

## STRESS LEVEL COMPARISON OF PARTICIPANTS ACCORDING TO THEIR AGE, GENDER AND THE REGION

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**Abstract:** Background - Stress has become a natural part of our lives. To some degree, it plays a motivating role, on the other side, when it comes to its long-term influence, it is reflected negatively not only in human behaviour but also in physiognomy of a man. Phenomenon of the stress has been analyzed and discussed for ages (Lazarus, 1936, 1966; Glasser, 1984; McGuigan, 1999) and the scientists also deal with its diversified impacts regarding the age and gender of human beings. Method - The examination was executed with an apparatus based on HRV analysis (heart rate variability) that analyzes the heart frequency. During 3 minute period of time the apparatus analyses the course of pulse frequency, time deviations between particular beats of heart and the number of probable cardiac arrhythmias. The analysis is recorded in HRV tachograph in the course of all measurements. Based on the measured data, the following indicators have been calculated: the current stress level in organism, the level of activation of sympathetic and parasympathetic nervous system, index of exhaustion, balance in autonomous nervous system, experienced rate of psychic (emotional) and physical stress and the level of stress resistance. Result - There were no significant gender differences found in the rate of physical and psychic stress, still there was some percentual difference recorded between men and women. Considerable differences have been shown among respondents in the category - their place of living (region). Conclusion - Our treatise has been dealing with the comparison of the stress level in dependence on age, gender and dwelling place of respondents.

**Keywords:** Stress, physical stress, emotional stress, stress resistance.

### 1 Introduction

Stress not only impacts people psychically (by means of anxiety or depression), but also physically. Physical stress symptoms can be presented in forms galore - starting with peptic ulcers, up to serious cardiac problems (Minirth, Hawkins, Meier, Flournoy, 1986, p. 16). The stress also negatively correlates with the level of satisfaction at work (Jex, 1998, Kasáčová, 2002; Paulík, 2010; Maslach, Leiter, 1997) and labour performance (Jex, 1998; McGuigan, 1999). Stress and its overall impact on a life of people can cause, besides other things, reduction in the human production (Glasser, 1984; McGuigan, 1999). Selye (1974) defined the stress as "a non-specific answer of human body to the threat" (p.27). Through the endocrinological indexes he pointed out and described some biological answers of organisms to the stress itself. Selye elaborated his theory of general adaptation syndrome GAS that includes three stages:

- Alarm
- Resistance
- Exhaustion (Selye, 1983, p.4).

Cannon (1915) used this term in connection to external impacts that negatively influence the homeostasis of organisms. Coherence between external conditions that was designed by Selye in his theory was later described by Grinker and Spiegel who also added physiological and psychic characters of that impacts (1945). In Slovakia, Nákonečný (1995) defines stress as an influence of extremely strong stimulation during a long period of time or as a necessity to remain in insufferable situation which cannot be avoided. Vágnerová (1999) understands the stress as a state of extreme burden and consequently the threat for a human body. Hennig and Keller (1995) describe the stress as a psycho-physical reaction to any external and internal stressors. Brockert (1993) offers an alternative model and he says that stress as such starts to exist in the situations when human aims in their lives differ from their needs. This means that a human being does not live in natural coherence with one's own needs. Čírtková (2000) believes that stress is a conflict between external demands and the capability of particular person to face them.

In our treatise we understand the stress not only as a reaction to the influence of both internal and external stressors, but also as a state that is conditioned by cognitive processing of particular

stress reaction and the previous experience in close connection with situational factors.

### 2 Research questions

In accordance with our research design we have created the following questions:

1. What is the overall level of psychic (emotional) and physical stress and the exhaustion index in the group of all respondents in regard to the place of their living (region where they live)?
2. What is the relation between the age, the stress score, average heartbeat and the number of arrhythmias in the group of our respondents?
3. What are the differences between measured indicators in regard to the gender?

