

THE MENTAL HEALTH BENEFITS OF NORDIC WALKING TRAINING IN NATURAL THERAPEUTIC LANDSCAPE OF KARLOVY VARY

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Abstract

Mental health is a real challenge for global society today. The COVID-19 pandemic also has a significant negative impact on people mental health through increased exposure to stressors. The results of many scientific studies show a relationship between outdoor activity and increasing general mental health. Outdoor treatments in the natural environment are a part of the complex spa care in all famous spas in the Czech Republic. This study aimed to conduct a standardized Profile of Mood States questionnaire and to find out the effect of Nordic Walking training in the natural environment of Karlovy Vary on the mood states (tension, anger, fatigue, depression, confusion, vigour) of the participants. The questionnaires were completed by 36 participants (25 women, 11 men) aged between 20 and 65 years (average 45 years). Based on the statistical evaluation, positive changes were observed in most of the investigated mood states. First of all, significantly increased vitality and, on the contrary, decreased fatigue (p -value <0.001) were confirmed. The training also had a positive effect on the anger and depressive states, with a significant reduction in both cases (p -value <0.05). This study results have confirmed that Nordic walking training in the natural environment of Karlovy Vary forests has a positive effect on the mood states of the participants and their mental health. These results will be the basis for follow-up research investigating the impact of physical activity in spa environments on the mental health of visitors and residents of spa towns.

Keywords

Mental health, POMS, Nordic walking, therapeutic landscape, Karlovy Vary, spa.

1 INTRODUCTION

Regular physical activity is closely related to health and overall quality of life. In contrast, a sedentary lifestyle decreases the health-related quality of life and increases all causes of mortality. One of the most effective physical activities is considered to be Nordic walking – a specific fitness technique that combines cardiovascular exercise with a vigorous muscle workout (Tschentscher et al., 2013). Outdoor walking, including Nordic walking in the spa forests, is a part of the comprehensive spa care in all larger spas in the Czech Republic. Physical activity can be considered an ideal way to enhance the effect of spa treatment. Multiple studies have shown that physical activity in a forest environment has a positive effect on the body's temperature-regulating system, improve cardiovascular and metabolic parameters, boosts the immune system, and supports respiratory systems (Li et al., 2011; Lee et al., 2014; Olafsdottir et al., 2018).

It is not only the physical activity itself that leads to overall psychological balance after walks in the forest environment. The physicochemical properties of the air in the forest stands also contribute to the beneficial effects. Firstly, the forest produces a higher amount of electrons in the air, which number is an important monitored indicator of the quality of the healing climate (Jandova, 2009). Negative ions have a positive effect on the reactions of the autonomic nervous system, improve the ability to concentrate, and increase mental performance (Ryushi et al., 1998; Pino & Ragione, 2013). Coniferous forests also produce large amounts of terpenes (specifically alpha and beta pinenes) – naturally occurring chemical compounds. Based on scientific studies, α -pinenes and β -pinenes have anti-inflammatory, anti-cancer, antioxidant, and neuroprotective effects (Salehi et al., 2019; Rufino et al., 2014; Nam et al., 2014; Chen et al., 2015).

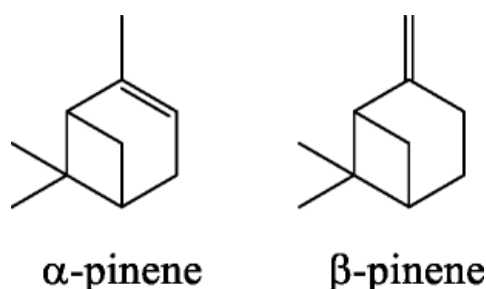


Figure 1. Chemical structures of the α - and β -pinene. (Vespermann et al., 2017)

Physical activity in forests also has a strong therapeutic effect on mental health (Frühauf et al., 2020). This is particularly relevant nowadays because mental health problems are becoming a real challenge to global society. Several studies have proven the positive effect of physical activity in the forest environment on current mood, mental well-being, and the prevention of mental health disorders (Frühauf et al., 2020; Cooney et al., 2013; Roe & Aspinall, 2011). Hartig et al. (2003) emphasize that the effects of physical activity in nature have a more positive effect on mood compared to physical activity in urban environments. A similar conclusion was reached by Grazuleviciene et al. (2016) and Olafsdottir et al. (2018). Researchers found a significant reduction in cortisol levels after walking in the nature compared to walking in the city.

