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The Effects of a Short Forest Recreation Program on Physiological and Psychological Relaxation in Young Polish Adults

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Abstract: Forest recreation is an activity that could be successfully used to alleviate negative symptoms of stress in individuals. Multiple positive psychological and physiological effects have been described in the literature, especially regarding works describing research from Asian countries such as Japan, Korea, and Taiwan. In East-Central Europe, however, the effectuality of forest recreation has not been addressed in scientific research. Thus, a special recreation program was developed, and its usability was examined with the involvement of 21 young Polish adults. A pre- and post-test design was used, wherein four psychological questionnaires were applied (Profile of Mood States, Positive and Negative Affect Schedule, Restorative Outcomes Scale, Subjective Vitality Scale), and physiological measures were assessed (pulse rate, blood pressure) before and after the program. A field study was also conducted at the nature reserve Redykajny, near the suburban forest of the city of Olsztyn. The recreational program had a significant impact on psychological and physiological parameters. After recreation, the negative mood markers of the negative affect decreased and the positive affect, including restoration and vitality, increased. Furthermore, pulse rates, systolic blood pressures, and mean arterial pressures of the participants were significantly lower after the program. These results reveal that the short forest recreation program may be effective in reducing negative symptoms of stress.

Keywords: emotional affect; blood pressure; forest bathing; forest therapy; mood; nature reserve; pulse rate; restoration; Shinrin-Yoku; stress reduction

1. Introduction

Recreation is a wholesome activity undertaken for pleasure, as well as any action that refreshes the mental attitude of an individual [1]. Forest recreation aimed at improving physical and mental health, as well as reducing stress, is called "forest therapy" (also "forest bathing", from Japanese Shinrin-Yoku) [2,3]. This type of forest recreation is well known in Japan and in some other Asian countries, where it is practiced as a remedy for problems induced by stress [4]. The importance of forest therapy in these countries is high, as shown by the multiplicity of organizations involving individuals

and professionals interested in this topic (e.g., the Forest Therapy Society, the International Society of Nature, and Forest Medicine).

To achieve a broad range of effects on health improvements in practice, researchers have developed different "forest recreation programs". The effects of these programs on humans have been tested for short-term, middle-term, and long-term scenarios. One short recreation program (a few minutes) had a positive influence on mood states and on the cardiovascular relaxation of Japanese participants [5]. Similarly, a one-day forest therapy study conducted in Japan significantly influenced mood states and decreased pulse rate [6]. Another short-term program conducted in a young conifer forest in Japan demonstrated that viewing and walking in the forest affected the psychology of participants, increasing their comfort and making them feel refreshed and calm. Physiological indices were also affected, as this program resulted in lowered diastolic blood pressure and pulse rate in the participants [7]. A two-day forest therapy program conducted in urban parks in China had an antianxiety effect [8], and another two-day forest therapy program conducted in a recreational forest in Taiwan had a significant positive influence on the mood states of women involved in the study, causing a decrease in both anxiety levels and systolic blood pressure [9]. A five-day forest therapy program conducted in Japan also had a positive influence on the mood states of the participants [10]. Forest recreation has also been reported to be effective in increasing human natural killer cell activity and expression of anticancer proteins [11–13], and to affect human immune function [14], as well as cardiovascular and metabolic parameters [15]. These forest recreation programs appear to have a broad spectrum of beneficial effects on the physiological and psychological parameters measured in Asian participants. Little is known, however, regarding the effectiveness of forest recreation programs on individuals living in East-Central Europe. One study has tested the effects of 15 minutes of viewing the forest on psychological relaxation [16], but there have been no reports of experiments investigating the effects of longer exposure to the forest environment or testing the effects of forest recreation programs conducted in this region.

Estimating the effects of forest recreation on human health is possibly of high importance to East-Central Europe citizens. Expectations regarding the functions of forests have recently changed in this region, whereas the status of "other than wood production activity in the forest" has increased as well [17]. The growing importance of the social function of a forest, especially its usefulness for recreation, is more frequently expected by society, which has been reflected in an increasing number of scientific reports addressing this topic. The importance of forest recreation is also growing in Poland, where forests cover 29.5% of the land area and the population's awareness of the positive influence of this environment on health is increasing.