### 3 Methods and Methodology

#### 3.1 Participants

There were 881 people from 24 districts of Slovakia participating in our measurements. In the following table we show the percentual distribution of respondents according to the districts of Slovakia.

Tab 1 Distribution of participants according to their place of living (region)

District	Number	Percentage
Myjava	44	5,0
Dubnica nad Váhom	37	4,2
Považská Bystrica	36	4,1
Holíč	45	5,1
Šamorín	35	4,0
Sereď	38	4,3
Malacky	43	4,9
Senec	38	4,3
Pezinok	41	4,7
Ružomberok	40	4,5
Námestovo	40	4,5
Čadca	38	4,3
Prešov	41	4,7
Humenné	35	4,0
Poprad	32	3,6
Zvolen	30	3,4
Lučenec	42	4,8
Banská Bystrica	33	3,7
Šaľa	37	4,2
Levice	31	3,5
Nové Zámky	30	3,4
Kropachy	37	4,2
Michalovce	37	4,2
Rožňava	21	2,4
Total	881	100,0

From the point of view of gender share we had 679 females (77.1%) and 202 males (22.9%) in our research. The youngest participant was just 14 and the oldest one 91 year old. The average age of all respondents was 49.88 (SD=16,186). The most numerous age category was between 30-49 followed by category 50-64 what was 69% out of all participants.

#### 3.2 Design

In our measurements we concentrated on the following variables: stress score, average heartbeat, number of arrhythmias, exhaustion index, physical and emotional stress and the last but not the least was the stress resistance. Not a single tested person was on psychopharmacs, none of them used a cardiac stimulator (pacemaker). Our research-testing was

executed in the frame of Festival of Health in towns across whole Slovakia.

**3.3 Measuring tools**

Examination of all participants was done in 24 Slovak towns. The measurements took 8 hours a day, usually on the town squares. Any people taking psychopharmacs, antidepressants, antipsychotics were excluded from the test sample. The choice of participants was coincidental, we just relied on their interest in our measurements. The examination itself was organized in a following way. A participant was seated and instructed to calm down. Before the analysis itself, we were finding out whether they have not eaten or drunk any stimulative stuff or energy drinks recently. The whole examination took about 10 minutes. After answering all the questions, we put a sensor on their left forefinger. In the course of next three minutes we were observing measured parameters of a participant and the consequent data interpretation took about another 7 minutes.

**3.4 Statistical analysis**

We used a statistical program SPSS 21 for evaluation of all obtained data. Since the distribution of our sample was uneven we had to use nonparametric tests.

**4 Conclusion**

Basic analysis

What is the overall influence of the stress score in our sample *a*) as a whole, and *b*) when divided according to the regions and gender?

What is the total rate of emotional and physical stress and the exhaustion index in the whole sample and when divided according to the region?

Our sample comprised of 881 respondents. The first question was orientated on the total rate of emotional and physical stress and exhaustion index within our sample of respondents. Particular outcomes can be seen in the following tables.

Tab 2 Exhaustion index in the whole research sample

	Frequency	Percent
Extremely bad	129	14,6
Bad	368	41,8
Standard	318	36,1
Good	28	3,2
Extremely good	38	4,3
Total	881	100,0

As we can see in table 2, exhaustion index in the category *extremely bad* was reached by 14.6 % and in the category *bad* it was 41.8 % of our respondents. This means that more than one half of all respondents belong to the category of bad or extremely bad exhaustion index.

Tab. 3 Prevalence of physical stress in the whole research sample

	Frequency	Percent
low	69	7,8
normal	516	58,6
high	201	22,8
Extremely high	95	10,8
Total	881	100,0

Based on the obtained data we can see that the low and normal physical stress was measured among 66.4 % of respondents, the rest (33.6 %) belongs to the category *high* and *extremely high* physical stress.