Regarding Nordic walking, the results of the study by Park and Yu (2015) show that it has a positive effect on depression and sleep disorders in the elderly. The researchers recommend designing exercise programs based on Nordic walking for older people who suffer from depression or sleep disorders. An et al. (2020) have similar results in their study and consider Nordic walking as one of the options for preventing mental disorders.

2 OBJECTIVE

The main goal of the presented study was to analyse the effect of Nordic walking training in the natural therapeutic landscape of Karlovy Vary on mental health. We examined 6 factors of mood and emotion based on the Profile of Mood States questionnaire (see chapter 3.3). The following hypotheses were stated.

H1: After completing Nordic walking training in the spa forests, subjects have a lower score and thus improvement in the following factors: fatigue, tension, depression, and anger.

H2: After completing Nordic walking training in the spa forests, the subjects have a higher score and thus an improvement in vitality factor.

H3: The Nordic walking training does not affect the confusion factor.

3 METHODOLOGY

3.1 Subjects

The study participated 36 people, including 25 women (69.4 %) and 11 men (30.6 %). The age of the subjects ranged from 20 to 65 years with an average age of 44.9 years, a median of 45 years, and a standard deviation of 11.2 years, see Figure 2. They all were participants of Nordic walking tours in the spa forest of Karlovy Vary which were organized by the city of Karlovy Vary and their participation in the study was voluntary.

3.2 Procedure

The Nordic walking trainings in the spa landscape were organized by the city of Karlovy Vary and they were led by a certified trainer of Nordic walking. These trainings were taken during the summer (July and August) 2021 and they always took about 2 hours. On weekdays they started at 4 p.m. and on Sunday at 9 a.m. Participants walked circa 9 km through spa landscapes including a forest with lookout towers and gazebos. The Profile of Mood States questionnaire (POMS) was collected by subjects before and after the

Nordic walking training. Before completing the questionnaires, participants were instructed on how to complete the POMS and what it was used for. In addition to the questionnaire, participants also filled in their data on age, gender, and profession.

3.3 POMS

The Profile of Mood States is a standard validated psychological method used in research to measure mood and emotion especially for monitoring effects of short-term intervention (from a few minutes to one week). It was developed by McNair, Droppleman and Lorr (1971) and is used primarily in the field of sports psychology. We used the Czech version of POMS by Stuchlíková and Man (2005) in this study. The questionnaire evaluates 6 factors which are characterized by 37 adjectives:

1. Tension (T) – e.g. nervous, worried,
2. Depression (D) – e.g. sad, unhappy,
3. Anger (A) – e.g. angry, annoyed,
4. Vitality (F) – e.g. active, lively,
5. Fatigue (F) – e.g. tired, exhausted,
6. Confusion (C) – e.g. confused, muddled.

Subjects should evaluate the offered adjectives on a five-point scale of intensity (from 1 – "at all" to 5 – "extremely") depending on how they are feeling. The final score for each factor was given by the sum of the ratings for the appropriate adjectives.

3.4 Statistical Analysis

For the statistical evaluation the R software was used. First of all, the obtained data were tested for normality by Anderson-Darling test in order to decide whether to use a parametric or nonparametric statistical test. In all cases the data were not normal, so the non-parametric Wilcoxon test was used for two paired samples. We tested the null hypothesis that the mean difference of score before and after the Nordic walking training is equal to zero, against the alternative that it is not equal at the 0.05 significance level. We rejected the null hypothesis if p-value of the test was less than the level of significance. For visualization of differences, the boxplots were used. Basic characteristics (median, mean, standard deviation) and mean differences in score values before and after training were also calculated for all evaluated factors.

