-being tourism development, innovations	qualitative approach	

Table 1 (continued)

Topic	Supply/ demand side	Subjective satisfaction	Focus of study	Methodology	Topics not addressed in the study from authors' perspective
Forest therapy	demand side	Lee, Park, Tsunetsugu, Kagawa, & Miyazaki, 2009, 2011; Park et al., 2007, 2009, 2010, 2012; Tsunetsugu et al., 2007, 2010, 2013 Li et al., 2007, 2008a, 2008b Song et al., 2015 Ochiai et al., 2015a Ochiai et al., 2015b Lee et al., 2015	blood pressure, pulse rate, heart rate variability natural killer cell activity pulse rate, heart rate variability blood pressure, adrenaline, cortisol pulse rate, cortisol physiological relaxation effects, landscape viewing	physiological examinations	business management perspectives, how long objective and subjective relaxation effects last after visiting tourism sites
Rural landscape					

Note: Results of literature review by the authors.

López-Moreno (2012) assessed the determinants of satisfaction of tourists with rural tourism in Spain in consideration of tourists' previous experience also by PLS. Peña, Jamilena, and Molina (2012) presented a perceived value (PV) scale for rural tourism by tourists, which reflected the satisfaction and loyalty of tourists. Cho, Byun, and Shin (2014) also measured satisfaction among rural tourists in Korea by exploratory factor analysis. In short, although methodological advancements were noted in rural tourism studies from both supply and demand sides, and the positive contributions to tourists' satisfaction were clarified, subjective evaluations were predominant while no physiological aspect was touched upon.

On the other hand, there have been an increasing number of studies from broader perspectives on the impact of tourism on the quality of life satisfaction or well-being rather than satisfaction focussed on a specific tourism destination or tourism behaviour. Matarrita-Cascante (2010) examined the impact of tourism on community satisfaction and quality of life of residents in Costa Rica. Dolnicar, Yanamandram, and Cliff (2012) investigated the positive contribution of vacations to people's quality of life. McCabe and Johnson (2013) investigated the quality of life and subjective well-being among social tourists who received financial support. Morgan, Pritchard, and Sedgley (2015) conducted a qualitative investigation of the positive relationship between social tourism and well-being of older people. Chen, Lehto, and Cai (2013) conducted a longitudinal quasi-experiment in China to investigate the effect of vacations on tourists' well-being. Chen, Petrick, and Shahvali (2016a) focussed on tourism as a stress reliever by confirmatory factor analysis. Chen, Huang, and Petrick (2016b) investigated the relationships between holiday experiences and tourism satisfaction and life satisfaction. Filep (2014) tackled the problems of conceptualizing tourist happiness and suggested an alternative approach. Su, Huang, and Chen (2015) examined the effects of service fairness and service quality on behavioural intentions and tourists' subjective well-being. Uysal, Perdue, and Sirgy (2012) performed a comprehensive study on the connection between tourism and quality of life of tourists and host communities. Uysal, Sirgy, Woo, and Kim (2016) conducted a comprehensive survey of research on quality of life and well-being related to tourism. Some studies had a more specific focus, such as exploration of the mental health aspects of tourism. Although Coghlan (2015) conceptually dealt with the connection between tourism and health, no empirical study was conducted. Lin (2014) evaluated psychological well-being and self-health perception on the revisit intentions of hot springs tourists by a structural equation model (SEM). Lin, Huang, Yang, and Chiang (2014) investigated

work-leisure conflict among employees in hospitality and tourism industries by a PLS model. To summarize, although quantitative and qualitative methodologies have commonly been used to examine life satisfaction among tourists alike, none of the prior studies have incorporated physiological effects.

In focussing on tourists' evaluation of nature-based tourism including forest-related tourism, just like tourism research in general, probably one of the most influential papers on this point is "Tourist Gaze" (Urry, 1990), which indicated that the subjective evaluation is determined by what tourists expected beforehand. To overcome the limitation of Urry's Tourist Gaze, Dash and Cater (2015) argued that the implications of the Lacanian Gaze should be considered regarding the relationship between tourism and the conception of nature. Tangeland (2011) addressed the motivation to purchase nature-based tourism by a factor-cluster segmentation approach. Fung and Jim (2015) also studied the motivation of Geopark visitors in Hong Kong from the perspective of visitor management for sustainable nature-based tourism. Sievänen, Neuvonen, and Pouta (2011) clustered interest in offered services and intention to revisit by focussing on national park visitors in Finland. Kim, Uysal, and Sirgy (2013) investigated how tourism impacted on the quality of life of community residents by SEM. Kim, Lee, Uysal, Kim, and Ahn (2015) also investigated motivation and subjective well-being of hiking-tourist behaviour by an exploratory factor analysis. Lee, Kruger, Whang, Uysal, and Sirgy (2014) empirically evaluated a customer well-being index related to natural wildlife tourism in South Africa. Wolf, Stricker, and Hagenloh (2015) concluded that visitors' experience in an Austrian national park enabled senior citizens to increase their physical, mental, and social well-being. Little (2012) discussed the therapeutic and well-being effects of nature and wilderness from a holistic approach and did not conduct an empirical evaluation of such effects. Thus, investigations of issues of well-being generated by nature and wildlife tourism clarified that such tourism enhanced the well-being of nature-loving tourists, including seniors. Still, these benefits remain to be explored from both subjective and physiological points of view.