Tab. 4 Prevalence of emotional stress in the whole research sample

	Frequency	Percent
low	222	25,2
normal	423	48,0
high	188	21,3
extremely high	48	5,4
Total	881	100,0

When comparing percentual share in the prevalence of emotional stress we have found out that the situation is very similar to the outcomes as in case of physical stress – the high and extremely high level of emotional stress was measured in 26.7% of respondents.

Comparison of these indexes from the point of view of the respondents' region we show in the following graphs.

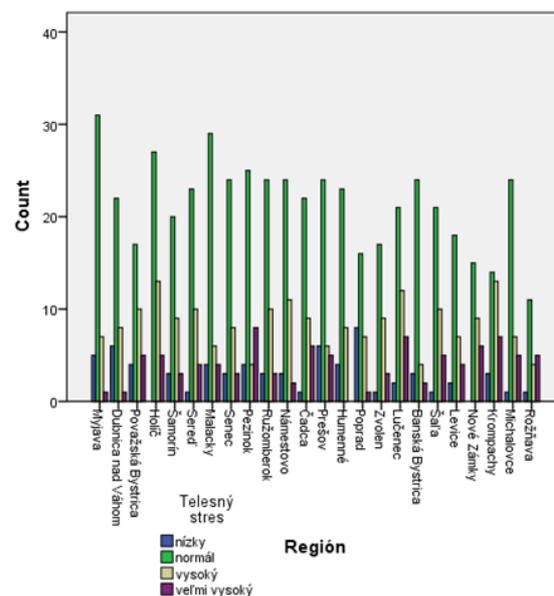


Fig 1 Percentual share of physical stress among respondents regarding their place of living

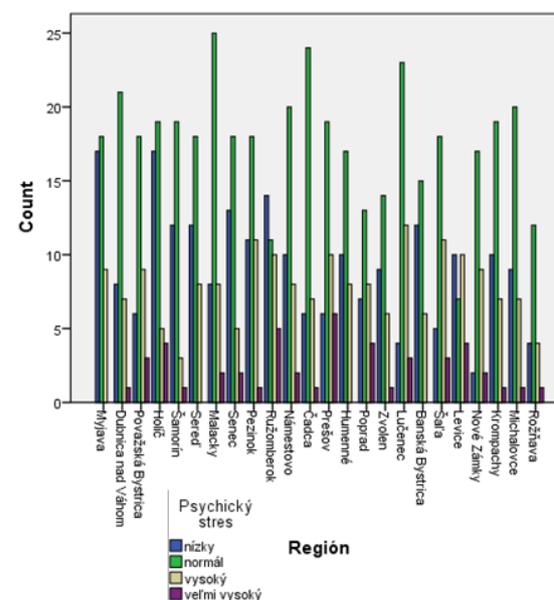


Fig 2 Percentual share of emotional stress among respondents regarding their place of living

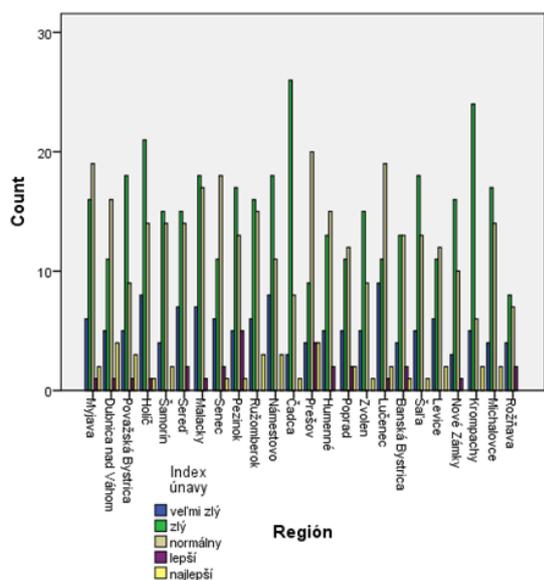


Fig 3 Percentual share of exhaustion index among respondents regarding their place of living

Tab 5 Comparison within groups

	Stress score	Physical stress	Exhaustion index	Emotional stress
Chi-Square	46,989	45,198	27,251	40,464
Df	23	23	23	23
Asymp. Sig.	,002	,004	,245	,014

a. Kruskal Wallis Test  
 b. Grouping Variable: Región

As we can see, statistically significant differences between the groups can be found in category of the stress score and emotional and physical stress, too.