Polish forests are of medium age, with most trees being 41–80 years of age. Forest management in Poland is conducted in a close to natural, sustainable way. Thus, there are not many deforested areas, and forest stands are suitable for forest recreational activities. Various kinds of activities are popular in Polish forests, with forest walks and mushroom picking being the most popular. In addition, individuals appreciate forest areas and perceive them as useful for forest recreation. Forest therapy roads are not designed, however, and the effectuality of forest therapy programs is not tested, while the severity of stress increases in workers, and their mental health declines. One of the main aims of the present study was therefore to verify the hypothesis that a short-term forest recreation program can influence the physiological and psychological relaxation of participants. The second hypothesis tested the usefulness of a forest near Olsztyn, on the nature reserve Redykajny, for forest recreation. The positive influence of this environment on the tested parameters was identified as a needed, desired effect, which could indicate that the nature reserve Redykajny is a proper area for conducting forest recreation programs. To verify these two hypotheses, the influence of a short-term (few hours) forest recreation program conducted at the reserve was estimated for young and working or learning Polish citizens.

In summary, the purposes of conducting and presenting this study were: (i) To fill in the gaps in knowledge regarding how effective a forest recreation program might be on the psychological and physiological relaxation of adults in East-Central Europe, and (ii) to assess the usefulness of the tested area for conducting forest recreation programs affecting the psychological and physiological relaxation of participants.

2. Materials and Methods

2.1. Participants

Twenty-one participants living in the city of Olsztyn were recruited for this study. Persons recruited for the study were former friends of researchers and their acquaintances who agreed to participate in the study. Twelve students from the University of Warmia and Mazury were selected (not from the forestry course). To avoid having only student sample, an additional nine working, non-student persons were recruited. Only young adults between the ages of 21 and 29 years participated in this study (demographics of the participants are presented in Table 1). Non-healthy adults, with mental or physical diseases or metabolic syndromes, were excluded from the study. Because it is less likely for young people to be taking medications, and because they appear to be more stable in terms of their physical condition, we assumed that individual differences among them would be smaller than in the case of older people. This group was therefore considered homogenous. An optimal sample size was used to balance the need for quick testing and the need to obtain reliable results. Additionally, the results of other researchers have indicated that a sample size of 12–16 participants in forest therapy experiments is enough to draw significant conclusions [10,18]. Thus, our group of 21 individuals was large enough to obtain valuable information.

Before the experiment, the participants were informed that they would be asked to contribute to a research study on "forest recreation", and informed consent was obtained. The participants were also informed of the research plan on the first and second days of research. 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.

Table 1. Demographic information of study participants.

Parameter	Value (Mean ± SD)
Total sample number	21
Sex	Female = 9, male = 12
Activities	Students = 12, workers = 9
Age (years)	23.86 ± 2.67
Weight (kg)	76.09 ± 13.95
Height (cm)	172.81 ± 7.12
BMI (kg/m^2)	25.38 ± 3.78

Note: BMI: Body Mass Index; SD: Standard Deviation.

2.2. Study Sites

The indoor pre-test experiment was conducted in an apartment in the city of Olsztyn. The field post-test experiment was conducted in the forested area of the nature reserve Redykajny, which covers 14 ha in the northwest part of the suburban forest of Olsztyn. Meteorological data on the pre-test day and post-test day were collected from the meteorological station in Olsztyn-Mazury (location: 53°28′50″ N, 20°56′10″ E). The mean annual temperature in Olsztyn is 7.9 °C, the mean annual precipitation is 635 mm, and the altitude is 139 m. On the pre-test day, the average temperature was 20 °C, atmospheric pressure was 1018 hPa, the speed of the southeast wind was 14 km/h, and humidity was 50%. Cloudiness was absent, and no precipitation was observed. On the post-test day, the average temperature was 25 °C, atmospheric pressure was 1014 hPa, humidity was 46%, the speed of the east wind was 22 km/h, and humidity was 46%. Cloudiness was low, and no precipitation was observed.

Sound levels and illuminance were measured on both experimental days with a Huawei P9 Lite smartphone (Huawei, China) using the "Sound Meter" and "Light Meter" applications, both of which have been shown to be excellent applications comparable to a professional laboratory sound analyzing instrument [19,20], and using a professional illuminance analyzing instrument. The mean sound level (±SD) measured with the "Sound Meter" application in the indoor environment was 47.86 ± 10.24 dB, whereas the mean sound level in the forest environment was 38.08 ± 5.19 dB.

