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ORIGINAL ARTICLE

Individual reactions to viewing preferred video representations of the natural environment: A comparison of mental and physical reactions

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Abstract

Aim: Globally, awareness of the vital link between health and the natural environment is growing. This pilot study, based on the idea of "forest bathing," or *shinrin-yoku*, the mindful use of all five senses to engage with nature in a natural environment, was initiated in order to determine whether stimulation by viewing an individual's preferred video of sea or forest had an effect on relaxation.

Methods: The participants were 12 healthy men in their twenties and they were divided into two groups based on their preference for sea or forest scenery by using the Visual Analogue Scale. The participants watched 90 min DVDs of sea with natural sounds and forest with natural sounds while their heart rate variability and Bispectral Index System value were measured by using MemCalc/Tawara and a Bispectral Index System monitor.

Results: The participants were divided into two groups of six based on their preference for sea or forest scenery and each indicator was compared between them. Significant differences in a decrease in heart rate, increase in high frequency, and sustained arousal level were observed while viewing the preferred video. These results indicated that the viewing individual's preferred video of sea or forest had a relaxation effect.

Conclusion: This study suggests that individual preferences should be taken into consideration for video relaxation therapy.

Key words: Bispectral Index System, natural environment video, parasympathetic nerve activity, relaxation, well-being.

INTRODUCTION

More than 20% of Japanese adults report some type of sleep disorder (Kim *et al.*, 2000) and the levels of stress, fatigue, and depression also are increasing globally (DeVries & Wilkerson, 2003). Concerns about the reliance on antidepressants have increased due to the undesirable effects of relying on medication. In recent years, researchers have been exploring the effect of relief for stress-related problems from the natural environment (Kamioka *et al.*, 2012). Exploring the green environment has been associated with increased mental health benefits, lowered stress, and steeper diurnal decline in cortisol secretion (Roe *et al.*, 2013). "Forest bathing," or *shinrin-yoku*, is a mindful use of all five senses to engage with nature in a natural environment and has been associated with positive health outcomes (Pretty *et al.*, 2009). There is increasing interest in

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exploring the impact of water and forests on people's physical and mental health (Smedley, 2013; White *et al.*, 2010).

Japan is one of the leading proponents of forest therapy and there have been many reports on its physical and mental effects. Morita *et al.* (2007) investigated the psychological effect on healthy people by comparing their mental status and stress levels on the days with and without forest bathing. As a result of the intervention, hostility and depressive symptoms decreased and vitality increased on the days with forest bathing, compared to the control days. Lee *et al.* (2011) compared the physiological and psychological responses of Japanese young college students to 3 day and 2 night exposure to a real forest environment with an urban environment and found that the forest environment significantly increased parasympathetic nervous activity, decreased sympathetic nervous activity, and lowered the heart rate (HR) and salivary cortisol levels.

The studies by Lee *et al.* (2011) and Morita *et al.* (2007) indicated the relaxation effectiveness of forest therapy with the characteristics of physical activities. The participants were able to enjoy changing scenery by walking in a natural environment where there were many kinds of stimuli from natural sounds: birds, water running, and wind in the trees; the smell of fresh air; and the sensation of stepping on fallen leaves and soil and touching those leaves with the hands. Studies in Europe found that the type of environment impacts well-being and group walks in green corridors were superior to those in urban areas, in terms of perceived stress and less negative affect and depression (Marselle, Irvine, & Warber, 2013).