Now we further narrow the focus on the well-being effects of forest-related nature-based tourism, which have been studied mainly by researchers in Nordic countries (Hjalager, 2011; Hjalager & Flagestad, 2012; Konu et al., 2010). However, physiological evidence of the effect of forest-related tourism on tourists' health and how long these effects last are not yet available; nor is such evidence available for rural tourism in general. In this respect, scientific evidence of the benefits of forest therapy was sought by

Table 2
Evolution of forest therapy program in Japan.

Year	Activity
2003	Discussion of implementation of “Plan of Forest Therapy Base” was started.
2004	1) Forest Therapy Program was inaugurated. 2) Secretariat office was set up in the National Land Afforestation Promotion Organization. 3) Three-year research project on the effects of Forest Therapy was launched.
2006	1) Designation of Forest Therapy Base was launched. 2) Initially, 6 Therapy Bases and 4 Therapy Roads were designated.
2007	NPO Forest Therapy Society (FTS) was set up and the secretariat office was transferred to the FTS.
2015	55 Therapy Bases and 5 Therapy Roads have been designated.

Source: Authors' Survey

Miyazaki and colleagues (Park, Tsunetsugu, Lee, Kagawa, & Miyazaki, 2012), and their results indicated that stress can be relieved by forest therapy.

Based on the results of that study and others by Miyazaki and colleagues, it can be concluded that forest therapy could decrease blood pressure, reduce the pulse rate, and increase the parasympathetic nervous activity that is enhanced in relaxing situations. In addition, the suppression of sympathetic nervous activity that is enhanced in stressful situations; decreased levels of salivary cortisol, a typical stress hormone; and decreased cerebral blood flow in the prefrontal cortex were also reported (Park et al., 2009, 2010, 2012, 2007; Tsunetsugu, Park, & Miyazaki, 2010, 2013, 2007; Ikei et al., 2015; Lee et al., 2011, 2009). These studies suggested that forest therapy can promote relaxation in humans. In other studies, natural killer cell activity was enhanced and weakened immune function was improved; these effects lasted for 30 days (Li et al., 2008a, 2008b, 2007).

In addition, several studies evaluated the effects of forest therapy on hypertensive middle-aged men. Song et al. (2015) showed that walking through the forest for 17 min decreased the pulse rate and enhanced parasympathetic nervous activity in comparison with walking in the urban area. Ochiai et al. (2015a) demonstrated the effects of a forest therapy program. Forest therapy decreased blood pressure from the value measured the day before the forest therapy program. Moreover, reductions in urine adrenaline and serum cortisol levels were also noted. These observations indicated the physiological relaxation effects of forest therapy on hypertensive male participants. Similar results were also obtained in middle-aged females (Ochiai et al., 2015b).

These physiological relaxation effects of the natural environment were also detected in traditional rural areas (Lee, Park, Ohira, Kagawa, & Miyazaki, 2015). Viewing a traditional paddy field landscape reduced stress hormone and sympathetic nervous activity and increased parasympathetic nervous activity. That exposure to a rural environment effectively reduced stress and enhanced relaxation was indicated by these results.

These physiological studies, however, did not take a tourism business perspective as an integrated system of local resource management and how the therapy-tourism program is managed. To our knowledge, there has been no study on rural tourism as an integrated system based on physiological and psychological evidence of effects on physical and mental health. Thus, this paper explores evidence by a multidisciplinary research team of the effects of forest therapy tourism especially focussing on how the relaxation effects persist and conditions for a viable new tourism activity in rural areas.

3. Outline of the forest therapy program in Japan

The evolution of the Forest Therapy Program is summarized in Table 2. This program was systematically implemented, and from the beginning was an evidence-based program. To put it into

practice, the concept of forest therapy was used, which differentiated it from “forest bathing” according to whether or not it was evidence-based as mentioned above (Miyazaki et al., 2014). Discussion of the “Plan of the Forest Therapy Base” was begun in 2003 by the initiative of the Forest Agency, the national policy maker for forestry, and the Forest and Forest Products Research Institute, a national research institute for forestry. A secretariat was temporality set up in the National Land Afforestation Promotion Organization (NLPO), an affiliated non-governmental body of the Forest Agency in 2004. A research project to accumulate evidence on the benefits of forest therapy was also launched in the same year.

Then, the NPO, the “Forest Therapy Society (FTS)”, which is specialized in dealing with forest therapy programs, was established and the secretariat work was transferred from the NLPO to the FTS in 2007. Forest therapy is considered preventive medicine rather than medical treatment as mentioned earlier and the head of this NPO is a medical doctor.

Certification of forest therapy includes two categories: “forest therapy base” and “forest therapy road”. The difference is simple depending on how widely the effects reach. When therapeutic effects of an entire candidate area are designated, it is certified as a “base”. In contrast, when those of only a roadside are designated, it is certified as a “road”. “Road” can be promoted to “base” when the therapeutic effects become area-wise rather than simply along a line. The first certification was established in 2006 (press release by Forest Agency issued on 18th April 2006, <http://www.rinya.maff.go.jp/j/press/h18-4gatu/0418wagakunino.html>).

