

Development of Tourism Resources Utilizing Healing Effects

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ABSTRACT

This research aims to provide tourism information on the healing effects of forest bathing and power spots in response to the health consciousness of the After Corona and With Corona era. For this purpose, we will elucidate the following questions: “What exactly are the effects of forest bathing, and what brings about the healing effects? Specifically, by collecting and analyzing information that links brain waves and GPS location information, it will be possible to provide pinpoint information on which places and how much of a relaxing effect they have, such as where to go near a waterfall or under a huge tree. We will also elucidate the factors that bring about the relaxation effect and examine the possibility of reproducing the relaxation effect. Regarding measuring the effects of forest bathing, measuring the amount of cortisol at the beginning and the end of the bath is common. However, in that case, we can know the effects as an area; however, it is not easy to provide pinpoint information on which place and how much relaxation is good, for example, near a waterfall here or there, or under this huge tree. In addition, research on the default mode network, the idle state of the brain, has been progressing in recent years. When relaxing by taking a forest bath and paying attention to the inner world, a state of mind-wandering (in which you think about many things in a daze) is created, which is expected to activate the default mode network. As a result, it is expected that memories in various parts of the brain under the conscious mind will be connected, and the brain will be in a state where creativity can be easily exercised. Suppose forest bathing or strolling promotes the activation state of the default mode network. In that case, we can measure the effect by continuously measuring EEG and know if there is any difference depending on the location. Once the location can be identified, it is possible to know which of the five senses of information are effective at that location, whether it is auditory, olfactory, or tactile. From this, we can expect to know the elements, such as the sound of water, wind, leaves rubbing, the scent of the trees, and the spray of wind and water, that bring about the effects of forest bathing. The result of our two preliminary tests using that EEG sensor, one was walking on our campus, and another was hiking at Senjyogahara, is explained to show the effect of water sound to increase α wave. In 2022, we are planning to start collecting and analyzing EEG data and location data in Senjogahara and investigating their relation.

Keywords: Forest bathing, Hearing effect, Default mode network, Mind-wandering, Health tourism, Brainwave sensor, Wearable device, Sightseeing support application

INTRODUCTION

Although restrictions on movement have been requested due to the spread of COVID-19, people are gradually returning to tourist destinations as vaccination progresses. According to “COVID-19 and Transforming Tourism” (UNWTO 2020), after COVID-19, tourism in nature and with small numbers of people is recommended. In addition, the digitalization of the tourism ecosystem is recommended. In Japan, Minister of Environment Koizumi proposed “GoTo National Park (Minister of Environment, 2020)” to enjoy nature while avoiding three densities. In 2018, the national government will launch a “health tourism certification system,” and in the years before the Corona disaster, it is expected that the number of tourists will increase. According to the Global Wellness Tourism Economy (Global Wellness Institute, 2018), the global tourism market is expected to grow from about \$639 billion in 2017 to \$919.4 billion in 2022, mainly in Asia and the Middle East. When it comes to health tourism in Japan, forest bathing is a prime example. Also, mindfulness tourism is becoming popular, such as in Thailand (The Mindful Tourist, 2020).

We have been researching the development of tourism resources using ICT in the Nikko region, and we would like to contribute to the development of tourism, including health tourism, in the future. There are two questions.

(Question 1) What are the effects of forest bathing, and what brings about the healing effects?

(Question 2) How can we best present tourism information on healing effects?

We plan to elucidate these issues with neuroscience and psychology and conduct research that will lead to tourism support compatible with the increasing health consciousness after COVID-19. In particular, from a neuroscientific point of view, some studies have shown that activation of the default network is effective for relaxation and new ideas, and we would like to verify this in the actual field.

BACKGROUND AND RELATED WORKS

The amount of cortisol is often used to measure the effect of forest bathing (Nei et al. 2009). However, even if the effect as an area is known by using cortisol, it is not easy to provide pinpoint information on which place and how much relaxation effect is good, for example, near a waterfall here or there, or under this huge tree. Recently, research on the default mode network, an idle state of the brain, has progressed (Koizumi et al. 2020). When we feel relaxed by taking a forest bath, for example, and pay attention to our inner world, a state of mind-wandering (in which you think about many things in a daze) is created, which is expected to activate the default mode network. As a result, it is expected that memories in various parts of the brain under the conscious mind will be connected, and the brain will be in a state that facilitates creativity (Hasenkamp, Wilson-Mendenhall et al. 2012), (Hasenkamp and Barsalou, 2012). What is the actual situation (Ikegaya, 2005)?