The highest rate of total stress was measured among respondents from Nové Zámky, Krompachy, Šala and Lučenec, on the other side of the scale, there were respondents from regions of Myjava, Banská Bystrica, Dubnica nad Váhom and Humenné with the lowest stress level. In the category of physical stress, the highest level of physical stress was reached by people from Nové Zámky, Krompachy, Lučenec, Lučenec and Rožňava, the lowest values were from Poprad, Myjava, Dubnica nad Váhom and Humenné. Highest numbers in the category of emotional stress were obtained from regions of Ružomberok, Prešov, Nové Zámky and Šala, on the other side were Šamorín, Senec, Myjava and Holíč. The difference in the category of exhaustion index between all groups was statistically negligible.

What is the relation between age, stress score, average heartbeat and number of arrhythmias in our sample?

Tab. 6 Mutual relations between observed categories

		Stress score	Average heartbeat	Number of arrhythmias
Age		,163**	-,217**	,053
	Sig. (2-tailed)	,000	,000	,113
	N	881	881	881
Stress score			,444**	-,303**
	Sig. (2-tailed)		,000	,000
	N		881	881
Average heartbeat				-,120**
	Sig. (2-tailed)			,000
	N			881

\*\* . Correlation is significant at the 0.01 level (2-tailed).

As we can see in table 6, statistically highly significant relations were observed in all categories except the category *number of arrhythmias*. Significance shows highly influential relation because it is equal to zero. Even if there is highly significant relation ( $r=-0,163$ ) between the age of respondents and the total stress score, we state that this is just a weak relation. There is statistically significant negative relation between categories of the age and the average heartbeat, still it is considered to be a weak relation ( $r=-0,217$ ). This leads us to the conclusion that hand in hand with advanced age, the average heartbeat is decreasing. There was a statistically significant medium-strong relation observed between the stress score and average heartbeat ( $r=0,444$ ) and a negative one between the stress score and number of arrhythmias ( $r=-0,303$ ).

What are the differences in measured indicators regarding the category of age?

Tab 7 Differences between the groups in all observed categories Vestibulum

	Gender	N	Mean Rank	U test	Asymp. sig
Stress score	Woman	679	439,87	67813,000	,809
	Man	202	444,79		
	Total	881			
Average heartbeat	Woman	679	446,12	65105,500	,274
	Man	202	423,80		
	Total	881			
Number of arrhythmias	Woman	679	435,40	64777,000	,204
	Man	202	459,82		
	Total	881			

As we can see, there is no statistically significant difference between men and women in our sample. This phenomenon can be caused by non-balanced participation of both genders in our research sample.

Based on this fact, we were finding out whether there is any percentual difference in observed variables between male and female gender.

In the following tables you can find gender comparison in categories of physical, emotional stress and exhaustion index.

Tab. 8 Percentual comparison of the groups in the category of physical stress

		Physical stress				
		Low	Normal	High	Very high	
Gender	woman	Count	49	403	157	70
		% within gender	7,2%	59,4%	23,1%	10,3%
		% within physical stress	71,0%	78,1%	78,1%	73,7%
	man	Count	20	113	44	25
		% within gender	9,9%	55,9%	21,8%	12,4%
		% within physical stress	29,0%	21,9%	21,9%	26,3%
Total	Count	69	516	201	95	
	% within gender	7,8%	58,6%	22,8%	10,8%	
	% within physical stress	100,0%	100,0%	100,0%	100,0%	

As we can see, the overall percentual distribution in particular groups is approximately the same.