A small-scale study that was conducted in Japan with 12 participants found that 2 day forest bathing exposure increased the amount of natural killer cells in the immune system, significantly increased parasympathetic nervous activity, and significantly suppressed sympathetic activity in the participants, compared with those in an urban environment (Lee *et al.*, 2011). In addition, the salivary cortisol levels and pulse rate decreased markedly in the forest setting, compared to the urban setting, and the forest bathing significantly increased the scores of positive feelings and significantly decreased the scores of negative feelings, compared to the urban environment (Lee *et al.*). A Chinese study that compared a 1 week forest bathing and urban stay in older patients with hypertension reported that forest bathing significantly decreased their blood pressure, lowered their scores on the negative scales of the Profile of Mood States (POMS) and induced inhibition of the renin–angiotensin system and inflammation after exposure to the forest environment. (Mao *et al.*, 2012). A larger scale Japanese study used 489 healthy volunteers and the measures were conducted twice in a forest on the same day (forest day) and twice on a control day; the results suggested that the forest environment had positive effects on acute emotions, especially among those experiencing chronic stress (Morita *et al.*, 2007). These reports indicate that the natural environment of forests can have a favorable impact on physical and emotional well-being, although a systematic review found that there was still insufficient evidence for forest therapy because of poor methodology and heterogeneity of the randomized controlled trials (Kamioka *et al.*, 2012).

Other research is looking at the effects of the presence of water because a growing body of evidence suggests that time spent in or near natural water environments, such as the coast, rivers, lakes, and inland waterways, can promote health and well-being (European Centre for Environment and Human Health, 2015). In other Japanese studies that used tactile experiences, positive effects were found: bathing in hot, deep seawater significantly reduced the lactate concentration in the participants 60 min after bathing (Tsuchiya *et al.*, 2003) and floating in seawater decreased salivary chromogranin A, one of the stress markers (Motomura, Arakawa, Toyosato, & Yokota, 2009).

Merely showing photographs of landscapes can lower stress levels, according to Ulrich, Simons, and Miles (2003), who were able to show that stress levels were reduced in proportion to the amount of green in the picture; when water was introduced, people showed a strong preference for increasing proportions of water in the pictures. White *et al.* (2010) showed the participants a set of 120 photographs of natural and built scenes, half of which contained aquatic elements. The proportions of water/"green" and built environments were standardized and the affect and perceived restorative ratings were recorded. The scenes that included water were preferred and were associated with a greater positive affect and restorativeness than those without water. Martin (2011) examined whether residents with dementia showed reduced agitation when shown natural landscape photographs, compared to photographs of the interior of the facility. The results of the measurements using the Brief Agitation Rating Scale were inconclusive, but the qualitative measures showed a preference for the natural landscape photographs.

Although forest bathing and walking in green environments have been shown to be effective, it is not

possible for older, bedridden, or hospitalized people to access these benefits and the final goal of the authors is to build on this initial exploratory study in order to develop suitable DVD interventions for the reduction of stress and improvement in well-being in this group of people.

Previous research by the authors has shown that preferred activities, such as playing games, interacting with others, and applying makeup, according to personal preference, has temporary positive effects on arousal levels, engagement, and effectively readjusted dysfunctional sleep–wake patterns (Tsutsumi, Wakui, Kobayashi, & Tanaka, 2007, 2013) This study explored whether preference relating to the choice of natural environment also could influence mental and physical reactions.

This pilot study examined whether the stimulation of viewing a preferred video of sea or forest had a relaxing effect, as measured by autonomic nerve parameters, in order to clarify whether viewing a preferred video had an effect on relaxation. The goal was to use the method of viewing a preferred video as an appropriate intervention for people who need bed rest, such as older people in delirium, with dementia, after surgery, or patients undergoing dialysis.

METHODS

Design

An experimental research design was used.

Participants

The study took place between February and March 2014. The participants were 12 adult men (mean age: 22.2 ± 1.7 years) The inclusion criterion was men and the exclusion criteria were people with major audiovisual impairment and those who experience nausea as a result of watching videos. Women were excluded. The purpose of the study was explained to the participants, who were assured of the protection of their anonymity. The participants' preference for either sea or forest was surveyed by using the Visual Analogue Scale (VAS). The VAS uses a 100 mm horizontal line whose left end is "like" and its right end is "dislike." The participants marked the appropriate point with a vertical dash. The values of the VAS ranged from 0 to 100 mm and, in this study, the high value indicated a high preference.