The mean illuminance in the indoor environment measured with the "Light Meter" was 710 ± 493.79 lx, whereas the mean illuminance in the forest environment was 37,755.24 ± 45,561.35 lx. Physical and meteorological parameters concerning this study are presented in Table 2. Sound levels and illuminance were measured 15 times in a random part of each environment (in one room of the apartment and in each forest area) at random times during the experimental procedure.

Table 2. Physical and meteorological parameters during the forest therapy experiment.

Parameter	Room Environment (Mean ± SD, *n* = 15)	Forest Environment (Mean ± SD, *n* = 15)		
		Area 1	Area 2	Area 3
Sound level (dB)	47.86 ± 10.24	37.33 ± 4.85	39.4 ± 4.81	37.53 ± 5.94
Illuminance (lx)	710 ± 493.79	23,657.67 ± 24,959.55	88,515.27 ± 38,563.678	1092.8 ± 467.83
Forest tree density (n/ha)	-	600	200	1200
Parameter	**The Day before Forest Recreation**	**The Day of Forest Recreation**		
Temperature (°C)	20	25		
Humidity (%)	50	46		
Cloudiness	Absent	Small		
Wind speed (km/h)	14	22		

The forest areas used in this study, numbered from 1 to 3 (Figure 1), were parts of the nature reserve Redykajny. The whole area of the reserve is covered mainly by 85- to 130-year-old *Picea abies* (L.) H. Karst. and 80- to 180-year-old *Pinus sylvestris*. L. Area 1 is covered by 105-year-old *P. abies* (40%), 180-year-old *P. sylvestris* (40%), 85-year-old *P. abies* (20%), and a mixture of additional species (*Quercus robur* L., *Fagus sylvatica* L.: 20%). Species composition in Area 2 is the same, but a less-dense part of the stand was selected—an area previously prepared by foresters for regeneration, leaving 200 residual trees/ha. Area 3 is covered by 60-year-old, 90-year-old, and 120-year-old *P. abies* (10%, 50%, and 20%, respectively), along with *Alnus glutinosa* (L.) Gaertn., *Betula pendula* Roth and 80-year-old *P. abies* (10% each). The ground in the part of the reserve intended for the forest recreation program is covered with moss and herbaceous vegetation. All views in this selected place were of the forest alone, undisturbed by buildings or other objects.

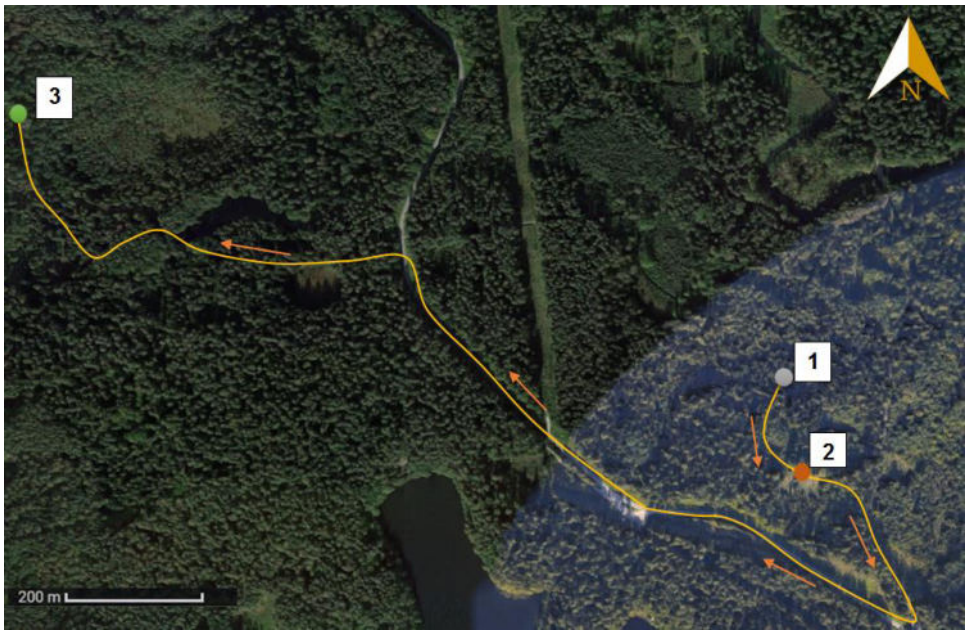

Figure 1. The walking route at the nature reserve Redykajny during the forest recreation program. Colored points indicate places intended for recreational activities. Points of stay are numbered from the start (Area 1) to the end (Area 3) of the walk. Map provided by F. Ordon.