The regional distribution of designated bases and roads is shown in Table 3. As of April 2015, 55 bases and 5 roads were designated. Region-wise, Chubu, in central Japan, which is largely covered by forests, has 16 designated bases and is followed by Kyushu, the southern-most main island, where 10 bases were designated. Nevertheless, the designation of a forest therapy base does not automatically guarantee that the relaxation effects will be fully realized. Facilitating the promotion of these effects are a forest therapy guide and a forest therapist. The designations of guide and therapist were also implemented by the FTS. The therapist is required to have greater knowledge of the relaxation effects than the guide. There were 872 guides and 705 therapists as of April 2015 (Table 4).

Turning to conditions for designation of bases, applicant areas are scrutinized in two stages: documentary and on-site evaluations. The documentary evaluation is conducted from two aspects. First, natural and social conditions are evaluated such as how the environment has been prepared for a forest therapy program and accessibility. Second, preparedness is examined for accommodation hardware and software such as the existence of an administration office, accommodation capability for tourists, and contents of the forest therapy program. At the second stage, on-site evaluation of the therapy effects is conducted by experts from outside of the local community. The evaluation normally lasts for two days and is conducted in the forest and also in the urban area where

Table 3
No. of forest therapy bases and roads (by region).

Region	No. approved bases	No. approved roads	No. applicants
Hokkaido	2	0	0
Tohoku	5	1	0
Kanto	8	1	2
Chubu	16	3	0
Kinki	5	0	0
Chugoku	6	0	0
Shikoku	2	0	0
Kyushu	10	0	0
Okinawa	1	0	0
Total	55	5	2

Source: NPO Forest Therapy Society as of April 2015.

tourists live as a control experiment. The evaluation is performed from physiological and psychological dimensions, which is a necessary and distinctive procedure to establish evidence of the benefits of forest therapy.

4. Methodology

This study had two parts. The first part empirically clarified the relaxation effects by focussing on office workers in major cities. How long these effects lasted mainly from the viewpoint of physiological anthropology was also examined. Participants in this study were 43 office workers from major urban areas, i.e. Tokyo and Osaka, who took part in the forest therapy program in Chizu. Among these participants, we selected 14 participants who had systolic blood pressure (SBP) ≥ 120 mmHg as measured before lunch at the office three days before the forest therapy. We defined this group as the ≥ 120 mmHg SBP group. The mean value of SBP was 132.7 mmHg in this group. The reason we selected SBP ≥ 120 mmHg instead ≥ 130 mmHg was based on the empirical evidence presented by [The SPRINT Research Group \(2015\)](#) that conducted a large scale survey that stipulated that although individuals with SBP ≥ 120 mmHg could not be considered to be in ill health, they would be at risk of a health problem. Thus, if blood pressure could be lowered, certain health issues could be avoided. In this sense, forest therapy tourism could have a preventive effect on disease development. This is the reason we investigated the effects of forest therapy on these participants.

We measured how physiological and psychological indicators changed from before the forest therapy (three days before; pre-therapy stage) to during the forest therapy (two days; on-site therapy stage) and after the therapy (three to five days after; post-therapy stage) as illustrated in [Fig. 1](#). The evaluation was conducted from May to October 2013 through physiological measurements of SBP, diastolic blood pressure (DBP), and pulse rate and subjectively by the semantic differential method and subjective symptoms index. [Fig. 2](#) shows pictures taken at the on-site therapy study in Chizu. The forest therapy package provided an overnight guided tour by forest therapists and guides including a home stay in a local

Table 4
No. approved forest therapy guides and therapists.

Year	No. approved guides	No. approved therapists
2009	313	141
2010	212	182
2011	90	118
2012	99	111
2013	85	102
2014	73	51
Total	872	705

Source: NPO Forest Therapy Society as of April 2015.

household, which is a common program in this region.

The second part was to investigate how forest therapy tourism was conducted and issues related to it by focussing on the supply side in Chizu from the perspective of how the local community integrates these effects into rural business management. Specifically, we investigated the situation of a home stay program as an integral part of therapy tourism according to the initiative of the municipality to accommodate therapy tourists and other issues related to the development of forest therapy tourism. Surveys administered to those concerned were conducted in April and October 2015, and a supplementary survey was done in December 2016.

Before the experiment, the participants were fully informed about the study aims and procedures. They then signed an agreement to participate in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committees of the Center for Environment, Health and Field Sciences, Chiba University, Japan (Project identification code number: 5).

5. Outline of the study area and its forest therapy program

Ninety percent of the study area, Chizu, is covered by forests, with forestry and timber processing as its main industries. Local population is 7614 habitants, and as of 2015 a survey by the Tottori Prefecture showed that the percentage of those 65 years old or older was 38.7% in Chizu. Chizu was the 5th oldest municipality of the 19 municipalities in that prefecture. In Tottori Prefecture, 30.0% of residents were 65 years old or older. The national average percentage of those aged 65 years or older was 26.7% (Statistics Bureau of Japan). Thus, Chizu can be considered an advanced ageing community because roughly 4 out of 10 local people are already elderly.