Materials

A healing DVD with both visuals and sounds of the sea (Kitajima, 2010) and a DVD with natural sights and sounds of the forest (Takeda, 2008) were used as stimuli for the intervention. These DVDs were constructed with only sea or forest scenery and natural sounds without music, captions, or narration. It was considered that these DVDs were appropriate for simulating the experience of sea viewing or forest bathing. This choice of video occurred because it was the closest that the researchers could find to a natural experience.

Survey of mood state

The POMS Brief was developed in the USA as an instrument to measure mood states (McNair, Lorr, & Droppeleman, 1992) and comprises 65 items to assess transient feelings and emotions that change according to the condition. The POMS assessment is a measure of affective mood state fluctuation in a wide variety of populations. It measures six identifiable mood or affective states: (i) tension–anxiety (T–A); (ii) vigour–activity (V); (iii) depression–dejection (D); (iv) fatigue–inertia (F); (v) anger–hostility (A–H); and (vi) confusion–bewilderment (C).

The reliability and validity of the Japanese version of the POMS is documented and the POMS has been reported to have good criterion-related validity, except for A–H (Yokoyama, Araki, Kawakami, & Tkakeshita, 1990).

Measurement of biochemical and emotional parameters

Premeasurement preparation

The day before the measurement, the participants avoided strenuous exercise, stimulating activities, heavy consumption of alcohol and medication, and slept enough so that they reported feeling refreshed. On the measurement day, they finished having a meal at least 2 h before the measurement and did not take caffeinated beverages. They wore loose clothing in order to feel relaxed. The measurements were taken between 13.00 and 17.00 hours.

The temperature and humidity of the room was set to an optimal 18–24% and 40–60%, respectively. The participants adopted a comfortable position on the bed, with their head reclined; the distance to the display and lightness of the room were adjusted to their preferred settings.

The participants watched the sea and forest DVDs on different days, three viewing first their preferred video and three their non-preferred video (clarified by their VAS score). The intervention comprised 15 min of viewing the DVD, 15 min of listening to the sound with eyes closed and 60 min free time with or without the eyes open. The intervention lasted for 90 min, the period of a natural sleep cycle.

Heart rate

The HR was measured for 90 consecutive minutes, from the beginning to the end of the experiment, and was recorded every 2 s by using maximum entropy calculation methodology (MemCalc/Tawara; Suwa Trust, Nagano, Japan). At the same time, as an indicator of sympathetic and parasympathetic nerve activity, low frequency (LF) component parts and high frequency (HF) component parts were measured to monitor the autonomic nerve response during the video viewing (Imamura *et al.*, 2014; Kasaoka, Nakahara, Kawamura, Tsuruta, & Maekawa, 2010).

Frequency

The range of LF is 0.04–0.15 Hz and it reflects both sympathetic and parasympathetic nerve activity, while HF with the range of 0.15–0.40 Hz reflects only parasympathetic nerve activity. This means that a relaxed state with a high level of parasympathetic nerve activity results in a high HF value. Using this mechanism, the HF value was used as an index of relaxation.

Bispectral Index System

The sleep–wake level was measured during the 90 min session by detecting dual channel brain waves with four electrodes placed on the participants' foreheads that connected them to the Bispectral Index System (BIS) monitor (QE-910P; NIHON KOHDEN, Tokyo, Japan). The measured values were in the range of 100–0 (full arousal – elimination of brain electrical activity). This measurement indicated whether the video viewing had a sleep-inducing effect. This method is widely used in healthcare research because of its simplicity and ability to measure the arousal level (Dahaba *et al.*, 2012; Prottengeier, Moritz, Heinrich, Gall, & Schmidt, 2014). The measurement process is shown in Figure 1.

Blood pressure

The participants' blood pressure was measured as a basic biomarker before and after viewing the DVD.

