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Overweight in Relation to Motor Activity and Stress Level of University Students

Abstract

A current problem of the population nowadays appears to be the lack of motor activity, the increase in BMI and the growth in stressogenic factors in the way of life of the population. This in turn affects the quality of human life and health. On a sample of university undergraduates (794 men and 1,169 women) we were observing the relation between overweight, namely the level of BMI gained via somatometric measurement, and the amount of subjectively evaluated level of motor activity, in their relation to the subjectively perceived extent of stress in their lifestyle, using the method of questionnaire. The results in both genders confirmed the existing relationship between BMI values and the degree of physical activity as well as the correlation between motor activity and subjectively perceived stress. As a result, the relationship between the variables motor activity and stress level did not prove significant.

Keywords: BMI, obesity, weight reduction, health, quality of life, lifestyle.

Introduction

Addressing obesity requires a comprehensive – holistic approach that respects and takes into account the biological, psycho-social and health elements. Obesity became, on the turn of the millennium, the most common metabolic disease due to the changes in living conditions and lifestyle (Hainer et al., 2004). The WHO (1) points out the plight. The prevalence of obesity has doubled after the year 2008. The national prevalence of obesity is monitored using data from the National Health and Nutrition Examination Survey. Obesity among adoles-

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cents aged 12–19 increased from 5% to 18,4% during the period 1976–1980 and 2009–2010 (Fryar et al., 2012).

In Slovakia, monitoring the occurrence of overweight and obesity in undergraduates has been pursued by Bartík et al. (2004), Žídek (2009), Ležovič et al. (2010), Štovčíková (2010), Hrčka et al. (2011), when they were determining overweight and obesity using the Body Mass Index (BMI) method. BMI level results by Ležovič et al. (2010), and Štovčíková (2010), point out higher values of those in men. It is important to follow the trend of BMI levels in undergraduates, because of the increase in their values in the upper grades (Bobrík, Benko, 2006) and a further increasing trend with ageing of both genders (Ležovič et al., 2010, Zusková et al., 2012). Critical incidence of underweight among female undergraduates and the potential impact of poor eating habits and the media influence on the trends in fashion and appearance are also being monitored (Gádošiová, 2003).

Globally, there are warnings against the gradual decline in habitual physical activity in children and youth, resulting in increased body weight with age and decline of functional ability. Research interest in physical activity (PA) is intensified by finding its association with obesity, cardiovascular diseases, type 2 diabetes and some forms of cancer. PA is thus an important part of primary and secondary prevention of these diseases (Church, Blair, 2009). It is currently becoming the biggest public healthcare problem (Blair, 2009). As an essential remedy for this situation appears to be an increase in the volume of regular physical activity (PA), establishment of active lifestyle, especially among children and the youth (Bouchard, 2006). There exist a documented decline in implementation of PA over the past two decades, regardless of age and gender (Bunc, 2008, 2010; Brtková et al. 1992, 2008; Uher, 2010; Uher, Pullmannová Švedová, 2013) point out the negative trends in undergraduates' lifestyle such as the decrease in the hours spent by carrying out PA, increase in proportion of fat within body composition and a decrease in functional ability. The impact of intrapersonal and interpersonal characteristics towards a healthy lifestyle, health-related behaviour, as well as risk-taking behaviour of adolescents is reflected in current models of health (Neyer, Lehnart, 2006).

Exercises as a form of PA affect not only weight reduction, but also improve a number of psychiatric symptoms, such as depression-loaded mind, help reduce anxiety, increase self-esteem and positive reinforcement of the psyche in coping with stress (Křivohlavý, 2009). In research by Zusková et al. (2012) carried out among undergraduates, we found significant correlation between increased BMI values and the reasons for participating in a weight-loss program, e.g. bodybuilding and improving one's lifestyle. The level of comprehensive education regarding healthy lifestyle and prevention of obesity in Slovakia does not match the one in Western European countries (Vojtová, Hrčka, 2011). In the above study, the question seeking answer on what BMI informs about was correctly

answered by only 65% Slovaks compared to 90% Austrians. The effects of endurance training on body weight were indicated by 70% Slovaks and 83% Austrians, and only 47% Slovaks compared to 78% Austrians responded stating that appropriate long-term exercise can reduce heart rate. The study by Stempelová and Topoľská (2010) points out that respondents have poor awareness of their responsibility for their own health and they are unable to properly internalize the knowledge of healthy lifestyle, even if it seems sufficient. Time distribution of activities refers to their capacity of making better use of leisure time for supporting health – sports, healthy diet, rest, sleep at the expense of labour are neglected. Physical activity is considered an important investment in the future of an individual also at the national level. Lee et al. (2012) state that inactivity causes 9% (range 5,1–12,5) of premature mortality, or more than 5,3 million of the 57 million deaths that occurred worldwide in 2008. If inactivity were not eliminated, but decreased by 10% or 25%, more than 533, 000 and more than 1.3 million deaths, respectively, could be averted every year. According to those authors, the assumption stands that elimination of physical inactivity would increase life expectancy of the world's population by 0,68 (range 0,41-0,95) years.