Despite the disadvantage of its mountainous location in the Chugoku region, Chizu is attracting growing interest as a unique community-based model of rural revitalization ([Research Institute for Local Government, 2013](#); [Odagiri, 2014](#), pp. 59–71). The original community-based initiative was named “one divided by zero”, which positively means an infinite possibility of ideas coming from the local community. The aim of this initiative was to revitalize local communities through bottom-up discussions among residents. Then, to cope with issues that could not be handled within the range of the community, this initiative naturally expanded to an inter-community initiative. Further, to tackle issues and ideas beyond the community-based domain, a topic-based committee called the “hundred-people committee”, which is a bottom-up residents’ task group, was set up to nurture novel proposals and explore how to put them into practice. Under this multiple bottom-up network, various ideas came up that were actually realized. What makes Chizu different from ordinary rural revitalization initiatives is that in initiating these activities Chizu not only takes a

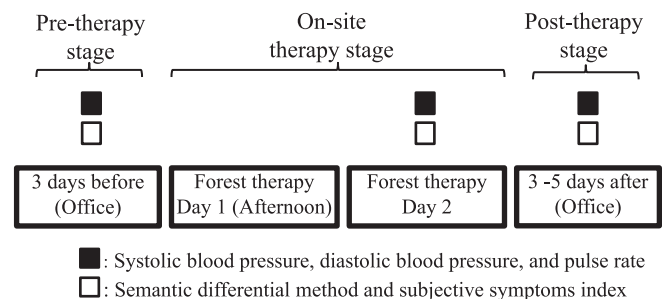


Fig. 1. Experimental schedule.



Fig. 2. Measurement scene (A, I) and scenery at forest therapy program (B-H).

Notes: A: Measuring blood pressure and pulse rate in the office, B: Cutting tree, C: Walking in the forest, D: Walking with closed eyes, E: Walking backward, F: Breathing deeply, G: Embracing a tree, H: Resting next to tree, I: Measuring blood pressure and pulse rate in the forest.

community-based approach at various levels, but also continues with this approach until a concrete proposal is formed rather than ending up with an unresolved discussion. Forest therapy tourism is one of these outcomes. These measures resulted in an increase in the number of newcomers from younger generations from outside. A detailed analysis of the revitalizing measures in this town was intensively conducted as already mentioned above; therefore, since our main purpose is forest therapy tourism, we will not touch upon these details. The Forest Therapy Program, however, was implemented in line with the revitalization measures in this forest town.

Chizu was certified as a forest therapy base in 2010 after evidence of relaxation effects was officially confirmed. As of April 2015, 19 forest therapy guides and 16 forest therapists were registered. Four forest therapy routes are available at present and three of the four routes were set in private and national forests covering 1.3 km, 2.0 km, and 2.3 km. The remaining 1.5 km is in a forest owned by the municipality because privately owned forests account for 82.6% of all forests in this town (Chizu Forestry Cooperative, <http://chizushinrin.com/town/index.html> referred on 7 December 2016). The owners of forests do not receive any reward

Table 5
No. of overnight stays in home stay program in Chizu.

Year	2010		2011		2012		2013		2014	
	units	stays	units	stays	units	stays	units	stays	units	stays
4	—	—	0	0	3	41	9	20	4	6
5	—	—	3	7	2	3	12	32	11	23
6	—	—	1	2	7	22	4	13	7	19
7	—	—	3	30	6	30	21	47	6	19
8	9	23	4	15	6	27	14	51	9	73
9	6	15	3	6	11	38	16	40	59	148
10	9	20	10	39	9	128	24	122	10	33
11	5	13	16	88	9	26	15	42	10	41
12	0	0	1	1	2	10	2	4	1	3
1	0	0	1	1	2	5	7	22	6	12
2	0	0	5	34	8	35	5	28	5	67
3	1	2	3	3	7	46	8	23	4	7
Total	30	73	50	226	72	411	137	444	132	451
No. households offering accommodation			30		38		40		41	
No. license holders for elementary accommodation business			24		32		34		35	
No. associates in home stay program			44		54		56		57	

Source: Chizu Town Note: Year indicates fiscal year from April to March.

Table 6
Attributes of study participants.

Category		Total		Those with ≥ 120 mmHg SBP	
		No.	%	No.	%
Sex	Male	16	37.2	9	64.3
	Female	27	62.8	5	35.7
	Total	43	100.0	14	100.0
Age groups	20s	4	9.3	0	0.0
	30s	8	18.6	4	28.6
	40s	16	37.2	4	28.6
	50s	13	30.2	5	35.7
	60s	1	2.3	1	7.1
	unknown	1	2.3	0	0.0
	Total	43	100.0	14	100.0
Occupation	Private sector	39	90.7	11	78.6
	Public sector	4	9.3	3	21.4
	Total	43	100.0	14	100.0
Place of work	Osaka	28	65.1	10	71.4
	Tokyo	15	34.9	4	28.6
	Total	43	100.0	14	100.0

Source: Authors' survey

due to an agreement between owners and the municipality except for leasing land for a hut used for stress checks and toilets, benches, and sign boards for tourists on the route. These facilities were built partly by subsidies from the national government and were financed by the municipality of Chizu. Maintenance of these facilities is done by the municipality. Basic fee for a group up to six people with one forest therapy guide for a half day route is 8000 yen (= 66.7 euro when 120 yen = 1 euro) and 13,000 yen for one day. There are additional charges for a tour of the town and accommodations for the two-day stay.