Survey of mood state

Before and after the video viewing, the participants' mood state was measured by using the T–A, D, A–H, V, F, and C scales in the POMS Brief.

Data analysis

According to the VAS results, the participants were categorized into two groups based on whether they preferred sea or forest. The two groups' mean values of blood pressure and POMS Brief standardized scores = 50 + 10 × (raw score – mean/standard deviation) were compared before and after the experiment, as well as the mean value in 90 min of HR, HF, and BIS.

BMI SPSS Statistics v. 21 was used for all the data analyses. The Wilcoxon Signed-Rank test for the blood pressure and POMS and the Mann–Whitney *U*-test for the HR, HF, and BIS were carried out. The significance level of <5% was considered as significantly different and <10% as tending to be different.

Ethical considerations

This study was approved by the research ethics committee of the author's institution. The researcher explained the research purpose to the participants and confidentiality was assured and maintained.

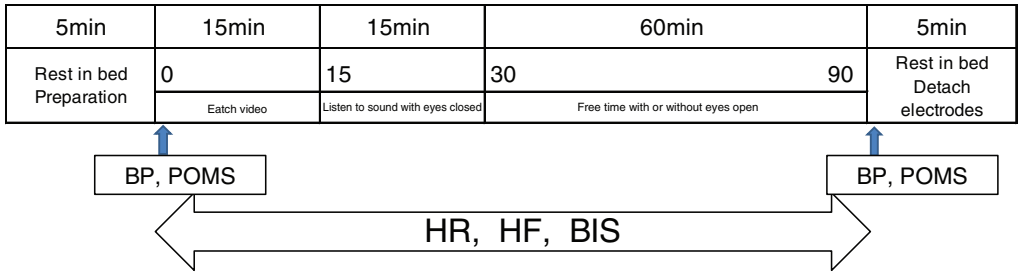

Figure 1 Measurement process. BIS, Bispectral Index System; BP, blood pressure; HF, high frequency component parts; HR, heart rate; POMS, Profile of Mood States.

RESULTS

Visual Analogue Scale

The results of the VAS are shown in Table 1. The sea preference group showed a strong preference for the sea.

Blood pressure

The mean blood pressure of the participants before and after viewing the sea video was 115.8 ± 69.0 (mean ± standard deviation) mmHg and 117.3 ± 69.5 mmHg, respectively, and there was no significant difference. The mean blood pressure before and after viewing the forest video was 118.9 ± 66.7 mmHg and 115.4 ± 68.4 mmHg and no difference was observed.

Table 1 Visual Analogue Scale

Group	Sea (mm)	Forest (mm)	*P*-value
Sea (n = 6)	86.0 ± 14.0	60.8 ± 18.5	0.028*
Forest (n = 6)	84.3 ± 13.2	84.3 ± 13.4	1.000NS

*P < 0.05 according to the Wilcoxon Signed-Rank test. NS, not significant.

Profile of Mood States

The results of the POMS are shown in Table 2. The mean values of all the items, except F in the forest preference group and C, were decreased, and this indicated overall mood improvement. In particular, the sea preference group showed lower values (P = 0.072) in T–A and a significant decrease in C (P < 0.05) after viewing the sea video. This group also showed a significant reduction in the values of V and C (P < 0.05) after viewing the forest video.

Comparison of the basic biomarkers in all the participants when viewing the sea video and forest video

Change in the heart rate

The change in the HR of all the participants when they watched the sea video is shown in Figure 2. The HR in

Table 2 Profile of Mood States scores before and after exposure to the chosen experience