2.3. Procedure

In this study, a pre-test–post-test design with a short, one-day intervention of the forest recreation program was applied. The participants' psychological and physiological responses were measured indoors on the day before forest recreation, and then under field conditions on the next day, directly after the forest recreation. On the pre-test day, before the pre-test, the subjects simply participated in their ordinary, everyday activities. These activities did not consist of performing tasks identical to those planned for the "forest recreation". The same time of each day (15:45–16:15) was chosen for psychological and physiological measurements to achieve comparable results. Measuring at different times during the day may cause biased results, due to the effect of the circadian rhythm on humans [21], and thus we chose the same time of measurement for each day. As the intervention was planned for several hours, the pre-test was carried out in the same hour as the post-test, at the same time of the day, but the day before (to avoid performing measurements during different hours of the biological clock). The participants took part in a single exit to the forest (in a single intervention) which is a common practice in forest therapy research. Their relaxation at individual stages of the intervention took place in privacy, and each participant chose a separate place a few meters away from other participants to be able to relax and follow the instructions of the researcher leading the therapy. The conducted forest recreation program engaged participants' senses: Auditory (e.g., listening to the sounds of the forest in a sitting position with closed eyes), visual (viewing the forest), and tactile (touching forest items, cuddling up to trees). The sense of smell was engaged during all activities, which is illustrated in Figure 2. The activities were repeated three times, once in each of the selected forest areas, which participants moved among on foot. The walking route and place of stay for forest recreation are shown in Figure 1. The time spent standing in the forest throughout the forest recreation program was approximately 5 h. In addition, participants could relax throughout the intervention, which made the intervention not an effort. The schedules of indoor and field experiments are shown in Table 3. The purpose of choosing three different activities in three different parts of the forest was to replicate a previous study, where different activities were repeated in different forest areas [6], and this scheme was applied to obtain an effect of forest therapy in this study comparable to that observed in the previous study. The three different localities intended for forest recreation provided the participants with a variety of views and experiences that could be useful in recreation and could increase the recreational effect.

Table 3. Schedule of the indoor (first day) and field (second day) experiments.

Date	Time	Activity
12 May 2018 (Saturday)	15:45~16:15	Psychological and physiological response pretest
	11:30~12:00	Orientation, traveling to Area 1
	12:00~12:15	Listening to the sounds of the forest
	12:15~12:30	Viewing at the forest
	12:30~12:45	Touching forest items
	12:45~13:00	Cuddling up to a tree
	13:00~13:05	Traveling to Area 2
	13:05~13:20	Listening to the sounds of the forest
13 May 2018 (Sunday)	13:35~13:50	Viewing at the forest
	13:50~14:05	Touching forest items
	14:05~14:20	Cuddling up to a tree
	14:20~14:30	Traveling to Area 3
	14:30~14:45	Listening to the sounds of the forest
	15:00~15:15	Viewing at the forest
	15:15~15:30	Touching forest items
	15:30~15:45	Cuddling up to a tree
	15:45~16:15	Psychological and physiological response post-test