Annually, around 1400 forest-therapy tourists visit this town. Those desiring forest therapy in Chizu are supposed to contact the Chizu Forest Therapy Promotion Council, which is mainly composed of those from various sections of the municipal government and provides coordination between tourists and local people concerned and trains therapy guides. The Village Renaissance, a division of the municipal government, plans and sets the policy for forest therapy programs and addresses issues of home stays for therapy tourists. Thus, forest therapy tourism in Chizu has been conducted by sharing roles within the municipality that take the initiative in planning the Forest Therapy Program. The Forest Therapy Promotion Council is responsible for implementation of

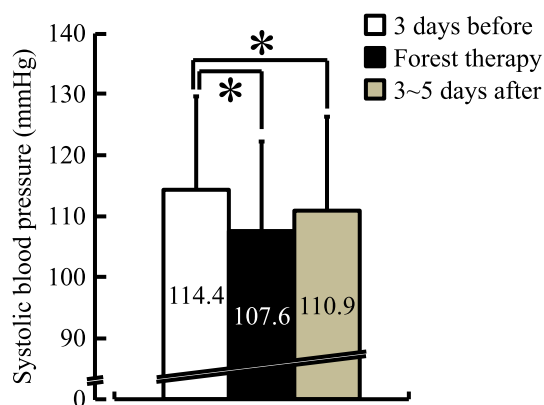


Fig. 3. Results of systolic blood pressure measurements made before lunch. Notes: $N = 43$, mean \pm standard deviation, * $P < 0.05$, determined by paired t -test with Holm correction.

the program.

6. Home stay program for therapy tourists and issues in the study area

From a rural business perspective, it is necessary to explore how to integrate these relaxation effects with sustainable development of rural business activity. We consider this point here. Because of the insufficient accommodation facilities in Chizu, tourists to Chizu had to stay in neighbouring towns. To counter this issue, in 2010 as a pilot project the municipality of Chizu took the initiative to launch a home stay program to give forest-therapy tourists accommodations and to promote interactions with local residents and subsequently to increase the economic benefits to the local community in 2010. Then, in 2011 this home stay program was in full swing. Booking is administered from an office of the municipality to confirm the purpose of the tourists' stay and ask local hosts for availability. The municipality thought that a home stay as a part of the forest therapy program in Chizu would let tourists know more about Chizu through interactions with local hosts. This feature makes the therapy program more impressive and differentiates it from ordinary accommodations and other therapy bases. While 57 households are registered as hosts at present, only 41 households are actually in operation as hosts mainly due to the ageing local population. The trend of arrivals is shown in Table 5. In 2014, 451 overnight stays were recorded, which means an average of about 10 stays per household a year (Table 5). This low level of accommodation activity is a common issue among rural tourism areas in Japan (Ohe, 2014). Although data on the number of overnight stays are not available, normally tourists stay one or two nights. The accommodation fee is 6800 yen a night per head including breakfast and dinner, which is much cheaper than that of ordinary accommodation facilities.

The municipality tried to increase the number of hosts due to a potential demand increase in incoming forest therapy tourists. Nevertheless, increasing the number of hosts from the younger generation was not easy due to the extremely reverse-shaped population pyramid there due to the highly advanced age of the local population as described above. Furthermore, the home stay service has not become a viable business because of the insufficient number of stays. On the other hand, a young newcomer who is a home stay host has played an active role in the home stay program, which could be one direction for the future. For group tourists such as school children, a renovated elementary school facility as a post-abolition measure is used as a dormitory.

To develop further forest therapy tourism, the municipality of Chizu is exploring the marketing of a training program for company employees in urban areas; developing an external partnership with onsen, i.e., a hot spring resort, in Hyogo; and collaboration with IT companies in Tokyo to develop a mobile phone application that enables users to measure physiological data handily. Since these innovative approaches have not borne fruit fully yet, we need to continue to watch the evolution of forest therapy tourism there.

7. Results of measurement of forest-therapy relaxation effects

The profiles of the 43 study participants as a whole and the ≥ 120 mmHg SBP group are shown in Table 6. Participants were in their 20s to their 60s. Females accounted for over 62.8% of the entire sample while males accounted for 64.3% of the group with SBP ≥ 120 mmHg.

First, we examine the results of physiological experiments for the whole sample. Fig. 3 shows results of SBP measurements made before lunch at three time points. Results clearly verified that forest

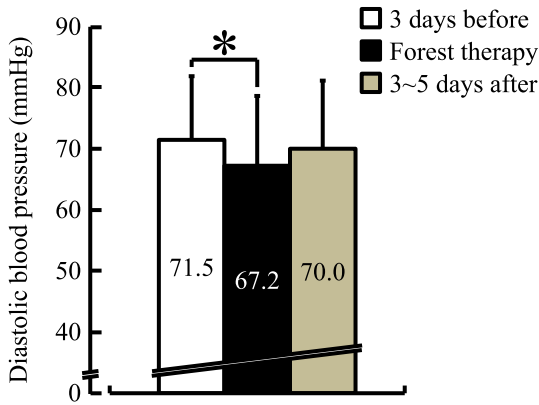


Fig. 4. Results of diastolic blood pressure measurements made before lunch. Notes: $N = 43$, mean \pm standard deviation, $*P < 0.05$, determined by paired t -test with Holm correction.