	Standardized values for the sea video (n = 6)				Standardized values for the forest video (n = 6)		
Group	Time	Mean ± SD	*P*-value	Group	Time	Mean ± SD	*P*-value
Sea				Sea			
T–A	Before	64.6 ± 24.3	0.072†	T–A	Before	63.2 ± 25.6	0.914
	After	54.3 ± 20.4			After	56.7 ± 24.0	
D	Before	52.3 ± 12.6	0.339	D	Before	57.7 ± 23.4	0.339
	After	46.7 ± 4.1			After	52.3 ± 16.3	
A–H	Before	50.8 ± 12.2	0.317	A–H	Before	52.3 ± 16.3	0.317
	After	49.6 ± 8.2			After	50.8 ± 12.2	
V	Before	75.2 ± 26.8	0.599	V	Before	76.1 ± 30.6	0.026*
	After	71.1 ± 22.3			After	61.8 ± 18.7	
F	Before	56.7 ± 15.5	0.167	F	Before	55.7 ± 14.1	0.463
	After	50.3 ± 9.8			After	52.3 ± 16.3	
C	Before	62.6 ± 13.7	0.026*	C	Before	79.1 ± 23.2	0.046*
	After	40.4 ± 8.2			After	56.7 ± 11.7	
Forest				Forest			
T–A	Before	73.5 ± 38.7	0.340	T-A	Before	77.2 ± 38.8	0.114
	After	62.5 ± 40.8			After	64.4 ± 36.3	
D	Before	55.0 ± 20.0	0.914	D	Before	57.9 ± 20.7	0.339
	After	52.3 ± 16.3			After	52.3 ± 16.3	
A–H	Before	68.9 ± 52.4	0.317	A–H	Before	81.9 ± 59.5	0.317
	After	67.5 ± 53.0			After	65.9 ± 49.0	
V	Before	92.8 ± 41.3	0.173	V	Before	90.8 ± 33.1	0.172
	After	71.0 ± 38.2			After	71.7 ± 35.8	
F	Before	81.7 ± 47.7	0.752	F	Before	93.8 ± 49.3	0.916
	After	83.3 ± 42.7			After	82.8 ± 40.8	
C	Before	65.4 ± 16.0	0.248	C	Before	70.6 ± 17.5	0.752
	After	74.3 ± 19.4			After	73.6 ± 20.7	

A–H, anger–hostility; C, confusion; D, depression–dejection; F, fatigue; SD, standard deviation; T–A, tension–anxiety; V, vigor.
*P < 0.05, †P < 0.1.

both the sea and forest video viewing decreased for the first 30 min. The average HR in the sea viewing in 90 min was higher than that in the forest viewing ($P < 0.05$).

Change in the parasympathetic nerve activity

The change in the HF, the indicator of parasympathetic nerve activity, of all the participants in the sea and forest video viewing is shown in Figure 3. A natural logarithmic transformation was carried out to the measured HF values in order to reduce the amount of variation in the value of each participant.

The logarithm natural high frequency (LnHF) in both the sea and forest viewing was increased for the first 30 min. The changes in the LnHF in the sea and forest viewing were strongly synchronized with each other, while the average value in the sea viewing was higher than that in the forest viewing ($P = 0.091$).

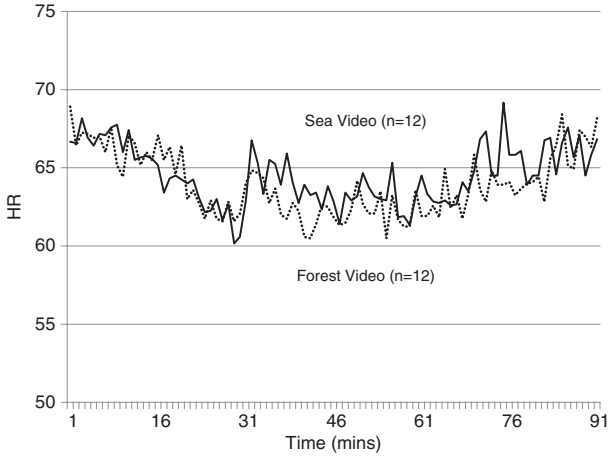

Figure 2 Change in the heart rate during the sea (–) and forest (---) video viewing.