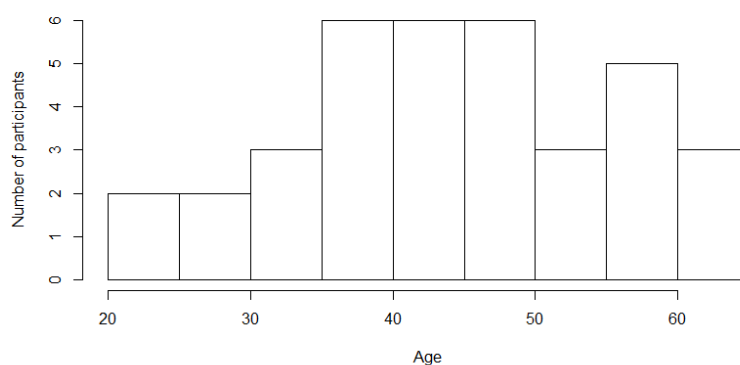


Figure 2. Age structure of participants

4. RESULTS AND DISCUSSION

The Wilcoxon test showed that there is a difference in score of anger, fatigue, vitality, depression and tension before and after the Nordic walking training. See Table 1 where

are basic statistical characteristics of scores for all evaluated factors, mean difference, and p-value of Wilcoxon test.

We reject the null hypothesis that the mean difference of the score before and after the

Nordic walking training is equal to zero in case of fatigue, vitality, and tension at the level of significance 0.05, in case of anger and depression at the level of significance 0.001. There is a statistically significant difference for these factors. Nordic walking training in the natural environment of Karlovy Vary has a

good influence on these factors of mood and emotion. We do not reject the null hypothesis for confusion, where is not a statistically significant difference and we can say that Nordic walking training has no influence on the confusion.

Tab 1. Basic statistical characteristics, mean difference and p-value of Wilcoxon test

Factor	Median		Mean		SD		Mean difference	Wilcoxon test p-value
	Before	After	Before	After	Before	After		
Anger	6	6	6,92	5,89	2,43	0,85	-1,03	< 0.05
Fatigue	10,5	7	10,81	7,19	4,21	1,43	-3,61	< 0.001
Vitality	9	16,5	11,14	17,72	5,55	5,11	6,58	< 0.001
Depression	7	7	7,81	7,08	2,44	0,28	-0,72	< 0.05
Tension	4	4	4,47	4,06	1,23	0,33	-0,42	< 0.001
Confusion	5	3	5,14	3,11	1,99	0,52	-2,03	> 0.05

We identified the biggest difference in vitality, where the number of points increased on average by 6.58, and in fatigue, where the score decreased on average by 3.61. The

lowest statistically significant difference was found in the case of depression, where the score decreased by an average of 0.72 points. Figure 3 shows all mean differences.

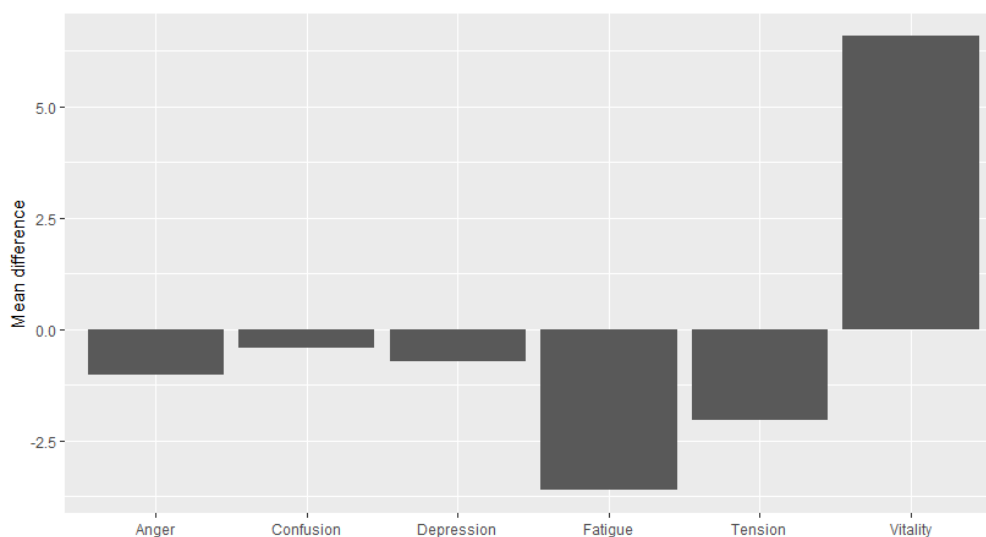


Figure 3. Mean difference of score before and after the Nordic walking training for evaluated factors

Summary results are in Figure 4 where the boxplots are showing the distribution of subjects' scores before and after the Nordic walking training for all evaluated factors. There is a significant difference in the case of

vitality and fatigue, a slightly lower difference in the factors of anger, depression and tension and almost no difference in the case of confusion.