therapy reduced the blood pressure level and that SBP remained lower during the post-therapy stage compared with the pre-therapy stage with statistical significance (5%) as determined by the paired t -test with Holm correction. Fig. 4 shows the results of measurements of DBP, showing a reduction during forest therapy from the pre-therapy stage but that the effect did not remain. We examined the participants' pulse rate at three stages, but no statistically significant differences were noted between the on-site therapy stage and pre-therapy stage (Fig. 5). In comparison with previous studies, Park, Tsunetsugu, Kasetani, Kagawa, and Miyazaki (2010) verified a drop in both SBP and DBP after forest viewing and walking at 24 sites, not including Chizu, in Japan. Our results shown here are consistent with these results. Further, we confirmed the lasting effects in the SBP drop for the first time.

Second, the results of subjective evaluations are shown in Figs. 6 and 7 for different indicators. "Comfortable feeling", "relaxed feeling", and "natural feeling", which indicates an expression of naturalness within the environment, were statistically significantly improved from the pre-therapy stage, with effects lasting into the post-therapy stage, according to the Wilcoxon signed-rank test with Holm correction (Fig. 6). Previously, Ikei et al. (2015) observed statistically significant differences among these three subjective evaluations between before forest therapy measurements and during forest therapy measurements. However, they did not confirm the post-therapy effects generated after three to five days. Our study is the first to observe a relaxation effect persisting into

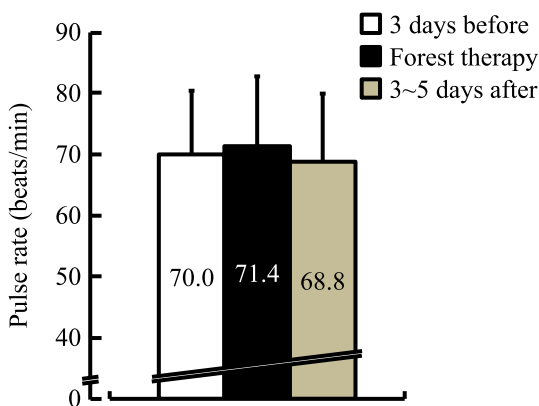


Fig. 5. Results of pulse rate measurements made before lunch. Note: $N = 43$, mean \pm standard deviation.

the post-therapy stage.

Fig. 7 shows results of subjective scoring for the subjective symptoms index (SSI) at three time points; negative feelings were measured vertically, which means that a lower value indicates a better result. The results did not demonstrate the effects of the forest therapy clearly, as shown in Fig. 7, because only one of the three indicators showed a statistically significant lasting effect. Specifically, changes in "less vigor", i.e., feelings of drowsiness and dullness, were not statistically significant while "uncomfortable physical feelings" showed improvement both at the on-site and post-therapy stages, and "less willingness", i.e., experiencing difficulty in concentration, differed significantly only between the pre-therapy stage and on-site therapy stage.

In short, statistical test results showed that the reductions in SBP and increased subjectively perceived positive feelings lasted from three to five days after forest therapy. However, improvements in negative feelings were not as clearly shown.

Now turning to the group of those with ≥ 120 mmHg SBP, the results of SPB measurements in this group showed statistically significant changes from the pre-therapy stage confirming a lasting effect (Fig. 8), a result similar to that of the whole sample. Thus, we can say that the physiological effect by forest therapy tourism in terms of lowering blood pressure and its lasting effect were stable in both groups. Nevertheless, the subjective effects differed from those in the whole sample. In the case of positive feelings (i.e., comfortable feeling, relaxed feeling, and natural feeling) as shown in Fig. 9, statistically significant lasting improvements were not shown although improvements in these effects were observed during the on-site stage.

In the case of negative feelings, although "less willingness" improved substantially with statistical significance at the on-site therapy stage, this improvement did not last until the post-therapy stage (Fig. 10). Only in the case of "uncomfortable physical feelings" was statistical significance shown at both the on-site and post-therapy stages. In short, in the ≥ 120 mmHg SBP group, forest therapy tourism caused a drop in SBP, which lasted for three to five days after the therapy tourism. In contrast, although subjective scoring evaluations showed improvements in negative and positive feelings, these relaxation effects did not always persist in contrast with results for the whole sample.

To sum up, the evaluation of relaxation effects in terms of physiological and psychological aspects revealed that SBP dropped after the forest therapy and that the reduction persisted for at least three to five days. In particular, we confirmed that even those in the ≥ 120 mmHg SBP group experienced a drop in SBP that persisted for three to five days. This is the first such confirmation of the relaxation effects of forest therapy in both such cases. Nevertheless, although we confirmed relaxation effects on psychological aspects as well as their persistence in the entire study group, observations of lasting effects were limited in the ≥ 120 mmHg SBP group. There are two possible reasons for this difference between groups. First, the ≥ 120 mmHg SBP group was small, which made determinations of statistical significance difficult. Second, those participants might have socio-economic and/or physiological conditions that would cause higher blood pressure than those with lower blood pressure, which would lead to the shorter-lived relaxation effects. Another possible reason is that the ≥ 120 mmHg group had higher scores for subjective symptoms, such as comfortable, relaxed, and natural feelings, than the entire sample. This suggests that the ≥ 120 mmHg group reached the peak of the effect of forest therapy earlier, so that the scores dropped after three to five days. Nevertheless, we could not identify causes at that time. Further studies on the lasting effects of forest therapy should be conducted in such participants.