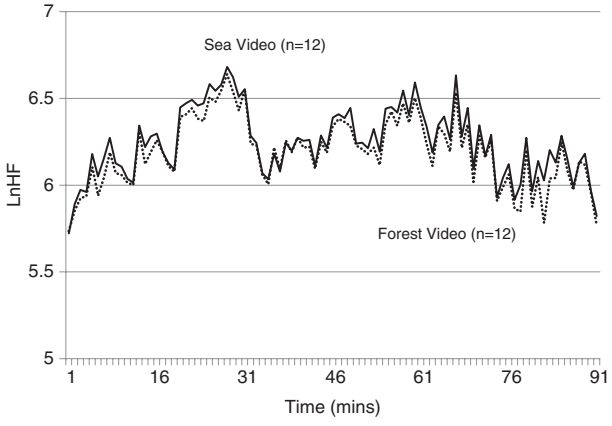

Figure 3 Change in the logarithm natural high frequency (LnHF) component parts during the sea (–) and forest (---) video viewing.

Change in the arousal level

The change in the BIS values of all the participants when viewing the sea and forest videos is shown in Figure 4. The average value for 90 min in the sea video viewing was higher than that in the forest viewing; the arousal level was maintained ($P < 0.01$).

Comparison of the basic biomarkers in the sea preference group and the forest preference group by video content

Sea video

Change in the heart rate

The HR while viewing the sea video generally remained at a higher level in the sea preference group ($P < 0.01$). Focusing on the changes during the first 30 min, the sea preference group showed a larger decrease, from 69.8 ± 12.4 at 8 min to 61.3 ± 9.3 at 27 min, than the forest preference group, which showed 67.2 ± 10.4 at 3 min and 59.8 ± 8.8 at 30 min.

Change in the parasympathetic nerve activity

Figure 5 shows the change in the LnHF by preference group in viewing the sea video. The mean value in 90 min in the sea preference group was higher than that in the forest preference group ($P < 0.01$).

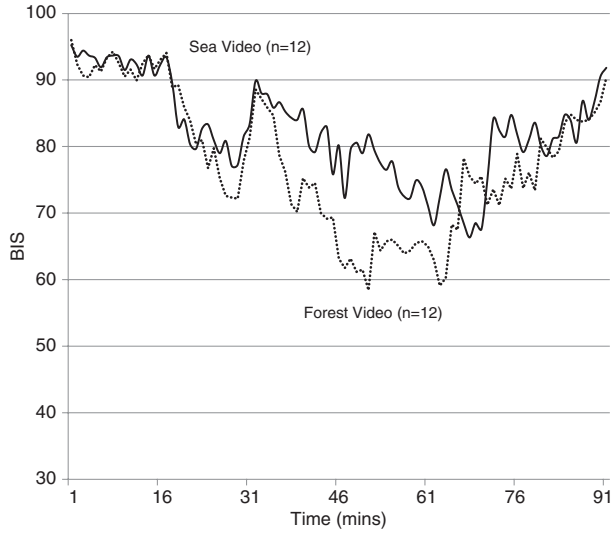

Figure 4 Change in the Bispectral Index System during the sea (–) and forest (---) video viewing.

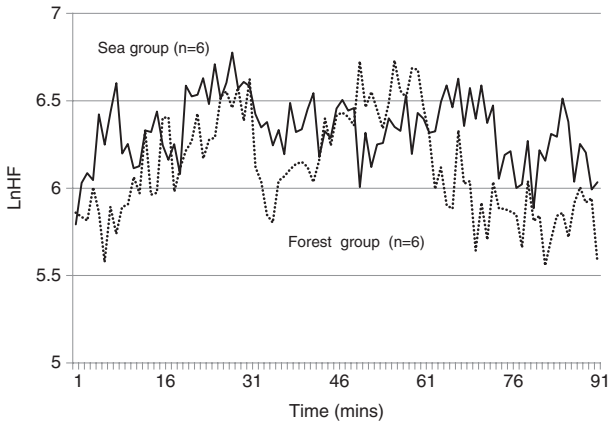

Figure 5 Change in the logarithm natural high frequency (LnHF) component parts during the sea video viewing for the sea (–) and the forest (---) groups.