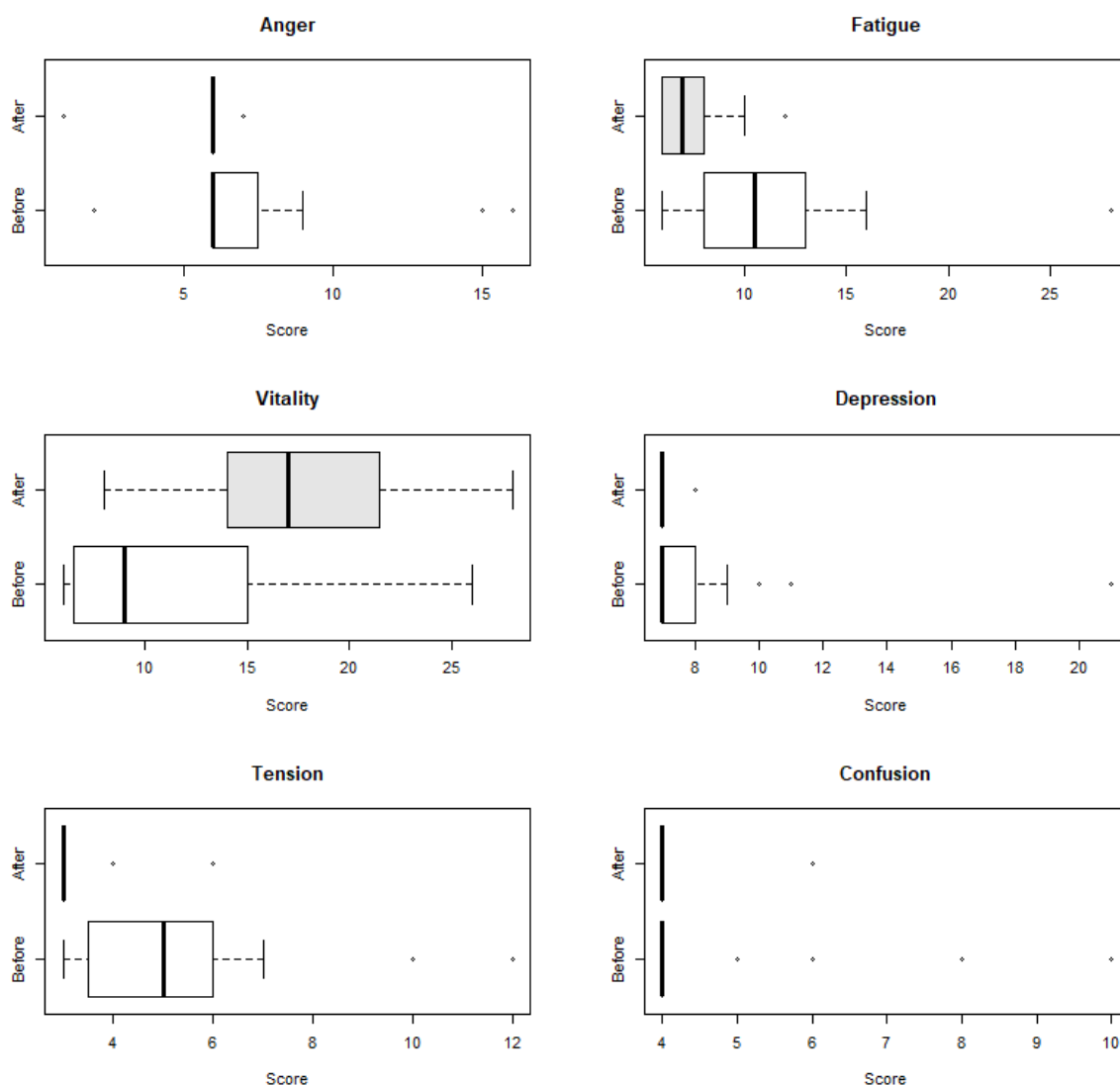


Figure 4. Boxplots for evaluated factors before and after Nordic walking training

