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QUESTIONNAIRE EVALUATION OF SELECTED PARAMETERS OF FOREST RECREATIONAL TRAILS SUITABLE FOR WHEELCHAIR USERS IN SLOVAKIA AND IN THE CZECH REPUBLIC

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Abstract

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The article presents the results of a survey on the preferences of disabled people in wheelchairs for selected features of recreational trails in forests. The study was conducted in in the years 2015 and 2016 with a sample of 109 people from Slovakia and from the Czech Republic (57 respondents in Slovakia and 52 in the Czech Republic). The questions in the survey were designed to determine the preferences concerned in this article: answers regarding the optimal length of the route for one trip and the distance between the accompanying trail elements (information signs, shelters etc.) are presented. We have observed differences between the respondents' preferences in Slovakia and the Czech Republic in the preferred length of the trail. On the other hand, preferences in the distance between the accompanying elements on the trail in the forest did not differ. Respondents in the Czech Republic prefer far longer routes, with relatively larger distances between the recreational elements. The results will be used in the future for designing optimal trails for visitors on wheelchairs in the Masaryk Forest Křtiny, property of the Mendel University in Brno.

Keywords: length of trail, distance, wheelchair, questionnaire, recreational elements

INTRODUCTION

There are many among us who like a quiet corner of nature – to climb rocky peaks, descend into valleys or breathe on the banks of roaring torrents. However, there are also people who, due to their medical condition, are unable to do so and we have somehow overlooked to give them the opportunity (Junek *et al.* 2012).

Nature is believed to restore the human body and mind because humans have evolved in close association with it. Miyazaki (2011) claims that "The human body is thus made to adapt to nature." Indoor or field studies on forest bathing (taking in the forest atmosphere) have helped in investigating whether the "natural environment" restores the human body and mind (Tsunetsugu *et al.* 2010) and repairs a suppressed immune system (Li Q, 2008). Navrátil *et al.* (2015) report that most of tourism activities undertaken by humans take place in the natural environment.

The main objective of the research, supported by the financial resources of the Visegrad fund, was to obtain the data necessary for development of a methodology for designing forest trails suitable for mainly short-term recreation of wheelchair users. We wanted to find out whether the wheelchair

users in the Czech Republic and in Slovakia share the same preferences regarding the forest trails and it is therefore possible to develop and follow one methodology, or whether the preferences differ to such level that it is necessary to design trails of different parameters. A partial goal was to learn the preferences of wheelchair users and their accompanying persons, such as trail difficulty, surface, length of trail, trail gradient (longitudinal and sideways), distance between the points allowing rest of both wheelchair users and accompanying persons, also with regard to the season preferred by the respondents. To the present, many papers addressed the mobility of wheelchair users in urban environment (i.e. Zdařilová, 2008) or in buildings (Šestáková *et al.*, 2010); however, research of trails for wheelchair users in forest environment was not performed.

Results and findings presented in this contribution will be applied in designing trails for wheelchair users on the territory of the Training Forest Enterprise Masaryk Forest in Křtiny (Czech Republic).

Hypothesis – H_0 was defined and statistically tested for two questions:

1. How long trail do you consider optimal for one trip?
2. What distance between the accompanying elements do you find optimal?

We hypothesized for both questions: There are not differences between the views of respondents in countries involved in the survey (SK, CZ).

Literature review

Wheelchair users are people with a handicap whose movement is dependent on the mechanical or power-driven wheelchair. These people are challenged with limited mobility and especially architecture-inflicted barriers (Kacanu, 2001). Vágnerová (2004) says that: "Mobility impairment is the cause of restricted independence; it strengthens the dependence on other people, represents a barrier to getting lots of experience, and brings about the related restriction of socialization or social adaptation."

It is important to provide all the people of impaired mobility with a compensation for their limited movement. Unless the society is aware of this, they may become excluded from social life. Support for people in wheelchairs can help them engage in various activities that will keep them active and prevent their social exclusion (Vítková, 2006).

As Gallis *et al.* (2013) wrote in his paper, providing equal access to the outdoors requires a sophisticated approach that recognises that people with disabilities have a range of different needs. A better understanding of the needs of disabled groups is the starting point for meeting legal requirements for equal access. Trees generally contain higher concentrations of specific bioactive defence substances than annual plants. Some tree extracts have been known since ancient times for their health-promoting properties, such as terpenoid resins from pine, spruce and mastic trees. Other substances extracted from European trees have been found to exert promising health-promoting effects. Bark and knots are especially rich sources of bioactive polyphenols, in particular of various lignans, stilbenes and flavonoids, which are strong natural antioxidants. Polyphenols extracted from trees are already marketed widely as nutritional supplements and may also be introduced in specialty, functional food products, like the xylitol and sitosterol products that have been marketed worldwide for more than ten years.