Physical activity in the form of sporting activity is clearly demonstrated as a means of stress reduction (Bidle, 1995). Some types of stress, such as work stress, have been associated with obesity-related behaviours among adults (Tamers et al. 2011; Cash et al. 2011). Higher levels of perceived stress were associated with lower levels of eating awareness, physical activity, and walking. BMI in that study was not associated with perceived stress (Barrington at al., 2012). Evidence for an association between stress and physical activity behaviours is mixed (Trost et al., 2012), and more testing of physical activity theory is needed to identify inconsistencies in the literature (Nigg est al., 2008; Rhodes, Nigg, 2011). Greater life stress and stress reactivity contribute to deposition of the central fat in lean women (Epel at al., 2000).

Objective

Analysis of the incidence of overweight and obesity in undergraduates in relation to physical activity and subjectively perceived amount of stress.

In relation to work, we assume that there exist a significant correlation between increased BMI levels and a lower level of physical activity in the lifestyle of students.

Research methods

The group of large-scale research consisted of first-year college students of the humanities and natural sciences, plus students with technical orientation at two universities. It comprised of 1169 women of the average age 21.68 (sd=2,83), and 794 men of the average age 21.28 (sd=2,22).

The data was obtained via a questionnaire and somatometry of basic parameters, height (cm) using a meter mounted on the wall, weight (kg) using a BF551 OMRON Body Composition Monitor scale, from which we calculated Body Mass Index (BMI). BMI values were categorized into different levels in accordance with WHO (< 18,5 underweight, 18,5–24,99 optimum weight, 25–29,99 overweight, 30–34,99 first degree obesity, 35–39,99 second degree obesity, >40 third degree obesity).

The questionnaire was completed by students in September 2012 at the Pavel Jozef Safarik University in Kosice and the Technical University in Kosice at the beginning of the first semester. From the original test battery we shortlisted the following set of questions for our work: "What is your overall amount of physical activity (works in the garden, at home, at school, sports, exercise etc.) during the past year?" The options for answer were: excessive, adequate, inadequate, minimum, other and "How would you assess on a scale the level of stress in your life over the past half a year?" expressed on a 7-point scale (1 – none, 4 – moderate, 7 – extreme). Data were processed using RExcel (Baier, Neuwirth 2007). In addition to basic measures of centre and spread, Wilcoxon Rank Sum Test and Chi-squared test for independence were applied. Statistical significance of the results was determined at $\alpha < 0,05$.

The article is part of the grant project

Results

In the male group, the average height recorded was 179,12 cm (sd 6,69 cm) and the average weight was 76,47 kg (sd 13,42 kg). In the female group, the average recorded height was 166,23 cm (sd 6,19 cm) and average weight was 60,22 kg (sd 10,49 kg). To apply the BMI method, we obtained the distribution of pro-bands at different levels (Fig. 1).

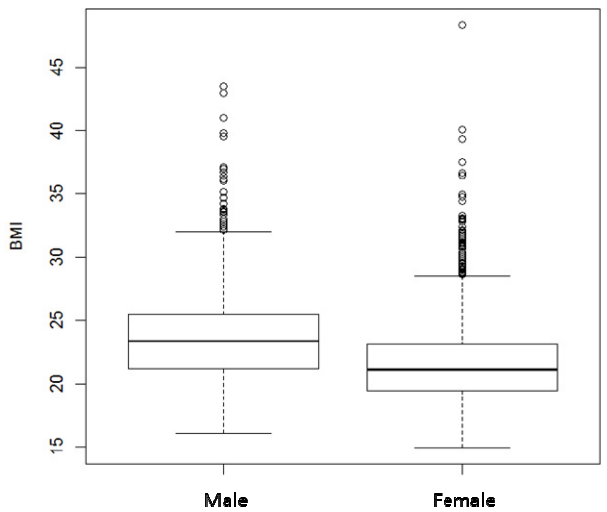

Figure 1. The spread of BMI values in the groups of male and female undergraduates

The male and female group differed significantly in BMI values (χ-squared 101,36 at $\alpha < 0{,}05$). In males the average BMI was 23,80 (sd 3,79) and in females it was 21,77 (sd 3,56). The percentage of pro-bands distribution, in particular the BMI levels, are presented in Table 1.