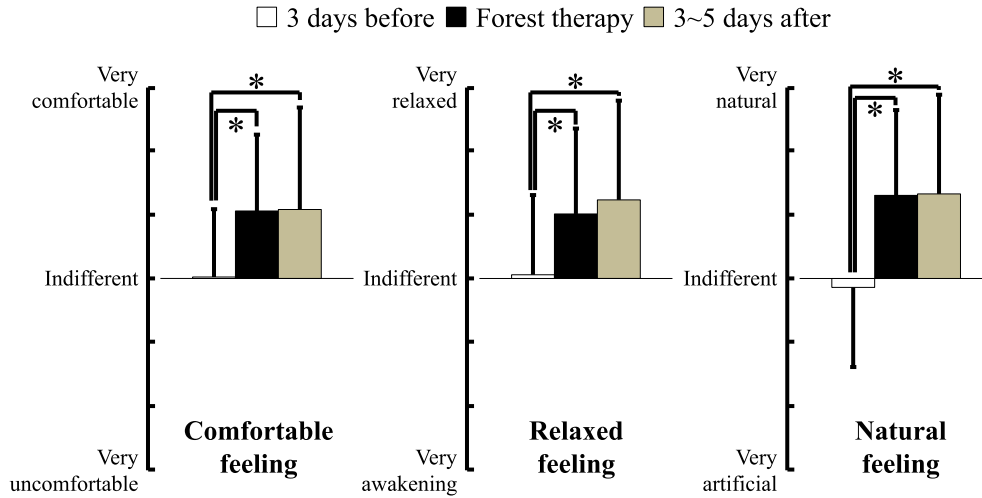


Fig. 6. Subjective scores obtained before lunch for comfortable, relaxed, and natural feelings. Notes: N = 43, mean ± standard deviation, *P < 0.05, determined by Wilcoxon signed-rank test with Holm correction.

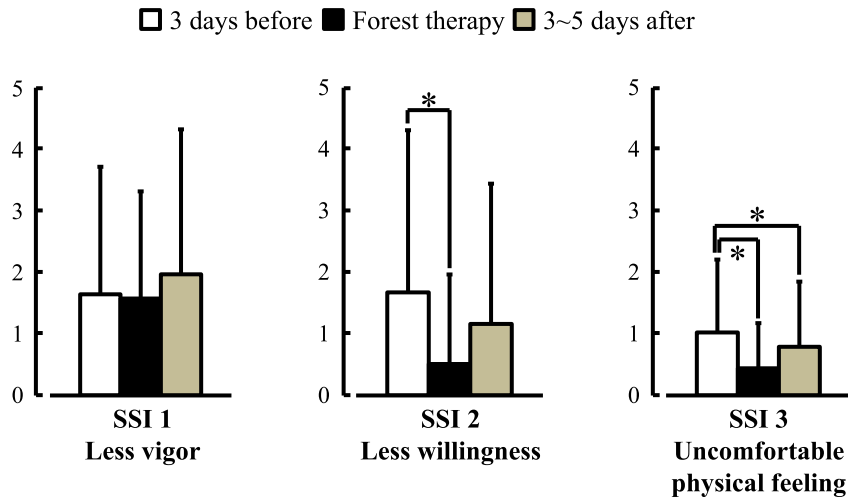


Fig. 7. Scores for the subjective symptoms index (SSI) obtained before lunch. Notes: N = 43, mean ± standard deviation, *P < 0.05, determined by Wilcoxon signed-rank test with Holm correction.

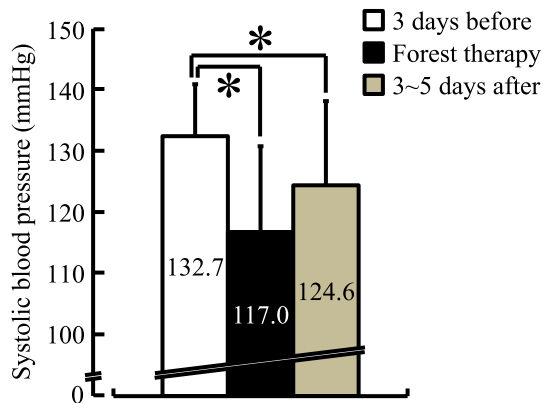


Fig. 8. Results of systolic blood pressure (SBP) measured before lunch among those with SBP ≥ 120 mmHg. Notes: N = 14, mean ± standard deviation, *P < 0.05, determined by paired t-test with Holm correction.