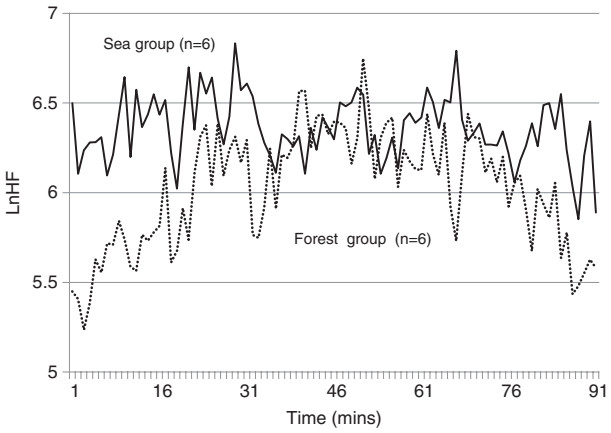

Figure 6 Change in the logarithm natural high frequency (LnHF) component parts during the forest video viewing for the sea (–) and the forest (---) groups.

Change in the arousal level

The mean BIS value in 90 min in the sea preference group when viewing the sea video was higher than that in the forest preference group ($P < 0.01$) and thus showed a higher arousal level.

Forest video

Change in the heart rate

The HR of both groups was approximately synchronized for the first 60 min and that of the forest preference group decreased afterwards. The forest preference group showed a lower mean value in 90 min than the sea preference group ($P < 0.05$).

Change in the parasympathetic nerve activity

The change in the LnHF while viewing the forest video is shown in Figure 6. The sea preference group indicated a generally higher level of LnHF and its mean value in 90 min was significantly higher than that of the forest preference group ($P < 0.01$). Compared to the sea preference group, whose range of value change was narrow, the forest group showed a marked rise in HF, especially in the first 30 min.

Change in the arousal level

The BIS values were slightly higher in the forest group, but no significant difference in the mean value in 90 min was observed ($P = 0.280$).

DISCUSSION

The sea preference group participants, when they watched the sea video, showed a decrease in the T–A standardized score of the POMS Brief, from 64.6 to 54.3 ($P = 0.072$). In addition, both groups when they watched their preferred video showed a quicker decrease in their HR, as shown in Figures 5 and 6, although the experiments were implemented in the same situation. A previous study also reported that the T–A was reduced more by viewing a forest video than a concrete video (Tsujiura & Toyoda, 2013). It gives credence to the results of this study.

These results suggested that enhanced effects are achieved when personal preferences are considered when video viewing is used for relaxation purposes. From the results of the BIS values for the arousal level, which was higher when viewing the preferred video, video viewing of the participants' personal preference could both maintain their arousal level and create a feeling of relaxation simultaneously.

This research builds on that of Morita *et al.* (2007) and suggests that it is not necessary to physically visit a forest to get a relaxation effect. It is difficult to directly compare the strength of the actual experience with the simulated experience because different measures were used: Morita used the Multiple Mood State–Short Form and the State–Trait Anxiety Inventory A–State Scale, while this study used the POMS Brief, HR, and BIS values. The HR and BIS were measured by using MemCalc/Tawara and a BIS monitor in this study.

Lee *et al.* (2011) found a positive effect that was clarified with a portable electrocardiograph after 3 days of forest bathing; in this study, some similar effects were found after the participants viewed their preferred video. It suggests that the quasi-experimental intervention had some positive effects for relaxation.

Comparison of the therapeutic effects between the sea and forest videos

As shown in Figure 4, the BIS was higher with the sea video than with the forest video, which indicates that the participants' wakefulness was sustained more with the sea video. There is no similar preceding study that uses audiovisual stimuli to support this result and it is speculated that there is something in the presence of water that lowers stress levels (Smedley, 2013). This accords with the study by White *et al.* (2010), which found that photographs that included water were preferred and were associated with a greater positive affect and restorativeness than those without water.