Tab. 9 Percentual comparison of the groups in the category of emotional stress

		Emotional stress				
		Low	Normal	High	Very high	
Gender	Woman	Count	160	329	153	37
		% within gender	23,6%	48,5%	22,5%	5,4%
		% within emotional stress	72,1%	77,8%	81,4%	77,1%

	Man	Count	62	94	35	11
		% within gender	30,7%	46,5%	17,3%	5,4%
		% within emotional stress	27,9%	22,2%	18,6%	22,9%
Total	Count	222	423	188	48	
	% within gender	25,2%	48,0%	21,3%	5,4%	
	% within emotional stress	100,0%	100,0%	100,0%	100,0%	

The same situation can be observed in the category of emotional stress, where the overall distribution is proportionally similar.

Tab. 10 Percentual comparison of the groups in the category exhaustion index

		Exhaustion index					
		Extremely bad	bad	standard	good	The best	
Gender	Woman	Count	86	285	257	24	27
		% within gender	12,7%	42,0%	37,8%	3,5%	4,0%
		% within exhaustion Index	66,7%	77,4%	80,8%	85,7%	71,1 %
		% of Total	9,8%	32,3%	29,2%	2,7%	3,1%
		Count	43	83	61	4	11
	man	% within gender	21,3%	41,1%	30,2%	2,0%	5,4%
		% within exhaustion Index	33,3%	22,6%	19,2%	14,3%	28,9 %
		% of Total	4,9%	9,4%	6,9%	0,5%	1,2%
		Count	129	368	318	28	38
		% within gender	14,6%	41,8%	36,1%	3,2%	4,3%
Total	% within exhaustion Index	100,0%	100,0%	100,0%	100,0%	100,0 %	
	% of Total	14,6%	41,8%	36,1%	3,2%	4,3%	

In this category is obvious that both genders differ – only 12.7 % of women reached extremely bad exhaustion index when compared to 21.3 % of all participating men. The outcomes in other categories are much closer to each other from the gender point of view.

## 5 Discussion

Based on the obtained outcomes we summarize that there were 881 participants from 24 districts of Slovakia in our research. Non-representative proportion of men to women in the research remains a possible threat regarding deformation of some outcomes. A typical feature across whole sample was an extremely high index of exhaustion; 14.4 % of respondents with *very bad* and 41.8 % with *bad* index of exhaustion. When taking a deeper look, we see 12.7 % of women and up to 21.3 % of men with very bad exhaustion index. Unfortunately, only 3.2 % of all respondents reached *good* and 4.3 % *the best* exhaustion index. These numbers are really alarming since the Institute of Public Health and the European Agency for Occupational Health and Safety officially announced that the stress was the second most frequent health problem across all Europe and the reason causing very high number of sick leaves. According to their findings, there is no difference between men and women, and our outcomes practically confirmed this information. There was no statistically significant difference between genders in any observed variables in the categories of both emotional and physical stress. The biggest and statistically most significant differences were found in the category – region of our respondents, or, in other words, the place where they live. Since we did not concentrate on the reasons for those differences, we cannot say where the origin of this problem lies. Generally, we

can confirm that the highest stress level, both emotional and physical one, was measured among respondents from regions of Nové Zámky and Saľa.

## 5.1 Conclusion and restrictions in our research

Our treatise brings transparent elaboration of indicators of exhaustion index, physical and emotional stress and the overall stress rate within observed sample. Obtained data describe contemporary situation in the frame of Slovakia.

Possible limits of our research:

- inadequate representativeness of the sample can be negatively reflected in the measurement outcomes,
- we were dealing only with volunteers who were willing to undergo this examination, so our outcomes might be a bit out of focus since those volunteers probably were people who particularly felt some problems regarding stress,
- another research limit was that we did not deal with the analysis of reasons causing stress among respondents.

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## Primary Paper Section: A

## Secondary Paper Section: AN, AQ, FP