Tab. 1. BMI of males (n = 794) and of females (n = 1169) within the same gender group

	Under-weight		Optimum weight		Overweight		Obesity 1st degree		Obesity 2nd degree		Obesity 3rd degree	
	n	%	n	%	n	%	n	%	n	%	n	%
Males	28	3,5	519	65,4	198	24,9	36	4,5	10	1,3	3	0,4
Females	145	12,4	845	72,3	139	11,9	33	2,8	5	0?4	2	0,2

Excessive physical activity was reported by 16% students compared to 5% female students in the previous semester. Insufficient physical activity was reported by 15% of male and 21% of female students. Up to 72% of the female students rated their PA as minimum level compared to 44% of males. Subjectively evaluated PA representation among university male and female students differs significantly in favour of a better assessment by males ($W = 540748.5$, $p < 2.25e\text{-}13$), whereas the subjective perception of stress is different, with significantly higher levels in women ($W = 329457.5$, $p < 2.2e\text{-}16$). On a scale evaluation of stress from 1 to 7, the extreme values of 1 and 7 in the rating have no such informative value as the values from the centre downwards and upwards to higher stress values. A mean was reported by 22% of male students and 43% of females, level 5 was reported by 12% of males and 28% of females, level 3

downwards was reported by 22% of males compared to 11% of females. Figures 2 and 3 provide graphic assessment of physical activity and stress.

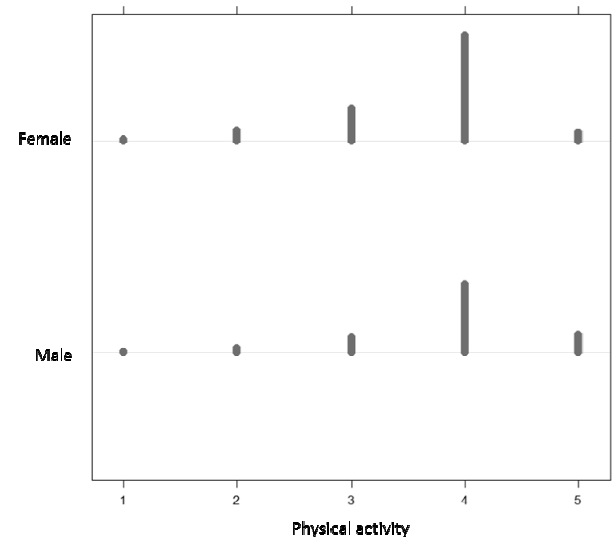

Figure 2. Assessment of physical activity in the male and female student groups

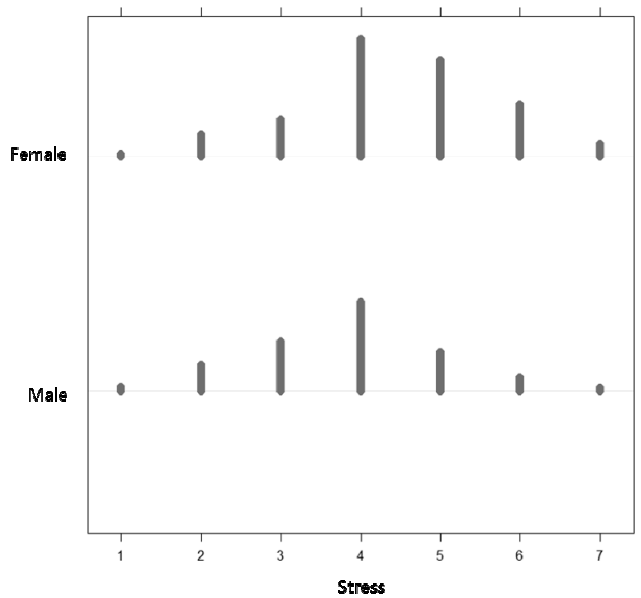

Figure 3. Subjective assessment of stress level in the male and female student groups

Legend: scale 1 – 7; 1 – none,4 – moderate, 7 – excessive

We reported significant connection between PA and BMI levels in both the female students group X-squared=18.8199, df=9, p-value=0.02677 and among the male students (X-squared=21.089, df=9, p-value=0.01226). For correct use of the Chi- square test, we merged obesity degrees I and II into one category of "obesity" and we did the same with physical activity level 1 and 2. Tables 2 and 3 show that optimum weight correlates with above- average and adequate PA, while the ranges of overweight and obesity are related to inadequate and minimum PA reported to a greater extent than it is in the optimum weight range.

