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THE DIFFERENCE BETWEEN WALKING AND HIKING OF STUDENTS REALIZED AS A REGULAR TEACHING ACTIVITY

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Abstract

On a sample of thirty-three students of the Faculty of Economics in Subotica and the Department of Novi Sad, which attends regular physical education, the structure of burden was determined during walking (hiking); and the difference of the burden in relation to the activity, subject to the place of study, was also determined. Students during their walking or hiking wore pulse rate monitors, which registered the heart beats every five seconds. The obtained values were subsequently analyzed by basic anthropometric and cardiovascular parameters of students and structure of the tracks.

1. Introduction

In line with the research draft, the basic thematic unit of the anthropometric, cardiovascular parameters and the parameters of the tracks in relation to the place of study were analyzed. The characteristic of study at the Faculty of Economics is that teaching is carried out in two cities ie. Subotica and Novi Sad. In the case of the class "Sport and Physical Education," students choose between an individual sport, a team sport or outdoor activities.

Disciplines within the subject were based on surveys conducted among students and the spatial opportunities for sport of the recreation center (Andrašić, 2008). The aim of the research is to determine the structure of burden for students during walking in Subotica, and hiking in Novi Sad. The plans average length is a 14 km walk while overcoming the height difference of 15 m, and 11 km of hiking while overcoming the height difference of 270 m. The results should indicate whether there are differences in the planned activities. If it is determined that there

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were significant differences in the groups, they will serve as a basis for correction of the planned routes (path length and alignment).

Changes to the planned route will equalize the structure of burden compared to the activity determined by the place of study; ie the criteria for obtaining a signature from the subject of Physical Education would be equalized. Since the Faculty of Economics, is the only one in the University of Novi Sad which has a regular physical education class, as such, it is interesting for research (Krsmanović, 2010).

2. Material and methods

The subject sample.

The subject sample in this study consisted of 33 second year students of the Faculty of Economics in Subotica (n = 15) and the Department of Economics in Novi Sad (n = 18). Who while attended regular classes also attended classes in Physical Education. The selection of students for this survey was random, or rather the students volunteered themselves. The average age of the students is 21.

The sample of variables.

Analysis of the structure of burden of the students during their walks and hiking was conducted according to the following variables, as follows: Total ascent (UUSP), total descent (USPU), body height (TELV), body weight (TELM), the minimum value of heart rate (MINHR), maximal heart rate (MAXHR) and the average value of heart rate (HRPRO).

Mathematical and statistical analysis.

Data obtained through the polar belts which were worn by the subjects, were processed by the corresponding polar team system software (Živanović, 2009).This paper will show the descriptive parameters, the mean value (sr.vr), the standard deviation (std.d), the minimum (min) and maximum (max) for all of the values, the coefficient of variation (k.var), the measure of asymmetry Skewness (sk), measures of flatness Kurtosis (ku) and the value of the Kolmogorov-Smirnov test (p).

For the differences between groups the multivariate MANOVA procedures and discriminating analysis were used. From the univariate procedures ANOVA and the t-test were applied. By calculating the ratio of discrimination we distinguish the characteristics that determine the specificity of the subsamples and the features that need to be excluded from further processing, i.e. a reduction of the observed space is performed.

3. Results and Discussions

Central and dispersion parameters, measures of asymmetry and flattening, the followed basic characteristics of the anthropometric and cardiovascular parameters, and the paths parameters represent the place of study and direct the possible application of parametric procedures.

Table 1 *Central and dispersion parameters of students from Novi Sad*

	sr.vr	std.d	Min	Maks	k.var	sk	Ku	P
UUSP	330.00	10.29	320.0	340.0	3.12	.00	-2.00	.036
USPU	112.50	.51	112.0	113.0	.46	.00	-2.00	.036
TELV	182.39	6.25	172.0	193.0	3.43	-.20	-.99	.828
TELM	82.28	8.29	65.0	102.0	10.07	.03	.74	.497
MINHR	79.72	12.39	56.0	102.0	15.54	.04	-.69	.963
MAXHR	167.00	11.00	136.0	185.0	6.59	-.94	1.80	.962
HRPRO	116.56	10.23	98.0	137.0	8.77	-.08	-.08	.886

The minimum (min) and maximum (max) values of basic anthropometric, cardiovascular parameters and track parameters of students from Novi Sad indicate that the values are in the expected range. The values of the variation coefficient (k.var) indicates the homogeneity of the group by characteristics: total ascent (UUSP 3.12), total descent (USPU .46), height (TELV 3.43), body weight (TELM 10.07), the minimum value of heart rate (MINHR 15.54), maximal heart rate (MAXHR 6.59), the average value of heart rate (HRPRO 8.77).