There has been much speculation as to what it is about aquatic environments that attracts us and improves our well-being (Smedley, 2013). Evolutionists, such as Elaine Morgan, believe that we were originally aquatic animals; whether or not this is true, it is clear that with increasing industrialization, we have become removed from nature and the environment. When you watch the sea without any physical activity, you still have stimuli from the colors of the sky and sea, sea breeze, and sand feel, but there are not so many stimuli as compared with the forest. Considering that this study used only an audiovisual method as an intervention, its relaxation effects might have come from our general image of the sea as a source of life and the rhythm of restless waves, which possibly make us relaxed.

From the discussion above, it was suggested that the selection of DVD in visual therapy should be based on personal preference when the person has a clear preference; when they do not have a definite taste, viewing a video of a seascape might be an effective simulation experience, given this study's results.

In order to make the forest video viewing more like a simulation experience and enhance its effects, the video should be designed to imitate the real experience; thus, the scene moves backward as if the viewer is walking. A previous study also reported that poststroke patients with low functional capacity maintained their motivation to continue rehabilitation by encouraging each other through the Internet (Uesugi, Kiyota, Adachi, & Uchimura, 2011). This kind of intervention is considered to be more appropriately used in a rehabilitation setting than in clinical settings for patients with low functional capacity or people who need bed rest, such as older people in delirium with dementia or after surgery or dialysis patients with stress, which is the purpose and final goal of this study.

LIMITATIONS OF THE STUDY

The participants in this study were healthy men in their twenties. In order to apply the study's results to clinical practice, the age range needs to be broadened in order to investigate the effects. It is also required to explore not only the videos of the natural environment, but also other kinds of videos of personal preference, for intervention. The choice of video could affect the experience, but the participants' comments and the results of this exploratory study suggest that the choice was appropriate.

Implications

The results suggest that viewing a favorite video of a natural environment can ease tension and reduce fatigue. Recently, having a short afternoon nap has been encouraged to revitalize the body and mind (Tanaka *et al.*, 2001); where there is no place to rest, viewing a nature video with natural sound might be a practical alternative. From the results on HF, which significantly increased in the first 30 min, it is suggested that viewing a video in the lunch hour would induce relaxation.

The results suggest that viewing nature videos with authentic sounds has possible application in clinical areas with older people who are unable to access the natural environment because of mobility problems, dementia, or a requirement to be stationary, such as people undergoing dialysis. People with these problems are physically depressed or need bed rest and it is difficult for them to expose themselves to an actual natural environment. Researchers in the UK also are planning to explore the effects of video screens showing aquatic environments in old people's homes (Smedley, 2013) and our research accords with the direction that the British research collaboration is taking.

CONCLUSIONS

This exploratory study aimed to explore whether the stimulation by viewing the individual's preferred video of sea or forest, which are often compared as preferences, has a relaxation effect. As a result of dividing the participants into a group of six with a sea preference and a group of six with a forest preference and comparing each indicator between them, significant differences were observed regarding a decrease in HR, increase in HF, and sustained arousal level in the preferred video viewing. This study suggests that individual preferences

should be taken into consideration in video relaxation therapy. Virtual reality exposure therapy using DVDs with natural sound might be a practical way to optimize relaxation and arousal. Using uncoercive, person-centered interventions such as these might reduce the need for medication and restraint; this is an important and topical area for future research.

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AUTHOR CONTRIBUTIONS

M. T., H. N., Y. S., and T. K. contributed to the conception and design of this study; Y. S. carried out the statistical analysis and M. T drafted the manuscript; and T. S. and T. K. critically reviewed the manuscript and supervised the whole study process. All the authors read and approved the final manuscript.

CONFLICT OF INTEREST

There was no conflict of interest that might influence the results or interpretation of the results.

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