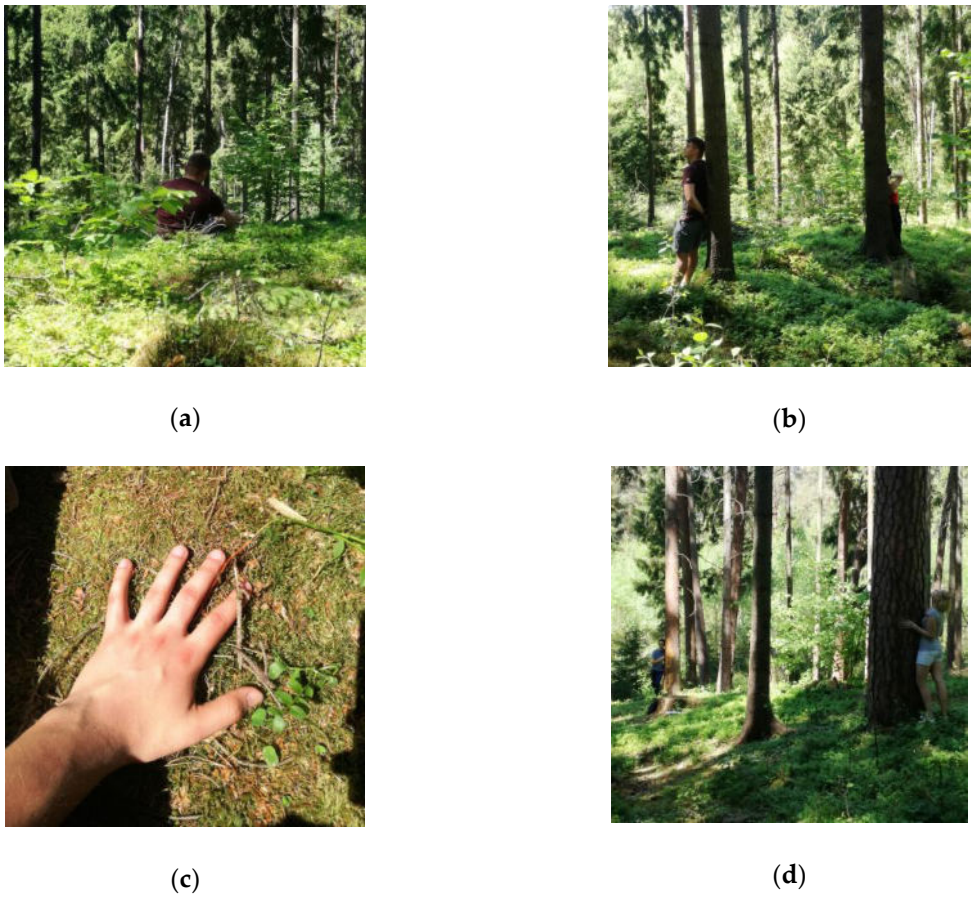

Figure 2. Activities undertaken during a forest recreation intervention: (**a**) Listening to the sounds of the forest; (**b**) viewing the forest; (**c**) touching forest items; (**d**) cuddling up to a tree. All photos provided by F. Ordon.

2.4. Measurements

Four psychological questionnaires were used to measure the psychological effect of forest therapy on the participants. In the Polish language, a 65-item version of the Profile of Mood States (POMS) questionnaire was chosen [22] to assess the program's effect on the emotional states of participants. POMS is a reliable and valid measure of psychological distress [23], and has previously been used to estimate the influence of the forest environment on mood states [16,24,25]. This tool measures six mood states: Confusion, fatigue, anger or hostility, tension or anxiety, depression or dejection, and vigor. A five-point Likert scale was used for each item to evaluate participants' mood states, with each item assessed from 0 (strongly agree) to 4 (strongly disagree).

The Positive and Negative Affect Schedule (PANAS) was used to measure the emotional affect of each participant. PANAS questionnaires contain 20 items, with 10 items addressing negative affect and 10 addressing positive affect. The reliability and validity of the PANAS is high [26], and its use for forest recreation assessments has been previously described [16,25]. A Polish adaptation of this schedule was used in the current study [27]. Each item was assessed using a five-point Likert scale (1—strongly disagree, 5—strongly agree). The PANAS scale was used for this study because it is often used in research on forest therapy.

The Restorative Outcome Scale (ROS) is a reliable and valid tool developed based on previous research concerning restorative phenomena [28,29]. Originally, this scale was used to assess humans' restoration in the forest environment [16,25]. It contains six to nine items, with each item assessed by participants on a seven-point Likert scale (1—not at all, 7—completely). In this study, we used a scale modified for forest experiments by Takayama et al. [26]. The scale with modifications was adapted

into Polish [16]. In this study, "Restorative Outcome" was measured (i.e., a general restorative effect that was obtained as a result of the intervention).