The results show that, based on the analysis of data from POMS questionnaires, all stated hypotheses were confirmed. Specifically, we confirmed that after completing the Nordic walking training in the spa forests, subjects have a lower score and thus improvement in the following factors: fatigue, tension, depression, and anger. We also confirmed that the subjects have a higher score in vitality factor and that Nordic walking training has no influence on confusion.

The results of this questionnaire survey may be influenced by various other factors. In addition to the positive effects of physical activity itself, we can also assume the impact of the forest in which the training was realized.

For example, scientists have studied the effect of so-called “forest bathing” (shinrin-yoku) on mood states of probands. Bowler et al. (2010) conducted a meta-analysis of forest bathing research and concluded that activities in the forest environment influence the reduction of negative emotions such as anger, fatigue, and sadness. Similar results have been obtained by several other authors (Lee et al., 2011; Mao et al., 2012; Kotera et al., 2020). This is mainly due to the physicochemical properties of the air in forest stands.

In addition to the physicochemical properties of the air in forest stands, the aesthetic value of the forest environment also plays a big role. The impact on the mood states of viewing

forest landscapes has already been demonstrated in research by Kobayashi et al. (2021). Researchers compared the effects of walking in the forest and viewing the forest landscape using the POMS questionnaire and found no significant differences.

Therefore, it could be assumed that the positive effect of Nordic walking in the forest combines two factors: the effect of the forest environment (aesthetic components and specific microclimate) and the effect of the physical activity itself.

We recommend monitoring the effects of the forest environment on biochemical and physiological parameters of probands. Finding correlations between clinical markers and stay in the natural environment will lead to a better understanding of the therapeutic effects of the forest environment.

5 CONCLUSIONS

Mental health is currently a great challenge for a global society. Physical activity and its impact on the mental health are of particular interest. Walks in spa forests are part of the comprehensive spa care in all major spas in the Czech Republic. Based on the analysis of scientific studies, it can be assumed, that it is not only the movement therapy in the forest itself that leads to overall psychological well-being but also the therapeutic effect of the forest environment.

This research aimed to analyse the effect of Nordic walking training in the natural therapeutic landscape of Karlovy Vary on mental health. The Profile of Mood States questionnaire was used to assess the impact of the Nordic walking training on 6 factors of mood and emotion: tension, depression, anger, vitality, fatigue, and confusion. The research involved 36 people. Nordic walking tours in the spa forest were organized by the city of Karlovy Vary. Three hypotheses were stated at the beginning of the research which was confirmed in the following manner.

H1: After completing Nordic walking training in the spa forests, subjects have a lower score and thus improvement in the following factors: fatigue, tension, depression, and anger; this hypothesis was fully confirmed. The positive

effect of Nordic walking was demonstrated for all considered factors. The biggest positive effect was confirmed in the case of reduced fatigue.

H2: After completing Nordic walking training in the spa forests, the subjects have a higher score and thus an improvement in vitality factor; this hypothesis was fully confirmed, the vitality factor was identified as the one where the highest positive change of all the examined factors occurred.

H3: The Nordic walking training does not affect the confusion factor; also, in this case, the hypothesis was fully confirmed. In the case of this factor, there was a positive change in only a small number of subjects.

This research was the first that we carried out as part of the study of the influence of the therapeutic landscape in spas and it is for us a pilot study for the preparation and implementation of the follow-up studies. We have shown that Nordic walking training in the natural therapeutic landscape of Karlovy Vary is beneficial for mental well-being. In the follow-up studies, we would like to focus on comparing the effect of movement in spa forests and forests outside the spa. We would like to add more measured quantities that would help us to better understand what specifically affects the mental state of the subjects.

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