The decrease of the skewness (sk) indicate that the distribution is *positively asymmetric*, this means the decrease of the skewness (sk) indicate that the distribution is positively asymmetric, this means that the curve of the distribution results tended towards lower values and have more smaller values than in normal distribution, with: body height (TELV -.20), maximal heart rate (MAXHR -.94) and the average value of heart rate (HRPRO -.08).

Skewness values (sk) indicate that the distribution is asymmetric: the total rise (UUSP .00), total descent (USPU .00), body weight (TELM .03), the minimum value of heart rate (MINHR .04). Larger values of kurtosis (ku) indicate that the curve is elongated, in: maximal heart rate (MAXHR 1.80). Negative values of kurtosis (ku) indicate that the curve is flattened, in: total ascent (UUSP-2.00), total descent (USPU-2.00) and height (TELV -.99). Distribution of values generally moves in the normal distribution (p) at: height (TELV .83), weight (TELM .50), the minimum value of heart rate (MINHR .96), maximal heart rate (MAXHR .96), average value of heart rate (HRPRO .89), and deviates from the normal distribution (p) at: total ascent (UUSP .04), total descent (USPU. 04).

Table 2 *Central and dispersion parameters of students from Subotica*

	sr.vr	std.d	min	maks	k.var	sk	ku	p
UUSP	82.13	71.34	63.0	340.0	86.86	3.47	10.07	.000
USPU	71.20	11.81	65.0	113.0	16.59	3.22	9.04	.002
TELV	178.53	7.66	160.0	193.0	4.29	-.36	1.07	.529
TELM	80.07	21.01	60.0	120.0	26.24	1.15	-.19	.131
MINHR	79.73	11.49	53.0	95.0	14.41	-.78	-.07	.999
MAXHR	152.00	17.47	115.0	179.0	11.49	-.32	-.23	.976
HRPRO	120.87	16.24	86.0	150.0	13.44	-.54	.12	.991

The minimum (min) and maximum (max) values of basic anthropometric, cardiovascular parameters and track parameters of students from Subotica indicate that the values are in the expected range. Higher values of the coefficient of variation (k.var) indicate the heterogeneity of the student's total ascent (UUSP 86.86) and body weight (TELM 26.24), while for the other values of the coefficient of variation indicates the homogeneity of the group.

Increased values of skewness (sk) indicate that the distribution is *positively asymmetric*, this means that the curve of the distribution results lean towards higher values, i.e. that there are more larger values together in relation to a normal distribution, with: total ascent (UUSP 3.47) and total descent (USPU 3.22). Larger values of kurtosis (ku) indicate that the curve is elongated, i.e. that we have pronounced clustering results around the arithmetic mean: total ascent (UUSP 10.07) and total descent (USPU 9.04).

The distribution of values generally moves in the normal distribution (p) for most variables, except for the total ascent (UUSP .00) and total descent (USPU .00) where the distribution of the results deviates from normal.

Table 3 *Significance in the difference between hiking and climbing in comparison to the observed space*

Analysis	**N**	**F**	**p**
MANOVA	7	38.285	.000
Discriminative	7	38.285	.000

Based on the value of p = .000 (analysis MANOVA) and p = .000 (discriminative analysis), it can be concluded that there is a difference and clearly defined boundaries between the analyzed activities determined by the place of study in comparison to the observed parameters.

Table 4. *Significant difference between hiking and climbing in comparison to the observed parameters*

	F	**p**	**k.dsk**
HRPRO	.861	.360	4.364
MINHR	.000	.998	2.085
MAXHR	9.016	.005	1.775
USPU	221.077	.000	.968
TELV	2.537	.121	.061
UUSP	213.295	.000	.025
TELM	.169	.684	.003

As p <.1, it means that there is a significant difference and clearly defined boundary between certain activities that were analyzed at the place of study, at: maximal heart rate (MAXHR .005), total descent (USPU .000) and total ascent

(UUSP .000). With the average value of heart rate (HRPRO .360), the minimum value of heart rate (MINHR .998), height (TELV .121) and weight (TELM .684) p > .1 or rather that no significant difference was observed.

Discrimination coefficient indicates that the largest contribution to the discrimination between the analyzed activities determined by the place of study compared to the observed parameters, that is that the biggest difference, is in: the average value of heart rate (HRPRO 4.364), the minimum value of the heart (MINHR 2.085), maximal heart rate (MAXHR 1.775), the total descent (USPU .968), height (TELV .061), total ascent (UUSP .025), weight (TELM.003).

It should be noted that, the latent characteristics, the characteristics with which no differences were determined between the activities determined by the places of study, and discriminative analysis included it in the structure at which there is a significant difference between the two activities. The latent characteristics are: the average value of heart rate (HRPRO .360), the minimum value of heart rate (MINHR. 998), height (TELV .121 and weight (TELM .684).