The Subjective Vitality Scale (SVS) [30] was used for vitality assessment. A version with four items, adapted to research in the forest environment, [25] was used in this study. The four items were assessed by participants using a seven-point Likert scale (1—not at all, 7—completely), with one inversely scored item. A Polish version was applied in this research [16]. Four common items were chosen: "I feel alive and vital", "I don't feel very energetic", "I have energy and spirit", and "I look forward to each new day".

Different time frames may be used in the POMS, PANAS, ROS, and SVS questionnaires, but in this study, the time frame "at the present moment" was applied. The raw data from each questionnaire were used for statistical purposes.

The physiological indices measured in this study were parameters connected to blood circulation in the body. All were measured with portable devices on the day before the forest recreation program and directly after the forest recreation program. Participants' pulse rates (in bpm), systolic blood pressures (SBPs), and diastolic blood pressures ((DBPs), both in mmHg) were measured with a blood pressure monitor (Tech-Med, TMA 10-PRO, Beijing, China). Measurements were conducted in a sitting position, in the same arrangement pre-test and post-test. The relative value of mean arterial pressure (MAP) was calculated after measurements as $((2 \times DBP) + SBP)/3$ [31].

2.5. Data Analysis

Raw data from psychological questionnaires and raw data from physiological measures were used for statistical analyses. MAP was calculated in Excel (Microsoft, Redmond, WA, USA), as were all mean values and SD values. A paired sample *t*-test was applied to compare pre-test and post-test measurements. Statistical analyses were conducted using SPSS Statistics Version 24 (IBM, Armonk, NY, USA). Cohen's *d* was used to estimate the effect size, with a Cohen's *d* close to 0.2 described as a weak effect, close to 0.5 as a medium effect, and close to 0.8 as a strong effect.

3. Results

Results of the paired sample *t*-test examining the psychological differences before (pre-test) and after (post-test) the forest recreation program are presented in Table 4. There was a significant decrease in four negative mood states of the POMS scale after the program, including confusion ($t = 2.392$, $p < 0.05$), anger or hostility ($t = 2.838$, $p < 0.05$), tension or anxiety ($t = 3.185$, $p < 0.01$), and depression or dejection ($t = 2.823$, $p < 0.05$). Regarding emotional affect, the level of negative aspects in participants decreased significantly after the forest recreation program (PANAS negative: $t = 2.905$, $p < 0.01$). In turn, the effect of participant restoration increased significantly post-test (ROS: $t = -5.225$, $p < 0.001$). Furthermore, there was a significant increase in participants' vitality levels post-test (SVS: $t = -3.759$, $p < 0.01$), in comparison to those levels before the test.

Results of the paired sample *t*-test regarding physiological differences pre- and post-test are presented in Table 5. There was a significant decline in three physiological indices after the forest recreation program: Pulse rate ($t = 3.581$, $p < 0.01$), SBP ($t = 3.366$, $p < 0.01$), and MAP ($t = 2.537$, $p < 0.05$). There were no significant differences in participants' DBPs pre- and post-test.

Table 4. Effects of the forest recreation program on emotional state, emotional affect, restoration, and vitality.

Psychological Indices	Pre-Test	Post-Test	*t*	*p*	Rate of Change (%)	ES
	Mean ± SD	Mean ± SD				
Mood State (POMS)						
Confusion	1.10 ± 0.63	0.71 ± 0.53	2.392	0.027 *	−35.8	1.07
Fatigue	1.22 ± 0.76	0.81 ± 0.79	1.817	0.084	−33.52	0.81
Anger or hostility	1.02 ± 0.73	0.58 ± 0.39	2.838	0.010 *	−42.58	1.27
Tension or anxiety	0.90 ± 0.64	0.40 ± 0.44	3.185	0.005 **	−55.56	1.42
Depression or dejection	0.72 ± 0.64	0.33 ± 0.35	2.823	0.011 *	−54.39	1.26
Vigor	2.39 ± 0.62	2.51 ± 0.92	−0.754	0.459	5.24	0.34
Emotional Affect (PANAS)						
Negative	1.65 ± 0.58	1.27 ± 0.37	2.905	0.009 **	−23.31	1.30
Positive	2.94 ± 0.61	3.14 ± 0.93	−1.099	0.285	6.8	0.49
Restorativeness (ROS)	4.30 ± 0.99	5.63 ± 1.02	−5.225	0.000 ***	30.81	2.34
Vitality (SVS)	4.40 ± 10	5.42 ± 1.03	−3.759	0.001 **	22.97	1.68

Note: POMS: Profile of Mood States; PANAS: Positive and Negative Affect Schedule; ROS: Restorative Outcomes Scale; SVS: Subjective Vitality Scale; ES: Effect size; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; $n = 21$.