8. Conclusion

This paper studied emerging forest therapy tourism by focusing on its physiological and psychological relaxation effects and what features and issues it has in Chizu, Japan. We investigated a group of urban office workers as well as a subgroup with SBP ≥ 120 mmHg selected from the whole sample. This is because it is important to explore evidence-based benefits of rural tourism under soaring national medical expenditures in every part of the world with the idea that rural tourism can contribute to realization of a more health-conscious society. The results of our investigation of the relaxation effects of forest therapy tourism verified both physiological and psychological effects, which were a drop in SBP and improvement in subjective feelings. These relaxation effects lasted for three to five days after the forest therapy, an effect of forest therapy tourism that had not been verified previously. In the ≥ 120 mmHg SBP subgroup, the same psychological relaxation effects were confirmed at the on-site stage but the lasting effects

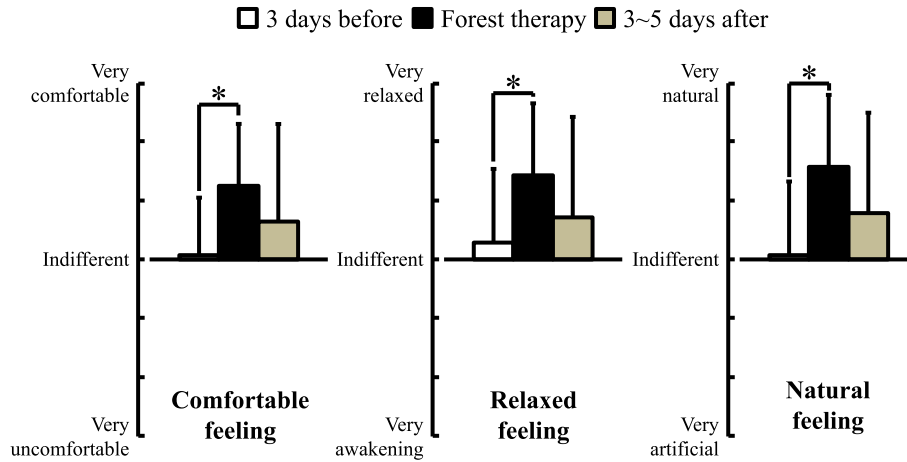


Fig. 9. Changes in subjective scoring for comfortable, relaxed, and natural feelings before lunch among those with systolic blood pressure ≥ 120 mmHg. Notes: N = 14, mean \pm standard deviation, * $P < 0.05$, determined by Wilcoxon signed-rank test with Holm correction.

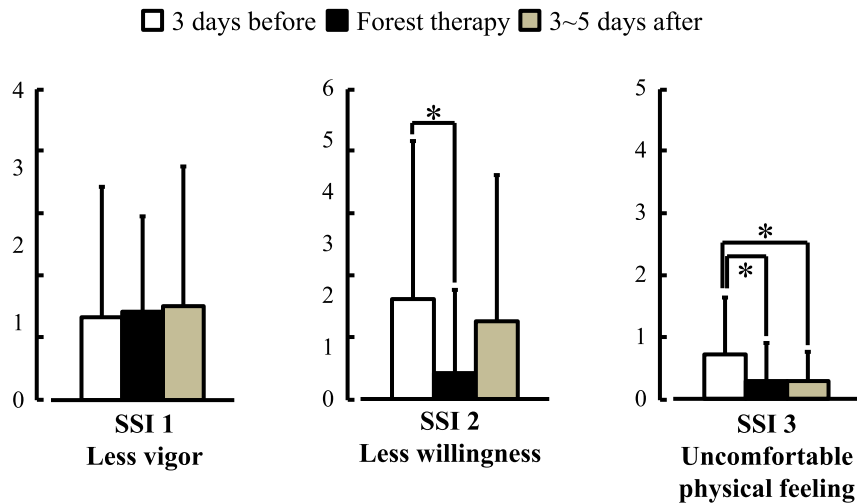


Fig. 10. Changes in subjective scoring for the subjective symptoms index (SSI) before lunch among those with systolic blood pressure ≥ 120 mmHg. Notes: N = 14, mean \pm standard deviation, * $P < 0.05$, determined by Wilcoxon signed-rank test with Holm correction.

were weaker than those for the entire sample, probably because those people might have faced higher stress in business. Our findings illustrate a novel way to identify the relaxation effects of rural tourism by combining physiological and psychological effects—an approach not previously reported in the literature.

From a managerial point of view, our findings are potentially limited by the demographics of the area studied. Our results, however, do provide an indication of the potential of such an approach in better recognizing the benefits of forest-therapy tourism for the different stakeholders, particularly urban office workers. Thus, evidence of the benefits of the relaxation effects can be used to establish a more effective and better-focused marketing strategy for the exploration of new markets for rural based tourism products. In this context, how to effectively integrate the acquired evidence into actual programs will be an important issue. For this purpose, it is recommended that rural tourism operators work collaboratively with external stakeholders such as private companies and the health and relaxation tourism sector to explore new markets based on clear scientific evidence by incorporating IT-smart technology.

Finally, since forest therapy tourism is a relatively new category and the methodology employed here is applicable to other parts of the world as well, further study is needed from a preventive health care perspective to accumulate evidence from other forest therapy sites especially in terms of the duration of the therapeutic effects among those with a highly stressful business life. Another research agenda would be to explore the conceptual contribution of this emerging type of rural tourism to the development of rural tourism in general.

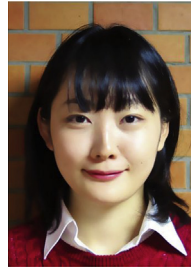
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