Tab. 2. Physical activity and BMI of male students (%)

BMI	Physical activity (%)					
	other	**minimum**	**insufficient**	**adequate**	**excessive**	**Total**
overweight	0,1	1,1	4,2	16	3,5	24,9
obesity 1st degree	0	0,5	1,3	2,4	0,4	4,5
obesity 2nd degree	0	0,3	0,3	0,9	0,9	1,6
optimum weight	0,6	2,4	8,3	41,4	12,6	65,4
underweight	0	0,1	0,6	2,6	0,1	3,5
Total	0,8	4,4	14,6	63,4	16,9	100

Tab. 3. Physical activity and BMI of female students (%)

BMI	Physical activity (%)					
	other	**minimum**	**insufficient**	**adequate**	**excessive**	**Total**
overweight	0,1	0,5	3,3	7,5	0,4	11,9
obesity 1st degree	0	0,2	0,7	2,0	0	2,8
obesity 2nd degree	0	0	0,3	0,2	0,1	0,6
optimum weight	0,5	4,8	13,7	49,1	4,2	72,3
underweight	0,1	1,7	2,7	7,1	0,8	12,3
Total	0,7	7,2	20,7	65,9	5,5	100

If in both sets of students, we look at the representation of extreme values of stress in the individual BMI ranges (line evaluation of contingency tables 4 and 5), there appears to be a tendency of higher incidence of the 7 value in pro-bands with overweight and obesity compared to pro-bands with optimum weight, those having, in contrast a higher representation of value 1. Significant correlation however was neither proved in the set of female nor male students.

Tab. 4. Rate of subjectively perceived stress and BMI among male students (%)

BMI	Stress							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
overweight	1,5	12,8	19,4	38,8	16,8	8,2	2,6	100,1
obesity 1st degree	0	13,9	16,7	36,1	16,7	11,1	5,6	100,1
obesity 2nd degree	7,7	0	30,8	38,5	15,4	7,7	0	100,1
optimum weight	2,9	11,4	22,6	38,6	17,8	5,2	1,5	100
underweight	3,6	14,3	25	46,4	7,1	3,6	0	100

Legend: scale 1 – 7; 1 – none,4 – moderate, 7 – excessive

Tab. 5. Rate of subjectively perceived stress and BMI among female students (%)

BMI	Stres							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
overweight	0	5,8	9,4	32,4	35,3	14,4	2,9	100,2
obesity 1st degree	3,0	3,0	15,2	30,3	24,2	18,2	6,1	100
obesity 2nd degree	0	0	14,3	14,3	28,6	14,3	28,6	100,1
optimum weight	0,7	6,8	10,9	35,5	27,3	15,2	3,7	100,1
underweight	0,7	7,6	11,8	31,2	27,1	16	5,6	100

Legend: scale 1 – 7; 1 – none,4 – moderate, 7 – excessive

We found significant relationship between PA and the degrees of stress both in the group of male students (X-squared=27.2819, df=12, p-value=0.007036) and in the group of female students (X-squared=36.6133, df=12, p-value=0.000258). For the correct use of chi-square test we merged the extreme levels of stress – 1 and 2 into an only category as well as 6 and 7 into one category.

Contingency tables 6 and 7 show a higher representation of correlation between high assessed stress levels and lower PA, and between higher PA values and lower assessed stress levels.

Tab. 6. Relationship between the level of stress and PA among male students

Physical activity	Stress						
	1	**2**	**3**	**4**	**5**	**6**	**7**
other	0	2,2	0	0,7	1,5	0	0
minimum	5	1,1	4,1	3,3	5,9	14,3	6,7
insufficient	15	9,7	11,6	13	22,2	22,4	20
adequate	60	67,7	64	68,1	54,8	55,1	40
excessive	20	19,4	20,3	15	15,6	8,2	33,3

Tab. 7. Relationship between the level of stress and PA among female students

Physical activity	Stres						
	1	**2**	**3**	**4**	**5**	**6**	**7**
other	0	0	08,	0,5	1,2	0	2,1
minimum	0	3,9	7	5,5	7	10,7	17
insufficient	25	22,1	18	15,5	25,6	23,6	23,4
adequate	50	68,8	70,3	72,2	63,4	56,7	51,1
excessive	25	5,2	3,9	6,2	2,7	9	6,4

