



The effect of winter forest bathing on psychological relaxation of young Polish adults

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ARTICLE INFO

Keywords:

Forest environment
Forest therapy
Landscape
Psychological traits
Urban environment

ABSTRACT

The impact of winter forest bathing on human psychological states was investigated in this study. Sixty-two participants were divided into two groups, each group was exposed to city forest or urban (control) environment for 15 minutes. The participants filled up four psychological questionnaires before and after exposure: the profile of mood states (POMS), the positive and negative affect schedule (PANAS), the subjective vitality scale (SVS), and restorative outcomes scale (ROS). The forest environment influenced the surveyed participants, causing a decrease in the negative subscales of POMS and an increase in the positive (vigor) subscale. Moreover, after exposure to the forest environment the participants had the highest scores of SVS, ROS, and a positive subscale of PANAS. This means that in conditions of Central Europe short winter interaction with forest had a substantial emotional, restorative, and vitalizing effect on the surveyed participants.

1. Introduction

Contemporarily, a large part of the population lives in an urban environment, which is full of stressors (Vlachokostas et al., 2014). Researches conducted in many countries indicate that a forest bathing (the interaction of participants with forest environment; taking in the atmosphere of the forest) might eliminate effects of these stressors, by reducing the negative psychological symptoms like distress and anxiety (Morita et al., 2007; Shin, 2007; Ochiai et al., 2015; Poulsen et al., 2016). The urban area might be treated as a stressful environment in comparison to the forest area, which in accordance to the Nature Therapy Theory extends health, benefits like psychological relaxation (Miyazaki et al., 2011; Song et al., 2017). The evaluation of forest bathing effects on psychological features (emotional, restorative, and vitalizing) was possible by using four psychological questionnaires: Positive and Negative Affect Schedule (PANAS), Profile of Mood States (POMS), Restorative Outcomes Scale (ROS), and Subjective Vitality Scale (SVS). These questionnaires were previously used in forest therapy research, thus later comparisons with findings from other surveys will be possible (Takayama et al., 2014).

In Poland, the effect of the forest bathing on the psychological well-being has not been studied so far, hence the necessity of examining the influence of the interaction with forest on participants' psychological

condition is eligible. Stress level at work is reported as relatively high in this country, a high level of occupational burnout is described as well (Buljan et al., 2016; Kiersztyn, 2016). This is the reason why the leisure time activities, like the interaction with forest, will be highly recommended for Polish working citizens as a means for distress reduction (Gigantesco, 2015). The strategy for distress management at the national level is common in well-developed countries (Lorig et al., 1999; Yukawa et al., 2010; Toyoshima et al., 2016). Sometimes, this strategy is of extremely high importance, like the life rescue practice in the case of “Karoshi” phenomenon observed in Japan (which can be literally translated as “overwork death” in Japanese) (Hino et al., 2015; Inoue et al., 2016; Munakata et al., 2016). In this respect, many experiments have been conducted to investigate the positive effect of forest bathing on the Asian phenotype populations. e.g. on Chinese, Japanese, and Koreans (Mao et al., 2012a,b; Sung et al., 2012; Song et al., 2017).

Nevertheless, it has so far remained unknown whether the forest environment can influence in the same way the healthy persons with the Central European phenotype. Thus, elucidation of this issue would be highly advisable. However, there is little literature dealing with the comparison of European and Asian populations response to the forest bathing. One position from this small set is a publication of Petrova et al. (2015), whose study aimed to reveal the similarities between

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Russian and Japanese respondents regarding the visual and emotional evaluation of landscape images. The main difference between these two nationalities is observable in rating the exotic landscapes as highly attractive; this tendency was observable in the case of Russians but not in the Japanese. Other research (Takayama et al., 2015), describing the attitude of respondents to the issue of ecocentrism, showed that the Russians were a more ecocentric nationality. Thus, the core values may affect the rating of landscapes in their evaluation and, hypothetically, may influence their response to the forest environment. These two cited studies showed differences between close to Europe and Asian nationalities, and indicated these differences should be further examined and their influence on forest therapy should be measured. In our research, we examined the response of one of the European nationalities, which might be useful in further comparative studies because, as shown below, little research is available regarding this topic.

Research in which participants viewed artificial or real plant indicated that they reacted only to the nature-close outside stimulation (Igarashi et al., 2015). The main part of plant used in this cited research was leaves, thus, it might be concluded that the positive, restorative effect of plant is induced by its main part. In the current research, we hypothesized that vegetative leaves might be the elements responsible for the positive response of the study participants, thus it is possible that trees without leaves (e.g. in forest in the winter season) will have no effect on the psychological condition of humans. This situation might occur in a temperate forest in the winter because some tree species maintain no leaves in these forests. Thus, hypothetically, no restorative effect may be expected in deciduous forests in the winter. Contrary, research conducted in a park in the winter showed that the positive effect of forest bathing also occurred in this season (Song et al., 2013). In the current research, it is postulated that the positive, restorative effect on humans also occurs in a forest in the winter, as it is assumed that there is not only the influence of the view on trees with vegetative leaves but also there is an effect of tree trunks without leaves on psychological relaxation, which might be measured with psychological questionnaires and which was confirmed in a winter-park research intervention (Song et al., 2013). Results of forest therapy experiments conducted in different seasons (spring, autumn) indicated that there were no differences between forest influence on humans, e.g. in spring and autumn the forest bathing influence on participants was approximately similar (Takayama et al., 2017), but research addressing the comparison between forest bathing in different seasons have not been described in literature.