Figure 1: EEG sensor.

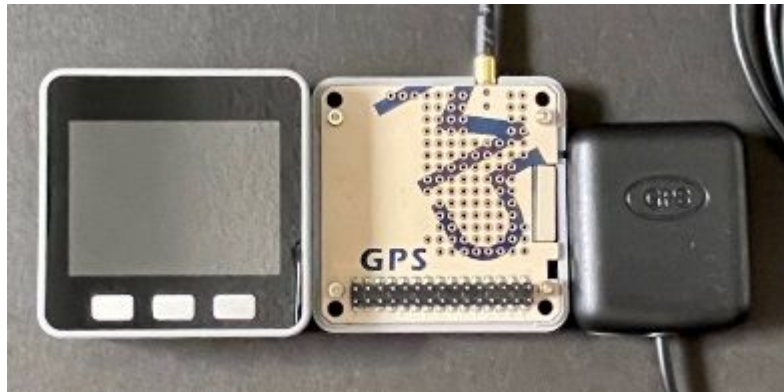


Figure 2: GPS module.

Is it only in the great outdoors or in places like shrines and temples that we can feel healing? What is the relationship between zazen, meditation, and forest bathing? The Buddha attained enlightenment in the forest, under the Bodhi tree. Also, it is said that ideas come to us on our pillows, one after another in our dreams, and when we wake up in the morning, we have completely forgotten about them, but sometimes something triggers us to remember them. The actual forest and various urban and linguistic landscapes may contribute to such an effect. If forest bathing or strolling promotes an activated state of the default mode network, we can measure its effects by continuously measuring EEG and whether there are differences between locations.

Therefore, we thought that if we could measure the effect of forest bathing in real-time, along with location information, during a walk in Senjogahara, it would be possible to show visitors where the relaxing effect of forest bathing is strongest, and also to examine what factors bring about the relaxing effect.

There is no research linking the healing effects of forest bathing and power spots with brain activity, and we decided to start this research and development to support tourism that meets the growing health consciousness after COVID-19.

PRELIMINARY TRIAL

We measure brain waves to measure the effects of forest bathing. We use the property that alpha waves increase when we relax, and beta waves increase when we are tense. In this study, we will also measure theta waves. In a recent study, for example, it was reported that high activation of the theta band was

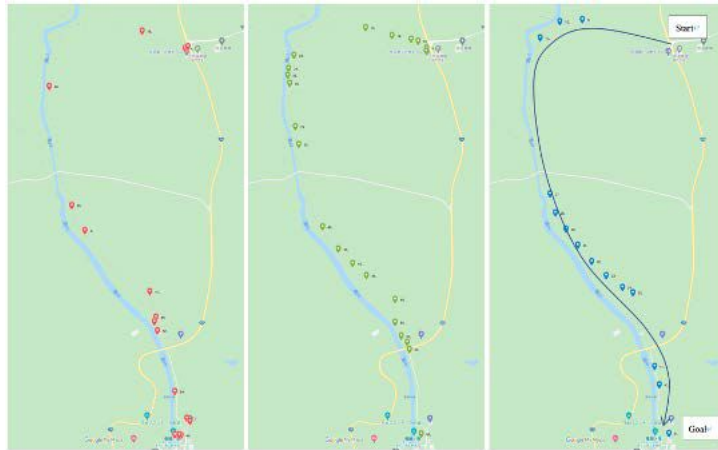


Figure 3: Log of EEG and location of three participants.

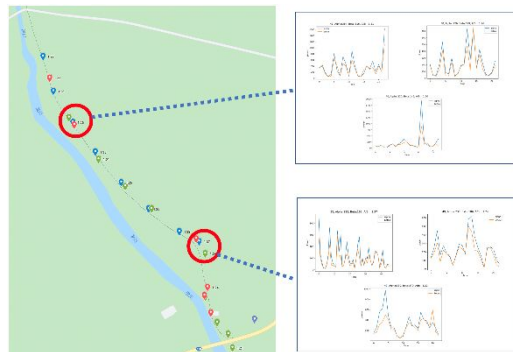


Figure 4: Two locations where all of them felt relax and EEG ($\alpha > \beta$).