Discussion

Our results regarding BMI values closely correspond with research in Slovak university students by Hrčka et al. (2011), where the average values for females were 20.56 and for males 23.89. In the research of Zidek (2009), the average index for men was 23.42 while for female students Bartik et al. (2004) reported 20.8. BMI results correspond to the findings of Ležovič et al. (2010), Štovčíková (2010), in favour of higher values in the male group. A higher representation of females within the range of underweight may seem to indicate different nutrition trends in the lifestyle of female students. The correlation between overweight and physical activity, as demonstrated in our study in the higher BMI values and lower level representation of physical activity during the initial year at college confirms the findings of Cepková (2010), (2011a, 2011b) and Kim at al. (2005). According to Parson et al. (2005), increasing age and inactivity are associated with BMI values more in middle adulthood than in adolescence. Physical activity is not yet replaceable by any other activity, there exists no alternative to it. It was already recognised as human health support factor in times of Hippocrates. It should be considered a priority within education towards a healthy lifestyle as an important factor in prevention of overweight and obesity, but also as a means of its therapy. In terms of prevention, it is important to start with physical activity in early childhood (Avdičová et al., 2012; Chovanová, 2011, 2012; Chovanová, Majherová, 2012; Peralta, Marques, 2013; Pullmannová, Švedová, 2010), but we believe that university education should include this dimension of education, too. The fact is that education can play an important role in the knowledge about healthy lifestyle and its real fulfilment. The research Avdičová et al. (2012) in this regard points out the need to address the lower education group, in terms of gender primarily middle-aged men. PA is insufficient more in women than in men. PA has an effect on inhibition of stress factors in a person's life (Máček & Vávra, 1988), which is indirectly pointed out also in our results. The problem of overweight and deficit in physical activity is not only linked with obesity. Blair (2001) describes the lack of exercise and low levels of

cardio-respiratory fitness as a major cause of chronic illness, premature mortality, poor quality of life, loss of functions and of independence while getting older. Adequate values of factors in our study such as health, BMI and physical activity reduce the risk hypertension occurrence (Hu et al, 2005). First year university students mostly bring in lifestyle habits from their family homes. After taking on college education, there comes a change in lifestyle, which may have an impact on the routines and lead to emergence of new behaviours. Therefore, monitoring the variables listed in our study is to undergo further investigation with a lapse of time within the study period of the pro-bands.

Conclusion

The results of our research have shown correlation between gender and BMI. Higher BMI values were recorded in male students. Underweight as an accompanying problem of bodyweight and health is mainly found in the group of female students. The study confirmed relationship in both genders between subjectively assessed satisfaction with the physical activity and BMI values with higher BMI values and lower level assessment of physical activity within the last year of students at university. We hereby confirm the hypothesis. Also, we proved the relation between physical activity and the occurrence of subjectively perceived stress level. On the other hand, the work did not confirm correlation between BMI and subjectively perceived stress level. We conclude that physical activity may be an important health factor in terms of weight loss and of stress perception in the life of college students. Another objective of our research is to monitor this area of study after accomplishing one year of study at university. Lifestyle changes in the life of the first-year students can play a vital role as an interfering factor in initiating changes to these variables.

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Streszczenie

Nadwaga w stosunku do aktywności fizycznej i poziomu stresu studentów wyższych uczelni

Współcześnie obserwuje się narastanie problemu deficytu aktywności fizycznej, wzrost wskaźnika BMI oraz coraz większy udział czynników stresu w sposobie życia społeczeństwa. Tendencje te z kolei wpływają negatywnie na jakość życia i zdrowie człowieka.

Badaniom somatometrycznym poddano grupę studentów wyższych uczelni (794 mężczyzn i 1169 kobiet), aby określić związek pomiędzy nadwagą – konkretnie wysokim poziomem BMI – a stopniem aktywności fizycznej i subiektywnie postrzeganym poziomem stresu. Opinie na ten temat zebrano w badanej grupie za pomocą kwestionariusza.

Wyniki – uporządkowane wg kryterium płci – potwierdziły związek między BMI i stopniem aktywności fizycznej oraz subiektywnym postrzeganiem stresu, nie stwierdzono natomiast związku między aktywnością fizyczną a poziomem stresu.

Słowa kluczowe: BMI, otyłość, redukcja wagi ciała, zdrowie, jakość życia, styl życia.