Table 5. Effects of the forest recreation program on physiological stress indices.

Physiological Indices	Pre-Test	Post-Test	*t*	*p*	Rate of Change (%)	ES
	Mean ± SD	Mean ± SD				
Pulse rate (bpm)	86.05 ± 9.50	81.19 ± 9.63	3.581	0.002 **	−5.65	1.60
Systolic blood pressure (mmHg)	135.1 ± 11.39	127.33 ± 9.47	3.366	0.003 **	−5.75	1.51
Diastolic blood pressure (mmHg)	83.62 ± 8.56	80.38 ± 9.67	1.400	0.177	−3.87	0.63
MAP (mmHg)	100.78 ± 7.85	96.03 ± 9.00	2.537	0.020 *	−4.71	1.13

Note: MAP: Mean arterial pressure; ES: Effect size; * $p < 0.05$; ** $p < 0.01$; $n = 21$.

4. Discussion

4.1. Psychological Effects

This study confirmed that a short program of forest recreation has a positive influence on the psychological indices of young learning and working adults. Negative emotions (confusion, anger or hostility, tension or anxiety, depression or dejection) of the participants were alleviated after this program, consistent with the results of previous studies [16,25,32]. The emotional state of vigor, however, did not increase significantly after the recreation program. The negative aspect of emotional affect, based on the PANAS, diminished after the recreation program, which had also been observed earlier [16], but was not always confirmed [25]. Positive emotional affect did not increase significantly post-test, which has not been confirmed by previous studies. Both aspects of PANAS have also been used as good indicators of the psychological response of participants in measuring the effect of the thinning in the forest [33]. The restoration and vitality reported by participants increased after the program, as has been observed in other forest therapy research [34]. These findings indicate that, in comparison to a short stay in the forest [16,25], longer stays within the elaborated forest recreation program also have a significant positive psychological effect on participants.

The observed positive influence of a forest recreation program on psychological indices suggests that this kind of intervention might be used in a therapeutic process. Forest recreation is a remedy for problems such as increased stress levels in the population and decreased levels of mental health [35] and, as shown in our study, it also works in East-Central Europe. Further research concerning mental health (e.g., with patients in mental hospitals) may also help establish if forest recreation programs are effective for the treatment of the mentally ill, which was not tested in this study.

The natural reserve Redykajny is a good place for the citizens of Olsztyn to be mentally refreshed, as a five-hour visit to this place had a significant positive effect on many psychological indices. In the future, the possibility of building special infrastructure, which could be designed for forest recreation, should be considered at the local governance level. In addition, a mental hospital is located in the city of Olsztyn, and its buildings are near the suburban forest of Olsztyn, which affords the possibility of using forest therapy roads for the treatment of patients. The observed positive effects on the psychological indices observed in this study will be a good argument in stimulating the establishment of infrastructure for therapeutic purposes and the development of strategies for therapeutic-friendly cities.

4.2. Physiological Effects

4.2.1. Pulse Rate

A lowered pulse rate has frequently been observed in previous studies in the field of forest recreation [6,36–39]. In this study, the pulse rate of participants was also lower after the forest recreation program, indicating that this form of activity may be useful in alleviating the negative effects of leading a highly stressful lifestyle [40]. Stressful work can increase the pulse rate level, which may have negative implications for human health and well-being [41]. Even a short forest recreation program, such as the one proposed in the present study, might be a useful tool in lowering the pulse rates of subjects, which is especially easy in areas located near cities, as is the case with Redykajny.