The possibility for disabled people to spend their free time in the forest is getting higher and higher importance in Slovakia and the Czech Republic as well (Loučková and Fialová 2010, Jakubis and Jakubisová 2012, Jakubisová 2013, Jakubis 2015). Forest gives people the opportunity to enjoy various forms of tourism and recreational activities. The research in this field is not developed yet so much all over the world including the Czech Republic and Slovakia. Basic data about preferences of the respondents can be found in the publication of Fialová *et al.* (2015). Leisure time spending by people with disabilities has been dealt with by e.g., Pagán (2012), Figueiredo *et al.* (2012), Kastenholz *et al.* (2015), Eichhorn *et al.* (2013), or Blichfeldt, Nicolaisen (2011). Rocca (2014) in his paper says that forest roads are often suitable for wheelchairs, but they must satisfy certain minimum requirements as regards surface, slope and obstacles (for example drainage channels).

Lundell (2005) mentions the basic parameters of designing trails for disabled people in the conditions of Sweden. A suitable length of a nature trail is between 300 and 1,500 metres. A suitable length for weak people and the elderly is a few hundred metres, whereas those with impaired vision, those in wheelchairs with strong arms, and persons using electric wheelchairs, can manage longer distances. There should be possibilities along the path to take a short cut on the way home. According to Lundell (2005), resting places in the shape of benches should be placed at regular intervals along paths to be used by disabled persons. Especially along shorter trails there should be benches at intervals of 50–100 metres.

MATERIALS AND METHODS

The paper presents results of a survey conducted in 2015 and 2016 on people with disabilities using wheelchairs. The questionnaire was distributed through several organisations working with wheelchair users (League of Wheelchair Users in the Czech Republic, the national Rehabilitation Centre in Kovacova, the Slovak Association of the Disabled and the Slovakian Paraolimpic Committee in Slovakia) and by e-mail. It was also

I: *The statistics of answers to Q1 by country*

Category of trail length (km)	How long trail do you consider optimal for one trip?					number of respondents
	less demanding routes (up to 2 km)		more demanding routes (more than 2 km)		I am not able to answer	
	<1	1–2	2–4	>4	d	
SK	5	8	22	11	11	57
CZ	0	6	20	20	6	52
Σ	5	15	42	31	17	109

published via a Google application for on-line surveys.

The questions within the questionnaire survey focused on various aspects of forest trail parameters; however, this contribution works only with the questions regarding the optimal trail length and optimal differences between the resting places with accompanying elements along the forest trail. The total number of filled-in questionnaires was 109, of which 57 by respondents from Slovakia (SK) and 52 from the Czech Republic (CZ). The null hypotheses were tested by a Chi-squared test and Mann-Whitney test. The Chi-squared test (test of goodness of fit), is generally used to test the fit of frequencies in categorical data. The Mann-Whitney test is used to compare the statistical datasets where normal distribution of probability of the analysed characteristic cannot be assumed (Pecáková, 2011).

RESULTS

1. In question „How long trail do you consider optimal for one trip?“ (hereinafter Q1) we have proposed the hypothesis H_o: There are not differences between the views of respondents in the countries involved: Slovakia (SK), Czech Republic (CZ)

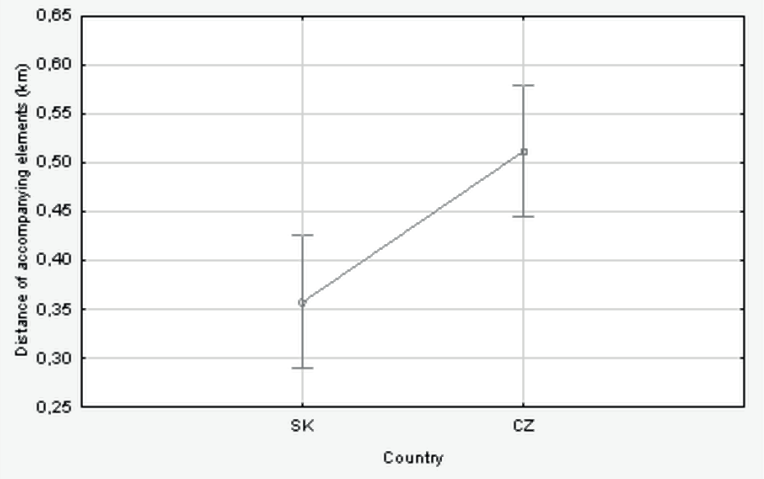
The basic universe of statistical testing in countries contains 109 respondents (SK/CZ = 57/52). Sample of the group for testing by countries can be seen in Tab. I: SK/CZ = 46/46, together 92 respondents. We did not take into testing the answers in the category "I am not able to answer", of which is 6 respondents CZ and 11 respondents SK.