Table 1. Percentage of the number of locations where $\alpha/\beta > 1.2$.

Participant ID	The number of local (total)	$\alpha/\beta > 1.2$	%	Average of α/β
1	111	27	24.3	1.14
2	124	22	17.7	1.13
3	157	41	26.1	1.17

observed in the frontal region when watching a highly rated movie (Dmochowski et al. 2012), which makes it possible to estimate the situation in which forest bathing relaxes and results in feeling positive emotions. Typically, EEG sensors are large devices used in hospitals, but we have developed a wearable EEG sensor that can acquire data for several hours, as shown in Figure 1, in cooperation with a US venture company. Figure 2 shows the data logger that we are currently using. It is linked to the EEG sensor and can record location information via GPS. We can find out where people are relaxing by analyzing collected information, which can be used as a power spot and a tourist resource.



Figure 5: Waterfalls (dotted circles) and two locations where all of them felt relax (solid lines).

We want to show the result of two preliminary trials. One was performed at Senjogahara, a popular hiking course near Tokyo. Three participants (two female (age: 21) and one female (age: mid 60th)) joined the trial.

Figure 3 shows the EEG data and location data during hiking in Senjogahara. The hiking route is a riverside, and there are many waterfalls. The points with pins are the location where the ratio of α wave and β wave was high ($\alpha/\beta > 1.2$). Table 1 shows the percentage of locations where $\alpha/\beta > 1.2$. In this experiment, we define “relaxed” as $\alpha/\beta > 1.2$. Table 1 shows the percentage of locations where each participant felt relaxed. We overlapped these three logs in Figure 3 and found two locations where all of them felt relaxed ($= \alpha/\beta > 1.2$), as displayed in Figure 4. Around the left circle of Figure 4, the score of α/β was 1.21, 1.26, 1.50 (average 1.32), and around the right circle, the score of α/β was 1.37, 1.24, 1.22 (average 1.28). At these two points, they showed a higher α/β ratio, so we can assume that these points are good for relaxing. Figure 5 shows that along the river, there are some waterfalls. At these two points, we can hear the sound. So we assume that near a waterfall may be a good place to be relaxed.

We performed another experiment around a fountain on the campus of Chuo University. One participant, age 62, male, joined the trial. Figure 6 shows a plot of location and ratio of α/β , pins with a white circle shows the location of higher β wave and pins without circle shows the location of higher α wave. Around the fountain, the EEG showed a higher α wave, and the other area was not. We could hear loud water sounds, assuming that water sound may give us relaxation.

Thus, if we can identify the location, we can know which of the information that works on the five senses is effective at that location, for example, whether it is auditory, olfactory, or tactile, and from this, we can expect to know the factors that bring about the effects of forest bathing. In this way, if we can investigate what elements lead to the relaxation effect, we can verify whether similar effects can be obtained in the laboratory. If the relaxation elements are identified, we can verify the possibility of reproducing them at home or in the office. At this time, we will also use fMRI to examine the state



Figure 6: Around a fountain in a pond.

of the brain. We believe that the brain's default mode may be related to the relaxation effect, and we will test this as well.

CONCLUSION

This research aims to provide tourism information on the healing effects of forest bathing and power spots in response to the health consciousness of the After Corona and With Corona era. For this purpose, we will elucidate the following questions: “What exactly are the effects of forest bathing, and what brings about the healing effects? Specifically, by collecting and analyzing information that links brain waves and GPS location information, it will be possible to provide pinpoint information on which places and how much of a relaxing effect they have, such as where to go near a waterfall or under a huge tree. We will also elucidate the factors that bring about the relaxation effect and examine the possibility of reproducing the relaxation effect. Based on the results of these studies, we will improve the functions and performance of the Nikko Senjogahara guide application developed so far. In addition, we will collaborate with researchers in Thailand, where research on forest bathing is becoming more and more popular, and aim to expand our R&D results overseas. Based on the results of these studies, we will improve the functions and performance of the Nikko Senjogahara guide application that will provide relaxing point information.

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