The causes of the relaxing effects on pulse rate induced by forest recreation have yet to be identified: However, several theories may be useful in explaining this effect. One is the "psycho-evolutionary theory" [42,43], which states that humans have lived for a very long time in the natural environment, and during this time some adaptations to unthreatening environmental conditions evolved, which may be observed as a relaxing response to this environment. Another theory, formulated by Kaplan [44], suggests that the forest environment has acquired some special requirements that are essential for restoration, and one of them is to be an idyllic place for "being away", which allows resting one's directed attention. In contrast, a theory proposed by Miyazaki et al. [45] suggests that humankind has spent more than 99.99% of its evolutionary history living in untransformed, natural environments, and thus their physiological processes function best in the forest, which could be observed as, for example, a lowering effect on their pulse rate. These three theories also prove useful in explaining the positive response of blood pressure.

4.2.2. Blood Pressure

As demonstrated in previous studies [5–7,10,24,37], our findings confirmed that a short forest recreation program influences participants' blood pressures. SBP decreased significantly after the intervention, whereas DBP did not change after the program. Such tendencies have also been observed by other authors [10]. MAP, defined as the average pressure in a person's arteries during one cardiac cycle, is likely a better indicator of perfusion to vital organs than SBP [46]. Thus, the significant decrease in MAP after the forest recreation program indicates that this activity might be useful in the prevention of many health issues, such as cardiac events. This is important for public health, because cardiac events are one of the most important causes of death worldwide [47], and doing any activity that can lower indices positively linked with cardiac events could be extremely important for the health of each individual. The lowering of SBP indicates the influence of the forest recreation intervention on autonomic nerve system activity [5,48], and thus it may be concluded that the tested intervention did have an influence on this system. Higher SBP is linked with cardiovascular disease and mortality, making every method that effectively lowers SBP valuable to overall human health [49]. Future experiments should focus on searching for areas that are best predisposed to forest recreation purposes, with the highest potential to decrease the blood pressures of participants.

Investigations addressing the effects of staying in the forest for five hours are not sparse, as two other forest recreation programs involving approximately five-hour stays in the forest conducted in Japan demonstrated similar effects on blood pressure reduction [6,50]. Forest recreation may prove useful in preventing the progression of hypertension [50]. Physiological stress was reduced in the current study in a manner similar to that reported by other short-staying studies dealing with forest recreation. In other words, participants were physiologically relaxed, but the superiority or inferiority of programs (differing lengths of interventions) should be examined in future studies.

5. Conclusions

In this study, we estimated the effects of a short forest recreation program on physiological and psychological relaxation in young adults. Measurements were performed on the day before the intervention and directly after the intervention. The results showed that participants' levels of negative mood (confusion, anger or hostility, tension or anxiety, depression or dejection) and negative affect significantly decreased after the program, whereas components of their positive affect—restoration and vitality—increased. Physiological parameters such as pulse rate, systolic blood pressure, and mean arterial pressure lowered after the program. These findings indicate that short forest recreation programs may positively influence the psychological and physiological characteristics of participants, which provides evidence for the hypothesis that forest therapy in East-Central Europe could be successful. Our short forest recreation program was conducted with success at the nature reserve Redykajny, confirming its usability for this type of recreation.

6. Experimental Limitations

In this study, a pre-test–post-test design was applied to one group. This design is frequently used to assess the effectuality of forest recreation programs [6,8–10]. The current study did not have a control group, however, which might violate its internal validity. Furthermore, in forest recreation research, a randomized, controlled trial should be used to reduce bias. Other factors possibly influencing the results should be controlled for during this kind of study. The effectuality of the regular use of this kind of intervention and the effectuality of this potential therapy on the overall quality of life of participants should be tested in future studies. Although many kinds of forest therapy programs have been developed, which of them is the most effective in improving respondents' bodies and minds remains unknown, and should also be addressed in future studies. Unfortunately, there is a lack of research that has investigated the lasting effects of this intervention. Therefore, such research should be carried out in the future to check whether the effects of forest recreation can have some prolonged effects on study participants.

Sympathetic or parasympathetic nervous system activity and stress hormone levels of participants, which are usually estimated in this kind of research [10,48], were not assessed this time. Only non-costly, quick-to-collect parameters were measured before and after the program, including physiological ones (pulse and blood pressure) and psychological ones (responses to four selected, previously-tested research questionnaires [16]). Using measures that were not time-consuming ensured accomplishing the aims of this research study in a relatively short time and without the potential bias caused by measuring at different times of the day.

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