The results of research conducted in Czech Republic show that according to the survey, 38.4% of the respondents from the Czech Republic believed that forest trails and recreation facilities should be longer than 4 km. More than 38.4% of them preferred the route with 2–4 km in length, 11.5% preferred the route with 1–2 km in length and 11.5% of respondents could not specify their preferred length of the trails for recreation. On the other hand, the dominant view of the people living in Slovakia is that the route for recreational trails should be up to 4 km in length. The majority of respondents (38.6%) preferred route with a length of 2–4 km, 8.8% of the respondents preferred a very short route (1 km), nearly 14% of respondents were in favour of routes with a length of 1–2 km, whilst 19.3% of the respondents living in Slovakia preferred the long route (more than 4 km). About 19% of the respondents could not specify their preferred length of recreational trails.

The analysis of variance confirmed that the views of the respondent from the two analysed countries differ from each other (see Fig. 1).

(Weighted averages – The current effect: F(1.90) = 8.2420, p = 0.00510; Vertical bars indicate the confidence interval 0.95)

The data were tested by the Chi-squared test. The respondents were given the option to choose one of four pre-defined categories of ideal trail



1: *Comparison of the preferences of respondents in Slovakia and the Czech Republic*

length. The critical value of the obtained data was found to reach 13.045, which exceeds the tabular value for Chi-square for three degrees of freedom and $\alpha = 0.05$, reaching 7.82. Hypothesis is rejected.

Result of evaluation for Q1

For statistical analysis, Chi-squared test was used. Statistical analysis was performed to determine the statistically significant differences between the preferences of people with disabilities living in Slovakia and in the Czech Republic.

We tested the hypothesis: there are no differences. The value obtained exceeds the critical value for Chi-squared test and the hypothesis is therefore rejected. There are differences in the views of respondents in the Q1: SK versus CZ.

The preferred lenght of the trail for wheelchair users was found to be 2.95 km in Slovakia and 3.75 km in the Czech Republic.

2. In question "What distance between the accompanying elements do you find optimal?" (hereinafter Q2) we have proposed the hypothesis H_0: "There are not differences between the views of respondents in the countries involved: Slovakia (SK), Czech Republic (CZ)."

The basic universe of statistical testing in countries contains 109 respondents (SK/CZ = 57/52). Sample of the group for testing by countries is: SK/CZ = 48/48, together 96 respondents. We did not take into testing the answers, that the respondents left blank, of which 4 respondents are from CZ and 9 respondents from SK.

The results of research conducted in Slovakia have shown that the vast majority of respondents (42.1%) is convinced of the need for the deployment of recreational facilities along the routes in the distance of 200–500 m. At the same time, approximately 8.7% of the respondents were of the opinion that the holiday and education spots should be at 100–200 m. Some of respondents (24.6% for both lengths) indicated smaller distance (<100 m) and longer than 500 m. On the other hand, amongst those surveyed in the Czech Republic prevailed (48.1% of respondents) the need for placing the facilities along the trails for recreation in the forests at a distance of not less than 500 m from each other. Quite numerous here was a group of respondents (38.5%) declaring the need to introduce recreational facilities at 200–500 m. About 9.6% of respondents were in favour of installing leisure time facilities at 100–200 m along the forest trails for recreational needs. About 3.8% respondents prefer more frequent placement of the points.

The data were tested using the Mann-Whitney test. The respondents were given the option to write their own value showing their preference for the distance between the individual resting places with accompanying elements. With regard to the number of the elements tested we had to approximate the values shown in tables of critical values for the Mann-Whitney test (Pecáková, 2011) up to the values $n_1 = 48$ and $n_2 = 48$. The value U, obtained in this way for $\alpha = 0.05$ was lower than the lower of the values U_1 and U_2, determined by calculation from the questionnaire survey data.

Hypothesis failed to reject.

Analysis of Mann-Whitney test did not show statistically differences between the views of respondents from the Czech Republic and Slovakia on the above-mentioned issues. The preferences within the two countries on the frequency of distribution of leisure time facilities and education facilities along forest trails for recreational needs are not different.

Result of evaluation for Q2

Statistical analysis was performed to determine the statistically significant differences between the preferences of people with disabilities living in Slovakia and in the Czech Republic. We hypothesized that there are not differences between the views of respondents in countries (SK, CZ).