Table 5. *The distance (Mahalanobis') between walking and hiking*

	Novi Sad	**Subotica**
Novi Sad	.00	6.95
Subotica	6.95	.00

By calculating the Mahalanobis distance between these aforementioned class activities we obtained another indication of similarity or difference. The distance of different areas can be compared. Distance on the table indicate that the distance between hiking and climbing is *higher*. Based on the graphic display of the ellipses (confidence interval) it is possible to observe the relative position and characteristics of each group of students *(Novi Sad (1) and Subotica (2))*, compared to the three most discriminating characteristics, which are as follows: the minimum value of heart rate (min), maximum heart rate (max) and the average value of heart rate (hr).

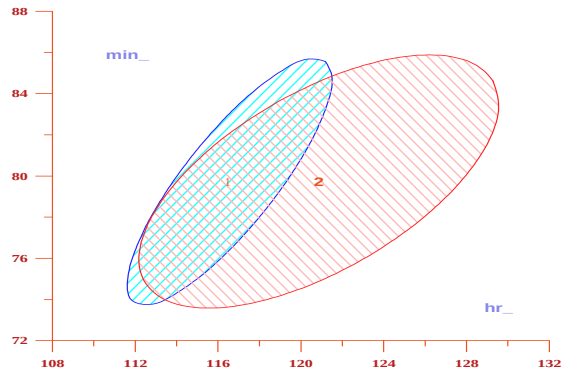

Figure 1. *Ellipses of groups compared to the minimum value of heart rate (min) and the average value of heart rate (hr).*

Legend: Novi Sad (1); Subotica (2); average value of heart rate *(hr);* minimum value of heart rate *(min)*

Based on the chart, ie. the overlapping ellipses it can be noted that in comparison the average and minimum values of the groupe do not differ.

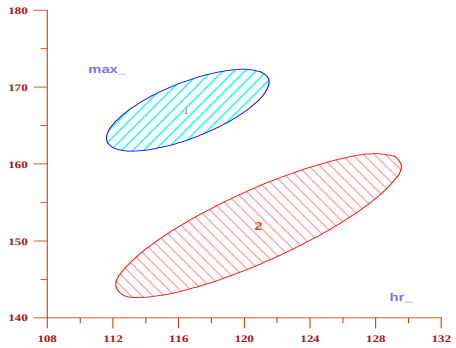

Figure 2.*Ellipses of the groups compared to the maximal heart rate (max)and the average value of heart rate (hr).*

Legenda: Novi Sad (1); Subotica (2); average value of heart rate *(hr);* maximum value of heart rate *(max)*

It is possible to note that compared to the average value of heartbeats of the students from Novi Sad (1) have the lowest value, and the students from Subotica (2) have the highest value. In relation to the maximum value of heart rate (max) students from Subotica (2) has the lowest value, and the highest value students from Novi Sad (1).

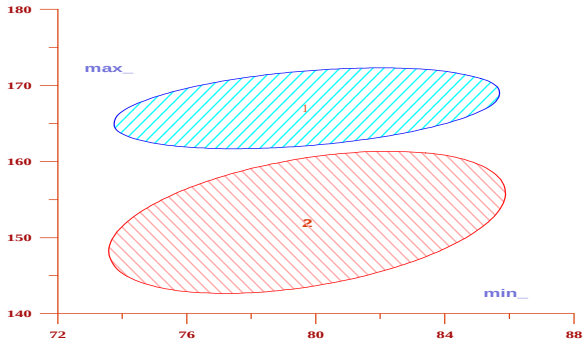

Figure 3. *Ellipses of the groups with regards to the maximal heart rate (max) and minimum heart rate (min)*

Legend: Novi Sad (1); Subotica (2); minimum value of heart rate *(min);* maximum value of heart rate *(max)*

It is possible to note that in relation to the minimum value of heart rate *(min)* of the students from Novi Sad (1) had the lowest value, and students from Subotica (2) had the highest value. In relation to the maximum value of heart rate *(max)* students from Subotica (2) had the lowest value and students from Novi Sad (1) had the highest value .

4. Conclusions

Reviewing the recieved results it is clearly shown that a significant difference was achieved by the realized hiking and walking tours.

The difference in altitude have contributed most to the higher mean values of heart rate during mountaineering. The maximum value of heart rate during climbing was hightend by ≈ 15 bpm / min, while the result of minimum values of heart rate were approximate. Values of total ascent and descent were significantly higher in mountaineering, which results in a higher load and intensity.

The obtained values provide guidelines for the correction of the foreseen tracks, i.e. the equalizing criteria between students from Subotica and Novi Sad.

When creating new paths it is needed to reduce the descent and ascent of hiking tours and to increase the length of the walk tour in order to equalize the structure of burden of the students during these outdoor activities.

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