This manuscript describes a study conducted in the winter season when the trees had no leaves. The aim of this study was to validate the effect of short winter forest bathing, on the psychological well-being as well as emotional, restorative, and vitalizing response of young Polish adults and to clarify their gender differences. It is hypothesized that the forest without leaves will have the same positive influence on participants' psychological well-being as the forest with leaves (Ikei et al., 2013; Takayama et al., 2014; Ochiai et al., 2015). Moreover, there are not many studies of forest bathing in Eastern Europe, and there are few studies investigating the effect of forest bathing in winter broadleaved woods (Song et al., 2013). In Poland, interaction with forest during leisure activities is a common practice. Thus this research is valuable, as it would allow clarifying the intercourse between forest bathing and its real effect on psychological traits. Finally, psychological measurements are inexpensive and rapid in assessment. Thus their use for quick evaluation of effects of the forest environment on humans was appreciated.

2. Material and methods

2.1. Participants

Sixty-two Polish university students (26 females, 36 males) participated in this experiment. None of them reported a history of physical or psychiatric disorders. Their mean age was 21.45 ± 0.18 years, none

of the participants were obese or had a metabolic syndrome. Students were informed that they would be asked to participate in a research study of 'forest bathing' and 'urban environment bathing' and informed consent was obtained. All procedures performed in this study were in accordance with the ethical standards of the Polish Committee of Ethics in Science and with the 1964 Helsinki Declaration and its later amendments.

2.2. Study sites

The field experiment was performed on the 2nd of March 2017 (winter season ends on the 19th of March in Poland) in the city of Olsztyn (northeastern Poland). Two experimental locations were selected: the urban and the forest environment. One of the most urbanized places in the city was selected, the view stretching from this place on the urban landscape was undistorted with any green areas. The forest environment selected as the experimental field was deciduous, broad-leaved urban forest situated near the city center and constituted by European beech (*Fagus sylvatica* L.), Pedunculate oak (*Quercus robur* L.), and Black alder (*Alnus glutinosa* (L.) Gaertn.). The forest area was flat, without any curved trunks or dead wood on the ground and without shrubs in the lower layers. The trees in the forest were without leaves, whereas leaves from the previous season were visible on the ground (Fig. 1). This forest environment was representative for Poland, as this type of forest is common in many afforested areas in the whole country.

During the experiment, the sound level was measured on both experimental fields with an iPhone 6.0 smartphone (Apple, USA) with an application 'Sound Level Analyzer lite (SLA)'. The SLA lite was examined as an excellent application, comparable with a professional laboratory sound analyzing instrument (Murphy and King, 2016). The mean sound level (\pm SD) measured with this application in the urban environment was 65.53 ± 5.90 dB, whereas the mean sound level in the forest was 47.22 ± 2.79 dB. Meteorological data was collected from the meteorological station in Olsztyn-Mazury (localization: $53^{\circ}28'50.0''N$, $20^{\circ}56'10.9''E$). The temperature was $4^{\circ}C$, humidity was 82%, cloudiness was 100%, and atmospheric pressure was 999 hPa. The speed of the southeast wind was 13 km/h. No precipitation was observed.

2.3. Psychological measurement

PANAS: The Positive and Negative Affect Schedule (PANAS) allows measuring the negative and positive affect with 20 items where 10 items are for the negative and 10 are for the positive affect. The reliability of the PANAS is high (Crawford and Henry, 2004), and its use for "forest bathing" assessments was previously described (Takayama et al., 2014). The original PANAS is in English (Watson et al., 1988), but in the current study Polish adaptation of this schedule was used (Brzozowski, 1991). Different time frames may be used in the PANAS (Watson et al., 1988), but in this study, the time frame 'during the present moment' was applied.

POMS: The Profile of Mood States (POMS) is a reliable and valid measure of psychological distress (McNair and Maurice, 1964). This psychometric tool was previously used to estimate the influence of forest environment on mood states (Lee et al., 2011). This tool measures six mood states; tension and anxiety (T-A), depression and dejection (D), anger and hostility (A-H), vigor (V), fatigue (F), and confusion (C). In the current research, we used a 65-item Polish version of POMS (Dudek and Koniarek, 1987).

ROS: The Restorative Outcome Scale (ROS) is a reliable and valid scale developed on the basis of a previous research and observations of restorative phenomena (Korpela et al., 2008, 2010). It was used to assess humans' restoration in the forest environment (Takayama et al., 2014). The ROS scale contains 6 items, each item was assessed by the participants in a seven-point Likert scale (from "1-not at all" to

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