We tested the hypothesis: there are no differences. The obtained value exceeds the critical values of the Mann-Whitney test. Hypothesis failed to reject. There are no differences in the views of respondents in the Q2: SK versus CZ.

Counting the average distance of accompanying elements, the distance should not be longer or shorter than 360 m in Slovakia and 510 m in the Czech Republic.

CONCLUSION

When assessing data about the preferences of the trail length, we noticed differences between the opinions of respondents from the two countries involved. In the Czech Republic, 46 respondents preferred the trail length for a single trip in the range from 3.4 to 4.1 km, with an average length of 3.75 km. In Slovakia, 46 respondents preferred the trail length in the range from 2.5 to 3.4 km, with an average length of 2.95 km.

Lundell (2005) reports the ideal length of trail for persons with impaired mobility between 300 and 1500 metres. Taking into consideration the categorization of difficulty of the routes in terms of evaluating their length, these routes are moderately difficult for healthy visitors, but from the perspective of people in wheelchairs are differently difficult and results reported in the two countries involved are different. These respondents preferred trails suitable for half-day activities. Jakubisová (2013), in the evaluation of the technical parameters of a standard type wheelchair and spatial parameters of the routes in moderately difficult terrain, determined the optimum length to 2.605 km because the half-day activities need to be undertaken in duration of 1.56 hours without any stop (break), which

corresponds to the general average speed of movement of wheelchair – 1 km/0,6 h. Counting with ten 10-minutes breaks, wheelchair users need 4.06 hours to pass trail, that is suitable for a half-day activity.
If we compare the length of trail proposed for the Swedish conditions and the results of our questionnaire survey in the Czech Republic and in Slovakia, we get the following result: respondents in the Czech Republic require more than two-times longer routes in forest environment than in Sweden and approx. two-times longer routes in Slovakia. This requirement is linked to the positive effect of staying in forest environment, as reported for example in Li Q (2008), Tsunetsugu *et al.* (2010), Gallis *et al.* (2013) or Pagán (2012).
The longer and the more interesting stay in forest environment we can provide for people with impaired mobility, the more it may help them retain their physical as well as mental condition on an acceptable level.
When assessing data about the preferences of the accompanying elements, we did not notice differences between the opinions of respondents from the two countries involved.
Regarding the preferred distances of accompanying elements along the route, 52 respondents from the Czech Republic prefer distances between 443.8 and 579.3 m (511.5 m on average). In Slovakia, 57 respondents prefer shorter distances between the accompanying elements in the range from 288.8 to 425.2 m, (357 m on average). These data are interesting mainly for their practical use in terms of ensuring the optimal spacing of the elements for wheelchair users at the existing trails and when designing new recreational trails for wheelchair users.
Lundell (2005) reports that the ideal distance between the accompanying elements along the trails in forest environment is between 50 and 100 metres.
This recommendation disagrees with the results of our survey. For a forest owner, who would have to install the required elements in the forest at his expense and cover their maintenance costs, it is more suitable to distribute the elements in the Czech Republic at the distances of approx. 500 m and in Slovakia at the distances of approx. 360 m, as required by the respondents in these two countries.
In further research it would be interesting to look at the reasons that lead the respondents in each country to their answers. The answers may have been affected by different conditions in Slovakia and the Czech Republic, e.g. by different access to higher-quality, more efficient and safer wheelchairs or different distance of the trails from residential areas. We cannot exclude the association with social and economic possibilities of providing services in countries with different social systems and individual capabilities of individual respondents. This pilot study can help to design suitable trails for people on the wheelchair in the property of the Mendel University in Brno – Masaryk Forest Křtiny.
With regard to the results of our survey we have to conclude that it is not suitable to develop a common methodology for designing trails for wheelchair users for the Czech Republic and Slovakia.
A joint survey on the preferences of wheelchair users for their movement in forest environment in the conditions of the Czech Republic and Slovakia has not been performed so far. From the viewpoint of the authors of this contribution and the above-cited researchers, this topic is very timely and should receive more attention. It is necessary to propose and develop modern principles of forest management and of public relations from the aspect of recreational use in the near future, including the expectations of disabled visitors. The basic principles can be:

- Use the proper push-bolts on the forest roads – passable for wheelchair users
- Use the turntables by and past the forest roads – wheelchair users can use it to avoid the traffic on the roads
- Inform the forest visitors about the works in the forest (connected with hoaling, cutting, hunting etc.) on the internet

The survey represents a contribution to improvement of accessibility of forest for physically handicapped persons.

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